



THE
POWER
TO KNOW.

SAS[®] 9.2

Companion for Windows

Second Edition

The correct bibliographic citation for this manual is as follows: SAS Institute Inc. 2010. *SAS® 9.2 Companion for Windows, Second Edition*. Cary, NC: SAS Institute Inc.

SAS® 9.2 Companion for Windows, Second Edition

Copyright © 2010, SAS Institute Inc., Cary, NC, USA

ISBN 978-1-60764-482-8

All rights reserved. Produced in the United States of America.

For a hard-copy book: No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise, without the prior written permission of the publisher, SAS Institute Inc.

For a Web download or e-book: Your use of this publication shall be governed by the terms established by the vendor at the time you acquire this publication.

U.S. Government Restricted Rights Notice. Use, duplication, or disclosure of this software and related documentation by the U.S. government is subject to the Agreement with SAS Institute and the restrictions set forth in FAR 52.227-19 Commercial Computer Software-Restricted Rights (June 1987).

SAS Institute Inc., SAS Campus Drive, Cary, North Carolina 27513.

1st electronic book, May 2010

1st printing, May 2010

SAS® Publishing provides a complete selection of books and electronic products to help customers use SAS software to its fullest potential. For more information about our e-books, e-learning products, CDs, and hard-copy books, visit the SAS Publishing Web site at support.sas.com/publishing or call 1-800-727-3228.

SAS® and all other SAS Institute Inc. product or service names are registered trademarks or trademarks of SAS Institute Inc. in the USA and other countries. ® indicates USA registration.

Other brand and product names are registered trademarks or trademarks of their respective companies.

Contents

<i>What's New</i>	<i>ix</i>
Overview	ix
SAS Default Directory Path	ix
Word Tip	ix
Software Migration	x
Support for Windows Versions	x
Running SAS in Batch Mode	x
SAS Disk Cleanup Handler Utility	x
Recovery Information If SAS Does Not Start	x
SAS Logging Facility	xi
Remote Browsing	xi
Reformatting SPSS Files	xi
SAS Language Elements	xi

PART 1 **Running SAS under Windows 1**

Chapter 1 △ Getting Started	3
SAS: Exploiting the Power of Windows	4
Starting SAS	6
Files Used by SAS	12
Submitting SAS Code	23
Interrupting Your SAS Session	26
Running Windows or MS-DOS Commands from within SAS	26
Terminating a SAS Process	30
Ending Your SAS Session	30
Chapter 2 △ Interacting with SAS under Windows	33
Overview of the SAS Interface	35
Working within Your SAS Session	37
Customizing Your SAS Session	58
Accessing Online Help and Documentation	73
Accessibility Features in SAS under Windows	77
Chapter 3 △ Using the SAS Editors	85
Using the Enhanced Editor	86
Using the Program Editor	111
Chapter 4 △ Using SAS Files	119
Introduction to SAS Files	120
Multi Engine Architecture	124
Using Data Libraries	127
Accessing SAS Files from Multiple SAS Sessions	136

Using SAS Files from Other Versions with SAS 9.2 for Windows	137
Using SAS 9.2 Files with Previous Releases	141
Using Remote Host SAS Files in SAS 9.2	142
Reading BMDP, OSIRIS, and SPSS Files	142
Transferring SAS Files between Operating Environments	145
Accessing Database Files with SAS/ACCESS Software	145
Using the SAS ODBC Driver to Access SAS Data from Other Applications	146

Chapter 5 △ **Using External Files** 147

About External Files	148
Referencing External Files	148
Accessing External Files with SAS Statements	158
Accessing External Files with SAS Commands	161
Advanced External I/O Techniques	162
Reading Data from the Communications Port	164

Chapter 6 △ **Managing SAS Output** 167

Printing	168
Routing Procedure Output to a Web Browser	181
Routing Procedure Output and the SAS Log to a File	184
Using the SAS Logging Facility to Write Log Messages to the Windows Event Viewer	186
Producing Graphics	186

Chapter 7 △ **Performance Considerations** 197

Hardware Considerations	197
Windows Features That Optimize Performance	200
SAS Features That Optimize Performance	206
Network Performance Considerations	207
Advanced Performance Tuning Methods	208

PART 2 **Using SAS with Other Windows Applications** 213

Chapter 8 △ **Using Lotus Notes to Distribute SAS Data** 215

Introduction to Using Lotus Notes with SAS	215
Populating a Lotus Notes Database Using the DATA Step and SCL Code	216

Chapter 9 △ **Using Windows System Tools with SAS** 223

Introduction to Using Windows System Tools with SAS	223
Event Viewer Application Log	224
Performance Tools	228
Starting SAS as a Windows Service	234

Chapter 10 △ **Using OLE in SAS/AF Software** 243

About OLE	244
SAS/AF Catalog Compatibility	244
Inserting an OLE Object in a FRAME Entry	244

Editing an OLE Object within a FRAME Entry	248
Invoking OLE Verbs	249
Using Linked OLE Objects	249
Converting OLE Objects	251
Automating OLE Objects and Applications	252
Using OLE Custom Controls (OCXs) in Your SAS/AF Application	259
Chapter 11 △ Controlling SAS from Another Application Using OLE	267
Introduction to Automating SAS	267
Creating an Instance of SAS	267
Getting Feedback from the SAS Session	268
Examples of Automating SAS with OLE	269
Methods and Properties for Use with a SAS OLE Automation Object	270
Chapter 12 △ Using Dynamic Data Exchange	275
Overview of Dynamic Data Exchange (DDE)	275
DDE Syntax within SAS	276
Referencing the DDE External File	276
DDE Examples	278
Chapter 13 △ Using Unnamed and Named Pipes	285
Overview of Pipes	285
Using Unnamed Pipes	286
Using Named Pipes	288
Chapter 14 △ Accessing External DLLs from SAS	297
Overview of Dynamic Link Libraries in SAS	297
The SASCBTBL Attribute Table	298
Special Considerations When Using External DLLs	303
Examples	312
Chapter 15 △ Special Considerations for SAS/AF Programmers	317
Controlling the Appearance and Behavior of SAS	317
Controlling the Main SAS Window	317
Accessing External DLLs from SAS	320
Designing, Saving, and Loading Custom Toolbar Controls	321
Invoking SAS/AF Applications Automatically	321
Associating Your Own Logo and Icons with Your SAS/AF Application	321
Incorporating Electronic Mail into Your SAS/AF Application	322
PART 3 Features of the SAS Language for Windows	323
Chapter 16 △ Data Set Options under Windows	325
SAS Data Set Options under Windows	325
Chapter 17 △ SAS Commands under Windows	327
SAS Commands under Windows	328

Chapter 18	△ SAS Formats under Windows	379
	SAS Formats under Windows	379
	Writing Binary Data	379
	Accessing User-Written Formats from Earlier Releases to SAS 9.2	380
Chapter 19	△ SAS Functions and CALL Routines under Windows	389
	SAS Functions and Call Routines under Windows	389
Chapter 20	△ SAS Informats under Windows	419
	SAS Informats under Windows	419
	Reading Binary Data	419
	Converting User-Written Informats from Earlier Releases to SAS 9.2	420
Chapter 21	△ SAS Procedures under Windows	429
	SAS Procedures under Windows	429
Chapter 22	△ SAS Statements under Windows	449
	SAS Statements under Windows	449
Chapter 23	△ SAS System Options under Windows	473
	SAS System Options under Windows	475
	Displaying SAS System Option Settings	476
	Changing SAS System Option Settings	476
	Processing System Options That Are Set in Several Places	478
	Summary of System Options for Windows	479
Chapter 24	△ Length and Precision of Variables	591
	Length and Precision of Variables under Windows	591
	Numeric Variables	591
	Character Variables	592
Chapter 25	△ SAS Macro Facility under Windows	595
	SAS Macro Facility under Windows	595
	Automatic Macro Variables	595
	Macro Statements	597
	Macro Functions	598
	Autocall Libraries	598

PART 4 **Appendixes** **601**

Appendix 1	△ SCL Methods for Automating OLE Objects	603
	Summary of OLE Class Methods	603
Appendix 2	△ Error Messages for SAS under Windows	613
	Overview of SAS Error Messages	613
	Return Codes and Completion Status	613
	Accessing Files	614
	Using SAS Features	615

Using OLE	616
Using Networks	617
Resolving Internal Errors	617
Resolving Operating System and Windows Error Messages	618
Initialization and Termination Error Messages	619
Appendix 3 △ Graphics Considerations	621
Using TrueType Fonts with SAS/GRAPH Software	621
Appendix 4 △ Default Key Settings for Interactive SAS Sessions	623
Default Key Definitions under Windows	623
Keyboard Shortcuts within the SAS Main Window	624
Keyboard Shortcuts within the Enhanced Editor	626
Keyboard Shortcuts within Print Preview	629
Appendix 5 △ SAS Disk Cleanup Handler	631
The SAS Disk Cleanup Handler Utility	631
Appendix 6 △ Recommended Reading	635
Recommended Reading	635
Glossary	637
Index	649

What's New

Overview

SAS under Windows enables you to complete your data and computation tasks in SAS while integrating with the Windows applications that are already in place on your desktop and within your enterprise. SAS supports information sharing through Windows tools and techniques.

The following changes and enhancements are new in SAS under Windows:

- SAS Default Directory Path
- Word Tip
- Software Migration
- Support for Windows Version
- Running SAS In Batch Mode
- SAS Disk Cleanup Handler Utility
- Recovery Information If SAS Does Not Start
- SAS Logging Facility
- Remote Browsing
- Reformatting SPSS Files
- SAS Language Elements

SAS Default Directory Path

The default directory path where SAS is installed has changed. The **C:\Program Files\SAS** directory is now the root location for all of the SAS products that you install. In previous versions of SAS, the directory path was **C:\Program Files\SAS\SAS X.X**. The directory path is now **C:\Program Files\SAS\SASFoundation\9.2**. This path maps to the **!SASROOT** directory that is used in this document.

Word Tip

Information was added about Word Tips that help you understand abbreviations that you add.

Software Migration

The following information was added and enhanced regarding the migration of SAS software.

- Differences between 32-bit SAS for Windows and 64-bit SAS for Windows are clarified.
- Short extensions are now included in Windows File Extensions and their corresponding SAS Member Types table.
- References are now included in Using SAS Files from Other Versions with SAS 9.2 for Windows to the SAS Migration focus area at support.sas.com/migration.
- Starting with SAS 9.1, you can now use the MIGRATE procedure to migrate a SAS library from a previous release. You are now warned not to use the CPORT and CIMPORT procedures when you are regressing a SAS file to a previous release.
- New references to cross-release compatibility are included in the Migration focus area at support.sas.com/migration.

Support for Windows Versions

The following are new:

- Windows Vista x64. Home editions are not supported.
- Windows 7 x64
- Windows Server 2008 EPIC (Itanium)
- Windows Server 2008 R2 EPIC (Itanium).

Windows NT, Windows 2000 Server, and Windows Server 2008 are not supported.

Running SAS in Batch Mode

Information about running SAS in batch mode was added to the document.

SAS Disk Cleanup Handler Utility

The SAS Disk Cleanup Handler Utility is new. The SAS Disk Cleanup Handler will search for and clean any temporary files or directories that were generated by SAS. The SAS Disc Cleanup Handler Utility cleans directories such as SAS Work and SAS_util directories as well. SAS Disk Cleanup Handler is a COM hook into the Microsoft Disk Cleanup Handler (cleanmgr.exe).

Recovery Information If SAS Does Not Start

Information has been added to the What If SAS Does Not Start? section to recover if SAS does not start, if the screen appears and then disappears, or if SAS is very slow.

SAS Logging Facility

Information about the SAS Logging Facility has been added to the document.

Remote Browsing

Information about remote browsing has been added to the document.

Reformatting SPSS Files

Information about reformatting SPSS files has been added to the document.

SAS Language Elements

Commands

The following SAS command was modified:

- The ICON command has two new arguments: ON and OFF.

Data Set Options

The following data set option is new:

- The SGIO data set option

Functions

Options FILE SIZE and DATE MODIFIED were added to the FINFO function .

Statements

The following statements was modified:

- The INFILE statement's option TERMSTR values: CRLF, LF were modified. NL was replaced with CR.

The range of the LRECL (record-length) option was changed to 1 – 1,073,741,823 for the following statements:

- FILE
- FILENAME
- &INCLUDE
- INFILE

Macros

The automatic macro variable, SYSSCPL, has several new values. The SYSSCPL variable returns the name of the specific Windows environment that you are using.

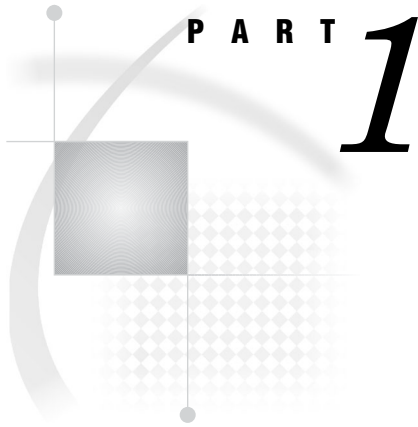
System Options

The following system options are enhanced:

- Information was added to the MEMSIZE system option to specify the total amount of memory that is available to each SAS session.
- Information was modified to the SASINITIALFOLDER system option to clarify the open OPEN and CLOSE dialog boxes and current folder.

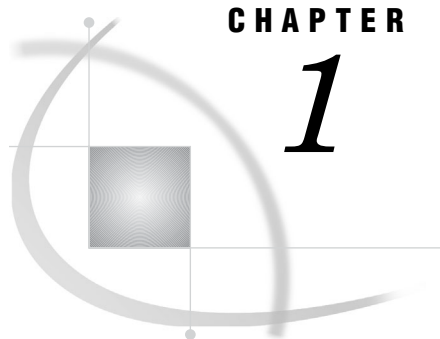
The following system options are new:

- APPEND
- INSERT
- PRIMARYPROVIDERDOMAIN
- PRNGETLIST



Running SAS under Windows

<i>Chapter 1</i>	Getting Started	<i>3</i>
<i>Chapter 2</i>	Interacting with SAS under Windows	<i>33</i>
<i>Chapter 3</i>	Using the SAS Editors	<i>85</i>
<i>Chapter 4</i>	Using SAS Files	<i>119</i>
<i>Chapter 5</i>	Using External Files	<i>147</i>
<i>Chapter 6</i>	Managing SAS Output	<i>167</i>
<i>Chapter 7</i>	Performance Considerations	<i>197</i>



CHAPTER

1

Getting Started

<i>SAS: Exploiting the Power of Windows</i>	4
<i>SAS Runs in Enterprise Environments</i>	4
<i>An Integral Part of Your Windows Editions</i>	5
<i>Compatible and Maintainable</i>	5
<i>Read and Write SAS Data Sets from Previous Releases</i>	5
<i>Use the Graphical Interface or the Command Line Interface</i>	5
<i>Starting SAS</i>	6
<i>Use SAS Interactively or in Batch Mode</i>	6
<i>Starting from the Start Menu</i>	6
<i>Starting from Custom Shortcuts or Program Items</i>	6
<i>Starting from the Run Dialog Box or a Command Prompt</i>	7
<i>Specifying the SAS Configuration File</i>	7
<i>Using the Run Dialog Box</i>	7
<i>Using the SAS Command from the Command Prompt</i>	7
<i>Starting from a SAS File</i>	7
<i>Submitting a Batch SAS Job</i>	8
<i>How to Submit a Batch SAS Job</i>	8
<i>The Status Window</i>	8
<i>Canceling a Batch Job</i>	8
<i>Windowing Procedures in a Batch Job</i>	8
<i>Starting the Program Editor When SAS Starts</i>	8
<i>Determining the Current Folder When SAS Starts</i>	9
<i>Sample SAS Session</i>	9
<i>What If SAS Does Not Start?</i>	12
<i>Files Used by SAS</i>	12
<i>Introduction to Files Used by SAS</i>	12
<i>SAS Configuration Files</i>	12
<i>Purpose of Configuration Files</i>	12
<i>The Default Configuration File</i>	13
<i>Specifying System Options in a Configuration File</i>	13
<i>Creating a Customized Configuration File</i>	14
<i>Starting SAS with an Alternate Configuration File</i>	14
<i>How SAS Finds and Processes Configuration Files</i>	15
<i>Processing Options Specified by Additional CONFIG Options</i>	18
<i>SAS Autoexec File</i>	18
<i>Introduction to the SAS Autoexec File</i>	18
<i>The Default Autoexec File</i>	18
<i>Locating a Renamed Autoexec File</i>	19
<i>Uses for the Autoexec File</i>	19
<i>Suppressing the Autoexec File</i>	19
<i>Profile Catalog</i>	20

<i>Introduction to the Profile Catalog</i>	20
<i>The Default Profile Catalog</i>	20
<i>Changing the Location of the Profile Catalog</i>	20
<i>Deleting the Profile Catalog</i>	20
<i>Work Data Library</i>	21
<i>Introduction to the Work Data Library</i>	21
<i>The Default Work Folder</i>	21
<i>Specifying the Location of the Work Data Library</i>	21
<i>Temporary Subfolders</i>	21
<i>Deleting the Work Folder</i>	21
<i>SAS Registry Files</i>	22
<i>SAS Default Folder Structure</i>	22
<i>Submitting SAS Code</i>	23
<i>Introduction to Submitting SAS Code</i>	23
<i>Submitting Code from the Enhanced Editor or Program Editor</i>	23
<i>Submitting Code from the SAS NOTEPAD Text Editor</i>	23
<i>Running SAS in Batch Mode</i>	24
<i>Submitting a Batch SAS Job</i>	24
<i>Submitting Code from the Clipboard</i>	24
<i>Submitting Code by Dragging and Dropping</i>	25
<i>Introduction to Submitting Code by Dragging and Dropping</i>	25
<i>Dragging Text from Other Windows</i>	25
<i>Dragging Files in an Interactive Session</i>	25
<i>Submitting Code Stored in Registered SAS File Types</i>	26
<i>Interrupting Your SAS Session</i>	26
<i>Running Windows or MS-DOS Commands from within SAS</i>	26
<i>Overview of Running Windows or MS-DOS Commands from within SAS</i>	26
<i>Running Windows Commands Using the X Statement or the X Command</i>	27
<i>Using a DATA Step to Issue Conditional Operating System Commands Conditionally</i>	27
<i>XWAIT System Option</i>	28
<i>XSYNC System Option</i>	29
<i>Comparison of the XWAIT and XSYNC System Options</i>	29
<i>Terminating a SAS Process</i>	30
<i>Ending Your SAS Session</i>	30

SAS: Exploiting the Power of Windows

SAS Runs in Enterprise Environments

The Windows enterprise environment provides a flexible, easy-to-use working environment by which you can integrate SAS into your enterprise solutions. The following Windows environments are supported in SAS 9.2:

Table 1.1 Supported Windows Editions for SAS 9.2

Chip Architecture	Operating System	Edition
x86, x86-64 (x64)	Windows XP	Professional
	Windows Server 2003	Standard Edition
	Windows Vista	Business
	Windows Vista	Enterprise
	Windows Vista	Ultimate
	Windows 7	Professional, Ultimate
x86, x86-64 (x64), EPIC (Itanium)	Windows Server 2003	Enterprise Edition
	Windows Server 2003	DataCenter Server
	Windows Server 2008	Standare, Enterprise, Datacenter
	Windows Server 2008 R2	Standare, Enterprise, Datacenter

Note: All other versions of Windows are not supported. Δ

An Integral Part of Your Windows Editions

SAS under Windows is designed to let you complete your data- and computation-intensive tasks while integrating with the Windows applications that are already in place on your desktop and within your enterprise. SAS supports information sharing through the most powerful tools and techniques that Windows has to offer, including

- OLE
- Dynamic Data Exchange (DDE)
- Open Database Connectivity (ODBC)
- e-mail system
- Lotus Notes
- pipes and named pipes
- the Windows clipboard.

Compatible and Maintainable

Read and Write SAS Data Sets from Previous Releases

SAS can read and write SAS data sets that were created by earlier releases of SAS.

However, in order to bridge the upgrades in the SAS catalog architecture and differences in the operating environment structure, catalogs must be converted from earlier formats (such as Release 8.2 under Windows) to SAS 9.2 format using the transport procedures CPORT and CIMPORT.

Use the Graphical Interface or the Command Line Interface

You can still use the command line as you did in previous releases. However, you can also use the graphical user interface (GUI) to issue commands. Most existing SAS

commands and windows are available through the GUI. In some cases, you select operations through dialog boxes and various other GUI controls.

Starting SAS

Use SAS Interactively or in Batch Mode

When running SAS under Windows, you can start an interactive session to submit programs and view the resulting output, or you can execute batch SAS jobs, and view the output later.

By default, invoking SAS begins an interactive SAS session. If you have a SAS program that you want to submit as a batch job, specify the `SYSPIN` system option with the name of the SAS program file when you invoke SAS.

When you start SAS in an interactive session for the first time, you are asked if you want to learn some basic tasks by taking the Getting Started Tutorial. To start the tutorial, click **Start Tutorial**. If you do not want to be prompted to take the tutorial, select **Don't show this dialog box again**. You can start the tutorial at any time by selecting **Help ► Getting Started with SAS Software**

Starting from the Start Menu

To start SAS from the Windows Start Menu:

- 1 Click **Start**.
- 2 Select **Programs**.
- 3 Select **SAS**.
- 4 Select **SAS 9.2**.

Starting from Custom Shortcuts or Program Items

During installation, the Setup program automatically creates a program item in the Start menu that you can use to start SAS. However, you can create multiple SAS items within a folder to represent several differently configured SAS sessions. Also, if you want SAS to start every time you start Windows, you can place a program item or shortcut in the Startup folder. For information about creating shortcuts, see your Windows documentation.

After you have created a shortcut to SAS, you can append system options to the SAS command. To append system options:

- 1 Open the SAS Properties window and click the **Shortcut** tab.
- 2 In the **Target** field, append the system options to the SAS command. Remember that double quotation marks are required around pathnames. For example,

```
"c:\program files\SAS\SASFoundation\9.2\sas.exe" -config "c:\mydir\sasv9.cfg"
```

Starting from the Run Dialog Box or a Command Prompt

Specifying the SAS Configuration File

If you start SAS by using a command line (either from the Run dialog box or the Command Prompt window), you might want to specify the SAS configuration file location through the CONFIG system option. Even if you use the default configuration file SASV9.CFG, specify the file to ensure that SAS uses the configuration file that you want. For more information about how SAS searches for the configuration file, see “How SAS Finds and Processes Configuration Files” on page 15.

When the WORK and SASUSER system options are set, the Work and Sasuser data libraries reside in the specified paths regardless of the path from which you invoke SAS. For more information about the Sasuser data library, see “Profile Catalog” on page 20. For more information about the Work data library, see “Work Data Library” on page 21.

Using the Run Dialog Box

To start an interactive session by using the **Run** dialog box

- 1 Select **Start ▶ Run**
- 2 In the **Open** field, type the path and the exact name of the program file, including the extension and options.
- 3 Click **OK**.

For example, if SAS is installed in the default folder **c:\Program Files\SAS\SASFoundation\9.2**, you type **c:\program files\SAS\SASFoundation\9.2\sas.exe**, and the options that you want to specify.

Using the SAS Command from the Command Prompt

You can start either an interactive SAS session or a batch SAS job by typing the SAS command at the command prompt. For example, the following command starts an interactive session, specifies the page size and line size, and indicates the location of the SAS configuration file:

```
c:\program files\SAS\SASFoundation\9.2\sas.exe -ls 80 -ps 60
-config c:\program files\SAS\SASFoundation\9.2\sasv9.cfg
```

This command starts a batch SAS job in a similar manner:

```
c:\program files\SAS\SASFoundation\9.2\sas.exe
-sysin c:\mysas\programs\progl.sas
-config c:\program files\SAS\SASFoundation\9.2\sasv9.cfg
```

Note: These examples are displayed on multiple lines because of space limitations. When you enter a command from the command prompt, the command must be on one line. Δ

Starting from a SAS File

There are two ways to start SAS from a SAS program file in Windows Explorer.

- Double-click on a SAS program file
- Right-click on a SAS program file and select the appropriate action.

Submitting a Batch SAS Job

How to Submit a Batch SAS Job

There are several ways to submit a batch SAS job:

- Specify the `SYSIN` system option in the SAS command (issued from the command prompt or from the Run dialog box) to specify the SAS program to submit.
- Right-click a file that has a `.sas` or `.sasv7bpgm` file extension. From the pop-up menu, select **Batch Submit**.
- Use the Windows Explorer and drag your SAS program file icon (the file that contains the SAS code) to the `SAS.EXE` file icon or shortcut.

The Status Window

When you run SAS in batch mode, SAS displays a Status window for the SAS job that you submit. This window tells you the name of the SAS job that is running and where your log and procedure output files are written. This window remains open until the SAS job is complete.

If you do not want to see the status window while your batch SAS job is running, invoke SAS with the `ICON` system option so that the status window becomes an icon when your job is running. You can also minimize the status window by clicking the **Icon** button when the window appears. The icon shows the busy cursor (usually an hourglass) while the SAS job is running. The icon disappears when the job is complete.

Canceling a Batch Job

You can cancel a batch job by using either the keyboard or the mouse:

- press `CTRL+BREAK`
- click **Cancel** in the Status window.

Windowing Procedures in a Batch Job

You can run windowing procedures along with `SAS/GRAPH`, `SAS/INSIGHT`, and `SAS/ACCESS` software, in a batch SAS job. When SAS reaches a point in your program where interaction is required, it opens the main SAS window.

Starting the Program Editor When SAS Starts

The Enhanced Editor is the default editor that starts when you start SAS. If you prefer to use the Program Editor, use one of the following methods to start the Program Editor when SAS starts:

- Start SAS with the `NOENHANCEDEDITOR` system option:

```
sas.exe -noenhancededitor
```

- Disable the Enhanced Editor in the Edit tab of the Preferences dialog box.

For additional information, see “Switching from the Enhanced Editor to the Program Editor” on page 111, “Edit Preferences” on page 61, and “`ENHANCEDEDITOR` System Option” on page 511.

Determining the Current Folder When SAS Starts

By default, SAS determines the current folder. SAS uses the current folder as the location to read and write SAS files when you do not specify a different pathname.

SAS also searches the current folder, based on the following statements, for the AUTOEXEC.SAS file or INITSTMT files. In this case, the path that the SASINITIALFOLDER system option specifies is disregarded.

However, you can specify a pathname to use for the current folder by using the SASINITIALFOLDER system option when you start SAS. Alternatively, you can use the following rules to determine the current folder:

- 1 If you use a program item or shortcut to start SAS and if a path is specified in the Windows Properties **Shortcut** tab (**Start in** field), SAS uses that path as the current folder.
- 2 If you use a command to start SAS by using either the Run dialog box or a command line and if the command contains a path to the SAS.EXE file, the current folder is the path that you specify as part of the SAS command, regardless of where Windows actually finds the SAS.EXE file.
- 3 If you use a command to start SAS and if you do not specify a path as part of the SAS command, then the current folder is specified by the path from which you issued the command.

If Windows cannot find the SAS.EXE file in the specified folder, the folder that is specified in the SAS command still becomes the current folder and Windows searches for the SAS.EXE file by using the Windows PATH environment variable.

For example, if you specify the following command, **c:\MYSAS** is the current folder, regardless of whether the SAS.EXE file is actually in that folder:

```
c:\mysas\sas.exe -config c:\mysas\sasv9.cfg
```

For more information, see “Changing the SAS Current Folder” on page 39 and “SASINITIALFOLDER System Option” on page 559.

Note: Do not confuse the current folder with the Work data library. For more information about the Work data library, see “Work Data Library” on page 21. Δ

Sample SAS Session

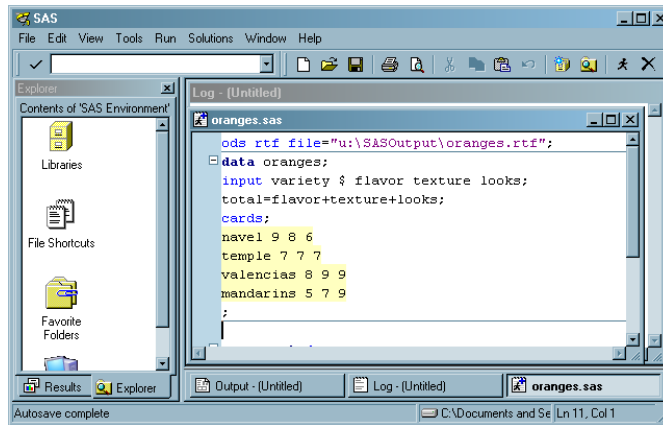
This section illustrates

- invoking SAS from the Start menu
- submitting a sample SAS program
- examining the program output
- ending the SAS session.

You can invoke SAS from the Start menu by, selecting **Programs** \blacktriangleright **SAS** \blacktriangleright **9.2**.

The following display shows the Enhanced Editor and Log windows with a sample SAS program that is ready to be submitted. This program creates a SAS data set called Oranges, which contains the results of a taste test on four varieties of oranges. The program sorts the data set by the total test score and prints the data set.

Display 1.1 Submitting the Sample SAS Program

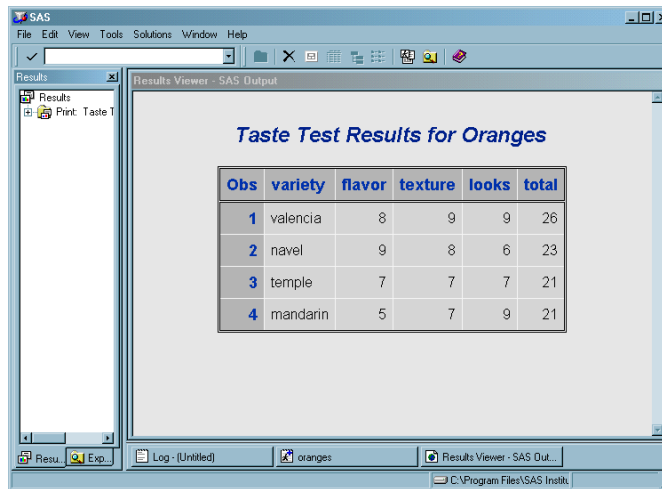


The following SAS code appears in the Enhanced Editor window:

```
ods rtf file="c:\em\oranges.rtf";
data oranges;
  input variety $ flavor texture looks;
  total=flavor+texture+looks;
  cards;
navel 9 8 6
temple 7 7 7
valencia 8 9 9
mandarin 5 7 8
;
proc sort data=oranges;
  by descending total;
run;
proc print data=oranges;
  title 'Taste Test Results for Oranges';
run;
ods rtf close;
```

After you submit the program, the output appears in the Results Viewer window as follows:

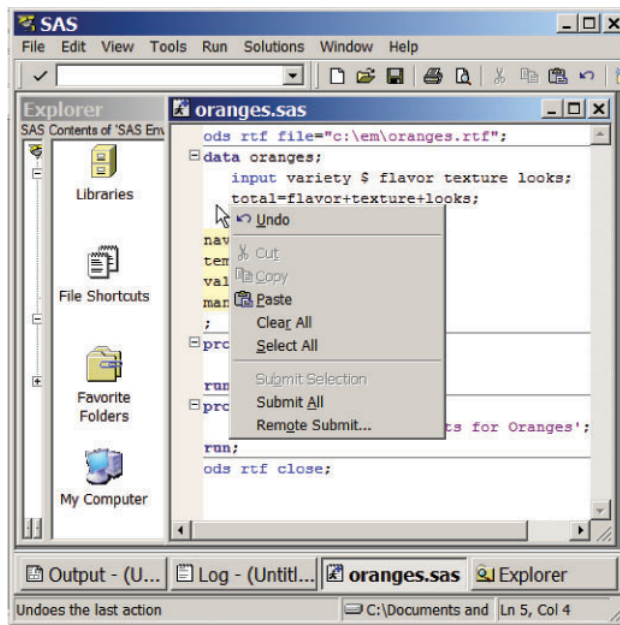
Display 1.2 Looking at the Program Output



Obs	variety	flavor	texture	looks	total
1	valencia	8	9	9	26
2	navel	9	8	6	23
3	temple	7	7	7	21
4	mandarin	5	7	9	21

The items in the SAS menu bar at the top of the main SAS window change, depending on which window is active within the SAS session. In addition, you can access window-specific pop-up menus, which offer the same menu choices. The pop-up menu in the following display was generated by right-clicking in an Enhanced Editor window.

Display 1.3 Pop-up Menu in the Enhanced Editor Window



When you are ready to end your SAS session, double-click the SAS control menu (the small icon in the upper-left corner of the main SAS window) or click the **x** (in the upper-right corner) and click **OK** when the dialog box verifies your request.

Note: If you have disabled the **Confirm Exit of SAS** option in the Preferences dialog box, your SAS session ends without asking if you are sure you want to end the

session. For more information about how to customize your SAS session, see “Setting Session Preferences” on page 59. \triangle

What If SAS Does Not Start?

If SAS does not start, the SAS log can contain error messages that explain the error. Any error message that SAS issues before the SAS log is initialized is written to the MSG window, if it is available, or to the SAS console log, which is a Windows file. Under Windows Vista, the SAS console log is typically located in **c:\Users\user-ID\AppData**. In all other Windows operating environments, the SAS console log is typically located in **c:\Documents and Settings\user-ID\Application Data**. You can obtain the location and filename for the SAS console log from the application event log. To open the application event log, submit **eventvwr** from the Run dialog box and click **Application**.

If SAS does not start, if the screen appears and then disappears, or if SAS is very slow to open, you might have a problem with a missing printer, a damaged printer driver, or a failed network printer connection. Use the following steps to correct this problem:

- 1 Verify that the printers are linking to valid network servers. If the printers are linking to invalid servers, then delete the printers by accessing **Start ► Settings ► Control Panel ► Printers**.
- 2 Download a new printer driver from the printer’s Web site and replace the current driver with the new driver.
- 3 Rename **profile2.SAS7bcat** to **profile2.old** and rename **profile.SAS7bcat** to **profile.old** at **c:\Documents and Settings\user-ID\My Documents\My SAS Files\9.2**.
- 4 Start SAS.

Files Used by SAS

Introduction to Files Used by SAS

SAS uses many files while it is running; however, some of these files are especially important from a user’s perspective. These files include the

- SAS configuration files (SASVx.CFG by default, where *x* is the release number)
- SAS autoexec file (AUTOEXEC.SAS by default)
- user Profile catalog (Profile.sas7bcat)
- user printer Profile catalog (Profile2.sas7bcat)
- Work data library (“SAS Temporary Files” folder in your system’s designated TEMP area)
- SAS Registry Files.

SAS Configuration Files

Purpose of Configuration Files

The SAS *configuration file* enables you to specify SAS system options that are used to establish your SAS session. These system options indicate, among other things, the

location of your SAS Help and Documentation files as well as the location of message files and the pathnames to SAS executable files. The SAS configuration file is particularly important because it specifies the folders that are searched for the various components of SAS products. You must have at least one configuration file in order for SAS to initialize; you can have multiple configuration files that are all processed while your SAS session begins. For a list of system options that you can use in your SAS configuration file, see “Summary of System Options for Windows” on page 479. For more information about system options, see Chapter 23, “SAS System Options under Windows,” on page 473 and “SAS System Options” in *SAS Language Reference: Dictionary*.

The Default Configuration File

In previous releases of SAS, the default configuration file was stored in the !SASROOT folder. The !SASROOT folder is the folder in which you install SAS. Starting with SAS 9, SAS creates two default configuration files during installation. Both configuration files are named SASV9.CFG.

SAS stores one of these files in the !SASROOT folder and the other in the !sasroot\nls\language-code folder. The *language-code* is a two-letter language code that indicates the SAS default language.

The SASV9.CFG file that is located in the !SASROOT folder contains a CONFIG system option that specifies the location of the configuration file for the SAS default language. The default system options that are used to start SAS are specified in the !sasroot\nls\language-code\SASV9.CFG file. For example, if SAS is installed in the default folder and the default language is English, the SASV9.CFG file in the !SASROOT folder contains

```
-config "c:\program files\SAS\SASFoundation\9.2\nls\en\sasv9.cfg".
```

SAS requires a configuration file, so you must use a SAS configuration file regardless of whether you are using interactive or batch mode.

SAS uses the default configuration file if you start SAS by double-clicking a registered SAS file type, such as .sas.

For more information about the !SASROOT folder, see “SAS Default Folder Structure” on page 22.

Specifying System Options in a Configuration File

Any system option can be specified when you start SAS. It is often more convenient to place frequently used system options in a configuration file. The syntax for specifying system options in a SAS configuration file is discussed in “Syntax for System Options in the SAS Invocation or SAS Configuration File” on page 477.

You can edit the default configuration file to add to or change the system option settings, or you can create your own configuration file. “Creating a Customized Configuration File” on page 14 discusses how to modify your configuration file.

Your configuration file is divided into two sections. The first section specifies system options that are not updated by the SAS Setup application. The second section is used by the setup application for updating information about where SAS software is installed. The sections are divided by the following warning:

```
WARNING:  INSTALL Application edits below this line. User
          options should be added above this box comment.
          INSTALL Application maintains and modifies the
          following options; -SASAUTO, -SASHELP, -SASMSG
          -PATH, and -MAPS. It also maintains and modifies
          the following CONFIG variables with the -SET option;
          INSTALL, USAGE, LIBRARY, SAMPSIO, SAMPSRC, SASCBT,
```

and SASEXT01--SASEXT50. It preserves all lines above the line containing 'DO NOT EDIT BELOW THIS LINE'.

The setup application deletes all data below this warning but does not affect the options that are specified above it. The SET system option defines the following SAS environment variables: SASROOT, SASEXT0, SASFOLDER, MYSASFILES, SASCFG, SASAUTOS, SAMPPIO, SAMP SRC, EISIMAGE, and INSTALL. The setup application appends the following system options below this warning: SASUSER, WORK, HELPLOC, DMSEXP, APPLETLLOC, TEXTURELOC, RESOURCESLOC, JREOPTIONS, SASSCRIPT, SASHELP, MSG, and PATH.

CAUTION:

To avoid corrupting your configuration file, use a SAS text editor or an ASCII text editor to edit your configuration file. The text editor that you choose to edit the configuration file is important to preserve some of the special character formatting in the file. The recommended method is to edit your configuration file by using a SAS text editor (such as the Enhanced Editor) and save it by using the Save As dialog box. If you do not use a SAS text editor, be sure to use another ASCII text editor (such as Windows Notepad). Do not use a specialized editor such as the WordPad application or Microsoft Word. Using such editors can insert carriage control characters into your configuration file or corrupt the characters that are there. \triangle

Creating a Customized Configuration File

When you install SAS, a SASV9.CFG file is created in the **!SASROOT\nls\language-code** folder. The *language-code* is a two-letter language code for the SAS default language. You can specify your own file to act as the configuration file, thus overriding the default file, SASV9.CFG.

The filename that you choose must follow the file-naming conventions for the Windows operating environment. The file extension must be .CFG.

When you use your own configuration file instead of the default configuration file, you must add several required system options. For example, you must either use the SET system option to define the environment variable, !SASROOT, or define SASROOT as a Windows environment variable.

To ensure that all required system options are defined in your configuration file, copy the default file (**!SASROOT\nls\language-code\SASV9.CFG**) and modify the copy instead of creating your own file.

You can create a customized configuration file and name the file either SASV9.CFG or .SASV9.CFG in your Windows user profile folder. During SAS invocation, SAS looks for either of these files in the Windows user profile folder if the -CONFIG options are not specified. Under Windows Vista, the path for Windows user profile folder is **c:\Users\user-ID\Documents\My SAS Files\9.2**. In all other cases, the user profile folder is **c:\Documents and Settings\user-ID\My Documents\My SAS Files\9.2**.

Starting SAS with an Alternate Configuration File

When you use a file that is located in a different folder or that has a different name as your default configuration file, you must tell SAS where to find the configuration file. Use the CONFIG system option to specify the location of this configuration file. For example, the **Target** field of the SAS Properties dialog box might contain

```
'c:\program files\SAS\SASFoundation\9.2\sas.exe -config c:\mysas\mysasconfig.CFG'
```

If SAS cannot find the configuration file, an error message is displayed, and SAS does not initialize.

For more information about the CONFIG system option, see “Processing Options Specified by Additional CONFIG Options” on page 18 and “CONFIG System Option” on page 506.

How SAS Finds and Processes Configuration Files

When you invoke SAS, SAS automatically searches several locations for configuration options that can affect your SAS session. SAS looks in the following areas and processes them in this order:

SAS_SYS_CONFIG operation system environment variable

This environment variable, if defined, must resolve to a valid configuration file. In a multi-user Windows system, this environment variable would most likely be defined as a system environment variable (instead of as a user environment variable) so that it is processed for all users on that system. Use the SAS_USER_CONFIG user environment variable to specify a user-specific configuration file.

files specified by CONFIG system options

In the SAS invocation command, you can specify one or more -CONFIG options with the names of the configuration files that you want to use. You must include a separate -CONFIG option for each file that you want to specify.

SASVx.CFG in the folder where SAS.EXE resides

SAS looks for a file that is named SASVx.CFG (*x* is the SAS version number) in the folder that contains the SAS.EXE file *only if* you do not specify a -CONFIG option at SAS invocation. This configuration file contains only a CONFIG system option that specifies the configuration file for the SAS default language.

.SASVx.CFG in the Windows user profile folder

SAS looks for a file that is named .SASVx.CFG (*x* is the SAS version number) in the Windows user profile folder *only if* you do not specify a -CONFIG option at SAS invocation. Under Windows Vista and Windows Server 2008, the Windows user profile folder is **c:\Users\user-ID\Documents\My SAS Files\9.2**. In all other cases, the user profile folder is **c:\Documents and Settings\user-ID\My Documents\My SAS Files\9.2**.

SASVx.CFG in the Windows user profile folder

SAS looks for a file that is named SASVx.CFG (*x* is the SAS version number) in the Windows user profile folder *only if* you do not specify a -CONFIG option at SAS invocation. Under Windows Vista and Windows Server 2008, the Windows user profile folder is **c:\Users\user-ID\Documents\My SAS Files\9.2**. In all other cases, the user profile folder is **c:\Documents and Settings\user-ID\My Documents\My SAS Files\9.2**.

SASVx.CFG in the current folder

SAS looks for a file that is named SASVx.CFG (*x* is the SAS version number) in the current folder *only if* you do not specify a -CONFIG option at SAS invocation.

SAS_USER_CONFIG operating system environment variable

This environment variable, if defined, must be a path to a valid SAS configuration file. In a multi-user Windows system, this environment variable would likely be defined as a user environment variable (instead of as a system environment variable) so that it is processed only for the current user on that system. Use the SAS_SYS_CONFIG system environment variable to specify a system-wide configuration file.

SAS_OPTIONS operating system environment variable

This environment variable, if defined, contains a string of option specifications for any other SAS system options that you want to process each time that you invoke SAS. For example, this environment variable might contain **-obs 2m -sasinitialfolder c:\myfolder -linesize max.**

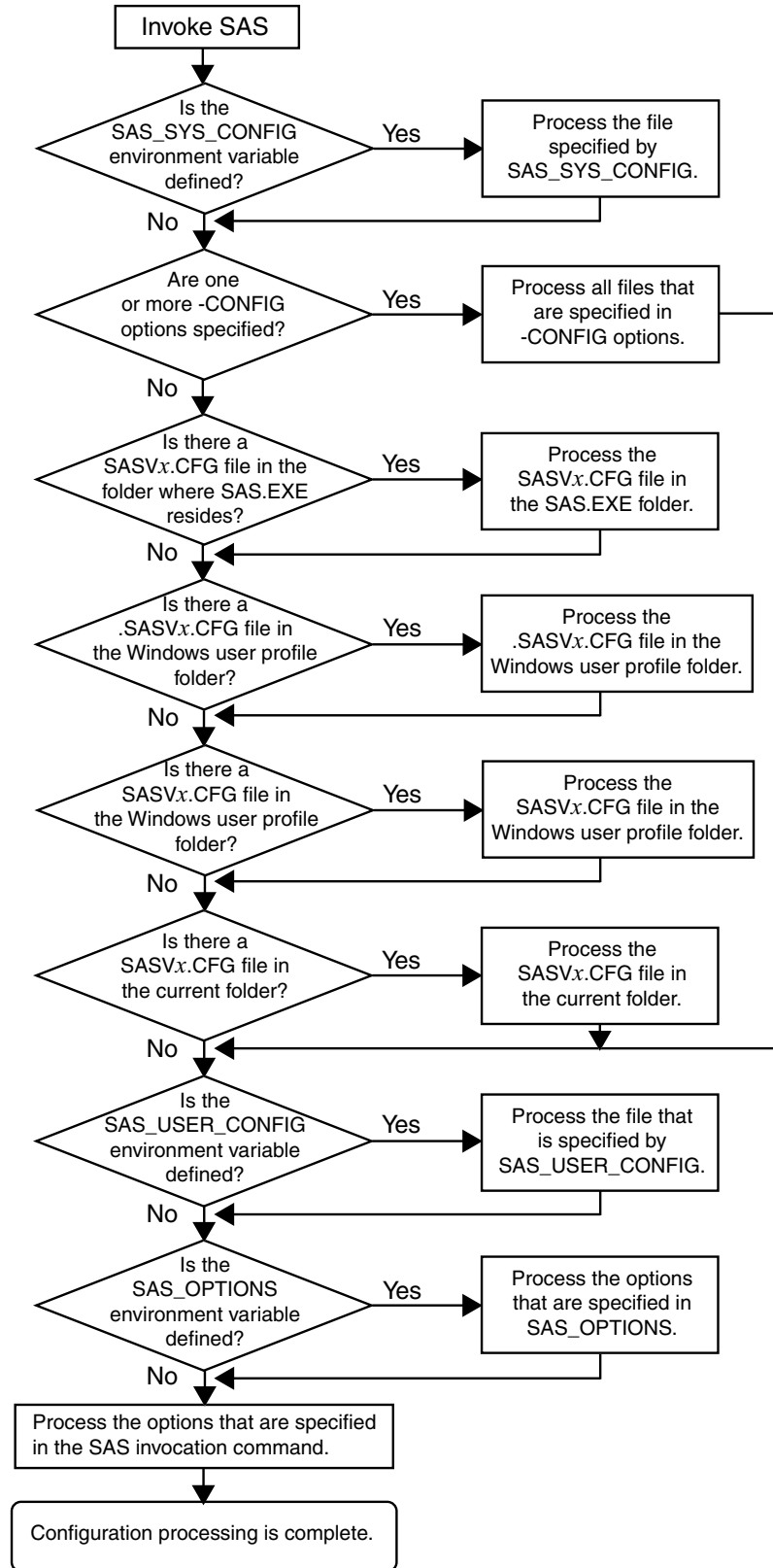
SAS invocation command line

You can specify additional system options in the command that you use to invoke SAS. These system options always override option values that are set within any of the configuration files.

If you start SAS from the Windows Start menu, the last configuration file to be processed is the one that is specified in the Start menu shortcut for SAS. The options that are specified in this configuration file override any options that have previously been processed. By default, the Start menu shortcut specifies

-config !SASROOT\nls\language-code\SASVx.CFG

SAS uses the default configuration file if you start SAS by double-clicking on a registered SAS file type, such as .sas or .sas7bpgm.

Figure 1.1 Order of Processing for SAS Configuration Files

Processing Options Specified by Additional CONFIG Options

You can also specify additional `-CONFIG` options within any configuration file. When SAS encounters a `-CONFIG` option, SAS immediately processes the options in that named file and then returns to process the remainder of the current file. SAS options that are encountered later in the processing always override those options that are specified earlier. For example, if you specify `-ICON` in the file that is specified by the `SAS_SYS_CONFIG` environment variable, and then `-NOICON` in the file that is specified by the `SAS_USER_CONFIG` environment variable, the `-NOICON` option is used. Since the options that you specify in the SAS invocation command are always processed last, those option values will always override the option values that are specified in configuration files. Figure 1.1 on page 17 illustrates the flow of the SAS configuration file processing.

For more information about the CONFIG system option, see “CONFIG System Option” on page 506.

SAS Autoexec File

Introduction to the SAS Autoexec File

The SAS *autoexec file* contains SAS statements that are executed immediately after SAS initializes and before any user input is accepted. These SAS statements can be used to invoke SAS programs automatically, set up certain variables for use during your SAS session, or set system options.

Use a SAS text editor to create your autoexec file. The text editor that you choose to create the autoexec file is important. The recommended method is to create the file by using a SAS text editor (such as the Enhanced Editor window) and save it using the Save As dialog box. If you do not use the SAS text editor, be sure to use another ASCII text editor (such as Windows Notepad). Do not use a specialized editor such as the WordPad application or Microsoft Word. Using such an editor can insert special carriage control characters into your autoexec file that SAS cannot interpret when it tries to execute the statements in the file.

The Default Autoexec File

Unlike the configuration file, a SAS autoexec file is not required in order to run SAS. But, if you do have an autoexec file, the default name is `AUTOEXEC.SAS`. SAS uses the following search order to find the `AUTOEXEC.SAS` file:

- 1 Search the current folder.

Note: For information on determining the current folder, see: “Determining the Current Folder When SAS Starts” on page 9. \triangle

- 2 Search the paths that are specified by the Windows `PATH` environment variable.
- 3 Search the root folder of the current drive.
- 4 Search the folder that contains the `SAS.EXE` file.

If an `AUTOEXEC.SAS` file is not present in one of these folders and if you did not specify the `-AUTOEXEC` option on the command line or within any of your configuration files, then SAS assumes that there is no autoexec file to process. For more information, see “AUTOEXEC System Option” on page 496.

Locating a Renamed Autoexec File

You do not have to name your autoexec file AUTOEXEC.SAS, but if you name it something else, you must use the AUTOEXEC system option to tell SAS where to find the autoexec file. For example, you can specify the following option after the path specification for the SAS.EXE file in the **Target** field of the SAS Windows shortcut:

```
-autoexec c:\mysasfiles\init.sas
```

If the specified autoexec file is not found, an error message is displayed, and SAS terminates.

Uses for the Autoexec File

The autoexec file is a convenient way to execute a standard set of SAS program statements each time that you invoke SAS. You can include OPTIONS, LIBNAME, or FILENAME statements, or any other SAS statements and system options that you want the system to execute each time you invoke a SAS session. For example, if you want to specify a script file for SAS/CONNECT software, you can place the following statement in the AUTOEXEC.SAS file:

```
filename rlink 'c:\program files\SAS\SASFoundation\9.2\connect\saslink\
startSession.scr';
```

Or you can use the OPTIONS statement to set the page size and line size for your SAS output and use several FILENAME statements to set up filerefs for commonly accessed network drives, as in the following example:

```
options linesize=80 pagesize=60;
filename saledata 'f:\qtr1';
filename custdata 'l:\newcust';
filename invoice 'o:\billing';
```

Other system options, in addition to the AUTOEXEC system option, provide ways to send SAS information as it is initializing. These options are listed below in the order in which they are processed:

- 1 CONFIG (at SAS invocation only)
- 2 AUTOEXEC
- 3 INITCMD
- 4 INITSTMT
- 5 SYSIN

For more information about the CONFIG, AUTOEXEC, INITSTMT, and SYSIN system options, see “SAS System Options under Windows” on page 475. For more information about the INITCMD system option, see *SAS Language Reference: Dictionary*.

Suppressing the Autoexec File

If you have an AUTOEXEC.SAS file in your current folder, but you want to suppress it, specify the NOAUTOEXEC option in the SAS command, as in the following example:

```
c:\program files\SAS\SASFoundation\9.2\sas.exe -noautoexec
```

Profile Catalog

Introduction to the Profile Catalog

Each time that you invoke a SAS session, SAS checks the Sasuser data library for your user Profile catalog (named Sasuser.Profile), which defines the start-up profile for your SAS session, including key definitions, display configurations, and other personal customizations. If you invoke SAS without accessing an existing Profile catalog, SAS creates one with the default key definitions and window configuration.

If Sasuser.Profile does not exist and Sashelp.Profile (in the Sashelp data library) does exist, SAS copies Sashelp.Profile to Sasuser.Profile before invoking a SAS session.

The Profile catalog is not re-created if it already exists. Any customizations (such as key definitions or color modifications) that are defined during subsequent sessions are stored in your Profile catalog in the specified folder.

The Default Profile Catalog

The default configuration file for SAS specifies the SASUSER system option as follows:

Table 1.2 The Default SASUSER Locations for the Windows Operating Environment

Windows Vista	Windows XP, and Windows Server 2003
<code>-sasuser "c:\Users\user-ID\Documents\My SAS Files\9.2"</code>	<code>-sasuser "c:\Documents and Settings\user-ID\My Documents\My SAS Files\9.2"</code>

Changing the Location of the Profile Catalog

Use the SASUSER system option to specify a location for the Profile catalog other than the default (which is a folder named `\My SAS Files\9.2`). This option is useful if you want to customize your SAS sessions when sharing a machine with other users or if users are accessing SAS from a network.

The SASUSER system option takes the following form:

```
-SASUSER ("library-specification")
```

Parentheses () are used to specify multiple library-specifications, and quotes (") are used when special characters and spaces are used in the library-specification.

If *library-specification* (which specifies a valid Windows pathname) does not exist, SAS attempts to create it. For example, if you specify the following option, a Profile catalog is created in a folder named MYUSER that resides in the root folder of the C: drive:

```
-sasuser "c:\myuser"
```

For more information, see “SASUSER System Option” on page 560.

Deleting the Profile Catalog

When you delete your Profile catalog, you lose the key definitions, window configurations, and option settings that you might have defined, as well as any other

entries that you saved to your Profile catalog. In addition, any text that you stored in NOTEPAD windows is erased. For this reason, it is a good idea to make a backup copy of your Profile catalog after making significant modifications to your SAS session settings.

Work Data Library

Introduction to the Work Data Library

SAS requires some temporary disk space during a SAS session. This temporary disk space is called the *Work data library*. By default, SAS stores SAS files with one-level names in the Work data library, and these files are deleted when you end your SAS session. You can change the Work data library in which SAS files that have one-level names are stored. For more information, see “Using the User Libref” on page 136.

The Default Work Folder

The default configuration file for SAS specifies the WORK system option to be a folder in your system’s designated temporary area (as defined by the TEMP environment variable). For example: **!TEMP\SAS Temporary Files**.

To determine TEMP environment variable, refer to the System Properties dialog box that you access from the Control Panel.

For more information about using the Work data library and overriding the default location, see “Using the Work Data Library” on page 135.

Specifying the Location of the Work Data Library

The WORK system option controls the location of the Work data library. You can specify the WORK option in your SAS configuration file or when you invoke SAS. Usually, you use the WORK option that is specified in the default configuration file.

Temporary Subfolders

Because you can run multiple SAS sessions at one time, SAS creates temporary subfolders under the folder that you specify with the WORK option. These temporary subfolders are created in the unique form `_TDnnnnnnnnnnnn`, where TD means temporary folder and `nnnnnnnnnnnn` is the process ID for each SAS session. These subfolders enable multiple SAS sessions to be invoked, each using the same configuration file, and they prevent the Work folder from being shared. SAS creates any temporary files that are required within each temporary folder. As with all temporary files that are created in the Work data library during a SAS session, these temporary folders are deleted when you end the SAS session. If SAS terminates abnormally, you might need to delete the temporary files.

Deleting the Work Folder

If SAS terminates abnormally, determine whether the Work library was deleted. If not, remove it by using Windows commands.

Note: Do not attempt to delete the Work folder while SAS is running. Δ

You can verify the location of the current Work folder by opening the Libraries folder in the SAS Explorer window. Click the right mouse button on the Work folder and select **Properties** from the pop-up menu.

SAS Registry Files

The SAS registry files are used to store information about the SAS session applications. The registry entries can be customized by using the SAS registry editor or by importing the registry files. To invoke the SAS registry editor, select **Solutions ► Accessories ► Registry Editor**.

CAUTION:

Incorrect registry entries can corrupt your SAS registry. Registry customization is generally performed by more advanced users who have experience and knowledge of SAS and their operating environment. △

SAS Default Folder Structure

The SAS Setup program creates a number of subfolders during the installation process. Understanding the organization of the SAS folders can help you to use SAS more efficiently.

The root folder of SAS is the folder in which you install SAS. Within SAS, this folder has the logical name !SASROOT. If you use the default provided by SAS, this folder is **c:\Program Files\SAS\SASFoundation\9.2**. (The examples in this document assume the !SASROOT folder is called **c:\Program Files\SAS\SASFoundation\9.2**.)

SAS creates a folder for shared components, such as the Enhanced Editor and images, that are used by other SAS products. For SAS 8, the default path for shared components is **c:\Program Files\SAS Institute\Shared Files**. For SAS 9 and 9.2, the default path for shared files, if shared components are installed, is **c:\Program Files\SAS\Shared Files**. If shared components are not installed, the default path is **c:\Program Files\SAS\SharedFiles**. There is no blank space in the spelling of SharedFiles.

One important subfolder of the !SASROOT folder is the CORE subfolder. The CORE subfolder contains many subfolders, three of which are described here:

!SASROOT\CORE\RESOURCE
contains SAS resources such as fonts and images.

!SASROOT\CORE\SAMPLE
contains the SAS sample programs.

!SASROOT\CORE\SASINST
contains the installation process software.

For each SAS product that is installed, the following subfolders might be created (not all products contain all of these folders):

!SASROOT\product\SASEXE
contains the SAS executable files.

!SASROOT\product\SASHELP
contains many specialized catalogs and files.

!SASROOT\product\SASMACRO
contains SAS autocall macro files.

!SASROOT\product\SASMSG
contains the SAS message files.

!SASROOT\product\SAMPLE
contains the Sample Library programs.

!SASROOT*product*\SASTEST
contains Test Stream programs.

!SASROOT*product*\SASMISC
contains miscellaneous external files shipped with the product.

Some products, such as SAS/CONNECT software, also have other subfolders that are associated with them. For details about each product's structure, see the specific SAS product documentation.

For more information about how the SAS folders are configured at your site, contact your on-site SAS support personnel.

Submitting SAS Code

Introduction to Submitting SAS Code

SAS under Windows provides several methods for you to submit your SAS programs for processing. SAS supports a variety of work strategies, whether you run SAS interactively or in batch, and in conjunction with other Windows programs or as a stand-alone application.

Submitting Code from the Enhanced Editor or Program Editor

To submit SAS code that you have typed into the Enhanced Editor or Program Editor window, you issue the SUBMIT command. SAS provides several ways to do this:

- Press F8 when the editor window is active.
- Click the Submit toolbar button.
- Enter **submit** in the command bar.
- From the Run menu, select **Submit**.

You can use the SUBTOP command from either the command line or the Run menu to submit one or more lines of your SAS code. For more information, see "SUBTOP Command" on page 355.

Submitting Code from the SAS NOTEPAD Text Editor

SAS allows you to submit SAS code that you have typed into the SAS NOTEPAD text editor. NOTEPAD can be invoked by selecting **Tools ► Text Editor** when the Enhanced Editor is disabled. SAS provides several ways to submit the code in NOTEPAD:

- Click the Submit toolbar button.
- Enter **submit** in the command bar.
- From the menu, select **Run ► Submit**.

Running SAS in Batch Mode

You can run SAS jobs in batch mode in the Windows operating environment. Place your SAS statements in a file and submit them for execution along with the control statements and system commands that are required at your site.

You can run windowing procedures, such as those that are associated with SAS/GRAPH, SAS/INSIGHT, and SAS/ACCESS software in a batch SAS job.

Submitting a Batch SAS Job

When you run SAS in batch mode, a status window is displayed. The status window displays the job that is running and also the location of the log and procedure output files. The status window remains open until the SAS job is complete.

If you do not want to see the status window while your batch SAS job is running, use the **ICON** system option to invoke the SAS System so that the status window becomes an icon when your job is running. You can also minimize the status window by clicking **Icon** when the window appears. The icon shows the busy pointer (usually an hourglass) while the SAS job is running, and then disappears when the job is complete. You can cancel a batch job either by pressing CTRL+BREAK or by clicking **Cancel** in the status window

The maximum line length is 32767 bytes.

If you want to establish a permanent libref, then enable the **STARTLIB** system option when you begin the batch job.

You can submit a batch SAS job by using the following methods:

- Specify the **SYSIN** system option in the SAS command (issued from the command prompt or in the Run dialog box) and specify the SAS program to submit. For example: **C:\SAS\SAS.EXE -SYSIN C:\SAS\PROGRAMS\PROG1.SAS -CONFIG C:\SAS\SASV9.CFG.**
- Right click to select a file that has either a **.SAS**, **.SS2**, **SS7**, or **.SASV7BPGM** file extension. From the pop-up menu, select **Batch Submit with SAS 9.2.**
- Select and drag your SAS program file icon (for the file that contains the SAS code) in Windows Explorer, and drop the file on the **SAS.EXE** file icon or shortcut.

Submitting Code from the Clipboard

Using the Enhanced Editor or the Program Editor, you can submit SAS code that you copied from another Windows application (such as an editor or word processor) or from SAS Help and Documentation. When you copy text from another Windows application, that text is stored in the Windows clipboard.

From the Run menu in the Enhanced Editor or from the Program Editor window, select **Submit clipboard**. The code is submitted from the clipboard directly to SAS (without appearing in the Enhanced Editor or in the Program Editor window). Notes and results are sent to the SAS Log and to the Output window, respectively. You can still issue the **RECALL** command (or press F4) to recall the submitted program into the Enhanced Editor or into the Program Editor window.

You can also use the **GSUBMIT** command to submit SAS code that is stored in the clipboard. For more information, see “**GSUBMIT Command**” on page 349.

Submitting Code by Dragging and Dropping

Introduction to Submitting Code by Dragging and Dropping

You can drag SAS programs from other Windows applications onto an open SAS session and submit them. You can also drag files that contain SAS code and drop them on an open SAS session to submit them.

Dragging Text from Other Windows

If you drag text from another Windows application or SAS window to the Enhanced Editor or the Program Editor window, that text is moved to the window by default. It is not submitted until you press F8 or issue the SUBMIT command.

However, you can override this default action by right-clicking the text to select it and then dragging it (if the application supports nondefault dragging). When you drop the selection on the Enhanced Editor or the Program Editor window, a menu appears and you can choose between moving the code or copying the code. The menu for the Program Editor also enables you to submit the code.

Dragging Files in an Interactive Session

By using the My Favorite Folders window, you can access files that exist outside the SAS environment. Files that contain SAS code can be dragged into your interactive SAS session for execution. Access the My Favorite Folders window by using the View menu.

If you drop a file that contains SAS code on the Enhanced Editor window or on the Program Editor window, that code is included in the window (but not submitted). If you drop the file on the Log or Output window or on a minimized SAS session, the code is automatically submitted.

When you minimize a SAS session, its icon appears on the Windows task bar. You cannot drop a file onto the task bar. Instead, you can drag the file to the SAS icon on the task bar and hold it there, without releasing the mouse button. After about one second, the SAS window resumes its normal size. Then you can drop the file on the open SAS session.

Dropping the file **C:\MYPROG.SAS** onto a window (other than the Enhanced Editor or Program Editor windows) of an open SAS session is the same as issuing this command:

```
gsubmit "%include 'c:\myprog.sas'";
```

You can submit more than one file at a time by selecting a group of files that contain SAS programs and then dropping them onto the open SAS session. The order in which the programs are run when they are submitted as a group is determined by Windows. Therefore, if order is important, you should drop each program file separately.

If SAS is busy when you drop a SAS program icon, the dropped file is ignored. The only indication that the dropped file was ignored is a warning beep.

Submitting Code Stored in Registered SAS File Types

During installation, the SAS Setup procedure registers certain file types with Windows to invoke specified actions when you double-click those types of objects. For example, files that have a file extension of .SAS are registered as SAS programs. These registered file types are displayed in Windows with a special icon, as shown here:



When you double-click a file that has this extension (or that has this icon) SAS is invoked and the contents of the file are included in the Enhanced Editor or Program Editor window. The SAS code that is contained in the file is not processed until you submit it (for example, by pressing F8 or by clicking the Submit tool). If you already have a SAS session running, double-clicking a file begins a second SAS session; it does not use the already-existing session.

SAS uses the default configuration file if you start SAS by double-clicking a registered SAS file type, such as .sas or .sas7bpgm.

Interrupting Your SAS Session

You can click the circled exclamation point (!) in the toolbar or press CTRL+BREAK to interrupt processing in your SAS session. Depending on what tasks SAS is performing at the time of the interrupt, you can cancel submitted statements or cancel an upload or download request. SAS prompts you with various choices (such as to continue the interrupt or cancel it) in a dialog box.

Note: Depending upon what tasks are in progress when you interrupt your session, SAS can require several seconds to stop processing. Δ

SAS also supports the common Windows methods of issuing interrupts: you can click the Control menu icon and choose to close the application, or you can select **Close** from the pop-up menu for SAS on the Windows Task Bar (or **End Task** from within the Windows Task Manager). If you use either of these methods, SAS displays a dialog box to allow you to verify your selection. Note that the task might not close until SAS has completed processing.

Running Windows or MS-DOS Commands from within SAS

Overview of Running Windows or MS-DOS Commands from within SAS

You can execute Windows or MS-DOS commands from within SAS by using the X statement or the X command. You can also use the CALL SYSTEM statement or the SYSTASK statement from within a DATA step. Windows or MS-DOS commands can be issued either asynchronously or synchronously. When you run a command as an asynchronous task, the command executes independently of all other tasks that are currently running. When you run a command as a synchronous task, the command must complete before another task can run.

To issue a command asynchronously, use either the SYSTASK statement with the NOWAIT option or specify the NOXSYNC system option. To issue a command synchronously, use either the SYSTASK statement with the WAIT option or specify the XSYNC system option. For more information about running asynchronous commands using the SYSTASK statement, see “SYSTASK Statement” on page 467.

Running Windows Commands Using the X Statement or the X Command

You can use the X statement or the X command to run Windows commands. The X statement can be run outside of a DATA step. You can enter the X command in the command bar or any SAS command line.

The X statement is similar to the X command in the SAS windowing environment. The major difference between the two is that the X statement is submitted like any SAS statement; however, the X command is issued as a windowing environment command. This section uses the X statement in its examples, but the information applies to the X command as well.

When you submit the X statement you exit your SAS session temporarily and gain access to the Windows command processor. The X statement has the following syntax:

```
X <'command'>;
```

The optional *command* argument is used either to issue an operating system command or to invoke a Windows application such as Notepad. This discussion concentrates on using the X statement to issue operating system commands; however, you should be aware that the X statement can also be used to invoke Windows applications.

If you want to run only one operating system command, include the command as an argument to the X statement. When you submit the X statement, the command is executed, and you cannot issue any additional commands.

If you want to run several operating system commands, submit the X statement without an argument. A command prompt appears where you can issue an unlimited number of operating system commands. Remember, any environment variables you define are not available to SAS. If you submit an X statement or command without a *command* argument, type EXIT to return to your SAS session.

The X command is a global SAS statement; therefore, it is important to realize that you cannot conditionally execute the X command. For example, if you submit the following code, the X statement is executed:

```
data _null_;
  answer='n';
  if upcase(answer)='y' then
    do;
      x 'md c:\extra';
    end;
run;
```

In this case, the **C:\EXTRA** folder is created regardless of whether the value of ANSWER is equal to 'n' or 'y'.

Using a DATA Step to Issue Conditional Operating System Commands Conditionally

If you want to issue operating system commands conditionally, use the CALL SYSTEM routine, as in the following example:

```
options noxwait;
data _null_;
```

```

input flag $ name $8.;
if upcase(flag)='Y' then
  do;
    command='md c:\'||name;
    call system(command);
  end;
datalines;
Y mydir
Y junk2
N mydir2
Y xyz
;

```

This example uses the value of the variable `FLAG` to conditionally create folders. After the `DATA` step executes, three folders have been created: `C:\MYDIR`, `C:\JUNK2`, and `C:\XYZ`. The `C:\MYDIR2` folder is not created because the value of `FLAG` for that observation is not `Y`.

For more information about the `CALL SYSTEM` routine, see “`CALL SYSTEM` Routine” on page 391 and the section on the `CALL SYSTEM` routine in *SAS Language Reference: Dictionary*.

XWAIT System Option

The `XWAIT` system option controls whether you have to type `EXIT` to return to your SAS session after an `X` statement or `X` command has finished executing an MS-DOS command. (The `XWAIT` system option is not used if an `X` statement is issued without a *command* argument or if the `X` statement invokes a Windows application such as Notepad.) This option and its negative form operate in the following ways:

- | | |
|----------------------|--|
| <code>XWAIT</code> | specifies that you must type <code>EXIT</code> to return to your SAS session. This is the default value. |
| <code>NOXWAIT</code> | specifies that the command processor automatically returns to the SAS session after the specified command is executed. You do not have to type <code>EXIT</code> . |

If you issue an `X` statement or `X` command without a *command* argument, you must type `EXIT` to return to your SAS session, even if `NOXWAIT` is in effect.

When a window created by an `X` statement is active, reactivating SAS without exiting from the command processor causes SAS to issue a message box containing the following message:

```

The X command is active. Enter EXIT at
the prompt in the X command window to
reactivate this SAS session.

```

If you receive this message box, click **Command Prompt** on the Windows Task Bar. Enter the `EXIT` command from the prompt to close the window and return to your SAS session.

XSYNC System Option

The XSYNC system option specifies whether the operating system command you submit executes synchronously or asynchronously with your SAS session. This option and its negative form operate in the following ways:

XSYNC specifies that the operating system command execute synchronously with your SAS session. That is, control is not returned to SAS until the command has completed. You cannot return to your SAS session until the command prompt session spawned by the CALL SYSTEM statement, the X command, or the X statement is closed. This is the default.

NOXSYNC specifies that the operating system command execute asynchronously with your SAS session. That is, control is returned immediately to SAS and the command continues executing without interfering with your SAS session. With NOXSYNC in effect, you can execute a CALL SYSTEM statement, an X command, or an X statement and return to your SAS session without closing the window spawned by the X command or X statement.

Specifying NOXSYNC can be useful if you are starting applications such as Notepad or Excel from your SAS session. For example, suppose you submit the following X statement:

```
x notepad;
```

If XSYNC is in effect, you cannot return to your SAS session until you close the Notepad. But if NOXSYNC is in effect, you can switch back and forth between your SAS session and the Notepad. The NOXSYNC option breaks any ties between your SAS session and the other application. You can even end your SAS session; the other application stays open until you close it.

Comparison of the XWAIT and XSYNC System Options

The XWAIT and XSYNC system options have very different effects. An easy way to remember the difference is the following:

XWAIT means that the command prompt session waits for you to type EXIT before you can return to your SAS session.

XSYNC means that SAS waits for you to finish with the other application before you can return to your SAS session.

The various option combinations are summarized in Table 1.3 on page 29.

Table 1.3 Combining the XWAIT and XSYNC System Options

Options in Effect	Result
XWAIT XSYNC	The command prompt window waits for you to type EXIT before closing, and SAS waits for the application to finish.
XWAIT NOXSYNC	The command prompt window waits for you to type EXIT before closing, and SAS does not wait for the application to finish.

Options in Effect	Result
NOXWAIT XSYNC	The command prompt window closes automatically when the application finishes, and SAS waits for the application to finish.
NOXWAIT NOXSYNC	The command prompt window closes automatically when the application finishes, and SAS does not wait for the application to finish.

Terminating a SAS Process

You can terminate a SAS process using several methods. A SAS server is a specific type of SAS process.

Note: Before you terminate SAS using one of the following methods, you should try to end the process using one of the methods described in “Ending Your SAS Session” on page 30 or in the documentation for the SAS server. Δ

If the SAS process was instantiated as a Windows service, then you can terminate the process using one of the following methods:

- at the command prompt, submit one of the following commands:
 - net stop <service name>** where *service name* is the name of the Windows service.
 - sc <server> stop <service name>** where *server* is in the form “\\ServerName” and *service name* is the name of the Windows service.
- in the Microsoft Management Console Services snap-in, select the service that you want to terminate and select **Stop**.

To terminate a SAS process, use one of the following methods:

- At a command prompt submit

```
taskkill/pid <process ID>
```

where *process ID* is the SAS process ID. You can get this process ID from the output of the **tasklist** command.

- in the Windows Task Manager, select the process and click **End Process**.

CAUTION:

Using the taskkill command or the Windows Task Manager to terminate a SAS process might result in data loss or data corruption. Δ

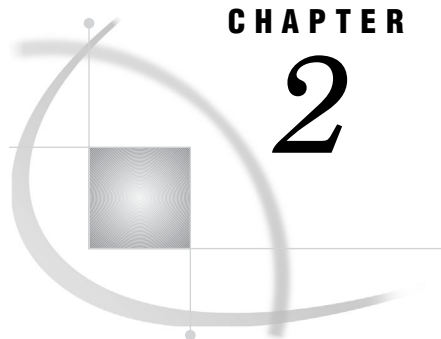
Ending Your SAS Session

You can end your SAS session using several methods, including

- selecting **Close** from the control menu of the main SAS window
- selecting **Cancel** in the Status window. This window appears when you are running in batch mode.
- double-clicking on the control menu of the main SAS window, or clicking on the **x** in the upper-right corner of the main SAS window
- issuing the **BYE** or **ENDSAS** command from a SAS command line
- submitting an **ENDSAS** statement

- closing the SAS session from the Task List by selecting the session process (the process name differs depending on how you started SAS) and selecting **End Task**
- selecting **Exit SAS** from the File menu in the main SAS window menu bar
- selecting **Exit** from the File pop-up menu
- pressing the ALT+F4 accelerator-key combination that is defined by Windows.

If SAS terminates with errors the SAS log might contain error messages that explain the failure. Any error message that SAS issues before the SAS log is initialized are written to the MSG window if it is available or to the SAS console log, which is a Windows file. Under Windows Vista, the Windows SAS console log is typically located in **c:\Users\user ID\AppData**. Under all other Windows operating environments, the SAS console log is typically located in **c:\Documents and Settings\ user ID\Application Data**. You can obtain the location and filename for the SAS console log from the Application Event Log. To open the application Event Log, submit **eventvwr** from the Run dialog box and click **Application**.



CHAPTER

2

Interacting with SAS under Windows

<i>Overview of the SAS Interface</i>	35
<i>The SAS Windowing Environment</i>	35
<i>Understanding Components of the Main SAS Window</i>	35
<i>Getting Help for the Main SAS Window</i>	37
<i>Working within Your SAS Session</i>	37
<i>Using the Docking View</i>	37
<i>Introduction to the Docking View</i>	37
<i>Docking and Undocking Windows</i>	38
<i>Resizing the Docking View</i>	38
<i>Minimizing and Restoring the Docking View</i>	38
<i>Enabling and Disabling the Docking View</i>	38
<i>Using the Window Bar</i>	39
<i>Using Menus</i>	39
<i>Changing the SAS Current Folder</i>	39
<i>What Is the Current Folder?</i>	39
<i>Interactively Selecting a New Current Folder</i>	40
<i>Using SAS Statements to Change the Current Folder</i>	40
<i>Issuing SAS Commands</i>	41
<i>Using Menus to Issue Commands</i>	41
<i>Using the Toolbar to Issue Commands</i>	41
<i>Using the Command Bar to Issue Commands</i>	41
<i>Using the Command Line to Issue Commands</i>	42
<i>Sending E-Mail Using SAS</i>	42
<i>Overview of Sending E-Mail</i>	42
<i>Initializing E-Mail</i>	43
<i>Using Your E-Mail Software to Send Mail</i>	43
<i>Using the SAS Send Mail Dialog Box</i>	44
<i>Sending the Contents of a Window by E-mail</i>	45
<i>Using the DATA Step or SCL to Send E-mail</i>	46
<i>Example of Sending E-Mail from the DATA Step</i>	49
<i>Example of Sending E-Mail Using SCL Code</i>	51
<i>Example of Sending E-Mail Using SMTP</i>	52
<i>Saving Windows to External Files</i>	53
<i>Clearing the Window and Filename</i>	54
<i>Defining Keys</i>	54
<i>Navigating with Microsoft IntelliMouse</i>	55
<i>Using the Clipboard</i>	55
<i>Selecting and Copying Text</i>	56
<i>Selecting and Copying in Nontext Windows</i>	56
<i>Pasting Bitmapped Information into Your SAS Session</i>	57
<i>Submitting SAS Code from the Clipboard</i>	57

<i>Creating Text Highlighting and Special Characters</i>	57
<i>Special Character Attributes</i>	57
<i>Alternate ASCII Characters</i>	58
<i>Customizing Your SAS Session</i>	58
<i>Selecting Fonts</i>	58
<i>Setting Session Preferences</i>	59
<i>Introduction to Setting Session Preferences</i>	59
<i>Using the Preferences Dialog Box</i>	59
<i>General Preferences</i>	60
<i>View Preferences</i>	61
<i>Edit Preferences</i>	61
<i>Results Preferences</i>	62
<i>Web Preferences</i>	62
<i>Advanced Preferences</i>	63
<i>Customizing Your Windowing Environment with Commands</i>	63
<i>Customizing Window Positions</i>	63
<i>Changing the Window Colors</i>	64
<i>Customizing Your Windowing Environment with System Options</i>	65
<i>Changing the Size and Placement of the Main SAS Window</i>	65
<i>Changing the Title of Your SAS Session</i>	66
<i>Adding Help to the Help Menu</i>	66
<i>Minimizing Your SAS Session</i>	66
<i>Adding Applications to the Tools Menu</i>	66
<i>Setting the Initial Path For the Current Folder and the Paths Specified in the Open and Save Dialog Boxes</i>	67
<i>Displaying a Custom Logo Screen during SAS Invocation</i>	67
<i>Adding User-Defined Icons to SAS</i>	67
<i>Enabling Web Enhancements in SAS</i>	68
<i>Customizing the Toolbar</i>	68
<i>Introduction to Customizing the Toolbar</i>	68
<i>Using the Customize Tools Dialog Box</i>	68
<i>Setting General Toolbar Preferences</i>	68
<i>Customizing a Toolbar</i>	69
<i>Adding a Tool to the Toolbar</i>	70
<i>Removing a Tool from the Toolbar</i>	71
<i>Customizing and Saving a Toolbar for Use with a Particular Application or Window</i>	71
<i>Resetting the Tools to the Default Settings</i>	72
<i>Examples of Useful Tools You Can Create</i>	72
<i>Accessing Online Help and Documentation</i>	73
<i>Using Microsoft HTML Help</i>	73
<i>Getting Help from the Command Bar</i>	73
<i>Getting Help in the Dialog Boxes</i>	74
<i>Getting Help for a SAS Product</i>	74
<i>Getting Help from the Help Menu</i>	74
<i>Getting to SAS Institute (and Other Web Sites) from within SAS</i>	75
<i>Viewing Output and Help in the SAS Remote Browser</i>	75
<i>What Is Remote Browsing?</i>	75
<i>Remote Browsing and Firewalls for General Users</i>	76
<i>Remote Browsing and Firewalls for System Administrators</i>	76
<i>Using Remote Browsing with ODS Output</i>	76
<i>Installing the Remote Browser Server</i>	77
<i>System Options for Remote Browsing</i>	77
<i>Accessibility Features in SAS under Windows</i>	77
<i>Introduction to Accessibility Features in SAS under Windows</i>	77

<i>Accessible Windows and Dialog Boxes</i>	78
<i>The ACCESSIBILITY System Option</i>	79
<i>Accessing the Standard or Fully Accessible User Interface</i>	79
<i>Using the Accessible Customize Tools Dialog Box</i>	80
<i>Using Accessible Properties Dialog Boxes</i>	80
<i>Enlarging Fonts</i>	81
<i>Enlarging Icons</i>	81
<i>Resizing the Docking View in the Main SAS Window</i>	81
<i>Sorting Window List Views by a Specific Column</i>	82
<i>Resizing the Detail Columns of a List View</i>	82
<i>Improving Access to Menus</i>	82

Overview of the SAS Interface

The SAS Windowing Environment

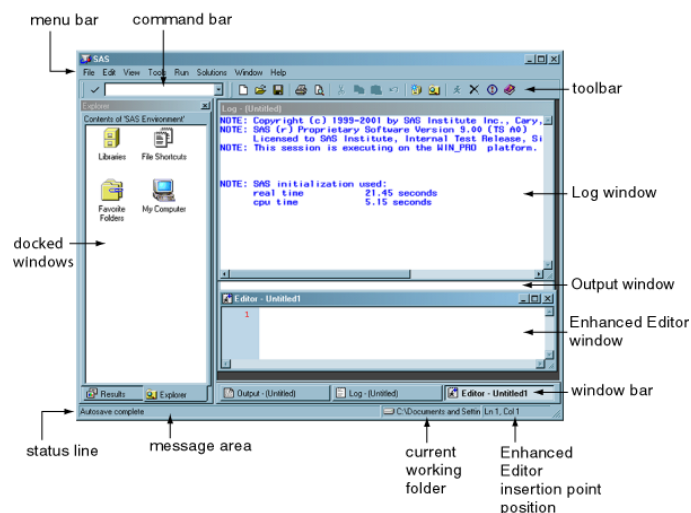
The SAS windowing environment refers to the windows that open in the main SAS window. You access the main SAS window when you start SAS from your PC or from a terminal emulator.

Windows in client software that do not access the main SAS window, such as Enterprise Guide, are documented in their product documentation. For more information about Enterprise Guide, see the Help in Enterprise Guide.

Understanding Components of the Main SAS Window

The main SAS window contains all other SAS application windows. The main SAS window is completely configurable, allowing you to use its features in a way that is productive for you. The following display shows the main SAS window as it appears when you first start SAS. This section briefly describes the features of the window.

Figure 2.1 The Main SAS Window



The following are the primary components of the main SAS window:

menu bar

presents the menus available for the active SAS application window. As you switch between application windows, the menu bar changes.

Similarly, the pop-up menus that appear when you click the right mouse button inside an application window are customized for that window.

command bar

provides a way to quickly enter any SAS command. The command bar retains a list of the commands that you enter.

To repeat a command that you previously issued, either type until the command appears in the command bar or select the command from the list box and click the check mark button. Pressing ENTER will also submit a command.

To switch the keyboard focus to the command bar, press F11 (the function key defined as COMMAND FOCUS).

toolbar

provides quick access to the commands you perform most often. The toolbar is completely configurable and can contain up to 30 tools.

You can associate different sets of tools with different SAS application windows. When you create a tool, you specify the tool button, the commands associated with the tool, Help text displayed on the status bar, and the tip text. The bitmap browser provides images that you can use to represent your commands on the toolbar.

windowing environment

contains a workspace to open windows within the main SAS window. Certain windows, such as windows that are used for navigation, can dock to the left side of the main SAS window when **Docking view** is enabled from the Preferences dialog box. Windows that cannot dock to the main SAS window open to the right of the docking area. In the above figure, the Log window, the Output window, the Enhanced Editor window, and the docked windows are all part of the windowing environment. For more information about using dockable windows, see “Using the Docking View” on page 37.

window bar

is located at the bottom of the main SAS window and provides easy access to any window within the main SAS window.

When a window opens, a button that represents that window is placed in the window bar. Whenever you want access to a window, click the button for that window. That window then becomes the active window.

You can load a file into an application by dragging a file to the window bar button for the application (making the application the active window), and then continue dragging the file into the application window.

The window bar can be enabled or disabled from either the Preferences dialog box or the window bar pop-up menu.

status bar

contains a message area, the current folder for SAS, and the Enhanced Editor insertion point position.

The message area displays Help text for menus and tools, as well as messages that are specific to SAS application windows.

The current folder area displays the name of the current working folder. To change the current folder, double-click the current folder area. For more information, see “Changing the SAS Current Folder” on page 39.

The Enhanced Editor insertion point position displays the current line and column when the Enhanced Editor is the active window.

The status bar can be enabled and disabled from the Preferences dialog box. The message line, the current folder, and the insertion point position can be enabled and disabled from either the Preferences dialog box or the status bar pop-up menu. When the message line is disabled, messages appear in the active window.

Getting Help for the Main SAS Window

SAS provides help for the main SAS window using screen tips and status bar messages.

For a description of a menu or a menu item:

- 1 Select the menu or menu item.
- 2 As the mouse pointer passes over the menu or menu item, a description of the item appears in the message area of the status bar.

For toolbar help, place the mouse pointer over a button. A pop-up ScreenTip appears below the mouse pointer and a longer description appears in the message area.

For help on other parts of the main SAS window, such as tabs, buttons, and the status bar:

- 1 Place the mouse pointer over the item.
- 2 Hold the mouse pointer over the item for a few seconds. A pop-up ScreenTip appears below the mouse pointer. When you place the mouse pointer over a window bar button, the ScreenTip contains the window name.

To customize ScreenTip and status bar help text for commands available from the toolbar see “Customizing the Toolbar” on page 68.

To enable or disable command bar or toolbar ScreenTips, you can use either the **Show ScreenTips on toolbars** option in the Customize dialog box or type the TOOL TIP command in the command bar.

All other ScreenTips can be enabled or disabled using the **ScreenTip** option in the Preferences dialog box **view** tab or by using the WSCREENTIPS command. For more information on enabling and disabling ScreenTips, see “Setting Session Preferences” on page 59, “Customizing the Toolbar” on page 68, “WSCREENTIPS Command” on page 373, and “TOOLTIPS Command” on page 358.

Working within Your SAS Session

Using the Docking View

Introduction to the Docking View

The Docking View allows for easy navigation within the main SAS window. When the docking view is enabled, windows that can be docked (integrated with the main SAS window) such as the Explorer and the Results windows, appear on the left side of the main SAS window. When you open an object from a docked window, the opened object appears to the right of the docking area.

Each docked window has a tab at the bottom of the docking area for easy access to the window. When the number of docked windows is large enough so that you cannot identify the tabs, a left and right arrow are displayed for you to navigate through the docked windows.

Docking and Undocking Windows

To dock or undock individual windows:

- 1 Select the window to make it the active window.
- 2 Toggle the **Docked** menu item by selecting **Window ► Docked**.

For information about setting docking view preferences, see “View Preferences” on page 61. To use a command to dock and undock the docking view, see “WDOCKVIEW Command” on page 362.

Resizing the Docking View

Docked windows cannot be individually moved or resized.

To enlarge or contract the docking area:

- 1 Place the mouse pointer over the split bar between the docking area and the remaining portion of the main SAS window.
- 2 Press and hold down the left mouse button.
- 3 Move the mouse to the left or right to resize the docking area.

You can also resize the docking view by using the WDOCKVIEWRESIZE command. For more information, see “Resizing the Docking View in the Main SAS Window” on page 81 and “WDOCKVIEWRESIZE Command” on page 363.

Minimizing and Restoring the Docking View

To minimize a docked window, do one of the following:

- Right-click the window title and select **Minimize**.
- Type `wdockviewminimize` in the command bar.

To restore the docked window, do one of the following:

- Click the **Docking view** button on the window bar.
- Type `wdockviewrestore` in the command bar.

For more information, see “WDOCKVIEWMINIMIZE Command” on page 363 and “WDOCKVIEWRESTORE Command” on page 364.

Enabling and Disabling the Docking View

To enable or disable the docking view, do one of the following:

- Type WDOCKVIEW in the command bar without any arguments to toggle the docking view.
- Use the Preferences dialog box **view** tab:
 - 1 Select **Tools ► Options ► Preferences ► View**
 - 2 Select (enable) or deselect (disable) the **Docking view** check box.

Using the Window Bar

The window bar, similar to the Windows taskbar, is a reserved space at the bottom of the main SAS window that is used to display a button for each opened window within SAS, providing immediate access to any opened window. When you click a button in the window bar, that window becomes the active window and appears on top of all other windows. When you click the button for the active window, the window is minimized.

Each button on the window bar has a menu that is associated with it. To access the menu, place the mouse pointer over the button and click the right mouse button.

You can enable and disable the window bar by using one of the following:

- the Preferences dialog box **View** tab
- the status bar pop-up menu
- the window bar pop-up menu
- typing **wwindowbar** in the command bar.

When you place the cursor over a window bar button, a ScreenTip pops up with the name of the window, or for an editor, the name of the opened file. You enable ScreenTips by using the Preferences dialog box or by typing **wscreeentips** in the command bar. For more information about enabling ScreenTips, see “View Preferences” on page 61 and “WSCREENTIPS Command” on page 373.

By using drag-and-drop editing, you can use an application’s window bar button to load a file into an application, such as the Enhanced Editor, that accepts file input. To load a file:

- 1 Drag the file on top of the application’s button on the window bar, which makes the application the active window.
- 2 Drag the file to the application window.
- 3 Release the mouse button to load the file into the application.

If you attempt to drop a file onto a windowbar button, SAS issues an error message.

Using Menus

You can access SAS commands, tools, and options by selecting them from the menus at the top of the main SAS window or by using the pop-up menus within application windows. The menus display options that are available to the active window. To access a pop-up menu for a particular window, click the *right* mouse button anywhere within the window. The pop-up menu that appears contains the menu items that are available for that particular window.

Some SAS windows (such as the Explorer window) along with the main SAS window can contain objects that have their own pop-up menus when you right-click an object. For example, the command bar, the toolbar, and the status bar each have a pop-up menu. In these windows, the pop-up menu is specific to the selected object.

Changing the SAS Current Folder

What Is the Current Folder?

The current folder is the operating environment folder to which many but not all of the SAS commands and actions apply. The current folder is displayed in the status bar

at the bottom of the main SAS window. By default, SAS uses the folder that is designated by the SASUSER system option in the SAS configuration file as the current folder when you begin your SAS session. You can specify a different default current folder by changing the **Start In** field that is available in the Properties tab for the SAS program shortcut or by specifying the SASINITIALFOLDER system option during SAS invocation. For more information, see “SASINITIALFOLDER System Option” on page 559.

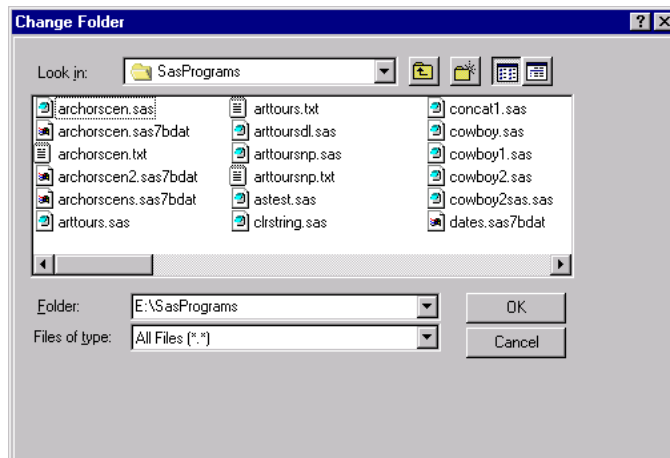
Interactively Selecting a New Current Folder

There are two methods to interactively select a new folder. One method is:

- 1 Select **Tools** ► **Options** ► **Change Current Folder**
- 2 Select a folder from the Change Folder window.

Another method to change the SAS current folder during your SAS session is to double-click the current folder in the status bar. Then use the Change Folder dialog box (shown in the following display) to select a new current folder.

Display 2.1 The Change Folder Dialog Box



If you organize your files so that each project has its own folder, then this Change Folder dialog box enables you to quickly switch between projects. As you select different projects, the dialog box stores in the **Folder** list box the directories that you select.

Using SAS Statements to Change the Current Folder

You can change the current drive and folder by submitting the change directory (CD or CHDIR) command with the X statement in SAS. SAS intercepts the change directory command and then changes drive commands and changes its current folder.

For example, the following statements change the current folder for your SAS session to the MYDATA folder and **G:\SALES\JUNE** folder, respectively:

```
x 'cd \mydata';
x 'cd g:\sales\june';
```

To change the current drive, you can submit a change drive command (the drive letter followed by a colon) such as the following:

```
x 'a:';
```

Issuing SAS Commands

Using Menus to Issue Commands

Many commands are already assigned to menu items for the windows in which they apply. For example, selecting the Run menu and then selecting **Submit** is the same as typing **submit** in the command bar.

The items in the menu bar and pop-up menu vary depending on the active window.

Using the Toolbar to Issue Commands

When you start SAS, by default, the toolbar appears at the top of the main SAS window. The toolbar provides a convenient way to issue commands that you use often. The toolbar commands are specific for the active SAS window.

To submit a command by using the toolbar, click the tool button that represents the command that you need.

To learn which tools perform what commands, position the mouse pointer over a tool briefly to reveal the ScreenTip for that tool.

To undock the toolbar to use it in a separate window or to dock the window to the main SAS window

- 1 Position the mouse pointer over the toolbar (not over a tool).
- 2 Press and hold down the right mouse button.
- 3 Select **Docked**.

You can add or change the tools that are defined in the toolbar and customize the toolbar for an application. For more information, see “Customizing the Toolbar” on page 68.

Using the Command Bar to Issue Commands

The command bar, as shown in Figure 2.1 on page 35, is an integrated command line that offers a central location from which you can type any SAS command, as long as the command is valid for the active window. The command bar can also be undocked and appear in a separate window. It can be moved anywhere on your desktop. If you type a command that is not valid for the active window, an error message is displayed on the status bar.

To move your insertion point position to the command bar, press F11.

SAS stores the commands that you type in the command bar from session to session, and you can easily retrieve previously issued commands by selecting them from the command list. The default number of commands to save is 15, but you can save from 0 to 50 commands. To change the number of commands to save in the command bar

- 1 Select **Tools** \blacktriangleright **Customize** \blacktriangleright **Toolbars**.
- 2 Press the up or down arrow in **Number of commands saved**.

By default, SAS stores the commands in the order of most frequently used. To store commands in the order of most recently used

- 1 Select **Tools** \blacktriangleright **Customize** \blacktriangleright **Toolbars**.
- 2 Select **Sort commands by most recently used**.

You can also retrieve previously issued commands by using the AutoComplete feature. When you start to type in the command bar, SAS completes the command that

best matches the command that you are entering. When the command that you want appears in the command bar, press ENTER. To enable AutoComplete

- 1 Select **Tools ► Customize**.
- 2 Select **Use AutoComplete**.
- 3 Click **OK**.

To dock or undock the command bar

- 1 Position the mouse pointer over the command bar (the mouse pointer should not be in the text field).
- 2 Press and hold down the right mouse button.
- 3 Select **Docked**.

To customize the command bar by using a command, see “COMMAND Command” on page 333. For more information about the Customize Tools Toolbars tab, see “Setting General Toolbar Preferences” on page 68.

Using the Command Line to Issue Commands

You can toggle the command line so that each window contains a command line. Commands that you enter in a window apply only to that window. For example, the INCLUDE command applies in the Enhanced Editor window, but not in the Log window.

To toggle the command line use the COMMAND command without arguments. You can also select **Command Line** from the Preferences dialog box **View** tab.

For more information, see “Setting Session Preferences” on page 59 and “COMMAND Command” on page 333.

Sending E-Mail Using SAS

Overview of Sending E-Mail

You can use SAS to send electronic mail either interactively (using a dialog box) or programmatically (using SAS statements in a DATA step or SCL). SAS supports three types of electronic mail interfaces:

- MAPI (Mail API, such as Microsoft Exchange, and Lotus Notes)
- VIM (Vendor Independent Mail, such as Lotus Notes)
- SMTP (Simple Mail Transfer Protocol).

You might need to install an e-mail client that supports one of these protocols before you can use SAS e-mail support. Also, although you can use SAS to send messages, you must use your e-mail program to view or read messages.

When you send mail interactively, SAS automatically includes the contents of the active window as an attachment to your e-mail. Depending on the contents of the active window, the attachment can be a text file (.TXT), a bitmap (.BMP), an HTML file (.HTML), or an RTF file (.RTF).

SMTP is available only by using the FILENAME statement for e-mail. If you specify SMTP as the e-mail system in the EMAILSYS system option and you are using an e-mail dialog box, the MAPI e-mail system is used. For information about using SMTP, see *SAS Language Reference: Concepts* as well as the FILENAME Statement, EMAIL (SMTP) Access Method, and the EMAILHOST and EMAILPORT system options in *SAS Language Reference: Dictionary*.

Initializing E-Mail

To send e-mail from within SAS, use the following system options that are appropriate for your e-mail system in the SAS configuration file or when you invoke your SAS session:

-EMAILSYS MAPI | VIM | SMTP

specifies which e-mail interface to use. By default, SAS uses MAPI. The SMTP interface is available only when you send e-mail programmatically. SMTP is not available when you use either your e-mail program native dialog box or the SAS e-mail dialog box.

Note: The directory that contains the e-mail DLL file (for example, MAPI32.DLL or VIM32.DLL) must be specified in your Windows PATH environment variable. SAS will use the first e-mail DLL that it finds for the interface that you specify. △

-EMAILDLG NATIVE | SAS

specifies whether to use the native e-mail interactive dialog box that is provided by your e-mail application or the e-mail interface that is provided by SAS. SAS uses the native dialog box by default.

-EMAILHOST SMTP server

specifies the domain name for the SMTP server that supports e-mail access for your site. This option is necessary only if you are using the SMTP e-mail interface.

-EMAILAUTHPROTOCOL authorization protocol

specifies the authorization protocol to use in SMTP e-mail. The default authorization protocol is LOGIN.

-EMAILID VIM e-mail login ID | MAPI profile | e-mail address

specifies either your VIM e-mail login ID, the MAPI profile that you use to access the underlying e-mail system, or a fully qualified e-mail address if you are using SMTP. If any of these values contain spaces, you must enclose them in double quotation marks.

-EMAILPORT port number

specifies the port number to which the SMTP server is attached. This option is necessary only if you are using the SMTP e-mail interface.

-EMAILPW "password"

specifies your e-mail login password, where *password* is the login password for your login name. If *password* contains spaces, you must enclose the password in double quotation marks.

For example, if your login ID is **J.B. Smith** and your password is **rosebud**, your SAS invocation might look like this:

```
c:\sas\sas.exe -emailsys vim
                -emailid "J.B. Smith"
                -emailpw rosebud
```

Using Your E-Mail Software to Send Mail

The default value of the EMAILDLG system option is NATIVE, which enables you to use your own e-mail software when you send e-mail interactively from within SAS. To send e-mail by using your own e-mail software, do one of the following:

- Select **File ► Send Mail**.
- Type DLGSMail in the command bar.

Your e-mail software provides the interface to send mail.

Using the SAS Send Mail Dialog Box

If the value of the EMAILDLG system option is set to SAS, you can send electronic mail by using the Send Mail dialog box that is provided by SAS, as shown in the display.

To send e-mail system by using the SAS Send Mail dialog box, select **File ► Send Mail**.

Display 2.2 Send Mail Dialog Box

The Send Mail dialog box contains the following fields:

To

the primary recipients of your e-mail. You must specify one or more e-mail addresses that are valid for your mail system before you can send e-mail. Separate multiple recipients with a semicolon (;).

Cc

the e-mail addresses of any users that you want to receive a copy of the mail that you are sending. You can leave this field blank if you want. Separate multiple recipients with a semicolon (;).

Bcc

specifies the recipients who will receive a copy of the e-mail. These addresses will not be visible to those individuals in the TO and CC options.

Subject

the subject of your message. You can leave this field blank.

Note

the body of your message. You can copy text from SAS application windows or other Windows applications and paste it here (using the CTRL+C and CTRL+V accelerator key combinations). If your note text exceeds the window space that is provided, you can scroll backward and forward by using the arrow keys, or you can use the PgUp and PgDn keys.

Some e-mail systems currently limit the note length to 32K (or 32,768 characters). Text that you type in the **Note** area will automatically wrap at the right side.

For large amounts of text, attach a text file as described below.

Attachments

icons and names of any files that you want to send with the message. You or the recipient can open an attached file by double-clicking its icon, provided that its file extension has a File Manager association with a Windows application (for example, the .TXT extension might be associated with Notepad).

To open a file selection dialog box that you can use to select files to attach, click **Attach File**.

To remove an attachment, select the file's icon in the **Attachments** field and click **Remove**.

Note: The attached files are sent as they exist on the disk; that is, if you edit a file before attaching it to an e-mail message, the *saved* version of the file is sent with the message. △

To verify whether the addresses that you specified in the **To** and **Cc** fields are valid, click **Check Names**. If one or more of the addresses is ambiguous (that is, the mail program cannot locate them in the address books) SAS displays an error message and highlights the first ambiguous address.

Note that an ambiguous address is not necessarily invalid. It is possible to send mail to recipients who are outside your immediate local-area-network (LAN) by using gateways, even though the addresses might not be resolved by using **Check Names**.

Whether an address is considered invalid or ambiguous depends on the e-mail program that you are using and on the configuration of your network. For example, suppose you want to send e-mail to a colleague on the Internet. Your LAN might have a gateway to the Internet that enables you to address the mail to **JBrown@rhythm.com at Internet** (where **at** is the gateway directive keyword and **Internet** is the name of a gateway on your LAN). Because your mail program uses the **at** keyword to direct your message to the **Internet** gateway, the address is considered valid. However, when you click **Check Names**, the address is considered ambiguous because the final destination address cannot be resolved by using the local address book. You can still click **Send** to send the message without an error.

Clicking **Address** invokes the address book facility for your e-mail program, provided that the facility is accessible.

Sending the Contents of a Window by E-mail

When you send mail from within SAS, SAS automatically attaches to the e-mail the contents of the active window. The type of file that SAS creates depends on the active window:

Table 2.1 File Type for E-mail Messages (by Active Window)

File Type	Active Window
.txt	Log
	Output
	Enhanced Editor
	Program Editor
.bmp	Explorer
	Graphics
	Results

File Type	Active Window
.htm	Results Viewer window and the output type is HTML
.rtf	Results Viewer window and the output type is RTF

Using the DATA Step or SCL to Send E-mail

By using the EMAIL access method, you can use the DATA step or SCL to send electronic mail from within SAS. This method has several advantages:

- You can use the logic of the DATA step or SCL to subset e-mail distribution based on a large data set of e-mail addresses.
- You can automatically send e-mail upon completion of a SAS program that you submitted for batch processing.
- You can direct output through e-mail based on the results of processing.
- You can send e-mail messages from within a SAS/AF FRAME application, customizing the user interface.

In general, DATA step or SCL code that sends electronic mail has the following components:

- a FILENAME statement that contains the EMAIL device-type keyword
- options that are specified in the FILENAME or FILE statement that indicate the e-mail recipients, subject, and any attached files
- PUT statements that contain the body of the message
- PUT statements that contain special e-mail directives (of the form !EM_directive!) that can override the e-mail attributes (TO, CC, BCC, SUBJECT, ATTACH) or perform actions (such as SEND, ABORT, and NEWMSG).

To send e-mail by using the DATA step or SCL, you must be signed on to your e-mail program.

The FILENAME statement syntax to send e-mail is

```
FILENAME fileref EMAIL 'address' <email-options>;
```

where

fileref

is a valid fileref.

EMAIL

is the device-type keyword that indicates that you want to use e-mail.

'address'

is the valid destination e-mail address that you want to send mail to. You must enclose the address in quotation marks. Specifying an address as a FILENAME statement argument is optional if you specify the TO= e-mail option or the PUT statement !EM_TO! directive, which will override an address specification.

email-options

can be any of the following:

Note: Each e-mail option can be specified only in a FILENAME statement that overrides the corresponding SAS system option. Δ

```
EMAILID= e-mail login ID | MAPI profile | e-mail address
```

specifies your e-mail login ID, MAPI profile name or your SMTP e-mail address that is used to access the underlying e-mail system. If you specify

MAPI in the EMAILSYS system option, specify your profile name. If the value contains a space, enclose the name in double quotation marks. This e-mail option can be specified in the FILENAME statement that overrides the SAS system option.

EMAILPW=*password*

specifies your e-mail login password, where *password* is the login password for your login name. If *password* contains a space, enclose it in double quotation marks. This e-mail option can be specified in the FILENAME statement that overrides the SAS system option.

EMAILSYS=MAPI | VIM | SMTP

SAS supports three types of e-mail interfaces:

MAPI

Mail API is the interface that is supported by Windows operating environments, which is used by Microsoft Exchange. MAPI is the default.

VIM

Vendor Independent Mail, such as Lotus Notes.

SMTP

Simple Mail Transfer Protocol.

TO=*to-address*

specifies the primary recipients of the e-mail. If an address contains more than one word, you must enclose the address in double quotation marks. If you want to specify more than one address, you must enclose the group of addresses in parentheses and each address in double quotation marks. For example, valid TO values are

```
to="John Smith"
to=("J. Callahan" "P. Sledge")
```

CC=*cc-address*

specifies the recipients who will receive a copy of the e-mail. If an address contains more than one word, you must enclose the address in double quotation marks. If you want to specify more than one address, you must enclose the group of addresses in parentheses and each address in double quotation marks. For example, valid CC values are

```
cc="John Smith"
cc=("J. Callahan" "P. Sledge")
```

BCC=*bcc-address*

specifies the recipients who will receive a copy of the e-mail. These addresses will not be visible to those individuals in the TO and CC options. If an address contains more than one word, you must enclose the address in double quotation marks. If you want to specify more than one address, you must enclose the group of addresses in parentheses and each address in double quotation marks. For example, valid BCC values are

```
bcc="John Smith"
bcc=("J. Callahan" "P. Sledge")
```

SUBJECT=*subject*

specifies the subject of the message. If the subject text is longer than one word (that is, it contains at least one blank space), you must enclose the text in double quotation marks. You must also use quotation marks if the subject

contains any special characters. For example, **subject=Sales** and **subject="June Report"** are valid subjects.

`ATTACH=filename.ext`

`ATTACH=(filename.ext <LRECL=record-length> <RECFM=record-format>)`

filename.ext

specifies the full path and filename of one or more files to attach to the message.

`LRECL=record-length`

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

`RECFM=record-format`

controls the record format. The following values are valid under Windows:

F indicates fixed format.

N indicates binary format and causes the file to be treated as a byte stream.

P indicates print format.

V | D indicates variable format. This is the default.

If you want to attach more than one file or if you want to specify a record length and record format, you must enclose the group of filenames in parentheses and each filename in double quotation marks. For example, valid values for file attachments are

```
attach=opinion.txt
attach=("june2004.txt" "july2004.txt")
attach=("home.html" recfm=v lrecl=372);
```

If your e-mail system is SMTP, see “FILENAME Statement, EMAIL (SMTP) Access Method” in *SAS Language Reference: Dictionary* for additional ATTACH arguments.

Options that you specify in a FILE statement override any corresponding options that you specified in the FILENAME statement. In your DATA step, after using the FILE statement to define your e-mail fileref as the output destination, use PUT statements to define the body of the message. For an example of using e-mail options in the FILE statement, see Example Code 2.2 on page 49.

You can also use PUT statements to specify e-mail directives that change the attributes of your electronic message or perform actions with it. You can specify only one directive in each PUT statement; each PUT statement can contain only the text that is associated with the directive that it specifies. The following are the directives that change your message attributes:

!EM_TO! *addresses*

replaces the current primary recipient addresses with *addresses*. If a single address contains more than one word, you must enclose that address in quotation marks. If you want to specify more than one address, you must enclose each address in quotation marks and the group of addresses in parentheses.

!EM_CC! *addresses*

replaces the current copied recipient addresses with *addresses*. If you want to specify more than one address, you must enclose each address in quotation marks and the group of addresses in parentheses.

!EM_BCC! *addresses*

replaces the current copied recipient addresses with *addresses*. These recipients are not visible to the !EM_TO! or !EM_CC! addresses. If you want to specify more than one address, you must enclose each address in quotation marks and the group of addresses in parentheses.

!EM_SUBJECT! '*subject*'

replaces the current subject of the message with *subject*.

!EM_ATTACH! *filename.ext*

replaces the names of any attached files with *filename.ext*. If you want to specify more than one file, you must enclose each filename in quotation marks and the group of filenames in parentheses.

Here are the directives that perform actions:

!EM_SEND!

sends the message with the current attributes. By default, SAS sends a message when the fileref is closed. The fileref closes when the next FILE statement is encountered or the DATA step ends. If you use this directive, SAS sends the message when it encounters the directive, and again at the end of the DATA step. This directive is useful for writing DATA step programs that conditionally send messages or use a loop to send multiple messages.

!EM_ABORT!

abends the current message. You can use this directive to stop SAS from automatically sending the message at the end of the DATA step. By default, SAS sends a message for each FILE statement.

!EM_NEWMSG!

clears all attributes of the current message that were set by using PUT statement directives.

Example of Sending E-Mail from the DATA Step

Suppose you want to share a copy of your SAS configuration file with your coworker Jim, whose user ID is **JBrown**. The following example code shows how to send the file with the DATA step.

Example Code 2.1 Sending a File with the DATA Step

```
filename mymail email "JBrown"
      subject="My SASV9.CFG file"
      attach="c:\sas\sasV9.cfg";
data _null_;
  file mymail;
  put 'Jim,';
  put 'This is my SAS configuration file.';
  put 'I think you might like the';
  put 'new options I added.';
run;
```

The following example code sends a message and attaches a file to multiple recipients, and specifies the e-mail options in the FILE statement instead of the FILENAME statement.

Example Code 2.2 Attaching a File and Specifying Options in the FILE Statement

```
filename outbox email "Ron B";
data _null_;
```

```

file outbox
/* Overrides value in */
/* filename statement */
to=("Ron B" "Lisa D")
cc=("Margaret Z" "Lenny P")
subject="My SAS output"
attach="c:\sas\results.out"
;
put 'Folks,';
put 'Attached is my output from the SAS';
put 'program I ran last night.';
put 'It worked great!';
run;

```

You can use conditional logic in the DATA step to send multiple messages and control which recipients get which message. For example, suppose you want to send customized reports to members of two different departments. The following example code shows such a DATA step.

Example Code 2.3 Sending Customized Messages Using the DATA Step

```

filename reports email "Jim";
data _null_;
  file reports;
  length name dept $ 21;
  input name dept;
  /* Assign the TO attribute */
  put '!EM_TO!' name;
  /* Assign the SUBJECT attribute */
  put '!EM_SUBJECT! Report for ' dept;
  put name ',';
  put 'Here is the latest report for ' dept '.';
  if dept='marketing' then
    put '!EM_ATTACH! c:\mktrept.txt';
  else /* ATTACH the appropriate report */
    put '!EM_ATTACH! c:\devrept.txt';

  /* Send the message. */
  put '!EM_SEND!';
  /* Clear the message attributes.*/
  put '!EM_NEWMSG!';
  /* Abort the message before the */
  /* RUN statement causes it to */
  /* be sent again. */
  put '!EM_ABORT!';
  cards;

Susan      marketing
Jim        marketing
Rita       development
Herb       development
;
run;

```

The resulting e-mail message, and its attachments, are dependent on the department to which the recipient belongs.

Note: You must use the !EM_NEWMSG! directive to clear the message attributes between recipients. The !EM_ABORT! directive prevents the message from being automatically sent at the end of the DATA step. Δ

The following example code shows how to send a message and attach a file to multiple recipients. It specifies the e-mail options in the FILENAME statement instead of in the FILE statement. This method will override the values for the SAS system options EMAILID, EMAILPW, and EMAILSYS.

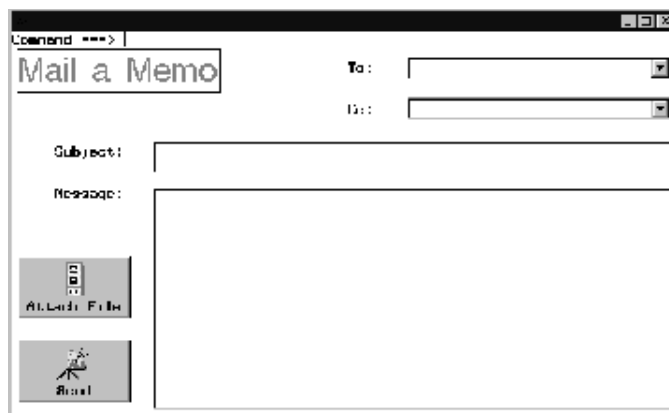
Example Code 2.4 Overriding SAS System Options

```
filename outbox email "Ron B" emailsys=VIM
  emailpw="mypassword" emailid="myuserid";
data _null_;
  file outbox
    /* Overrides value in */
    /* filename statement */
    to=("Ron B" "Lisa D")
    cc=("Margaret Z" "Lenny P")
    subject="My SAS output"
    attach="c:\sas\results.out"
  ;
  put 'Folks,';
  put 'Attached is my output from the SAS';
  put 'program I ran last night.';
  put 'It worked great!';
run;
```

Example of Sending E-Mail Using SCL Code

The following example is the SCL code that generates a FRAME entry that is designed for e-mail. The FRAME entry might look similar to the one shown in the following display.

Display 2.3 An Example E-Mail FRAME Entry



The FRAME entry has objects that enable the user to type the following information:

MAILTO	the user ID to send mail to.
COPYTO	the user ID to copy (CC) the mail to.

ATTACH the name of a file to attach.
 SUBJECT the subject of the mail.
 LINE1 the text of the message.

The following example code shows the FRAME entry that also contains SEND button that invokes this SCL code (marked by the **send** label).

Example Code 2.5 Invoking SCL Code from a FRAME Entry

```
send:
  /* set up a fileref */
  rc = filename('mailit','userid','email');
  /* if the fileref was successfully set up,
  open the file to write to */
  if rc = 0 then do;
    fid = fopen('mailit','o');
    if fid > 0 then do;
      /* fput statements are used to
      implement writing the mail and
      the components such as subject,
      who to mail to, etc. */
      fputcrc1= fput(fid,line1);
      rc = fwrite(fid);
      fputcrc2= fput(fid,'!EM_TO! '||mailto);
      rc = fwrite(fid);
      fputcrc3= fput(fid,'!EM_CC! '||copyto);
      rc = fwrite(fid);
      fputcrc4= fput(fid,'!EM_ATTACH! '||attach);
      rc = fwrite(fid);
      fputcrc5= fput(fid,'!EM_SUBJECT! '||subject);
      rc = fwrite(fid);
      closerc= fclose(fid);
    end;
  end;
return;
cancel:
  call execcmd('end');
return;
```

Example of Sending E-Mail Using SMTP

The following examples show how you can send e-mail by using SMTP from a DATA step and how you can send your ODS HTML output as HTML and not as an attachment to your e-mail.

To use SMTP you need an SMTP e-mail server that you can access.

To configure SAS to use SMTP, add these system options to your configuration file:

- emailsys SMTP
- emailhost *your.email.server.com*
- emailport 25.

Ask your system administrator for the location of *your.email.server.com*. Port 25 is the most common port.

The following code uses the FILENAME statement and a DATA step to send e-mail:

```
filename mymail email from="yourid@email.com"
to="id1@emailaddr.com" "id2@emailaddr.com")
```



```

                                subject="Put Subject Here"
                                content_type="text/html";
data _null_;
  file mymail;
  put 'hello world';
run;
quit;

```

You can also send an attachment by using the ATTACH e-mail option in the FILENAME statement. Compress non-textual attachments such as SAS data sets, bitmap files, and HTML files before using the ATTACH e-mail option.

You can also use SMTP to send HTML output without using an attachment:

```

filename temp1 email to=("yourid@email.com")
                    from="wileycoyote@acme.com"
                    subject="HTML OUTPUT"
                    content_type="text/html";
ods html body=temp1 style=default;
proc print data=sashelp.class;
run;
ods html close;

```

Saving Windows to External Files

You can save any text editor window, such as the Enhanced Editor window, the Program Editor window, or other SAS windows, such as the Log, Output, or Results Viewer windows to an external file.

To save the contents of the active window to a file:

- 1 Either click the Save button (the diskette) or select the File menu and select **Save**. If you have previously saved the contents of this window to a file (and the filename is part of the window title), SAS saves the contents to the file that you specified previously. If you have not saved the window contents during this session, then SAS displays the Save As dialog box.

If you have previously saved the window contents but now want to save the window contents to a different file, type **dlgsave** in the command bar or select **File ► Save As**.

CAUTION:

Using Save instead of Save As from the File menu to save a file causes SAS to overwrite or append the file. Always use Save As when you want to save the contents of the editor to a new file. If you open a text file in the editor window, whether you use the Open dialog box or the INCLUDE command, the editor title bar displays the name of the file that you opened. When you select the File menu and then the **Save** item, SAS overwrites or appends the file of that name with the current contents of the editor. △

- 2 Select or name the file in which to store the window contents. You can also select a file type from the **Save file as type** list. SAS saves most file types as plain text and assigns different file extensions based on the type you select; the exception is the RTF file type, which SAS saves in rich text format (RTF).

If you select a file type from the list, SAS remembers that selection and presents it as the default type the next time that you save a new file in that window.

Clearing the Window and Filename

To clear a SAS window of its contents and saved filename (if it has one), do one of the following

- Press CTRL + E
- Select **Clear All** from the Edit menu
- Click the New (the blank page) button
- Select the File menu and select either **New** or **New Program**
- Type CLEAR in the command bar and press ENTER.

If the contents of the window have not been saved, SAS prompts you to save the contents before it clears the window.

Defining Keys

To display the key definitions that are active for the SAS session (that is, the DMKEYS entry in your Sasuser.Profile catalog), either type KEYS in the command bar or select **Tools ► Options ► Keys**. These key definitions apply to the basic SAS windows, such as the Enhanced Editor, Output, and Log windows. For a list of default keys, see “Default Key Definitions under Windows” on page 623 and “Keyboard Shortcuts within the Enhanced Editor” on page 626.

To define or redefine a key within SAS:

- 1 Click the mouse pointer in the **Definition** column across from the key or mouse button that you want to define.
- 2 Type the command or commands that you want to associate with that key or button.

The definition must be a valid SAS command or sequence of commands. When you specify a sequence of commands, separate the commands with a semicolon (;). For example, if you want to define the Ctrl + H key sequence to maximize a window and recall the last submitted program, specify the following commands in the **Definitions** column next to **CTL H**:

```
zoom; recall
```

SAS does not check the syntax of a command until it is used (that is, when the key is pressed). If you misspell a command or type an incorrect command, you do not discover your error until you use the key and receive an error message that indicates that the command was unrecognized.

Key definitions are stored in your Sasuser.Profile catalog. SAS creates a Profile catalog each time you invoke SAS with a different value for the SASUSER option. Changes that you make to one Profile catalog are not reflected in any other catalog. However, you can use the COPY command from the KEYS window or the CATALOG procedure to copy key definition members to other Profile catalogs. For more information, see the CATALOG procedure in *Base SAS Procedures Guide*.

Although SAS enables you to define any key that is listed in the KEYS window, Windows reserves some keys for itself to maintain conformity among Windows applications. These reserved keys are not shown in the KEYS window.

Other SAS products have their own key definitions. Use the menus in the specific product window to access key definitions for specific products.

Navigating with Microsoft IntelliMouse

SAS provides support for the Microsoft IntelliMouse. The IntelliMouse is a modified mouse that includes a rotation wheel (wheel control) that enables new forms of navigation. The IntelliMouse works within the SAS windows that use a vertical scroll bar to scroll the window contents.

With the IntelliMouse, you can use the mouse to scroll instead of interacting with the navigational controls in the SAS windows. To scroll with the IntelliMouse, you rotate the wheel control forward or backward, which is equivalent to pressing the up arrow or down arrow on the scroll bar.

The IntelliMouse also supports AutoScroll. To initiate AutoScroll, click the mouse wheel and then move the mouse away from the origination point. The contents of the window starts to scroll in the direction that you move the mouse. The farther away you move the mouse from the origination point, the faster the contents scroll. Pressing a key, clicking a mouse button, or rotating the mouse wheel terminate AutoScroll mode.

You can modify IntelliMouse settings through the Windows Control Panel mouse settings. For more information about IntelliMouse, see the Microsoft documentation.

Using the Clipboard

The Windows clipboard enables you to exchange text and graphics between applications. You can also submit SAS code that is stored on the clipboard. The clipboard uses operating environment memory as an intermediate storage buffer for exchanging text and graphics. With the clipboard, you can move text between

- windows within SAS
- SAS and other Windows applications
- two SAS sessions
- two SAS processes.

SAS communicates with the clipboard using these formats:

SAS text format

preserves the text and color attributes between SAS sessions. This format is understood by SAS, but not by other Windows applications.

Windows text format

is understood by most Windows applications and is called the ANSI text format.

RTF text format

encapsulates text font and highlighting attributes when copying text between applications that both support RTF format. SAS can cut and copy text in RTF format; you *cannot* paste RTF text into a SAS window.

Unicode text format

is a universal text format that can represent all possible characters. The format is also referred to as a wide-character format. For more information about this text format, see your Microsoft documentation.

Windows bitmap format

is for graphics. This format is understood by most Windows applications and is called the BITMAP format.

Windows metafile (WMF) format

is used in many SAS applications, such as the Graphics Editor in SAS/GRAPH software, SAS/QC software's ISHIKAWA procedure, and SAS/INSIGHT software.

The metafile format provides more information about the image than the bitmap format and is sometimes called the PICTURE format.

DIB (Device Independent Bitmap) format is used with color bitmap files. When a bitmap is stored in the DIB format, colors correspond correctly from one device to another.

These formats enable you to copy text and SAS bitmapped information (for example, from a graphic) to another application. You can also use the Print Screen and ALT+Print Screen keys to copy information from your SAS session to the clipboard. Pressing the Print Screen key places the entire display in bitmap form on the clipboard. Pressing ALT+Print Screen places just the SAS session (including any menus and scroll bars) or the active dialog box (if any) on the clipboard.

You can use the clipboard only if both the source and destination applications provide support for the clipboard facility and for the format you are using. Note that whereas some operating environments allow multiple paste buffers, SAS uses the Windows clipboard, which is a single buffer.

Selecting and Copying Text

For windows that contain text, such as the Enhanced Editor, Notepad, Log, Output, and KEYS windows, you can hold down either the left mouse button or ALT + the left mouse button and drag the mouse to mark the area that you want to cut or copy. Holding down the left mouse button when you are selecting multiple lines selects whole lines of text. Holding down ALT + the left mouse button selects a rectangular block or column of text. The text area is immediately marked in reverse video while you are dragging the mouse. In text windows, you can scroll while you are dragging the mouse by moving the mouse pointer beyond the border of the window in the direction that you want to scroll. To extend the selection of a text area, use the SHIFT key + the left mouse button. Release the mouse button when you have included all the text you want to copy.

To copy marked text to the clipboard, do one of the following:

- press Ctrl + C
- click the Copy button (the double document)
- select the Edit menu and then select **Copy**.

To paste text that is stored on the clipboard, position the insertion pointer in a text area of a window and do one of the following:

- press Ctrl + V
- click the Paste button (the clipboard and document)
- select the Edit menu and then select **Paste**.

The text from the clipboard is pasted to the area that you indicate. If there is already an area of selected text within the target window, the selected text is replaced with contents of the clipboard. You can paste text only into SAS windows that accept text input, such as the Enhanced Editor or the SAS Notepad.

Selecting and Copying in Nontext Windows

For windows such as SAS/GRAPH windows, an area is marked by a box, not by reverse video. The box indicates that the area you are marking is in bitmap format. After you finish marking an area, you can copy it to the clipboard. If the window you are working in has no Edit pop-up menu, you can use the following key combinations to perform the copy and paste functions:

- | | |
|--------|--|
| CTRL+C | copies the selection to the clipboard. |
| CTRL+V | pastes the contents of the clipboard. |

Pasting Bitmapped Information into Your SAS Session

Some windows, such as the BUILD: DISPLAY window for FRAME entries in SAS/AF software, allow you to paste bitmaps into the window. For more information, see “Pasting an OLE Object from the Clipboard” on page 245.

Also, you can paste bitmaps into the SAS/GRAPH window to import graphics. For more information, see “Importing Graphics from Other Applications” on page 190.

Submitting SAS Code from the Clipboard

SAS enables you to use the Windows clipboard to submit SAS code. This feature can be used to copy or cut SAS code from another application, such as the Windows Notepad or another text editor, and submit it to SAS for execution. This feature is also convenient for submitting the sample programs that are available in SAS Help and Documentation.

To submit SAS code that is stored on the clipboard, select the Run menu and then select **Submit clipboard** when the Enhanced Editor window or the Program Editor window is active. Alternatively, you can use the GSUBMIT command from the command line, with the following syntax:

```
gsubmit buf=default
```

The GSUBMIT command can be used to submit SAS code that stored on the clipboard even if the editor window is not the active window (or is closed). If you use the GSUBMIT command often, you can define an icon for the command in the toolbar, or assign the GSUBMIT command to a function key. For more information about how to define buttons, see “Customizing the Toolbar” on page 68.

If you submit SAS code from the Windows clipboard while a procedure RUN group is active, the submit will fail. You can submit this code by copying the code to a new Enhanced Editor window and then submitting the code.

Creating Text Highlighting and Special Characters

Special Character Attributes

The SAS Notepad and SAS/AF applications let you use extended color and highlight attributes for text. To access these attributes, press the ESC key and the appropriate letter or number to toggle a color or attribute. With this feature, you can alter the color or attributes of entire lines or individual words or letters. Valid colors and attributes, as well as the keys that you use to implement them, are listed in Table 2.2 on page 57 and Table 2.3 on page 58. You can type the letters for the colors in either uppercase or lowercase letters.

Table 2.2 Extended Color Key Sequences

Key	Color	Key	Color
ESC+A	gray	ESC+B	blue
ESC+C	cyan	ESC+G	green
ESC+K	black	ESC+M	magenta
ESC+N	brown	ESC+O	orange

Key	Color	Key	Color
ESC+P	pink	ESC+R	red
ESC+W	white	ESC+Y	yellow

Table 2.3 Extended Attribute Key Sequences

Key	Description
ESC+0	turns off all highlighting attributes.
ESC+2	turns on the underline attribute.
ESC+3	turns on the reverse-video attribute.

Alternate ASCII Characters

If you want to create alternate ASCII characters such as foreign language characters, you can use the ALT key in combination with the ASCII character code. Use the numeric keypad and press the Num Lock key to enter the character code. For a list of ASCII character codes and instructions about how to use the ALT key sequences, see your Microsoft documentation.

Customizing Your SAS Session

Selecting Fonts

To change the font for button text and descriptive text elements, use the SYSGUIFont system option either in the configuration file or at the command prompt when you start SAS.

To choose a different font or point size for text in SAS windows, open the Fonts dialog box by using the DLGFont command or by selecting **Tools ► Options ► Fonts**

To change the font in the Enhanced Editor, select **Tools ► Options ► Enhanced Editor** and click the **Appearance** tab.

The fonts that are available for SAS windows depend on the monospace fonts that you have installed under Windows. For example, you might have the Courier font and Lucida Console font available.

When you select a font or point size, the Font dialog box and the Enhanced Editor Options dialog box display a sample of the font that you have selected. For more information about selecting fonts for the Enhanced Editor, select **Help ► Using This Window** or press F1 when the Enhanced Editor is the active window.

When you install SAS, the Setup program automatically installs a TrueType font, named SAS Monospace, that is designed specifically for use with SAS. This font, in combination with the Sasfont display font, ensures that tabular output is formatted properly whether you view it in the Output window, print it, or copy it to another Windows application.

By default, SAS uses the SAS Monospace font to produce printed output. In addition, any text that you cut, copy, or drag from a SAS window to paste into another Windows application will be formatted with the SAS Monospace font.

You cannot use the **Fonts** item to select SAS/GRAPH fonts.

CAUTION:

Beware of changing certain display characteristics on low-resolution displays. If you select large font sizes on some monitors, you might not be able to see all the text in your SAS windows at one time. In windows that have no scroll bars, large font sizes can hide some choices, causing them to be invisible. For these types of displays, large font sizes are not recommended. This same problem can occur if you change the Windows Appearance properties and select a thick window border. On low-resolution displays, you should not use thick window borders. △

Setting Session Preferences

Introduction to Setting Session Preferences

You can configure your SAS session to accommodate the way that you like to work. For example:

- You can use the command bar in a separate, movable window.
- You can set preferences for scrolling behavior and window appearance.
- You can set a preferred Web browser to use when viewing Internet Web pages or HTML output.

The following sections describe the Preferences dialog box and how to use these settings to control your SAS session.

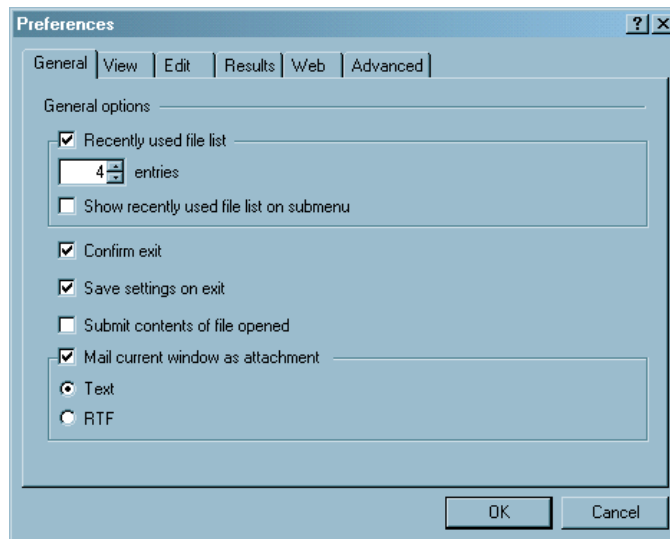
Using the Preferences Dialog Box

To customize your SAS session, open the Preferences dialog box in one of the following ways:

- Type **dlgpref** in the command bar
- Select **Tools ► Options ► Preferences**

The Preferences dialog box contains tabs that separate the session settings into categories. Click the tabs for each sheet to navigate to the settings that you want to change, and then select the options that you want. When you are finished, click **OK**.

The settings that you select are saved from session to session in the Sasuser.Profile catalog by their respective pages, except for the Results tab. The entries in the Sasuser.Profile are GENWSAVE, VIEWWSAVE, EDITWSAVE, WEBWSAVE, and ADVWSAVE. The Results tab settings are saved in the SAS registry, so they are not moved to another machine when the Sasuser.Profile catalog is copied.

Display 2.4 Preferences Dialog Box (showing the General tab)

General Preferences

The General tab enables you specify the general options that control how your SAS session works. The following are the General options:

Recently used file list

specifies whether SAS retains a list of the files that you have accessed. If this option is selected, you can specify in the **entries** field up to 30 files that you want to retain. **Show recently used file list on submenu** specifies whether the files will be displayed from the **Recent Files** submenu that you access from the File menu. If **Show recently used file list on submenu** is not selected, the files are displayed in the File menu. Each time that you access a file from an editor window, the filename is added to the list.

Confirm exit

specifies whether you want SAS to prompt you for confirmation before you end your SAS session.

Save settings on exit

specifies whether SAS should automatically save your settings when you exit your SAS session.

Submit contents of file opened

specifies whether you want to submit the contents of all files that you open to SAS.

Mail current window as attachment

specifies whether the active window should be automatically included as an e-mail attachment when you initiate electronic mail from within SAS. If you select this option, then you can also specify whether the attachment should be formatted as plain text or as RTF (rich text format, which retains font and color information).

View Preferences

The View tab lets you specify the options that control the appearance of your SAS session. The View options include

Window

specifies whether your SAS windows contain scroll bars and a command line. You can also enable or disable ScreenTips (the helpful hints that appear when you position your mouse pointer over window controls).

Show

specifies whether to show certain aspects of the SAS interface, including the following settings:

Docking View

specifies whether to enable the docking area so that windows that can be docked appear on the left side of the main SAS window.

Window Bar

specifies whether to display the window bar at the bottom of the main SAS window.

status bar

specifies which aspects of the status bar, if any, you want to have visible in your session. **Display message lines** specifies whether to display the message area of the status bar. **Display current folder** specifies whether to display the SAS current folder area. **Display cursor position** specifies whether to display the line and column position of the Enhanced Editor insertion point.

Edit Preferences

The Edit tab controls options that affect the SAS text editors, including:

Overtyping mode

specifies whether to insert text or type over on existing text when you type text in a SAS application window. You can also toggle the overtype mode by pressing the Insert key on your keyboard. *Overtyping mode is not available for the Enhanced Editor.*

Autosave every *n* minutes

specifies whether to automatically save the contents of the editor, and how often to save it.

The Enhanced Editor contents are saved as **Autosave of filename.\$SAS** in the operating environment Application Data folder. Under Windows Vista, the pathname for the Application Data folder is **c:\Users\user ID\AppData**. Under all other Windows operating environments, the pathname for the Application Data folder is **c:\Documents and Settings\user ID\Application Data**.

The Program Editor contents are saved to **pgm.asv** in the current active folder so that you can recover your work in the event that your SAS session ends without enabling you to save the contents of the editor.

Enable unmarking with navigation keys

enables you to unmark text by using the UP, DOWN, LEFT, and RIGHT navigation keys.

Use Enhanced Editor

specifies whether the Enhanced Editor is the primary editor. If this check box is not selected, the Program Editor opens when SAS starts.

Results Preferences

The Results tab enables you to configure how you would like to view your program output results. The Results tab options include the following:

Listing

specifies to display program output in the Output window.

HTML

Create HTML

specifies to display program output in HTML format.

Folder

specifies a folder to store HTML output files. You can either type a folder name or click **Browse** to search for a folder. This setting is available only when the **Use WORK folder** setting is not selected.

Use WORK folder

specifies to store HTML output files in the Work folder. The Work folder is a temporary folder that is deleted when SAS closes.

Style

enables you to choose the appearance of the program output. For more information about styles, see the *TEMPLATE* procedure in *SAS Output Delivery System: User's Guide*.

View results as they are generated

specifies whether to update the browser with the latest generated HTML output.

View results using

specifies a browser to view HTML program output. **Internal browser** is available if Microsoft Internet Explorer is installed. When **Internal browser** is selected, SAS displays HTML output using the Results Viewer.

If you select **Preferred browser**, your HTML output appears using the browser that is specified by the **Preferred browser - Other** text field of the Preferences dialog box **Web** tab.

Note: If you select **Use default** in the Preferences dialog box **Web** tab, your output is displayed using the browser that is registered with Windows. \triangle

Web Preferences

The Web tab enables you to specify your preferred Web browser for use within your SAS session. These preferences are used whenever you issue the WBROWSE command (either directly or by selecting a Help menu item or toolbar button that issues the command). For more information, see “WBROWSE Command” on page 361. You can specify the following Web options:

Preferred browser

specifies the preferred Web browser to use when accessing Web information from within SAS. By default, SAS uses the browser that is installed on your system and registered with Windows as the default browser. To use a browser other than the default, select the **Other** radio button and either type a path to the Web browser or click **Browse** to search for the path to the Web browser.

Start page

specifies the default Web page to which to navigate when invoking the web browser within SAS. By default, the browser navigates to <http://www.sas.com> (the SAS Institute home page on the World Wide Web).

Advanced Preferences

The Advanced tab enables you to specify options that can affect your SAS session, including scrolling policy and other miscellaneous behavior. The Advanced options include

Scrolling Options

specifies the number of lines that the Log and Output windows scroll when information is written to them. The default value for the Log window is 8.

When you select **Scroll page**, the Output window will not display any lines until an entire page is written.

When **Scroll max** is selected, no output will be written to the window until the procedure is complete.

If **Scroll lines** is selected and the Output window is full, the Output window scrolls the number of lines specified in the **Scroll lines** box. The default value is 0. If the value is 0, no output is written to that window while statements are executing, thus providing the best performance.

Scrolling can increase the length of time that SAS takes to run your program. The less that the Log and Output windows have to scroll, the faster your program will run.

You can also set these values by using the Editor Options window or the AUTOSCROLL command. For more information, see “AUTOSCROLL Command” on page 329 and the SAS Help and Documentation.

Other

The following settings are miscellaneous options settings:

Hide cursor in non-input windows

specifies that the insertion point will not appear in windows that do not require text input, such as some SAS/AF programs.

Disable scroll bar focus

specifies that the scroll bar does not become the selected window component when you click it. This setting eliminates flashing problems that can occur in some SAS applications.

Customizing Your Windowing Environment with Commands

Customizing Window Positions

In the default display configuration of an interactive session (shown in Figure 2.1 on page 35) the main SAS window displays the Explorer and Results windows as docked windows, and the Log, Enhanced Editor, and Output windows in the remaining SAS workspace.

Using the Windows menu, you can position SAS windows in the same manner as other Windows applications:

- Minimize (Restore) All Windows**
- Cascade**
- Tile Vertically**
- Tile Horizontally**
- Resize**

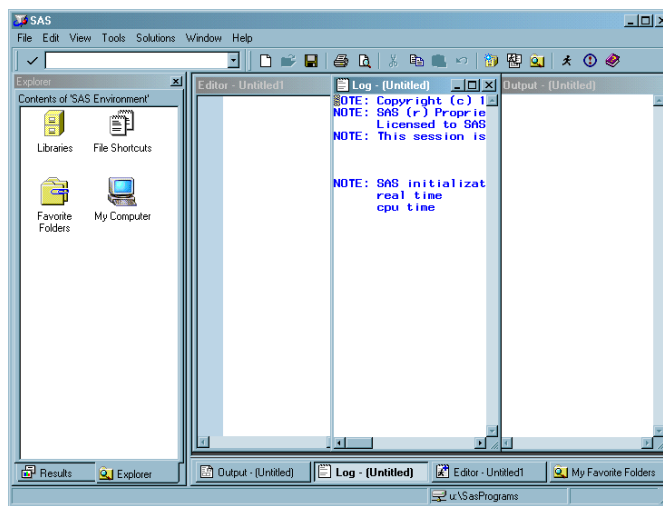
While the default configuration is sufficient for efficient SAS use, you can open more windows for easy access and rearrange the windows within the main SAS window. For example, you can keep the My Favorite Folders window open, but minimized, and the windows arranged in a mosaic pattern so you can see all of them at once.

To accomplish this configuration

- 1 Open the My Favorite Folders by selecting **View ► My Favorite Folders**
- 2 Select the minimize button in the window title bar for the My Favorite Folders window
- 3 Select **Windows ► Tile Vertically**

The following display shows the resulting main SAS window:

Display 2.5 Customized SAS Session



In addition, you can undock windows so that all windows can be positioned where you want them or you can minimize the docking view. For more information about the docking view, see “Using the Docking View” on page 37.

For a list of SAS commands used to control the appearance of the main SAS window, see “SAS Commands That Control the Main SAS Window” on page 318.

Changing the Window Colors

Changing the color of window components is a shared responsibility of Windows and SAS. You change the color of most standard window parts by changing the properties of the Windows desktop. Several window element colors are controlled by SAS (such as the color of error message text in the Log).

To change a window component that is controlled by SAS do one of the following

- Enter **sascolor** in the command bar
- Select **Tools ► Options ► Colors**

Use the SASCOLOR window to choose the colors for specific elements.

Close and reopen any active windows for new color settings to take effect.

For more information, see the SAS Help and Documentation for the SASCOLOR window.

Customizing Your Windowing Environment with System Options

Several SAS system options are available to control the default windowing environment within SAS. The most commonly used options are the following:

AWSDEF

specifies the location and dimensions of the main SAS window when SAS initializes.

AWSTITLE

specifies the text for the main SAS window title bar.

HELPREGISTER

enables you to add Help to the main SAS window Help menu in order to access custom Help. See “HELPREGISTER System Option” on page 521.

ICON

minimizes the SAS window when SAS initializes.

REGISTER

enables you to add applications to the main SAS window Tools menu so that you can execute them by clicking their names.

SASINITIALFOLDER

specifies the pathnames to set for the current folder and the default folder for the Open and Save As dialog boxes when SAS starts.

SPLASHLOC and NOSPLASH

specifies the pathname or the dynamic link library name of the logo screen that is to appear at the start of a SAS session, or it specifies to suppress the logo screen.

USERICON

specifies user-defined icons to be incorporated into SAS/AF applications.

WEBUI

specifies to enable use of the pointer to select an object and a single click to invoke the object's default action.

These system options can be specified in your SAS configuration file or in the SAS command when you start SAS from a command prompt. Some are also valid in an **OPTIONS** statement. For details about the syntax of these options and about where you can specify them, see “SAS System Options under Windows” on page 475. For a comprehensive list of these options, see “SAS System Options That Control the Main SAS Window” on page 317.

Changing the Size and Placement of the Main SAS Window

The **AWSDEF** system option enables you to control the placement and size of the main SAS window when SAS initializes. If you want your SAS session always to occupy the upper-left quarter of your screen, specify the following **AWSDEF** option in your SAS configuration file:

```
-awsdef 0 0 50 50
```

For more information, see “**AWSDEF** System Option” on page 498.

Changing the Title of Your SAS Session

By default, the main SAS title bar contains the text **SAS**. If you want a different title, you can use the `AWSTITLE` system option. For example, to set the title to **My SAS Session**, specify the following option in your SAS configuration file:

```
-awstitle "My SAS Session"
```

For more information, see “`AWSTITLE` System Option” on page 500.

Adding Help to the Help Menu

The `HELPREGISTER` system option enables you to access customized help from the main SAS window Help menu. You can add up to 20 WinHelp (.hlp), HTML (.htm), or Microsoft HTML Help (.chm) files to the Help menu. `HELPREGISTER` system option arguments enable you to

- link to a topic within a Help file
- customize the text that appears in the Help menu
- customize the text that appears in the message line when you position the pointer over the Help menu item.

Note: WinHelp (WinHlp32.exe) is no longer supported by Microsoft and is excluded from Windows Vista. The preferred method is Microsoft HTML Help (.chm). Δ

To add multiple Help files to the Help menu, use multiple `HELPREGISTER` system options either in your configuration file or at the command prompt when you start SAS. The following example adds the Help file `My Help.htm` to the Help menu:

```
sas -helpregister "My Help" c:\mysashelp\myHelp.htm html
```

For more information, see “`HELPREGISTER` System Option” on page 521.

Minimizing Your SAS Session

The `ICON` system option causes SAS to be minimized at invocation. If you are running a batch job, you might want to use this system option to save space on your screen. For more information, see “`ICON` System Option” on page 524.

Adding Applications to the Tools Menu

The `REGISTER` system option enables you to add names of applications to the Tools menu of the main SAS window. You can execute one of these applications by clicking its name. The `REGISTER` system option takes as arguments a menu name and an operating environment command or a path specification for an executable file. You can also specify a working folder.

The following is an example that adds a command to print the contents of the SAS folder:

```
-register "Contents of SAS"
      "dir c:\program files\sas"
```

When you click **Contents of SAS** in the Tools menu, the output of the Windows `DIR` command is displayed in a command prompt window.

The following is an example of adding an .EXE file to the menu along with a specification of a working folder of `C:\EXDATA`:

```
-register "Excel" "excel.exe" "c:\exdata"
```

This action adds **Excel** to the menu. When you click **Excel**, the file `EXCEL.EXE` is invoked.

The REGISTER system option is valid only as an invocation option (that is, in a SAS configuration file or in the SAS invocation command). For more information, see “REGISTER System Option” on page 553.

Setting the Initial Path For the Current Folder and the Paths Specified in the Open and Save Dialog Boxes

If you want to start SAS with a current folder other than the default current folder, use the SASINITIALFOLDER system option when you start SAS. The pathname that you specify in the SASINITIALFOLDER option sets the initial current folder as well as the initial pathname for the Open and Save As dialog boxes.

You can specify the SASINITIALFOLDER option either on the command line when you start SAS or in a configuration file. For example, you might specify **sas -sasinitialfolder "c:\mySasFiles"** to start SAS.

For more information, see “SASINITIALFOLDER System Option” on page 559.

Displaying a Custom Logo Screen during SAS Invocation

To display your own logo when SAS starts

- 1 Create the logo that you want to display and save it either as a Windows bitmap (which has a .bmp file extension), or compile it as a resource and build it into a dynamic link library.
- 2 When you invoke SAS, specify the -SPLASHLOC system option with the full pathname of the file that contains your bitmap. If the bitmap is in a DLL, you must specify the resource number as well. The default resource number is 1.

For example, if your logo is stored in **C:\MYBMPs\SPLASH.BMP** specify the following SPLASHLOC system option:

```
-splashloc c:\mybmps\splash.bmp
```

If your logo is stored in **C:\MYDLLS\OPENING.DLL** as resource 101, you specify the following SPLASHLOC system option:

```
-splashloc c:\mydlls\opening.dll 101
```

For more information, see “SPLASHLOC System Option” on page 571.

Adding User-Defined Icons to SAS

The USERICON system option enables you to add your own icons to SAS. These icons can be used with SAS/AF and SAS/EIS applications. The syntax for the USERICON system option is as follows:

```
-USERICON icon-resource-file number-of-icons
```

The *icon-resource-file* argument specifies the full path to a dynamic link library (DLL) file that contains the user icons. The *number-of-icons* argument specifies the number of icons found in the resource file. For example, the following system option specifies that there are four icons located in an icon resource file named ICONS.DLL found in the **C:\JUNK** folder:

```
-usericon c:\junk\icons.dll 4
```

The DLL that is used as the icon resource file must be created using the Win32 Software Development Kit (and must therefore be 32-bit). For more information about how to build a resource file, refer to the documentation for the Microsoft Win32 Software Development Kit.

You can incorporate icons into your SAS/AF and SAS/EIS applications using a FRAME entry. For more information, see “USERICON System Option” on page 582 and refer to the SAS Help and Documentation for SAS/AF software and SAS/EIS software.

Enabling Web Enhancements in SAS

If you have Microsoft Internet Explorer 5.0 (IE) or greater installed, the WEBUI system option enables some SAS windows, such as the SAS Explorer window, to work like an IE web page where pointing to an object selects the object and a single mouse-click invokes the default action.

To select a range of objects, press and hold down the SHIFT key, and point to the first and last objects in the group.

To select multiple items, press and hold down the CTRL key, and point to individual items in the group.

Customizing the Toolbar

Introduction to Customizing the Toolbar

SAS assigns several commonly used commands to the buttons for your convenience. You can customize the toolbar settings to access commonly used commands or create a toolbar with a specific application window. This section describes how to customize the toolbar settings.

Using the Customize Tools Dialog Box

You customize all toolbar settings using the Customize tools dialog box. To open the Customize Tools dialog box, do one of the following:

- Enter TOOLEEDIT in the command bar.
- Select **Tools** \blacktriangleright **Customize**

Use the **Toolbars** tab for general toolbar settings and the **Customize** tab to define tools on the toolbar.

Setting General Toolbar Preferences

The **Toolbars** tab has settings to control the behavior and appearance of the toolbar. Tool options include:

General

specifies button appearance and Help options. These options include:

Large icons

specifies whether to use the set of large buttons on the toolbar. This setting is useful for high-resolution displays.

Show ScreenTips on toolbars

specifies whether to display a brief button description when you place the pointer over the button.

Toolbars

specifies whether to display the toolbar and command bar. These options include:

Application Toolbar

specifies whether to display the toolbar for the active application.

Command Bar

specifies to display the command bar and enable the options to use the command bar.

When **Use AutoComplete** is selected, SAS stores commands that were entered previously and completes the command once you start typing the command.

Select **Sort commands by most recently used** to display commands in the command bar list by the most recently entered command. If this setting is not selected, the commands are ordered by the most frequently used.

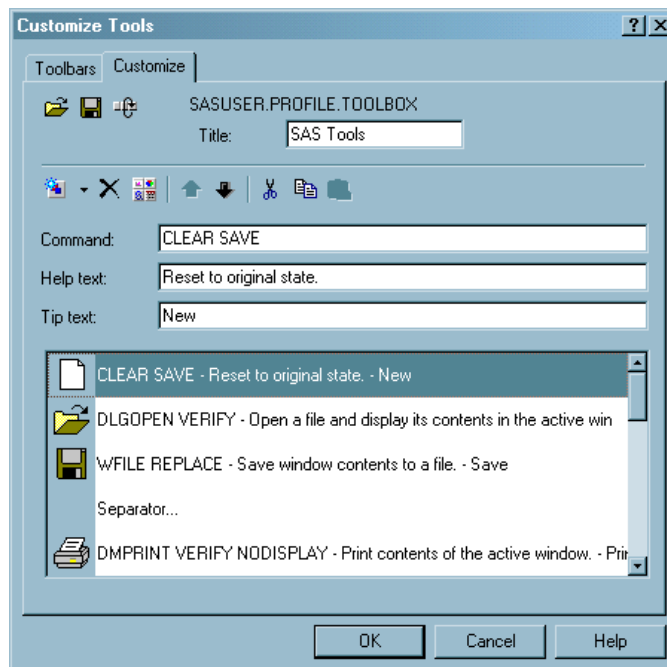
In **Number of commands saved**, type the number of commands to save in the command bar list. Valid values range between zero and 50. The default is 15.

When you have configured the **Toolbars** tab, either click **Customize** to complete your customization or click **OK** to close the dialog box.

Customizing a Toolbar

The **Customize** tab, as shown in the following display, enables you to add, delete, and modify commands on the toolbar.

Display 2.6 Customize Tab of the Customize Tools Dialog Box



The following explains each of the buttons (commands) and fields:

Open

Opens a toolbar file.

Save

Saves a toolbar file.

Restore

Restores a toolbar to the default settings.

Title

Displays the title text which appears in the title bar when the toolbar is undocked.

Add a tool

Adds a tool or a separator space to the toolbar. This tool has two parts. When you click the left button a blank tool is added to the toolbar. When you click the down arrow, you can select to add either a **Blank tool** or **Separator**. Windows that define an action set (for example, Explorer) have a selection for **Action**.

Remove tool

Deletes the selected tool from the toolbar list.

Change icon

Opens the Bitmap Browser for you to select a new icon for the selected tool.

Move tool up

Moves a tool up one position in the toolbar list.

Move tool down

Moves a tool down one position in the toolbar list.

Cut

Deletes the selected icon from the toolbar list and places it in the clipboard.

Copy

Places a copy of the selected icon in the clipboard.

Paste

Copies an icon from the clipboard to the selected tool in the toolbar list.

Command

displays the command for the tool that is selected in the toolbar list. You can modify the command in the **Command** box.

Help Text

displays the Help text that appears in the status bar message area when the pointer is placed over the button in the toolbar. You modify the Help text in the **Help Text** box.

Tip Text

displays the ScreenTip that appears under the button when the pointer is placed over the button in the toolbar. You modify the tip text in the **Tip Text** box.

Toolbar list

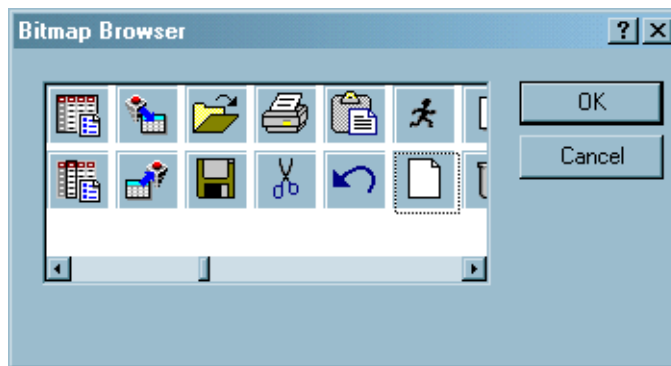
lists the buttons, commands, Help text and separators that are defined in the toolbar.

Adding a Tool to the Toolbar

To add a tool to the toolbar:

- 1 Do one of the following:
 - Click the Add tool button to add a blank tool to the toolbar list. Enter a SAS command in the **Command** box.
 - For windows that have a set of predefined tools, such as the Explorer window or the My Favorite Folders window, click the Add tool down arrow and select **Action**. From the Add Action dialog box, select an action. This selection adds a new action to the toolbar. You can enter multiple commands separated by semicolons.

- Click the Add tool down arrow and select **Separator** to add a separator to the toolbar list.
- 2 Click the Bitmap Browser button to select an icon for the tool. When you have selected an icon, click **OK**.
 - 3 Type Help text in the **Help Text** box.
 - 4 Type ScreenTip text in the **Tip Text** box.
 - 5 Position the tool in the toolbar list by clicking the Move tool up and Move tool down buttons.
 - 6 When you are finished, click Save. In the Save Tools dialog box, type the library, catalog, and toolbox name. Then click **OK**.

Display 2.7 Bitmap Browser Dialog Box

Removing a Tool from the Toolbar

To remove a tool from the toolbar:

- 1 Select the tool in the toolbar list that you want to remove.
- 2 Click Remove tool.
- 3 When you are finished, click Save.

Customizing and Saving a Toolbar for Use with a Particular Application or Window

Before you add a command to a toolbar, ensure that the command is available from a menu. Buttons are enabled only if the command is available from a menu, with the exception of the Print and Copy commands, which are always enabled.

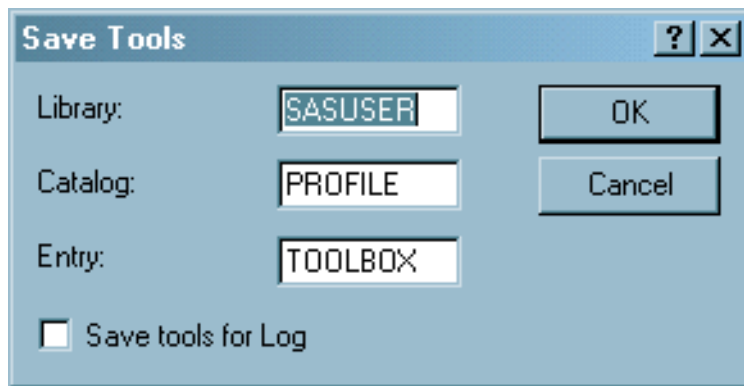
Use the following procedure to customize a toolbar to use with a particular application or window:

- 1 Click in the application or window to make it the active window.
- 2 Customize the toolbar by adding and removing tools as described in previous sections.
- 3 When you are finished customizing the toolbar, click Save. The Save Tools dialog box appears (as shown in Display 2.8 on page 72).
- 4 SAS completes the libref, catalog, and entry fields. Select the **Save tools for window** check box, where *window* is the active window, and then click **OK**.

When you select the **Save tools for window** check box, the toolbar is associated with the particular application or window by using the same library,

catalog, and entry name as the PMENU entry for the application or window. SAS first looks for toolbox entries in Sasuser.Profile before searching the application catalog.

Display 2.8 Save Tools Dialog Box



If you save the toolbar so that it is associated with a particular application, SAS automatically loads the tools when that application's window is active.

You can use the TOOLLOAD command to load your custom toolbar manually. For more information, see "TOOLLOAD Command" on page 357.

Resetting the Tools to the Default Settings

To restore a toolbar to its default settings, click Restore Defaults. SAS asks you to confirm that you want to restore to the default tool settings. When you click **Yes**, the tools are reset to their original settings (the settings that were in place when SAS was installed).

If a SAS application defines a default toolbar for its application window, clicking the Restore Defaults button restores the settings for that toolbar.

Examples of Useful Tools You Can Create

Suppose that you want to create a tool that opens the SAS Web page to the sample programs for Base SAS when the Enhanced Editor is the active window. You would perform the following steps:

- 1 Make the Enhanced Editor the active window.
- 2 In the Customize tab of the Customize Tools dialog box, click the **Add tool** toolbar button. This action creates a template for a new tool in the list box.
- 3 In the **Command** field, type `http://support.sas.com/techsup/sample/base_samples.html`.
 In the **Help Text** field, type `Sample programs for Base SAS on sas.com`.
 In the **Tip Text** field, type `sas.com sample programs`.
- 4 Click the **Change icon** button. From the Bitmap Browser dialog box, select a bitmap that is appropriate for the sample programs on the SAS Web site and click **OK**.
- 5 Use the **Move tool up** and the **Move tool down** buttons to position the tool in the toolbar.

- 6 Click the **Save the toolbar** button to save the tool with your default tool configuration.

The following are some examples of other tools that you might find useful to create:

WPGM; CLEAR; INCLUDE C:\SAS\MYPROGRAM.SAS

includes a program that you use often into the Enhanced Editor window for editing.

WPGM; FILE C:\SAS\MYPROGRAM.SAS; CLEAR

saves a SAS program after you finish editing it and clears the Enhanced Editor window.

WPGM; CLEAR; INCLUDE C:\SAS\MYPROGRAM.SAS; SUBMIT

includes and submits a SAS program that you use often.

WPGM; CLEAR; INCLUDE C:\SAS\SIGNON.SAS; SUBMIT

includes and submits a SAS program to sign on to a remote system. For example, to sign on to a remote MVS session, the SIGNON.SAS program might contain

```
options comamid=tcp remote=mytso;
libname remtdata 'mylib.mydata.monthly';
signon;
```

For more information about signing on to remote sessions, see the *SAS/CONNECT User's Guide*.

WPGM; CLEAR; INCLUDE C:\SAS\DOWNLOAD.SAS; SUBMIT

includes and submits a SAS program to download a data set from a remote session. Assuming that you have already signed on to the remote session, DOWNLOAD.SAS might contain:

```
proc download data=remtdata.june;
  /* where libname 'remtdata' is */
  /* already defined          */
run;
```

For more information about signing on to remote sessions, see the *SAS/CONNECT User's Guide*.

TOOLLOAD BAR SASUSER.PROFILE.MORTOOLS

loads a different toolbar that contains another collection of tools.

Accessing Online Help and Documentation

Using Microsoft HTML Help

SAS Help and Documentation uses Microsoft HTML Help for easy navigation, indexing, and search capabilities. Microsoft Internet Explorer (IE) 5.00 and Microsoft HTML Help 1.3 or above are required. No action is required to configure SAS to use Microsoft HTML Help.

Getting Help from the Command Bar

You can get Help for the active window and SAS language elements by using the HELP command in the command bar. The following table lists the HELP command arguments and the resulting display in the SAS Help and Documentation.

Table 2.4 Types of Help Available Using the Command Bar

Help Argument	SAS Help and Documentation Displays	Example
none	help for the active window	help
language element name and type	help on the specified language element	help libname statement
HELP	how to use the HELP command	help help

Getting Help in the Dialog Boxes

To access Help in a dialog box, click ? at the top of the dialog box, and then click the item you want information about. A pop-up window appears with a definition for the item. To close the pop-up window, click anywhere in the dialog box.

If a dialog box doesn't have the ? button, look for a Help button or press F1.

Getting Help for a SAS Product

To access help information about the SAS product associated with the currently active window, do one of the following:

- Click the Help button (the book with the question mark).
- Press the F1 function key.
- Select the Help menu and **Using This Window**. (For example, if you click the Help button and the active window is a SAS/GRAPH window, the SAS Help and Documentation displays help information about SAS/GRAPH software.)

Complete documentation for installed SAS products is available from the **SAS Products** entry in the SAS Help and Documentation table of contents.

Getting Help from the Help Menu

The Help menu is always available within your SAS session. Here are descriptions of the Help topics available from the Help menu:

Using this Window

Help information that is relevant to the active window. Selecting this topic is the same as clicking the Help button or pressing the F1 key.

SAS Help and Documentation

tutorials and sample programs to help you learn how to use SAS, comprehensive documentation for all products installed at your site, and information about contacting SAS for additional support.

Getting Started with SAS Software

opens a tutorial that will help you get started with SAS.

Learning SAS Programming

open the SAS Online Tutor, if it is installed, to help you develop your SAS programming skills. SAS Online Tutor is a separately licensed product.

SAS on the Web

provides links to useful areas on the SAS Institute Web site, including technical support, frequently asked questions, sending feedback to SAS, and the SAS home page.

About SAS System

opens the About SAS System dialog box which provides software levels for SAS and Windows, and your hardware information. You can also access SAS legal information and site information. The **System Info** button opens the Microsoft System Information window.

Getting to SAS Institute (and Other Web Sites) from within SAS

SAS is configured to launch your local Web browser to view HTML files. You can invoke your Web browser several ways:

- Type a URL (uniform resource locator) in the command bar. SAS launches the browser that you specified in the Preferences dialog box Web tab.
- Type **wbrowse** in the command bar. This action opens the browser to the SAS home page or another default URL that you specify in the Preferences dialog box Web tab. For more information, see “WBROWSE Command” on page 361.

Note that you can access web pages on the Internet (such as the SAS Institute home page) only if your workstation is connected to a network that allows access.

Viewing Output and Help in the SAS Remote Browser

What Is Remote Browsing?

You can use remote browsing to view the following types of HTML documents in the Web browser on your local computer:

- URLs that are specified in the WBROWSE command
- ODS output

By displaying ODS output locally with remote browsing, you have access to output that requires browser plug-ins that are not available for Windows 64-bit servers.

A software agent that is called the *remote browser server* runs on your local computer. When SAS needs to display HTML content, SAS connects to the remote browser server and sends to the remote browser server the URL that references the content. The remote browser server then passes the URL to your browser for display. If the remote browser server is not running on your computer, SAS displays a dialog box that contains the URL that you need to use to download the remote browser server.

Two system options are provided to configure remote browsing: HELPHOST and HELPPORT. These options specify the host name and port number of the local computer where HTML content is displayed. In most cases, these options do not need to be set. HELPHOST defaults to the host name that is specified in the X11 DISPLAY environment variable, and HELPPORT defaults to the standard port for the remote browser server.

Remote browsing is supported on Windows 64-bit servers.

Remote Browsing and Firewalls for General Users

If your network has a firewall between desktop computers and the computer that is hosting SAS, Web browsers cannot display Web pages from your SAS session. Usually, this problem is indicated by a timeout or connection error from the Web browser. If you receive a timeout or connection error, contact your system administrator.

Remote Browsing and Firewalls for System Administrators

To enable the display of Web pages when a firewall exists between desktop computers and the computer that is hosting SAS, a firewall rule must be added that allows a Web browser to connect to SAS. The firewall rule specifies a range of network ports for which SAS remote browsing connections are allowed. Contact the appropriate system administrator who can select and configure a range of network ports for remote browsing. The range depends on the number of simultaneous SAS users. A value of approximately three times the number of simultaneous SAS users should reserve a sufficient number of network ports.

After the firewall rule is added, SAS must be configured to listen for network connections in the network port range. Normally, SAS selects any free network port, but the HTTPSERVERPORTMIN and the HTTPSERVERPORTMAX system options limit the network ports that SAS selects. Add these system options to your SAS configuration file. Set HTTPSERVERPORTMIN to the lowest port in the network range. Set HTTPSERVERPORTMAX to the highest port in the network range. For example, if the system administrator defined a network port range of 8000 to 8200, the system options would be set as follows:

```
httpserverportmin=8000  
httpserverportmax=8200
```

After these system options are set, desktop computers can display Web pages. If there is an insufficient number of ports or if the system options are specified incorrectly, a message appears in the SAS log.

For more information about these options, see HTTPSERVERPORTMIN= System Option and HTTPSERVERPORTMAX= System Option in *SAS Language Reference: Dictionary*.

Using Remote Browsing with ODS Output

The SAS Output Delivery System (ODS) can be used to generate graphical reports of your SAS data. Remote browsing enables you to view your output directly from a SAS session either in real time as the output is generated, or on demand from the Results window.

Remote browsing displays ODS output in PDF and RTF formats. If your browser does not have the appropriate plug-in for non-HTML data types, the browser displays a dialog box rather than the output. This dialog box enables you to download the report to your PC and view it using a local program, such as Excel for an XLS file.

The automatic display of ODS output (PDF and RTF formats) is turned off by default. You can turn on the automatic display of ODS output by issuing the AUTONAVIGATE command in the Results window.

Installing the Remote Browser Server

You can install the remote browser server directly from your SAS session. If SAS is unable to make a connection for remote browsing, SAS displays a dialog box that contains the URL that you need to download the installer. Use this URL to download and install the remote browser server. Do not exit SAS. To install the remote browser server, follow these steps:

- 1 Type the URL that appears in the dialog box into your Web browser and press ENTER.
- 2 After the download page is displayed, download the installer that is appropriate for your computer.
- 3 Run the installer.
 - In the Windows environment, the remote browser server is added to your Startup items, so that the server will start whenever you log in. An icon is displayed in your system tray to indicate that the remote browser server is running.
 - In the Linux environment, manually add the command `rbrowser` to the start-up script for your windowing environment. The remote browser server will run, but will be minimized initially.

System Options for Remote Browsing

After the remote browser server is running on your computer, you can run remote browsing by specifying the HELPHOST and HELPPORT system options.

- The HELPHOST system option specifies the name of your host computer. If you do not specify this option, then the host name that is specified in the X Windows display is used. For more information, see “HELPHOST System Option” on page 518.
- The HELPPORT system option specifies the port number for the remote browser server that is installed on your computer. For more information, see the HELPPORT system option in the *SAS Language Reference: Dictionary*.

You can set these options in your configuration file, at SAS invocation, or during your SAS session in either the OPTIONS statement or in the SAS System Options window.

Accessibility Features in SAS under Windows

Introduction to Accessibility Features in SAS under Windows

SAS under Windows includes the following accessibility and compatibility features that improve the usability of SAS for users with disabilities. These features are related to accessibility standards for electronic information technology adopted by the U.S. Government under Section 508 of the U.S. Rehabilitation Act of 1973, as amended.

- “Accessible Windows and Dialog Boxes” on page 78 lists the accessible SAS windows and dialog boxes.
- “The ACCESSIBILITY System Option” on page 79 explains how to use the standard user interface and the fully accessible interface.
- To enhance the readability of SAS windows, see “Enlarging Fonts” on page 81 and “Enlarging Icons” on page 81.

- You can use the keyboard, menus, and commands to access and modify the docking view and the SAS Explorer list view. See the following:
 - “Resizing the Docking View in the Main SAS Window” on page 81
 - “Sorting Window List Views by a Specific Column” on page 82
 - “Resizing the Detail Columns of a List View” on page 82
- If your accessibility aid has difficulty reading menus, see “Improving Access to Menus” on page 82.

Accessible Windows and Dialog Boxes

In addition to the main SAS window, the following table lists the SAS windows and dialog boxes that are compliant with Section 508 of the U.S. Rehabilitation Act of 1973:

Table 2.5 Accessible SAS Windows and Dialog Boxes

Window or Dialog Box	Related Window or Dialog Box
About SAS System	Legal Notices Siteinfo
Change Folder	none
Customize Tools, Customize tab	Bitmap Browser Open Tools Save Tools
DDE Triplet in Clipboard	none
Enhanced Editor	Find Replace Run Keyboard Macro Keyboard Macros Assign Keys Create Keyboard Macro Edit Keyboard Macro Import Keyboard Macros Export Keyboard Macros Add Abbreviation Enhanced Editor Options User Defined Keywords SAS Extensions Enhanced Editor Keys Assign Keys
Explorer	Find New Library Catalog Create Explorer Options Properties Catalog

Window or Dialog Box	Related Window or Dialog Box
Export Wizard	all subsequent dialog boxes
Find	none
Font	none
Import Wizard	all subsequent dialog boxes
Libraries	New Library Modify Library
Log	Log Options
My Favorite Folders	none
NOTEPAD	none
Open	none
Output	Output Options
Preferences	none
Print (Windows and Universal Print dialog boxes)	Page Setup Print Abort Print Preview Print Setup (Windows and Universal Print dialog boxes)
Program Editor	none
Replace	none
Results	Results Properties Rename Save as Object Templates and resulting dialog boxes
Results Viewer - SAS Output	none
Run	none
SAS System Options	none
Save	none
Send mail	none
Windows	none

The ACCESSIBILITY System Option

Accessing the Standard or Fully Accessible User Interface

The ACCESSIBILITY system option enables you to specify either the standard user interface or the fully accessible user interface. The standard user interface enables accessibility aids to read components of most of the windows and dialog boxes that are listed in the previous section. The fully accessible user interface enables accessibility aids to read components of all of the windows that are specified in the previous section.

The fully accessible user interface adds buttons to these dialog boxes so that all commands and tabbed pages are accessible by using the keyboard:

- the Customize Tools dialog box Custom tab
- some SAS Properties dialog boxes.

You specify the ACCESSIBILITY system option either in your configuration file or at the command prompt when you start SAS. Valid values for ACCESSIBILITY are

standard

specifies to use the preferred user interface that is not fully accessible. This is the default.

extended

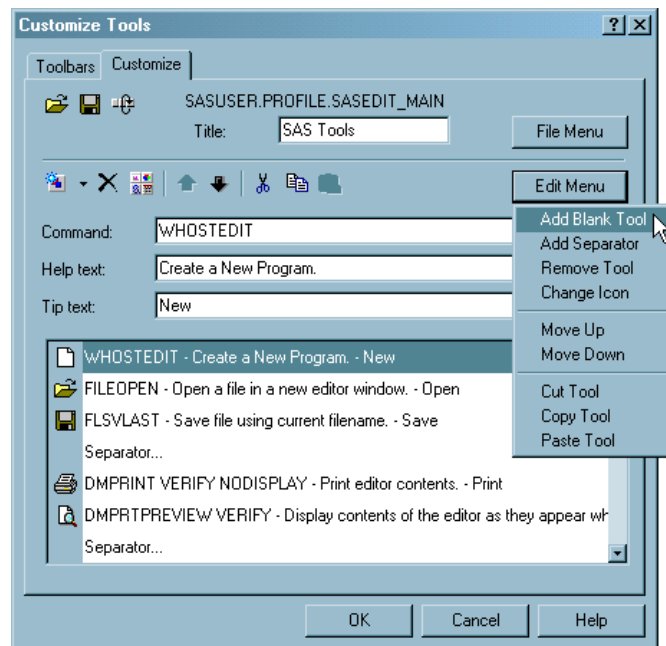
specifies to use the fully accessible user interface.

For more information, see “ACCESSIBILITY System Option” on page 492.

Using the Accessible Customize Tools Dialog Box

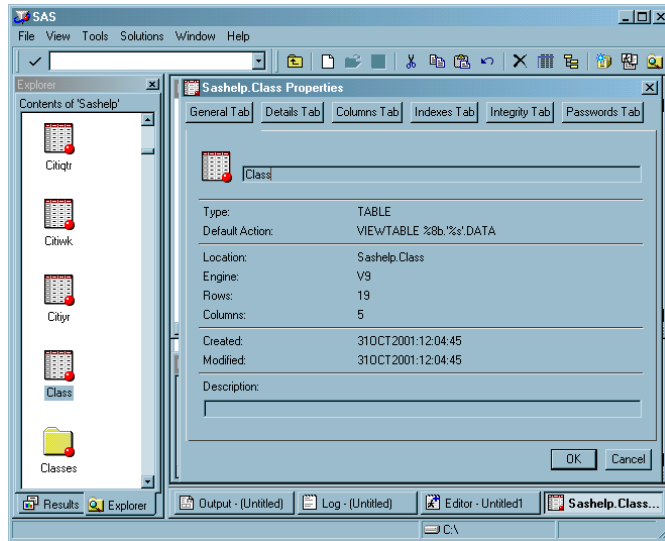
The Customize Tools dialog box Customize tab provides command buttons for file and edit commands, such as Open a toolbar and Add tool. When you start SAS with the ACCESSIBILITY system option set to **extended**, SAS adds a **File Menu** button and an **Edit Menu** button to the Customize tab. These buttons enable you to use the keyboard to issue the commands that are available from the File and Edit menus commands.

Display 2.9 The Accessible Customize Tools Dialog Box



Using Accessible Properties Dialog Boxes

When the ACCESSIBILITY system option is set to **extended**, the tabbed pages in some SAS Property dialog boxes are accessible as buttons. You can press Ctrl + Page Up and Ctrl + Page Down to navigate through the Properties dialog box.

Display 2.10 An Accessible Properties Dialog Box

Enlarging Fonts

To make text easier to read, you can enlarge the font by using the Font dialog box and the SYSGUIFont system option.

To open the Font dialog box, type **dlgfont** in the command bar or select **Tools ► Options ► Fonts**. Specify the font size in the **Size** box and click **OK**.

To enlarge fonts in button text and the descriptive text, such as the words **Contents of SAS Environment** in the SAS Explorer window, use the SYSGUIFont system option either in the configuration file or at the command prompt when you start SAS. The following SAS command uses the Times New Roman font with a font size of 16:

```
sas -sysguifont "times new roman" 16
```

Note: You might need to maximize the SAS window in order to allow space for large fonts to be readable. △

Enlarging Icons

To enlarge icons, do the following

- 1 Select **Tools ► Customize**
- 2 In the **Toolbars** tab, select **Large icons**.

Resizing the Docking View in the Main SAS Window

To resize the docking view by using the keyboard, press Alt + W + S or select **Window ► Size Docking View**. Alternatively, you can type **wdockviewresize** in the command bar.

Use the following keyboard sequences to resize the docking view:

- Press the right arrow (->) or left arrow (<-) to move the split bar slightly to the right or to the left.
- Press Ctrl + right arrow (->) or Ctrl + left arrow (<-) to move the split bar a larger amount to the right or to the left.

- Press Home to move the split bar completely to the left.
- Press End to move the split bar completely to the right.
- Press Return to accept the docking view size.
- Press Esc to cancel all docking view resizing.

For more information, see “WDOCKVIEWRESIZE Command” on page 363.

Sorting Window List Views by a Specific Column

When a window contains a list view (such as SAS Explorer), you can sort the list by the detail information that is associated with the list by using the Sort Columns dialog box:

- 1 If the window is not already a list, select **View ► List**
- 2 Type **dlgcolumnsort** in the command bar.
- 3 Select a column to sort.
- 4 Click **Sort**.
- 5 Click **Close**.

For more information, see “DLGCOLUMNSORT Command” on page 336.

Resizing the Detail Columns of a List View

You can resize the details columns in a List view by using the Column Settings dialog box. You must display the details in order to do this action.

- 1 If the window is not already a list, select **View ► List**
- 2 If the details are not already displayed, select **View ► Details**
- 3 Type **dlgcolumnsize** in the command bar.
- 4 Select a column to resize.
- 5 Press TAB and type the pixel width that you want for the column.
- 6 Do one of the following:
 - Click **Apply** to view the changes without closing the dialog box. Once you have finished making your changes, press ENTER to close the dialog box.
 - Click **OK** to apply the changes and close the dialog box.

The columns in the SAS System Options window cannot be resized.
For more information, see “DLGCOLUMNSIZE Command” on page 335.

Improving Access to Menus

Applications that provide custom icons to menu items can impede the readability of menus by accessibility aids. When you specify the NOMENUICONS system option, SAS does not include menu icons for all windows. When menu icons are excluded, menus conform to the standard Windows menu structure.

You can specify the NOMENUICONS system option in the configuration file, at SAS invocation, or by using the OPTIONS statement:

```
-MENUICONS | -NOMENUICONS  
MENUICONS | NOMENUICONS
```

MENUICONS

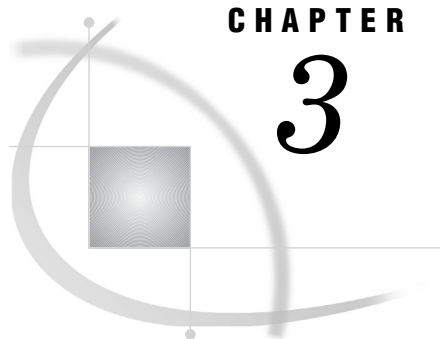
specifies to include icons in menus.

NOMENUICONS

specifies not to include icons in menus.

For example, **sas -nomenuicons** starts SAS and excludes menu icons. In an **OPTIONS** statement, you specify

```
options nomenuicons;
```

CHAPTER

3

Using the SAS Editors

<i>Using the Enhanced Editor</i>	86
<i>Enhanced Editor Features</i>	86
<i>Using the Enhanced Editor Window</i>	87
<i>Overview of the Enhanced Editor Window</i>	87
<i>Opening Files</i>	88
<i>Saving Files</i>	88
<i>Using Multiple Views of the Same File</i>	89
<i>Scrolling and Line Number Commands</i>	89
<i>Moving the Insertion Point</i>	90
<i>Selecting and Editing Text</i>	91
<i>Dragging Text</i>	93
<i>Finding and Replacing Text</i>	93
<i>Checking for Coding Errors</i>	94
<i>Using Automatic Indenting and Tabs</i>	95
<i>Bookmarking Lines</i>	96
<i>Using Abbreviations</i>	96
<i>Using Word Tips</i>	97
<i>Submitting Your Program</i>	97
<i>Obtaining the Filename and Full Path of Submitted Programs or Catalog Entries</i>	98
<i>Using Keyboard Shortcuts</i>	100
<i>Using Keyboard Macros</i>	100
<i>Using Collapsible Code Sections</i>	102
<i>Creating Your Own Keywords</i>	104
<i>Associating File Extensions with File Types</i>	105
<i>Setting Enhanced Editor Options</i>	105
<i>Opening the Enhanced Editor Options Window</i>	105
<i>General Editor Options</i>	106
<i>Appearance Options</i>	107
<i>Setting Appearance Options</i>	108
<i>Using Schemes</i>	109
<i>Using Keyboard Shortcuts to Customize the Enhanced Editor</i>	109
<i>Assigning Keyboard Shortcuts</i>	109
<i>Deleting Keyboard Shortcuts</i>	110
<i>Resetting Keyboard Shortcuts to the Enhanced Editor Defaults</i>	110
<i>Enabling and Disabling the Enhanced Editor</i>	110
<i>Using the Program Editor</i>	111
<i>Switching from the Enhanced Editor to the Program Editor</i>	111
<i>Opening Files</i>	111
<i>Using Line Numbers</i>	112
<i>Moving the Insertion Point</i>	112
<i>Using Tabs</i>	112

<i>Understanding Line Breaks</i>	113
<i>Selecting Text</i>	113
<i>Deleting Text</i>	114
<i>Finding and Replacing Text</i>	114
<i>Dragging and Dropping Text</i>	115
<i>Drag Scrolling</i>	116
<i>Using Rich Text Format Text</i>	116
<i>Saving Files</i>	117
<i>Saving Program Editor Files Using Autosave</i>	117
<i>Understanding Unique Features of the Editor</i>	117

Using the Enhanced Editor

Enhanced Editor Features

While retaining some familiar Program Editor features, the Enhanced Editor enables you to

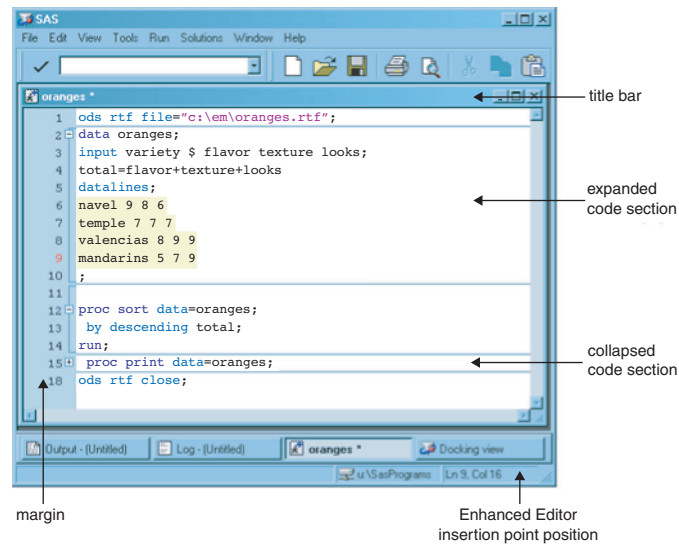
- use color-coding to identify SAS and SCL program elements as well as HTML and XML document elements. Color-coding settings can be saved in a color scheme.
- create and format your own keywords.
- automatically indent the next line when you press ENTER.
- view the high-level flow of your SAS program or see each detailed statement by expanding or contracting sections of SAS procedures, DATA steps, and macros.
- create macros that record and play back program editing commands by using the keyboard macro recorder.
- create shortcuts for typing in text using abbreviations.
- bookmark lines of code for easy access to different sections of your program or document.
- customize keyboard shortcuts for most Enhanced Editor commands.
- open multiple views of a files.
- access Help for the SAS language by placing the insertion point within the language element name and pressing F1.

Using the Enhanced Editor Window

Overview of the Enhanced Editor Window

The parts of the Enhanced Editor window are shown in the following display:

Display 3.1 Enhanced Editor Window



title bar

The title bar contains the Enhanced Editor icon and the name of the file. If the file is new, the filename is **Editor Untitled x** , where x is a window number. An asterisk (*) in the title bar indicates that any changes to the file have not been saved.

expanded code section

An expanded code section displays all of the code within the code section. It is indicated in the margin by the minus sign (-).

collapsed code section

A collapsed code section displays only the signature line of code (the line of code that contains the keyword). It is indicated in the margin by the plus sign (+).

Enhanced Editor insertion point position

Part of the main SAS window, the Enhanced Editor insertion point position displays the insertion point line and column position.

margin

You use the margin on the left side of the Enhanced Editor window to

- select one or more lines of text
- expand and collapse code sections
- display line numbers, code section brackets, and bookmarks.

You can move between Enhanced Editor windows by

- selecting an Enhanced Editor window
- typing **wnextedit** or **wpgm** in the command bar.

Opening Files

The following table shows different methods of opening files in the Enhanced Editor.

Table 3.1 Opening Files

Actions	Instructions
Open a new file	Do one of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Type wedit in the command bar <input type="checkbox"/> Select View ► Enhanced Editor <input type="checkbox"/> Click the New Program toolbar button <input type="checkbox"/> Select File ► New Program
Open an existing file by using the Open dialog box	<ol style="list-style-type: none"> 1 Open the Open dialog box by using one of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Click the Open Program toolbar button <input type="checkbox"/> Select File ► Open Program <input type="checkbox"/> Type fileopen in the command bar.* 2 Select the file. 3 Click Open.
Open multiple individual files by using the Open dialog box	<ol style="list-style-type: none"> 1 Hold down the Ctrl key. 2 Select the files. 3 Click Open.
Open an existing file, bypassing the Open dialog box	Do one of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Type wedit "filename" in the command bar. <input type="checkbox"/> Type fileopen "filename" in the command bar.*
Open multiple views of an opened file	<ol style="list-style-type: none"> 1 Make the file the active window. 2 Select Window ► New Window* <p>When you open multiple views of a file, changes that you make in any view of the file are made simultaneously in all views.</p>
Append a file to an opened file	<ol style="list-style-type: none"> 1 Make the file that is to be appended the active window. 2 Select File ► Append. 3 Select a folder and the file to append. 4 Click Open.

* The Enhanced Editor must be the active window.

Note: To change the default directory for the Open dialog box, either start SAS using the SASINITIALFOLDER system option or change the current working directory. For more information, see “SASINITIALFOLDER System Option” on page 559 and “Changing the SAS Current Folder” on page 39. Δ

Saving Files

An asterisk (*) that appears in an Enhanced Editor window title bar indicates that the editor contains text that has not been saved to disk. Enhanced Editor windows that

display the name **Editor Untitled x** in the title bar are new files that have never been saved. The x indicates a window number.

To save the contents of the Enhanced Editor window, click the **Save** toolbar button (the diskette). If the file is to be saved for the first time, the Save As dialog box opens for you to name the file.

To save a file with a new name

- 1 Select **File ► Save As**
- 2 Select a folder in the **Save in** field.
- 3 Type a filename in the **File name** field.
- 4 Select a file type from the **Save as type** field.
- 5 Click **OK**.

Note: To change the default directory for the Save dialog box, either start SAS using the SASINITIALFOLDER system option or change the current working directory. For more information, see “SASINITIALFOLDER System Option” on page 559 and “Changing the SAS Current Folder” on page 39. △

If SAS ends unexpectedly, you can recover the contents of Enhanced Editor windows if the autosave feature is selected in the Preferences dialog box. The Enhanced Editor autosave files are saved in the operating environment Application Data folder with the filename **Autosave of filename.\$AS**, where *filename* is the name of the file. Under Windows Vista, the pathname for the Application Data folder is **c:\Users\userid\AppData**. Under all other Windows operating environments, the pathname for the Application Data folder is **c:\Documents and Settings\user name\Application Data\SAS\EnhancedEditor**. For example, the path to the autosave file for MYPROGRAM.SAS in folder C:\TEMP would be

```
c:\Documents and Settings\myuserid\Application Data\SAS\EnhancedEditor
\Autosave of myprogram.$AS
```

SAS deletes autosave files when a file is saved, when the Enhanced Editor window closes, or when a SAS session ends normally. If you have renamed a file and SAS ends abnormally, you will find the autosaved file under the original filename.

For information about setting the autosave feature, see “Edit Preferences” on page 61 and “WAUTOSAVE Command” on page 360.

Using Multiple Views of the Same File

You can see different parts of the same file simultaneously by opening multiple views of the same file. While you are working with multiple views, you are working with only one file, not multiple copies of the same file.

To open multiple views of the same file:

- 1 Make the file the active window.
- 2 Select **Window ► New Window**

The filename in the title bar is appended with a colon and a view number. For example, **myfile.sas:1** and **myfile.sas:2**.

Changes that you make to a file in one view, such as changing text or bookmarking a line, occur in all views simultaneously. Actions such as scroll bar movement, text selection, and expanding or contracting a section of code occur only in the active window.

Scrolling and Line Number Commands

The Enhanced Editor supports a limited number of scrolling and line number commands that you might be familiar with from using the Program Editor. All Enhanced Editor commands can be typed only from the command bar.

The Enhanced Editor supports the following scrolling commands:

Table 3.2 Scrolling Commands

Command	Description
UP	Move one page toward the beginning of the file.
DOWN	Move one page toward the end of the file.
LEFT	Move one page to the left.
RIGHT	Move one page to the right.

You can display line numbers either by selecting **Show line numbers** in the Enhanced Editor Options dialog box or by typing **nums** in the command bar. To suppress line numbers, either deselect **Show line numbers** or type **nums** again in the command bar.

All line number commands begin with a colon (:). A space is not required between the command and the number. The following line number commands are supported:

Table 3.3 Line Number Commands

Command	Description	Default Value of n	Maximum Value Allowed	Example
:In	Insert n lines after the current line.	1	9999	:I4 Inserts 4 lines after the current line
:IAN	Insert n lines after the current line.	1	9999	:IA4 Inserts 4 lines after the current line
:IBn	Insert n lines before the current line.	1	9999	:IB2 Inserts 2 lines before the current line
:Dn	Delete n lines starting at the current line.	1	9999	:D3 Deletes three lines, starting with the current line.
:Rn m	Repeat the block of m lines, starting with the current line, n times. A space is required between n and m .	1	9999	:R1 6 Repeats six lines, starting with the current line, one time.

Moving the Insertion Point

The Enhanced Editor accepts numerous key sequences for moving the insertion point, as shown in the following table. The key sequence Ctrl + G opens the Go To Line dialog box. All other key sequences move the insertion point as defined.

Table 3.4 Key Sequences for Moving the Insertion Point

Use this key sequence...	To move the insertion point....
Up arrow	up one line
Down arrow	down one line
Left arrow	left by one character
Right arrow	right by one character
Page Down	down a page
Page Up	up a page
Home	to the beginning of the current line
Ctrl + Home or Ctrl + Page Up	to the beginning of the document
End	to the end of the current line
Ctrl + End or Ctrl + Page Down	to the end of the document
Ctrl + up arrow	toward the top of the file while scrolling up
Ctrl + down arrow	toward the bottom of the file while scrolling down
Ctrl + right arrow	to the start of the next word
Ctrl + left arrow	to the start of the previous word
Ctrl +]	to the matching parenthesis or bracket
Ctrl + G	to a specific line number
Alt + up arrow	to the first visible line
Alt + down arrow	to the last visible line
Alt + right arrow	to the next case change or word boundary
Alt + left arrow	to the previous case change or word boundary
Shift + Tab	backward to the previous tab stop

In addition to using key sequences, you can move the insertion point up by one page, down by one page, to the left by one page and to the right by one page by using the UP, DOWN, LEFT, and RIGHT commands in the command bar.

By default, when you click the mouse button past the end of a line, the insertion point is placed after the last character in a line.

To enable the Enhanced Editor to place the insertion point past the end of a line:

- 1 Select **Tools ► Options ► Enhanced Editor ► General**
- 2 Select the **Allow cursor movement past end of line** check box.
- 3 Click **OK**.

Selecting and Editing Text

Use the following mouse and keyboard shortcut actions to select and manipulate text.

Table 3.5 Selecting Characters and Lines of Text

Text Selection	Instructions
One or more lines of text using the margin	<ol style="list-style-type: none"> 1 Click and hold down the left mouse button in the margin on the first line of text that you want to select. 2 Still holding down the left mouse button, drag the mouse pointer within the margin to the last line that you want to select. 3 Release the left mouse button.
Single or multiple characters, or whole lines of text	<ol style="list-style-type: none"> 1 Click and hold down the left mouse button before the first character that you want to select. 2 Still holding down the left mouse button, drag the mouse pointer to the last character that you want to select. 3 Release the left mouse button.

The following keyboard shortcuts are also available to select text.

Table 3.6 Keyboard Shortcuts to Select Text

To...	Instructions
Extend a selection in a particular direction	Press the Shift key and then press a directional arrow.
Extend a selection one character at a time	Press Shift + left arrow or right arrow
Unmark selected text	Press any directional key
Copy selected text	Press Ctrl + C or select Edit ► Copy
Cut selected text	Press Ctrl + X or select Edit ► Cut
Paste from the clipboard	Press Ctrl + V or select Edit ► Paste
Move selected text	<ol style="list-style-type: none"> 1 Place the mouse pointer over the selected text. 2 Click and hold down the left mouse button. The mouse pointer displays a vertical line. 3 Still holding down the left mouse button, drag the selected text and place the vertical line at the position where you want to place the text. 4 Release the left mouse button.

Text that you select appears in reverse video.

For a complete list of selection keyboard shortcuts, see the Selection category in “Keyboard Shortcuts within the Enhanced Editor” on page 626.

Note: In addition to using commands from the Edit menu, you can use editing commands that are available from the pop-up menu when you click the right mouse button in the Enhanced Editor window. Δ

Dragging Text

To move or copy text

- 1 Select the text, place the pointer over the selected text, and hold down the left mouse button.
- 2 To move the text
 - a Drag the text to the location.
 - b Release the left mouse button.
- 3 To copy the text
 - a Press the Ctrl key.
 - b Drag the text to the desired location.
 - c Release the left mouse button.

To disable drag and drop editing

- 1 Select **Tools ► Options ► Enhanced Editor ► General**
- 2 Clear the **Drag and drop text editing** check box and click **OK**.

Finding and Replacing Text

To find text

- 1 Open the Find dialog box by selecting **Edit ► Find**
- 2 Supply the following information:

Find text

Type a text string to find. The initial value of this field is the last text string that was used in a search.

Find in

Click the **Find in** box to specify whether to search in the code only, in the comments only, or in both the code and comments.

Direction

Select either the **Up** or the **Down** option. **Up** specifies to search from the insertion point position toward the beginning of the file. **Down** specifies to search from the insertion point position toward the bottom of the file.

Match whole word only

Select the check box to specify that a match of the text must be a whole word and not part of a word.

Match case

Select the check box to specify that upper and lowercase characters must match exactly.

Regular expression search

Select the check box to specify that the text string is a regular expression. A regular expression uses special characters as wildcards to search for a string or substring. For a selection of special characters that you can use in regular expressions, click the arrow that is located to the right of the **Find text** field.

- 3 Click **Find Next**.

To find and replace text

- 1 To search only within a subset of text, select the text.
- 2 Open the Replace dialog box by selecting **Edit ► Replace**

3 Supply the following information:**Find text**

Type a text string to find and replace. The initial value of this field is the last text string that was used in a search.

Replace with

Type the replacement string.

Find in

Click the **Find in** box to specify whether to search in the code only, in the comments only, or in both the code and comments.

Direction

Select either the **Up** or the **Down** option. **Up** specifies to search from the insertion point position toward the beginning of the file. **Down** specifies to search from the insertion point position toward the bottom of the file.

Match whole word only

Select this check box to specify that any match of the text must be a whole word and not part of a word.

Match case

Select this check box to specify that upper- and lowercase characters must match exactly.

Regular expressions

Select this check box to specify that the text string includes a regular expression. A regular expression uses special characters as wildcards to search for a string or substring. For a selection of special characters that you can use in regular expressions, click the right arrow that is located to the right of the **Find text** field.

4 Click **Find Next**.**5** If the text is found, click one of the following:

- Replace** to replace this single occurrence of the text with the replacement string.
- Replace All** to replace all occurrences of the text in the file with the replacement string.
- Replace in Selection** to replace all occurrences of the text that is within selected text with the replacement string.

Checking for Coding Errors

To assist you in finding coding errors, the Enhanced Editor

- color-codes program elements, quoted strings, and comments.
- searches for ending brackets or parentheses when you press Ctrl +].
- searches for matching DO-END pairs when you press Alt + [.

See the following table for suggestions about finding coding errors.

Table 3.7 Hints about Finding Coding Errors

Code Error Type	Instructions
Undefined or misspelled keywords	<p>In the Enhanced Editor Options dialog box Appearance tab, set the file elements Defined keyword, User defined keyword, and the Undefined keyword to unique color combinations.</p> <p>When SAS recognizes a keyword, the keyword changes to the defined colors. You'll be able to easily spot undefined keywords by looking for the colors that you selected for undefined keywords.</p>
Unmatched quoted strings	<p>Look for one or more lines of the program that are the same color.</p> <p>Text following a quotation mark remains the same color until the string is closed with a matching quotation mark.</p>
Unmatched comments	<p>Look for one or more lines of the program that are the same color.</p> <p>Text that follows an open comment symbol (/*) remains the same color until the comment is closed with a closing comment symbol (/*).</p>
Matching DO-END pairs	<p>Place the cursor within a DO-END block and press Alt + [. The cursor moves first to the DO keyword. If one of the keywords is not found, the cursor remains as positioned.</p> <p>When both of the keywords exist, pressing Alt + [moves the cursor between the DO-END keywords.</p>
Matching parentheses or brackets	<p>Place the cursor on either side of the parenthesis or bracket. Press Ctrl +].</p> <p>The cursor moves to the matching parentheses or bracket. If one is not found, the cursor remains as positioned.</p>
Missing semi-colons (;)	Look for keywords that appear in normal text.

For a list of the components that you can color-code, open the Enhanced Editor Options dialog box. Select the Appearance tab. The components are listed in the **File elements** box. For more information about defining colors for program components, see “Setting Appearance Options” on page 108.

Using Automatic Indenting and Tabs

When you press ENTER, you automatically indent the next line by the amount of space that the current line is indented. If you prefer not to use automatic indentation:

- 1 Select **Tools ► Options ► Enhanced Editor ► General**
- 2 In the **Indentation** box, select **None**.

In addition to automatic indenting, you can indent by using the TAB key. Pressing the TAB key moves the insertion point and any text to the right of the insertion point by the amount of space that you specified in the **Tab size** field of the Enhanced Editor Options dialog box.

Tab characters can be replaced by spaces either when you press the TAB key or when you open a file. To insert spaces instead of tab characters when you press the TAB key, select the **Insert spaces for tabs** check box. To replace tab characters with spaces when you open a file, select the **Replace tabs with spaces on file open** check box.

Note: Changing the tab size modifies tab settings to the new value in *all* Enhanced Editor windows. Δ

Bookmarking Lines

When you bookmark a line, you create a line marker that is used to easily access that line. A vertical rectangle in the margin indicates that the line is bookmarked. Table 3.8 on page 96 shows the keyboard shortcuts that you can use with bookmarking.

Table 3.8 Keyboard Shortcuts for Bookmarking Lines

Action	Keyboard Shortcuts
Bookmark a line	Ctrl + F2 on an unmarked line
Unmark a line	Ctrl + F2 on a marked line
Go to the next bookmark	F2
Go to the previous bookmark	Shift + F2

Using Abbreviations

You can define a character string so that when you type it and then press the TAB key or the ENTER key, the string expands to a longer character string. For example, you could define the abbreviation *myv6sasfiles*, which would expand to *'c:\winnt\profiles\myid\personal\mysasfiles\v6'*. Abbreviations are actually macros that insert one or more lines of text.

To create an abbreviation

- 1 Press Ctrl + Shift + A or select **Tools ► Add Abbreviation**
- 2 In the **Abbreviation** field, type the name of the abbreviation.
- 3 In the **Text to insert for abbreviation** field, type the text that the abbreviation will expand into.
- 4 Click **OK**.

To use an abbreviation, type the abbreviation. When an abbreviation is recognized, a tooltip displays the expanded text. Press the TAB key or the ENTER key to accept the abbreviation.

To modify an abbreviation

- 1 Press Ctrl + Shift + M or select **Tools ► Keyboard Macros ► Macros**.
- 2 Select the abbreviation from the list of current macros.
- 3 Click **Edit**.
- 4 Select the string in the **Keyboard Macro Contents** field.
- 5 Click **Modify**.
- 6 Type your modification in the Insert String dialog box and click **OK**.
- 7 Click **OK** in the Edit Keyboard Macros dialog box.
- 8 Click **Close** in the Macro dialog box.

To delete an abbreviation

- 1 Press Ctrl + Shift + M or select **Tools ► Keyboard Macros ► Macros**
- 2 Select the abbreviation from the list of **Current Macros**.
- 3 Click **Delete**.
- 4 Click **Close**.

Using Word Tips

You can use Word Tips to help in understanding the abbreviations that you add. To use Word Tips, you must first add abbreviations.

- 1 Press Ctrl + Shift + A.
- 2 Add the abbreviation and corresponding text.
- 3 Click OK to accept, or click Cancel to discard.

Word tips will automatically appear as you type.

To accept a Word Tip, press Enter. To ignore the Word Tip, press ESC or continue typing.

To recall a Word Tip:

Position the pointer so that it immediately follows the abbreviation.

Press Alt + F1.

Submitting Your Program

You can submit either a complete program or a specified number of lines of your program, beginning with the first line.

Note: The maximum line length is 6K bytes. Δ

Submitting a Complete Program	Instructions
When you open the program in the editor	Select the Submit check box in the Open dialog box.
From the Enhanced Editor	Do one of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Click the Submit toolbar button <input type="checkbox"/> Press F3 or F8 <input type="checkbox"/> Select Run ► Submit <input type="checkbox"/> Type submit in the command bar.

Use the SUBTOP command to submit either the first line or a specified number of lines of a program.

Submitting Partial Programs	Instructions
Only the top line of a program	Do one of the following: <ul style="list-style-type: none"> <input type="checkbox"/> Type subtop in the command bar. <input type="checkbox"/> Select Run ► Submit Top Line
A specified number of lines, beginning with the first line	<ul style="list-style-type: none"> <input type="checkbox"/> In the command bar, type subtop n, where n is the number of lines that you want to submit. <input type="checkbox"/> Select Run ► Submit N Lines and type the number of lines that you want to submit.

For more information, see “SUBTOP Command” on page 355.

The Enhanced Editor Options dialog box provides the **Clear text on submit** setting for you to specify whether you want the contents of the Enhanced Editor window to be cleared after you submit your program. For more information, see “Setting Enhanced Editor Options” on page 105.

If a line of data in a DATALINES or CARDS statement is greater than 256 characters long, the data is read into one observation. You do not need to specify the LRECL option in the FILENAME statement as you do when you submit a long line of data using the Program Editor.

Obtaining the Filename and Full Path of Submitted Programs or Catalog Entries

When you submit code or a catalog entry from the Enhanced Editor, the filename or catalog entry name and their respective folders are placed in these environment variables:

SAS_EXECFILEPATH

contains the full path of the submitted program or catalog entry. The full path includes the folder and the filename.

SAS_EXECFILENAME

contains only the name of the submitted program or the catalog entry name.

You can then extract the filename and full path for use in your SAS programs.

After the following DATA step runs and the data is sorted, the PRINT procedure includes the filename in the title and the full path in the footnote of the procedure output. The results are shown in Display 3.2 on page 99.

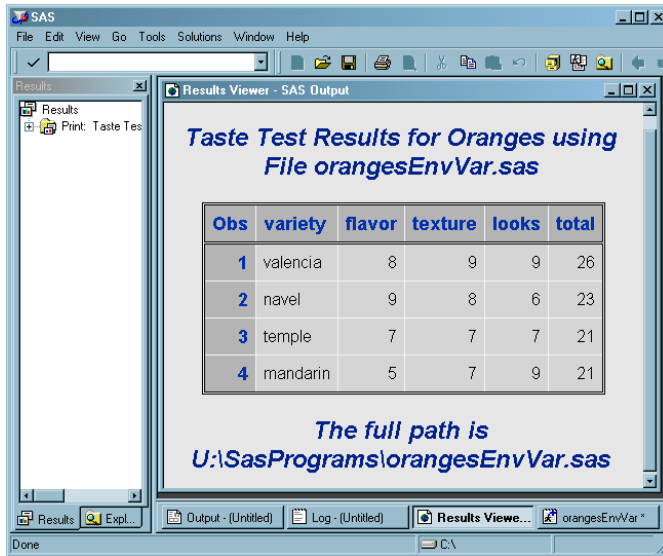
```
data oranges;
  input variety $ flavor texture looks;
  total=flavor+texture+looks;
cards;
navel 9 8 6
temple 7 7 7
valencias 8 9 9
mandarins 5 7 9
;

proc sort data=oranges;
  by descending total;
run;

proc print data=oranges;
title 'Taste Test Results for Oranges using File ' %sysget(SAS_EXECFILENAME);
footnote 'The full path is ' %sysget(SAS_EXECFILEPATH);
run;
```

The resulting output displays the filename in the title and the full path in the footnote:

Display 3.2 Using an Environment Variable to Place a Filename in DATA Step Output



These environment variables are set only when code is submitted using the Enhanced Editor in the Windows environment. They are not set when you submit SCL code or when you submit code in a batch session.

However, when SAS is running in batch mode, you can obtain the full path (which includes the filename) by submitting `%sysfunc(getoption(SYSIN))`. The following macro can be used to obtain the full path in both a batch session and an interactive session by using the Enhanced Editor:

```
%let execpath=" ";
%macro setexecpath;
  %let execpath=%sysfunc(GetOption(SYSIN));
  %if %length(&execpath)=0
    %then %let execpath=%sysget(SAS_EXECFILEPATH);
%mend setexecpath;

%setexecpath;
%put &execpath;
```

You can also use the following `%PUT` macro statements to display the filename and full path in the SAS log:

```
%put Submitted file path is %sysget(SAS_EXECFILEPATH).;
%put Submitted file name is %sysget(SAS_EXECFILENAME).;
```

CAUTION:

The values for these environment variables can be overwritten if subsequent programs are submitted while an interactive procedure is active. The environment variables are set to the last submitted program. If a program starts an interactive procedure and subsequent programs are submitted while the interactive procedure is still active, the environment variables are set to the filename and full path of the latest submitted program. The filename and full path of the program that submitted the interactive procedure are no longer available. △

Using Keyboard Shortcuts

The Enhanced Editor provides extensive keyboard shortcuts for the Enhanced Editor. “Keyboard Shortcuts within the Enhanced Editor” on page 626 provides a complete list of commands and their default keyboard shortcuts. The following table shows some of the more useful keyboard shortcuts.

Table 3.9 Useful Keyboard Shortcuts

Keyboard Shortcut	Task
Get help for a SAS procedure	Press the mouse button and place the insertion point within the procedure name and press F1
Add a new abbreviation	CTRL + Shift + A
Toggle expand current line	Alt + Num *
Collapse all code sections	Alt + Ctrl + Number pad -
Expand all code sections	Alt + Ctrl + Number pad +
Toggle marker on the current line	Ctrl + F2
Go to the next marked line	F2
Go to the previous marked line	Shift + F2
Go to line	Ctrl + G
Go to the beginning of the file	Ctrl + Page Up
Go to the end of the file	Ctrl + Page Down
Convert selected text to uppercase	Ctrl + Shift + U
Convert selected text to lowercase	Ctrl + Shift + L

For information about defining keyboard shortcuts, see “Using Keyboard Shortcuts to Customize the Enhanced Editor” on page 109.

Using Keyboard Macros

A keyboard macro is a series of Enhanced Editor commands and instructions that you group together as a single command to accomplish a task automatically. Instead of manually performing a series of time-consuming, repetitive actions, you can create and run a single macro. You run a macro from the Tools menu or by using a keyboard shortcut. For information about defining a keyboard shortcut for using macros, see “Using Keyboard Shortcuts to Customize the Enhanced Editor” on page 109.

You can create a macro by recording it from the Enhanced Editor window:

- 1 Start recording either by pressing Alt + Shift + R or by selecting **Tools ► Keyboard Macros ► Record New Macro**
- 2 Execute the sequence of actions to accomplish the task.
- 3 Stop recording either by pressing Alt + Shift + R or by selecting **Tools ► Keyboard Macros ► Stop Recording**
- 4 If you want, define a keyboard shortcut to run the macro. For information, see “Using Keyboard Shortcuts to Customize the Enhanced Editor” on page 109.

An alternative way to create a macro is to add commands by using the Create Keyboard Macro dialog box. To create the macro:

- 1 Open the Keyboard Macros dialog box by pressing Ctrl + Shift + M or by selecting **Tools ► Keyboard Macros ► Macros**
- 2 Click **Create** to open the Create Keyboard Macro dialog box.
- 3 Type the name of the macro in the **Keyboard macro name** field.
- 4 Type a description of the macro in the **Keyboard macro description** field.
- 5 The **Keyboard macro contents** box lists the commands in the order in which they will be executed.

To add a command, select the command from the **Commands** box and click the Insert Selected Command button (the double arrow). Repeat this step until all commands are listed in the **Keyboard macro contents** box.

You can reorder commands by selecting the command in the **Keyboard macro contents** box and clicking the UP or DOWN arrows.

To delete a command, select the command and click **Delete**.

- 6 When all of the commands are present in the box and are ordered correctly, click **OK**.
- 7 In the Keyboard Macros dialog box, click **Close**.

To run a macro, use a keyboard shortcut or

- 1 Select **Tools ► Keyboard Macros ► Run Macro**
- 2 In the Run Macro dialog box, select a macro and click **Run**.

To edit a macro

- 1 Open the Keyboard Macro dialog box by pressing Ctrl + Shift + M or by selecting **Tools ► Keyboard Macros ► Macros**
- 2 Select a macro and click **Edit** to open the Edit Keyboard Macro dialog box.
- 3 To add a command, select a command from the **Commands** box and click the Insert Selected Command button.

To modify a command, first ensure that you can modify the command by selecting the command from the **Keyboard macro contents** box. If a command can be modified, the **Modify** button is active. Click **Modify** to open a dialog box that will enable you to modify the command.

To delete a command, select the command in the **Keyboard macro contents** box and click **Delete**.

To reorder a command, select the command and click the up or down button.

- 4 When the commands are in the correct order, click **OK**.

To delete a macro

- 1 Press Ctrl + Shift + M or select **Tools ► Keyboard Macros ► Macros**
- 2 Select the macro and click **Delete**.
- 3 Click **Yes** in the Delete Macro dialog box.
- 4 Click Close.

This example lists the steps to create an RSUBMIT statement, an ENDRSUBMIT statement, a blank line between these statements, and tabs by the amount that you specified **Tabs size** field in the Enhanced Editor Options dialog box.

- 1 Select **View ► Enhanced Editor**
- 2 Select **Tools ► Keyboard Macros ► Record New Macro** and click **OK** in the message box.

- 3 In the Enhanced Editor window:
 - a Press ENTER.
 - b Type `rsubmit;`
 - c Press ENTER.
 - d Press ENTER.
 - e Type `endrsubmit;`
 - f Press the UP arrow.
 - g Press the TAB key.
 - h Select **Tools** \blacktriangleright **Keyboard Macros** \blacktriangleright **Stop Recording**

The resulting macro contains the following commands:

```

Insert carriage return
Insert character ['r']
Insert character ['s']
Insert character ['u']
Insert character ['b']
Insert character ['m']
Insert character ['i']
Insert character ['t']
Insert character [';']
Insert carriage return
Insert carriage return
Insert character ['e']
Insert character ['n']
Insert character ['d']
Insert character ['r']
Insert character ['s']
Insert character ['u']
Insert character ['b']
Insert character ['m']
Insert character ['i']
Insert character ['t']
Insert character [';']
Move cursor up
Insert character ['|']

```

Keyboard macros can be shared by multiple users. You can import or export them to or from a folder by using the Keyboard Macros dialog box. To open the dialog box, select **Tools** \blacktriangleright **Keyboard Macros** \blacktriangleright **Macros**

To import a keyboard macro, click **Import**, select a folder from the **Look in** box and a filename from the **Filename** box. Then click **OK**.

To export a keyboard macro, click **Export**, select a folder from the **Look in** field, type a filename in the **Filename** box, and click **OK**.

Using Collapsible Code Sections

Collapsible code sections enable you to expand or collapse one or more sections of code. A section begins with a step keyword, a comment, or spaces above a section word or comment. A section ends with the next step keyword, a comment, or space above the next section word or comment. Step keywords include the DATA statement, the PROC statement, and the %MACRO statement. The *signature line* is the line in which the step keyword appears.

An expanded section is indicated by a minus sign in the margin next to the signature line. To collapse a section, click the minus sign.

A collapsed section is indicated by a plus sign in the margin, and the signature line is the only line of code that is displayed. To expand a section, click the plus sign.

Display 3.3 The Enhanced Editor When Collapsible Code Segments Are Enabled

```

oranges.sas *
/* The Oranges Program in the Enhanced Editor */
data oranges;
input variety $ flavor texture looks;
total=flavor+texture+looks;
cards;
navel 9 8 6
temple 7 7 7
valencia 8 9 9
mandarin 5 7 9
;
proc sort data=oranges;
by descending total;
run;
proc print data=oranges;

```

Brackets in the margin and a section line across the editor window mark the beginning and end of a section. If you do not want to see either the brackets or the section line, you can suppress them by using the Enhanced Editor Options dialog box.

To disable collapsible code sections, or brackets and lines, select **Tools ► Options ► Enhanced Editor ► General** and select the appropriate settings:

- Clear the **Collapsible code sections** check box to disable collapsible code sections.
- Clear the **Show section lines in text** check box to disable section lines in the editor.
- Clear the **Show section brackets in margin** check box to suppress section brackets in the margin.

The following rules apply when you select and edit collapsed segments:

- Selecting a line from the margin that includes a collapsed segment includes all text within the collapsed segment.
- Selecting a line of text by dragging the mouse over the text or by using the keyboard selects only that line of text.
- Selecting text from above a collapsed section and into a collapsed signature line copies text from the start of the selection to the end of the selection. The selection includes any hidden lines above the signature line up to the end of the selection.
- Selecting text on a signature line down into another section marks text from the beginning of the selection to the end of the selection and includes hidden text below the signature line.
- Any keystroke on a signature line expands the section.
- Pasting into a signature line or section expands the section.
- Typing something above a section that affects the section, such as comments or quotes, expands the section.
- Pressing **ENTER** at the beginning of a signature line adds code at the beginning of the section.
- Pressing **ENTER** at the end of a signature line adds code at the end of the section.
- Selecting **Undo** will not undo the collapse and expand commands.

- When you search for text and the text is found within a collapsed segment, the segment expands.
- When text within a collapsed segment is to be replaced, the segment expands.
- When text within a collapsed segment is to be replaced and you select **Replace All**, collapsed sections do not expand.

Creating Your Own Keywords

In addition to the many SAS program file elements that you can format within the Enhanced Editor, you can create user-defined keywords for programming elements such as SAS procedure statements, variables, and user-defined formats. The appearance of user-defined keywords overrides the appearance of identical keywords that are defined in the SAS language.

Use the following rules for naming keywords:

- 1 The first letter must be a letter (A, B, C, ... Z) or an underscore (_).
- 2 Subsequent characters can be letters, numeric digits (0, 1, ... 9) or underscores.
- 3 You can use uppercase or lowercase letters. Keywords are not case-sensitive.
- 4 Blanks are not allowed in keyword names.

To create and format user-defined keywords, use the Enhanced Editor Options dialog box as follows:

- 1 Make an Enhanced Editor window the active window.
- 2 Select **Tools ► Options ► Enhanced Editor**
- 3 From the General tab, click **User Defined Keyword**.
- 4 Click **Add**.
- 5 Replace **NewKeyword** with your keyword.
- 6 Click **OK**.
- 7 Select the Appearance tab.
- 8 In the **File elements** box, select **User defined keyword**.
- 9 Select a font, foreground color, and background color.
- 10 Click **OK**.

To rename a keyword from the User Defined Keywords dialog box

- 1 Select the keyword.
- 2 Click **Rename**.
- 3 Rename the keyword.
- 4 Click **OK**.

To delete a keyword from the User Defined Keywords dialog box

- 1 Select the keyword.
- 2 Click **Delete**.
- 3 Click **OK**.

Associating File Extensions with File Types

The following table lists the default file extensions for the types of files that are recognized by the Enhanced Editor.

Table 3.10 Default File Extensions Recognized by the Enhanced Editor

File Type	Default File Extension
SAS Program File	.sas
SCL Program File	.scl
HTML Document	.htm, .html, .xml

To associate other file extensions with SAS and SCL programs, and HTML and XML documents, do the following:

- 1 Open the Enhanced Editor Options dialog box by selecting **Tools ► Options ► Enhanced Editor**.
- 2 Click the General tab.
- 3 Select a file type from the **File type** box.
- 4 Click **File Extensions** and then click **Add**.
- 5 Type the file extension and press ENTER.

To rename a file extension

- 1 Select the file extension.
- 2 Click **Rename**.
- 3 Type the new file extension and press ENTER.

To delete a file extension, select the file extension and click **Delete**.

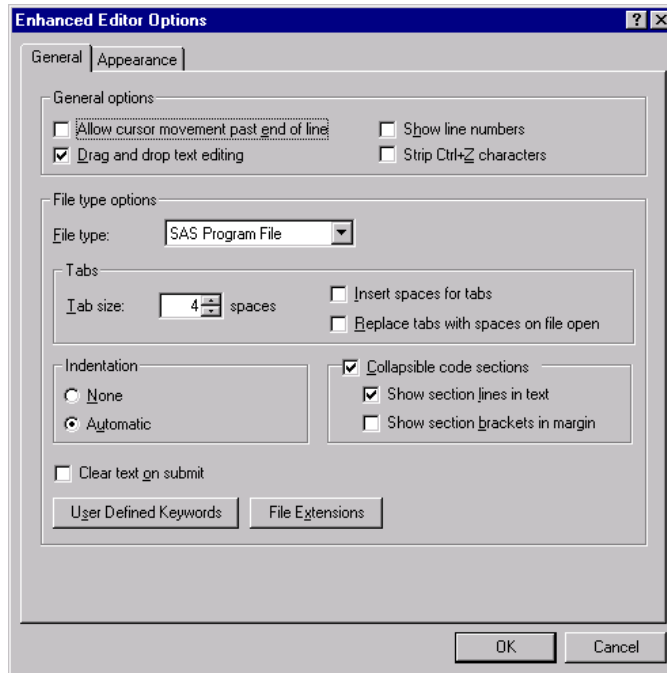
To revert to the default file extensions, click **Default**.

Setting Enhanced Editor Options

Opening the Enhanced Editor Options Window

To open the Enhanced Editor Options window from the menu, ensure that an Enhanced Editor window is the active window and select **Tools ► Options ► Enhanced Editor**.

Display 3.4 Editor Options Dialog Box



Click the tabs that are located along the top of the dialog box to navigate to the settings that you want to change, and then select the options that you want. When you are finished, click **OK**.

General Editor Options

From the General tab you can specify the following options that control how the Enhanced Editor works.

Allow cursor movement past end of line

specifies where the insertion point is positioned when you click the mouse pointer after the last text character on a line. If it is selected, the insertion point is positioned where you click the mouse pointer. If it is not selected, the insertion point is positioned after the last text character on the line.

Drag and drop text editing

specifies whether selected text can be moved by using drag-and-drop editing. If it is selected, selected text can be moved. If it is not selected, selected text cannot be moved.

Show line numbers

specifies whether to display line numbers in the margin. When line numbers are displayed, the current line number is red.

Strip Ctrl+Z characters

specifies to remove the Ctrl+Z end-of-file characters that might be included in files that were created in a DOS editor.

File type

specifies the type of file to which tabs, indentation, and collapsible code sections apply. File types include HTML documents, SAS programs, SCL programs, and text documents.

Tab size

specifies the number of spaces to indent.

Insert spaces for tabs

specifies whether to insert the space character or the tab character when you press the TAB key. If it is selected, the space character is used. If it is not selected, the tab character is used.

Replace tabs with spaces on file open

specifies whether to replace all tab characters in a file with the space character when the file is opened.

Indentation

specifies the type of indentation to use. When **None** is selected, no indentation is used. When **Automatic** is selected, the next line is automatically indented by the same amount of space that the previous line is indented.

Collapsible code sections

specifies whether to enable the expansion and contraction of code sections. If it is selected, the collapsible code sections can be collapsed or expanded. If it is not selected, all code appears in the editor window. The following settings are active when the **Collapsible code sections** setting is selected:

- When **Show section lines in text** is selected, a line appears after each section of text.
- When **Show section brackets in margin** is selected, brackets are displayed around each section in the margin.

Clear text on submit

specifies whether to clear the contents of the Enhanced Editor window after you submit a program for processing. If it is selected, the Enhanced Editor window is cleared when you submit the program. If it is not selected, the program remains in the editor window. If this setting is selected, you can recall the last submitted program by using the F4 key.

User Defined Keywords

opens the User Defined Keywords dialog box that you use to create user-defined keywords.

File Extensions

opens the SAS Extensions dialog box. Use the SAS Extensions dialog box to define file extensions that are recognized by the Enhanced Editor.

Appearance Options

The following appearance options enable you to specify foreground and background colors, and font styles for file elements. You can also create and save color schemes. For more information about using these appearance options, see “Setting Appearance Options” on page 108 and “Using Schemes” on page 109.

File type

specifies the type of file whose elements you want to color-code. You can color-code file elements for SAS programs, SCL programs, HTML and XML documents, and text documents. To color-code an XML document, select **HTML Document**. The default is the file type of the file that you are editing at the time that you invoke the Editor Options dialog box.

Scheme

is a name that represents a saved set of appearance options for the specified file type.

Name

specifies the name of the font for the scheme.

Size

specifies the font size for the scheme.

Script

lists the character sets available for the specified font. The character set that is used by the default script is determined by the Windows regional options.

File elements

lists the elements of the specified file type that can be color-coded.

Foreground

specifies the text color that is to be applied to the selected file element.

Background

specifies the background color that is to be applied to the selected file element.

Font Style

specifies whether **Normal**, **Bold**, **Italic**, or **Bold Italic** font is to be applied to the file element.

Underlined

specifies whether the file element is to be underlined.

Sample

displays a sample of the selected file element colors and font.

Setting Appearance Options

When you set appearance options, you set them for the elements of the file type that you specified in the **File type** box. As you make your selections, the **Sample** box displays your selected formatting. The formatting options that you specify are applied to all opened Enhanced Editor windows of that file type. When you start SAS, the formatting options that are applied to the Enhanced Editor files are the formatting options that were in effect when the last SAS session ended.

To specify appearance options

- 1 Open the Editor Options window by selecting **Tools** \blacktriangleright **Options** \blacktriangleright **Enhanced Editor** \blacktriangleright **Appearance**
- 2 Select a file type from the **File type** box.
- 3 You can also select a saved formatting scheme from the **Scheme** box. For more information about using schemes, see “Using Schemes” on page 109.
- 4 From the **Name** box, select a font.
- 5 From the **Size** box, select a font size.
- 6 From the **Script** box, select a script that is appropriate for the language that your computer uses. The Default script is determined by the Windows regional options.
- 7 For each file element that you want to format
 - a Select a file element.
 - b Click in the **Foreground** box and select a color for the file element. To create a custom color, select **Custom** and create a color from the Color dialog box.
 - c Click the **Background** box and select a color for the background of the file element. To create a custom color, select **Custom** and create a color from the Color dialog box.

Note: Changing the background color for **Normal text** changes the Enhanced Editor window to the specified color. Δ

- d From the **Font Style** box, select **Normal**, **Bold**, **Italic**, or **Bold Italic**.
 - e If you want the element to be underlined, select the **Underlined** box.
- 8 Review your selections in the **Sample** box. Click on a file element in the sample to see its color and font assignment. When you have finished formatting all file elements, click **OK**.

Using Schemes

A *scheme* is a saved set of formatting options, such as font, font size, and script. You can set your appearance options by selecting a file type and a scheme instead of setting individual file elements. SAS provides several schemes which you can select from the Scheme box. Schemes provided by SAS use the Default script.

To create a scheme

- 1 Select a file type from the **File type** box.
- 2 Select a font, font size, and a script.
- 3 For each file element, select a color for the foreground and background, a font style, and the underlining option.
- 4 Click **Save As** and type a scheme name in the Save Scheme dialog box.
- 5 Click **OK**.

To modify a scheme

- 1 Click in the **File type** box and select a file type.
- 2 Click in the **Scheme** box and select a scheme.
- 3 Make the font and file element changes that you want.
- 4 Click **Save As**. The selected scheme name appears in the Scheme name entry box.
- 5 Click **OK**.

To delete a scheme

- 1 Click in the **File type** box and select a file type.
- 2 Click in the **Scheme** box and select the scheme name that you want to delete.
- 3 Click **Delete**.

Using Keyboard Shortcuts to Customize the Enhanced Editor

You can customize Enhanced Editor commands and keyboard macros by using the Enhanced Editor Keys dialog box.

Assigning Keyboard Shortcuts

When you open the Enhanced Editor Keys dialog box, you can choose to view only commands that have been assigned keyboard shortcuts, or you can view all commands. To see only the commands that have assigned keyboard shortcuts, ensure that the **Show all commands** check box is not selected. To see all commands, including the commands that have no key assignment, check the **Show all commands** check box.

To assign keyboard shortcuts

- 1 Select **Tools** \blacktriangleright **Options** \blacktriangleright **Enhanced Editor Keys**
- 2 Select a category from the **Categories** box. Macros are listed in the **User Defined** category.
- 3 Select a command from the **Commands** box. If a keyboard shortcut is already defined for the command, it is displayed in the **Keys** column.

- 4 Click **Assign keys**.
- 5 Place the insertion point in the **Press new shortcut key** field.
- 6 Press a key sequence for the selected command. The sequence displays in the **Press new shortcut key** field, and the assignment status for that key appears at the bottom of the dialog box. If the value in the **Currently assigned to** field is **None**, then no other command is assigned to this keyboard shortcut.
- 7 To assign the keyboard shortcut, click **Assign**.

Note: Assigning a keyboard shortcut to a key sequence that is assigned to another command deletes the shortcut for that command. For example, if you assign the Backspace key to the **Add a new abbreviation** command, pressing the Backspace key displays the Add Abbreviation dialog box, and you can no longer backspace by using the Backspace key. △

Deleting Keyboard Shortcuts

To delete a keyboard shortcut

- 1 Select **Tools ► Options ► Enhanced Editor Keys**.
- 2 Click **Assign keys**.
- 3 Select the category in the **Categories** box. Macros are listed in the **User Defined** category.
- 4 Select the command in the **Commands** box.
- 5 Select the key sequence in the **Keys currently assigned to command** box.
- 6 Click **Remove**.

Resetting Keyboard Shortcuts to the Enhanced Editor Defaults

Resetting keyboard shortcuts to the default keyboard shortcuts deletes all macro keyboard shortcuts. See “Keyboard Shortcuts within the Enhanced Editor” on page 626 for a list of the default keyboard shortcuts.

To reset keyboard shortcuts to the Enhanced Editor default keyboard shortcuts

- 1 Select **Tools ► Options ► Enhanced Editor Keys**.
- 2 Click **Assign keys**.
- 3 Click **Reset All**.

Enabling and Disabling the Enhanced Editor

By default, the Enhanced Editor is the active editor when you start SAS.

To disable the Enhanced Editor when you start SAS, use the **NOENHANCEDEDITOR** system option. For more information, see “**ENHANCEDEDITOR** System Option” on page 511. You can also enable or disable the Enhanced Editor by using the **Use Enhanced Editor** setting in the Preferences dialog box Edit tab or by using the **wedit** command. For more information, see “**WEDIT** Command” on page 364.

When you disable the Enhanced Editor, the menu commands are not available. All opened Enhanced Editor windows remain open, and you can open new Enhanced Editor windows by using the View menu or the **wedit** command. If the Enhanced Editor is disabled when you start SAS, the Enhanced Editor window does not open.

When the Enhanced Editor is enabled, the **Text Editor** command in the Tools menu opens an Enhanced Editor window. When the Enhanced Editor is disabled, the **Text Editor** command opens SAS NOTEPAD.

Using the Program Editor

The SAS text editor windows, Program Editor and NOTEPAD, work similarly to other Windows editors. Therefore, you can edit your SAS code without learning how to use a new text editor.

Switching from the Enhanced Editor to the Program Editor

If the Enhanced Editor is enabled when SAS starts, the Program Editor is disabled. To start the Program Editor when SAS starts, disable the Enhanced Editor in one of the following ways:

- Start SAS using the NOENHANCEDEDITOR system option.
- Disable the Enhanced Editor in the Preferences dialog box:
 - 1 Select **Tools ► Options ► Preferences ► View**.
 - 2 Deselect the **Use Enhanced Editor** check box.
 - 3 Click **OK**.

For more information about the NOENHANCEDEDITOR system option, see “ENHANCEDEDITOR System Option” on page 511.

You can always access the Program Editor window from the View menu.

Opening Files

To open a file in the Program Editor:

- 1 With the editor window active, do one of the following:
 - Click the Open toolbar button (the opened file folder)
 - Type **dlgopen** in the command bar
 - Select **File** and click **Open**

SAS displays the Open dialog box.

- 2 Use the Open dialog box to select the file you want to include. By default, SAS looks for files with the .SAS file extension (which contain SAS code, by convention). However, you can change the default by adjusting the **Files of type** field. (If you change the selected file type, SAS will remember that selection and present it as the default the next time that you open a file for that window during the SAS session.)

Note: To change the default directory for the Open dialog box, either start SAS using the SASINITIALFOLDER system option or change the current working directory. For more information, see “SASINITIALFOLDER System Option” on page 559 and “Changing the SAS Current Folder” on page 39. △

- 3 If the file that you are including contains SAS code that you want to submit, check the **Submit** box before clicking **OK**.

Note: If you select **Submit**, it remains selected each time you use the Open dialog box to open a file. You must deselect it if you do not want to submit the contents of the file you want to open. △

You can also drag and drop a file into the Program Editor from the Windows Explorer or the My Favorite Folders window. To drag and drop a file:

- 1 Open the source window.

- 2 Position the source window and the Program Editor window so that both are visible.
- 3 In the source window, find and select the file you want to open; click and hold down the left mouse button
- 4 Drag the file over the Program Editor window and release the left mouse button.

If you open a file with lines longer than 256 characters in the Program Editor window, the lines are truncated unless you use the INCLUDE command with an LRECL= value equal to the number of characters in the longest line, and you set either the AUTOWRAP or AUTOFLOW command to ON. If you want to use the Open dialog box to open a file with lines longer than 256 characters, use the FILENAME statement to set up a fileref with the appropriate options and then use the fileref, enclosed in double quotes, in the **Filename** field in the Open dialog box.

If you recall a SAS program that has more than 256 characters on a line into the Program Editor, the Program Editor wraps the line on to the next line. A line that is greater than 256 characters and wraps onto the next line is considered one line of code.

Using Line Numbers

If you are familiar with the SAS Program Editor window under other operating systems, such as z/os, notice that line numbers are turned off by default under Windows. You can type **numbers on** in the command bar to display line numbers in the Program Editor window. You can also type **nums** to turn line numbers on and off.

You can also control line numbers using the Editor Options dialog box when the Program Editor or NOTEPAD is the active window. To open the Editor Options dialog box:

- 1 Type **edop** in the command bar or select **Tools ► Options ► Program Editor**
- 2 Select the Editing tab.
- 3 Select **Display line numbers** and click **OK**.

Moving the Insertion Point

The insertion point movement keys (arrow keys, PgUp, PgDn, and so on) function the same way in SAS text windows as they do in other Windows applications.

Pressing the CTRL key with the left arrow (word left) or right arrow (word right) causes the insertion point to move one word at a time. When advancing through text, the word-left and word-right commands stop at the end of the text on a line and at the beginning of the first word on a new line. You can move to the top of a file by pressing CTRL+PgUp or to the bottom of a file by pressing CTRL+PgDn.

Pressing the Home key causes the insertion point to go to the beginning of the current line unless the command line (not the command bar) is active in the active window. Pressing the Home key when the command line is active causes the insertion point to toggle between the current insertion point position in the text and the command line. The F11 key moves the insertion point to the command bar. You can toggle the command line on and off using the COMMAND command or by selecting **Command line** in the Preferences dialog box **General** tab.

Using Tabs

Many text editors retain tab characters, while others expand tabs into space characters. The SAS Program Editor window expands tabs into space characters.

Pressing the TAB key inserts spaces and moves any text to the right of the insertion point.

Understanding Line Breaks

Conceptually, line breaks are at the end of the line rather than at the beginning. Pressing the ENTER key creates a line break. To delete a line break, press the Backspace key at the beginning of a line or press the Delete key at the end of the line.

Selecting Text

You can use the mouse or the SHIFT key in combination with the insertion point movement keys to select text. The marking of an area of text continues until you release the mouse button or release the SHIFT key. To select all of the text in the active window, select the Edit menu and then select **Select All**. The following are some advanced text selection methods:

- Double-click a single word to select it. To select an entire line, hold down the CTRL key as you click on the line you want.
- Use the ALT key as you hold down the mouse button and drag the mouse to select a rectangular block (or column) of text (as illustrated below.)

```

Program Editor - (Untitled)
OPTIONS LS=132 PS=60;
DATA CHILDREN;
  INPUT SEX $ AGEM HEIGHT WEIGHT;
  AGE=INT(AGEM/12);
  IF AGE<=16;
CARDS;
F 143 56.3 85.0
F 155 62.3 105.0
F 153 63.3 108.0
F 161 59.0 92.0
F 191 62.5 112.5
F 171 62.5 112.0
F 185 59.0 104.0
F 142 56.5 69.0
F 160 62.0 94.5
F 140 53.8 68.5
F 139 61.5 104.0
F 178 61.5 103.5
F 157 64.5 123.5
F 149 58.3 93.0
  
```

- Use the SHIFT key in combination with the mouse button to select the text between the current text insertion point and the position in the text where you click. You can also use this technique to extend a text selection. (You can use this feature only within the current page.)

If characters are selected and you start typing text, the marked area is replaced with the new text. This action occurs even if you have moved the mouse pointer away from the marked area. For information about marking and copying text with a mouse, see “Using the Clipboard” on page 55.

To unmark text, click the left mouse button in the window. Alternatively, you can unmark text by selecting **Deselect** from the Edit menu or you can press the ESC key. Typing the WNAVKEYUNMARK ON in the command bar also enables unmarking with the arrow navigational keys.

Deleting Text

The Delete key deletes the currently selected text, if there is any; otherwise, it deletes the character to the right of the insertion point. To delete from the insertion point to the end of the current line, press ALT+Delete. To delete from the insertion point to the end of the current word, press CTRL+Delete. To delete from the insertion point to the start of the current word, press CTRL+Backspace.

You can also use the Edit menu to delete text. To delete all text in the window, click **Clear All**. To delete only selected text, click **Clear**. To delete selected text and copy that text to the Windows clipboard, click **Cut**.

Finding and Replacing Text

To find text

- 1 Open the Find dialog box by selecting **Edit ► Find**
- 2 Supply the following information:

Find text

Type a text string to find. The initial value of this field is the last text string that was used in a search.

Direction

Select the **Up** or **Down** check box. **Up** specifies to search from the insertion point position toward the beginning of the file. **Down** specifies to search from the insertion point position toward the bottom of the file.

Match whole word only

Select the check box to specify that a match of the text must be a whole word and not part of a word.

Match case

Select the check box to specify that upper- and lowercase characters must match exactly.

- 3 Click **Find Next**.

To find and replace text

- 1 Open the Replace dialog box by selecting **Edit ► Replace**
- 2 Supply the following information:

Find text

Type a text string to find and replace. The initial value of this field is the last text string that was used in a search.

Replace with

Type the replacement string.

Direction

Select either the **Up** or **Down** check box. **Up** specifies to search from the insertion point position toward the beginning of the file. **Down** specifies to search from the insertion point position toward the bottom of the file.

Match whole word only

Select this check box to specify that any match of the text must be a whole word and not part of a word.

Match case

Select this check box to specify that upper- and lowercase characters must match exactly.

3 Click Find Next.

4 If the text is found, click one of the following:

- Replace** to replace this single occurrence of the text with the replacement string.
- Replace All** to replace all occurrences of the text in the file with the replacement string.

Dragging and Dropping Text

The following table lists the places from which you can drag text and to which you can drop the selected text.

Table 3.11 Summary of Text Drag and Drop Possibilities

Text Source	Text Destination
any SAS text window	another SAS window that supports text editing (such as the Program Editor window)
any SAS text window	another Windows application that supports text drag and drop
a Windows application that supports text drag and drop	any SAS window that supports editing
Windows Explorer (text file item)	any SAS window that supports editing

To drag and drop text from one window to another:

- 1** Arrange your windows, if necessary, so that both the source and target windows are visible on the display.

Note: Instead of arranging your windows so that the target window is visible, the target window will become the active window when you drag the selected text to the target window's button on the window bar. Δ

- 2** Select the desired text from the source window.
- 3** Click and hold the left mouse button with the pointer on the selected text.
- 4** With the mouse button still pressed, drag the text to the target window.
- 5** Move the insertion point to the position where you want to insert the text. (If you plan to just submit the text as SAS code for processing, position the insertion point anywhere in the window).
- 6** Release the mouse button. The text is either included at the point where you positioned the insertion point, or it is submitted to SAS for processing. (The default action depends on the type of the target window.)

You can override the default action of the drag and drop by initiating the drag and drop using the *right* mouse button. This action is called *nondefault drag and drop*. When you drag the selection to the target SAS window and release the mouse button, SAS displays a popup menu to let you choose which action to perform.

Table 3.12 on page 116 is a summary of drag-and-drop actions available for the possible target windows in SAS.

Table 3.12 Summary of Drag-and-Drop Actions

Data	Target	Default Action	Nondefault Actions
text	SAS text editor	move	move, copy, cancel
text	PROGRAM EDITOR	copy	copy, submit, cancel
file	SAS text editor	not valid	not valid
file	PROGRAM EDITOR	move	copy, submit, cancel
file	LOG, OUTPUT	submit	submit, cancel

The actions that occur when you drag text out of a SAS window into another Windows application depend on the target application. In most cases, dragging and dropping text between SAS and other applications actually moves the text from one window to another (that is, the text is cut from one window and placed in the other).

You can change that behavior by applying a *drag-modifier*—a key you press while you drag and drop. To copy text from one window to another (instead of moving it), press and hold the CTRL key before and during the drag and drop. When you release the mouse button to drop the text, release the CTRL key as well.

Drag Scrolling

While dragging text to a SAS text editor window, you can cause the target window to scroll vertically or horizontally. This action lets you drop text in a window area that is not currently visible.

Once you have selected the text and drag it to the SAS text editor window, pause near the border of the SAS text editor window. The window scrolls in the direction of that border. For example, to cause the target window to scroll down, drag the mouse pointer just above the bottom border of the window and pause.

Drag scrolling only happens when you pause near the drop area border; it does not occur if you drag quickly past the border.

Using Rich Text Format Text

When you copy text out of a SAS window to the clipboard and paste it into the window of another application, the text retains all of the format information it had in SAS (except for color) if the target window accepts RTF formatting. For example, the Windows Notepad application does not preserve formatting, but Microsoft Wordpad and many word processors do. The same is true when you drag text out of SAS and drop it in another application window.

If the display font is Sasfont, any text that you copy out of SAS is formatted with the SAS Monospace TrueType font. If your text has other highlighting attributes, such as underline, those attributes are also transferred to the target window in the other application (provided the target window supports rich text format (RTF)).

Saving Files

To save the contents of the Program Editor window, click the Save toolbar button (the diskette icon). If the file is to be saved for the first time, the Save As dialog box will open for you to name the file.

To save a file with a new name:

- 1 Select **File ► Save As**
- 2 Select a folder in the **Save in** field.
- 3 Type a filename in the **Filename** field.
- 4 Select a file type from the **Save as type** field.
- 5 Click **OK**.

Note: To change the default directory for the Save dialog box, either start SAS using the SASINITIALFOLDER system option or change the current working directory. For more information, see “SASINITIALFOLDER System Option” on page 559 and “Changing the SAS Current Folder” on page 39. △

Saving Program Editor Files Using Autosave

To ensure that you do not lose any of your work in the Program Editor, SAS can automatically save your files at an interval you specify. The interval can range from 0 (Autosave off) to 480 minutes. The default interval is 10 minutes.

The autosave file is saved as `pgm.asv` in the current folder or in the location specified by the AUTOSAVELOC system option.

To enable or disable autosave and set the interval:

- 1 Select **Tools ► Options ► Preferences ► Edit tab**
- 2 Select or deselect **Autosave every**.
- 3 Set the interval by typing a number between 1 and 480 in the **minutes** box.

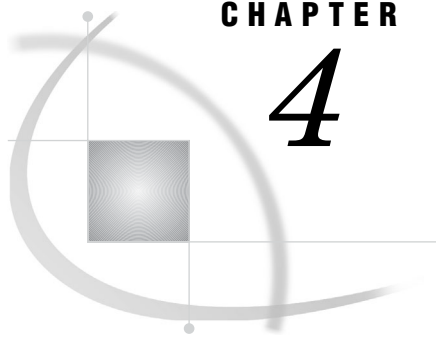
You can also use the WAUTOSAVE command to enable, disable, and set the interval. `WAUTOSAVE INTERVAL=minutes` will turn on autosave using *minutes* as the interval.

For more information on the Autosave feature, see “Edit Preferences” on page 61, “WAUTOSAVE Command” on page 360, and “AUTOSAVELOC= System Option” in *SAS Language Reference: Dictionary*.

Understanding Unique Features of the Editor

The following features of a SAS text editor window are different from the standard features of other editors commonly used in the Windows environment:

- A SAS text editor window allows you to move the insertion point past the last character entered on a line or past the last line of text entered.
- You can mark an area of text, move the mouse pointer away from the marked area, and the marked text remains marked.
- You can unmark text by pressing the ESC key.
- You can use Shift + Tab to delete blank space characters back to the last tab stop.



CHAPTER

4

Using SAS Files

<i>Introduction to SAS Files</i>	120
<i>What Is a SAS File?</i>	120
<i>File Extensions for SAS Files</i>	121
<i>SAS Data Sets (Member Type: Data or View)</i>	122
<i>SAS Catalogs (Member Type: Catalog)</i>	124
<i>SAS Stored Compiled DATA Step Programs (Member Type: Program)</i>	124
<i>Access Descriptor Files (Member Type: Access)</i>	124
<i>Multi Engine Architecture</i>	124
<i>SAS Libraries</i>	124
<i>SAS Engines</i>	125
<i>What Is an Engine?</i>	125
<i>Types of Library Engines</i>	125
<i>Native Library Engines</i>	125
<i>Interface Library Engines</i>	126
<i>Rules for Determining the Engine</i>	127
<i>Using Data Libraries</i>	127
<i>Specifying a Libref</i>	127
<i>Assigning SAS Libraries Using the Graphical User Interface</i>	128
<i>Assigning SAS Libraries Using the LIBNAME Statement or Function</i>	128
<i>LIBNAME Statement Syntax</i>	128
<i>Assigning a Libref to a Single Folder</i>	128
<i>Assigning a Libref to the Working Folder</i>	128
<i>Assigning a Libref to Multiple Folders</i>	129
<i>Assigning Engines</i>	129
<i>Making Librefs Available When SAS Starts</i>	129
<i>Assigning Multiple Librefs and Engines to a Folder</i>	130
<i>Assigning SAS Libraries Using Environment Variables</i>	130
<i>Types of Environment Variables</i>	130
<i>Using a SAS Environment Variable as a Libref</i>	131
<i>Using Windows Environment Variables</i>	131
<i>Listing Libref Assignments</i>	132
<i>Listing Librefs Using the Explorer Window</i>	132
<i>Listing Librefs Using the LIBNAME Command</i>	132
<i>Listing Librefs Using the LIBNAME Statement</i>	132
<i>Clearing Librefs</i>	132
<i>SAS Explorer Window</i>	132
<i>LIBNAME Window</i>	133
<i>LIBNAME Statement</i>	133
<i>LIBNAME Function</i>	133
<i>Understanding How Multi-Folder SAS Libraries Are Accessed</i>	133
<i>Protocols for Accessing Folders</i>	133

<i>Input and Update Access</i>	133
<i>Output Access</i>	134
<i>Accessing Data Sets with the Same Name</i>	134
<i>Using the Sasuser Data Library</i>	134
<i>Using the Work Data Library</i>	135
<i>Using Temporary Files</i>	135
<i>Using an Environment Variable</i>	136
<i>Using the User Libref</i>	136
<i>Using Large Data Sets with Windows and NTFS</i>	136
<i>Accessing SAS Files from Multiple SAS Sessions</i>	136
<i>Using SAS Files from Other Versions with SAS 9.2 for Windows</i>	137
<i>Introduction to Using SAS Files from Other Versions with SAS 9.2 for Windows</i>	137
<i>Using Release 6.08 through Release 8.2 Data Sets</i>	138
<i>Using Release 6.03 and Release 6.04 SAS Data Sets</i>	139
<i>Converting Release 6.08 through Release 6.12 SAS Data Sets</i>	139
<i>Using Version 7 and 8 Catalogs in SAS 9.2</i>	139
<i>Converting Version 6 SAS Catalogs in SAS 9.2</i>	140
<i>Converting Release 6.08 SAS Catalogs to SAS 9.2</i>	140
<i>Converting Release 6.03 and Release 6.04 SAS Catalogs to SAS 9.2</i>	141
<i>Creating Release 6.08 through Release 6.12 Data Sets</i>	141
<i>Using SAS 9.2 Files with Previous Releases</i>	141
<i>Using Remote Host SAS Files in SAS 9.2</i>	142
<i>Reading BMDP, OSIRIS, and SPSS Files</i>	142
<i>BMDP Engine</i>	142
<i>BMDP Engine Examples</i>	143
<i>OSIRIS Engine</i>	143
<i>OSIRIS Engine Example</i>	144
<i>SPSS Engine</i>	144
<i>SPSS Engine Example</i>	144
<i>Reformatting SPSS Files</i>	144
<i>Transferring SAS Files between Operating Environments</i>	145
<i>Accessing Database Files with SAS/ACCESS Software</i>	145
<i>Using the SAS ODBC Driver to Access SAS Data from Other Applications</i>	146

Introduction to SAS Files

What Is a SAS File?

SAS creates and uses a variety of specially structured files called SAS files. Although Windows manages the file for SAS by storing it, the operating system cannot process it. For example, you can list SAS files with the Windows Explorer, but SAS files must be processed by SAS. SAS files are different from external files. While external files can be processed by SAS statements and commands, they are not managed by SAS.

SAS files usually reside in SAS libraries. Under Windows, a SAS library is a named collection of SAS files within one or more Windows folders that SAS can access. Each SAS library has an access engine associated with it the first time that a file in the library is accessed. The engine name specifies the access method that SAS uses to process the files in the library. SAS libraries are described in detail in *SAS Language Reference: Concepts*.

The various engines enable SAS to access different formats or versions of SAS files and other vendors' files. For this reason, SAS is said to have Multi Engine Architecture. Multi Engine Architecture, combined with conversion utilities, provides access to SAS

9.2 files and SAS files created with previous releases of SAS (back to Version 5), whether they were created under Windows or other operating environments. Multi Engine Architecture also provides access to files created by other vendors' products, including database files.

The following sections highlight information you need in order to create and use SAS files with the various engines under Windows.

File Extensions for SAS Files

SAS files are stored in SAS libraries and are referred to as members of a library. Each member has a member type. SAS distinguishes between SAS files and external Windows files in a folder by using unique file extensions. SAS assigns certain file extensions to a general set of SAS member types. The following table lists the Windows file extensions and their corresponding SAS member types for the V6, V7, V8, and V9 engines. For more information about engines, see “Multi Engine Architecture” on page 124. For more information about processing files from previous releases, see “Using SAS Files from Other Versions with SAS 9.2 for Windows” on page 137.

Table 4.1 Windows File Extensions and their Corresponding SAS Member Types

V6 File Extension	V7 and Beyond File Extensions	Short Extensions	SAS Member Type	Description
.sas	.sas	none	none	SAS program
.ss2	.sas7bpgm	ss7	Program	stored program (DATA step)
	.cfg (Version 8 and beyond)	none	none	configuration file
.lst	.lst	none	none	output file
.log	.log	none	none	log file
none	.sas7baud	st7	Audit	audit file
.sd2	.sas7bdat	sd7	Data	data set
.sv2	.sas7bview	sv7	View	data set view
.si2	.sas7bndx	si7	Index	data set index. Indexes are stored as separate files but are treated by SAS as integral parts of the SAS data file.
.sc2	.sas7bcat	sc7	Catalog	SAS catalog
.sa2	.sas7bacs	sa7	Access	access descriptor file
.sf2	.sas7bfdb	sf7	FDB	consolidation database file
.sm2	.sas7bmdb	sm7	MDDB	multi-dimensional database file
none	.sas7bdmd	s7m	DMDB	data mining database file
none	.sas7bitm	sr7	Itemstor	item store file
.su2	.sas7butl	su7	Utility	utility file
.sp2	.sas7bput	sp7	PUtility	permanent utility

V6 File Extension	V7 and Beyond File Extensions	Short Extentions	SAS Member Type	Description
.stx	none	none	none	transport file
none	.sas7bbak	none	none	back up file

CAUTION:

Do not change the file extension of a SAS file; doing so can cause unpredictable results.

The file extensions assigned by SAS to SAS files are an integral part of how SAS accesses these files. Also, you should not change the filename of a SAS file using operating system commands. If you want to change the name of a SAS file, use the DATASETS procedure or select the file in the SAS Explorer window or the My Favorite Folders window and select **Edit ► Rename**. Δ

Note: Do not delete files from your Work and Sasuser libraries during your SAS session. SAS creates temporary utility files that you do not need to access directly but that are necessary for processing SAS data.

If your SAS session ends abnormally, you might need to delete files outside SAS in order to regain disk space. You can delete files in the Work library by using the WORKINIT and the WORKTERM system options when you start SAS. For more information, see “WORKINIT System Option” and “WORKTERM System Option” in *SAS Language Reference: Dictionary*. Δ

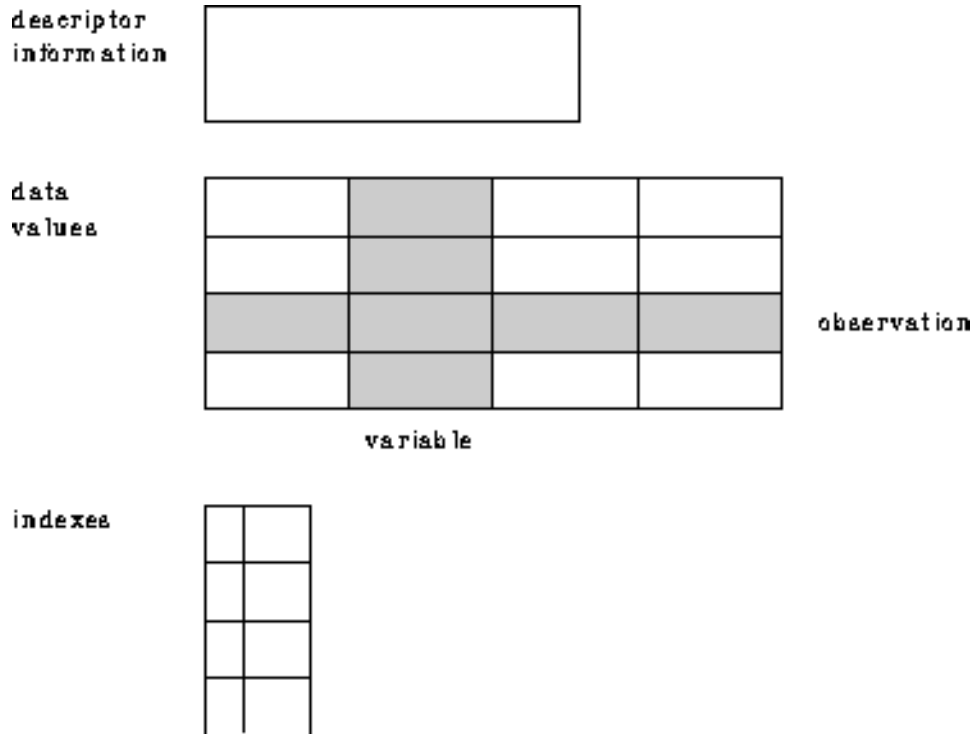
SAS Data Sets (Member Type: Data or View)

SAS data set is an umbrella term for SAS data files and SAS data views, which are both discussed here. This section provides a brief overview of the concept of SAS data sets. For complete details, see the data sets section in *SAS Language Reference: Concepts*.

Logically, a SAS data set consists of two types of information: descriptor information and data values. The descriptor information includes such things as data set name, data set type, data set label, and number of variables, as well as the names and labels of the variables in the data set, their types (character or numeric), their length, their position within a record, and their formats. For more information, see “CONTENTS Procedure” on page 431.

The data values contain values for the variables. A SAS data set can be visualized as a table consisting of rows of observations and columns of variable values. The following table illustrates the SAS data set model.

Figure 4.1 SAS Data Set Model



SAS data files (member type: Data)

The SAS data file is probably the most frequently used type of SAS file. SAS data files have a SAS member type of Data and are created in the DATA step and by certain SAS procedures such as the RANK procedure in Base SAS software. SAS data files have a file extension of `.sas7bdat`.

SAS defines two types of SAS data files, native and interface. Native data files store data values and descriptor information, as described earlier, in files formatted by SAS. These files are the SAS data sets you might be familiar with from previous versions of SAS under other operating environments. In SAS under Windows, native SAS data files can be indexed. The index is an auxiliary file that you create to provide fast access to records within a SAS data file through a variable or key. Indexes are stored as separate files but are treated by SAS as integral parts of the SAS data file. To learn more about indexes, see *SAS Language Reference: Concepts*.

The second type of data file is the interface SAS data file. These files store data in a file formatted by other software. Examples of interface SAS data files are BMDP, OSIRIS and SPSS files, which SAS can access as read-only files. For more information, see “Reading BMDP, OSIRIS, and SPSS Files” on page 142.

SAS data views (member type: View)

SAS data views have a member type of View. They describe data values and tell SAS where to find the values, but they do not contain the actual data values themselves. SAS data views have a file extension of `.sas7bview`.

Views can be native or interface. A native SAS data view is created with the SQL procedure or with the DATA step and describes a subset or combination of the data in one or more SAS data files or SAS data views. For information on SQL views, see the *Base SAS Procedures Guide*. For information on DATA step views, see *SAS Language Reference: Concepts*.

Interface SAS data views contain descriptor information for data formatted by other software products, for example, a database management system. You access database views using the SAS/ACCESS LIBNAME statement. For more information, see *SAS/ACCESS Interface to PC Files: Reference* and *SAS/ACCESS for Relational Databases: Reference*.

SAS Catalogs (Member Type: Catalog)

A SAS catalog is a special type of SAS file that can contain multiple entries. You can keep different types of entries in the same SAS catalog. For example, the Sasuser.Profile catalog contains function key definitions, fonts for graphic applications, some of your selections from the Preferences dialog box, and other information from interactive windowing procedures. SAS catalogs have a file extension of .sas7bcat.

SAS Stored Compiled DATA Step Programs (Member Type: Program)

A stored compiled DATA step program is a SAS file that contains a DATA step program that has been compiled and then stored in a SAS library. You can execute compiled DATA step programs as needed, without having to recompile them. SAS stored compiled DATA step programs have a file extension of .sas7bpgm.

Stored compiled programs are available for DATA step applications only. Your stored programs can contain all SAS language elements except global statements. If you include global statements in your source program, SAS stores the compiled program but not the global statements, and does not display a warning message in the SAS log.

For more information about this type of SAS file, see *SAS Language Reference: Concepts*.

Access Descriptor Files (Member Type: Access)

Descriptor files created by the SAS/ACCESS LIBNAME statement have a member type of ACCESS and are used when creating interface SAS data views. Descriptor files describe the data formatted by other software products supported by SAS. For more information, see *SAS/ACCESS for Relational Databases: Reference*, *SAS/ACCESS Interface to PC Files: Reference* and other available SAS/ACCESS documentation.

Multi Engine Architecture

SAS Libraries

All permanent and temporary SAS files are stored in SAS libraries. A SAS library is a collection of SAS files that are stored in a physical location under the operating system. Although the physical location in the operating system can contain files that are not managed by SAS, only SAS files are considered part of the SAS library. Any Windows folder can be treated as a SAS library.

To use a SAS library in your SAS session, you must assign a libref (library reference) and an engine to the library. The libref is the name you use to refer to the data library during a SAS session or job. You can create a libref from the Explorer window or you

can programmatically define it with an environment variable or with the LIBNAME statement or function. For information on using librefs in the Windows environment, see “Using Data Libraries” on page 127. For a complete explanation of librefs, see *SAS Language Reference: Concepts*.

The Explorer window provides an easy way to manage all of your SAS files, including librefs. For information about working with SAS files in the Explorer window, see the SAS Help and Documentation.

SAS Engines

What Is an Engine?

Engines, also called access methods, provide access to many formats of data, giving SAS a Multi Engine Architecture. Engines apply only to SAS data sets.

The engine identifies the set of routines that SAS uses to access the files in the library. With this architecture, data can reside in different types of files, including SAS files and data formatted by other software products, such as database management systems. By using the appropriate engine for the file type, SAS can write to or read from the file. For some types of files, you need to tell SAS what engine to use. For others, SAS automatically chooses the appropriate engine. For more details about engines and Multi Engine Architecture, see *SAS Language Reference: Concepts*.

Engines are of two basic types, library and view. Library engines control access at the SAS library level and can be specified in the LIBNAME statement or function. View engines enable SAS to read SAS data views described by the DATA step, SQL procedure, or SAS/ACCESS software. The use of SAS view engines is automatic because the name of the view engine is stored as part of the descriptor portion of the SAS data set.

Types of Library Engines

SAS has two types of library engines: native and interface. These engines support the SAS library model. Library engines perform several important functions, including determining fundamental processing characteristics. For a more detailed description of library engines, see *SAS Language Reference: Concepts*. For examples of using library engines, see “Using Data Libraries” on page 127.

Native Library Engines

Native library engines are engines that access forms of a SAS file created and maintained by SAS. Native library engines include the default engine, the compatibility engine, and the transport engine. The following table lists the acceptable names (and nicknames) for these engines.

Table 4.2 Native Library Engines

Engine Type	Engine Names	Description
default	V9, BASE	accesses SAS System 9, 9.1, and SAS 9.2 data files
Version 8 compatibility	V8	accesses the Version 8 data files
Version 7 compatibility	V7	accesses Version 7 data files

Engine Type	Engine Names	Description
Release 6 compatibility	V6	accesses any data file created by Release 6.08 through Release 6.12. In 64-bit environments, the V6 engine can read onlydata.
Release 6.12 compatibility	V612	accesses Release 6.12 data files
Release 6.03 and Release 6.04 compatibility	V604	read-only access to data files created by Release 6.03 and Release 6.04
transport	XPORT	accesses transport files

When using the default engine, choose which name, V9 or BASE, that you use in your SAS jobs considering future releases. If your application is intended for SAS 9.2 only, and you do not want to convert it to later releases, use the name V9. If, however, you plan to convert your application to new releases of SAS, use the name BASE because that refers to the latest default engine. Using the name BASE makes your programs easy to convert. The engine name BASE does not refer to Base SAS software; it refers to the base, or primary, engine. The BASE engine can be used with more than the Base SAS software product.

This document uses the term default engine to refer to the V9 engine. The V9 engine is the default engine for accessing SAS files under SAS 9.2 unless the default engine is changed with the ENGINE system option. To see the value of the ENGINE system option, do one of the following:

- Submit

```
proc options option=engine;
run;
```

- select **Tools** ► **Options** ► **System** to open the SAS System Options window. Then select **Files** ► **SAS Files**. The ENGINE system option displays the default engine for SAS libraries.

Interface Library Engines

Interface library engines support access to other vendors' files. These engines allow read-only access to BMDP, OSIRIS, and SPSS files. You must specify as part of the LIBNAME statement or function the name of the interface library engine that you want. The following table lists the interface engine names:

Table 4.3 Interface Library Engines

Name	Description
BMDP	allows read-only access to BMDP files in a 32-bit operating environment
OSIRIS	allows read-only access to OSIRIS files
SPSS	allows read-only access to SPSS files

For more information about these engines, see “Reading BMDP, OSIRIS, and SPSS Files” on page 142 and “ENGINE System Option” on page 509.

Rules for Determining the Engine

If you do not specify an engine name in a LIBNAME statement or function, SAS attempts to determine the engine (either the default or a compatibility engine) that should be assigned to the specified data library libref. Under Windows, SAS looks at the file extensions that exist in the given folder and uses the following rules to determine which engine should be assigned to the libref:

- If the folder contains SAS data sets from only one of the supported native library engines (not including XPORT), the libref is assigned to that engine.
- If there are no SAS data sets in the given folder, the libref is assigned to the default engine.
- If the folder contains SAS data sets from more than one engine, it is called a mixed mode library. The libref is then assigned to the default engine. A message is printed in the SAS log informing you the libref is assigned to a mixed mode library.

Note: It is always more efficient to specify the engine name than to have SAS determine the correct engine. △

You can use the ENGINE system option to specify the default engine that SAS uses when it detects a mixed mode library or a library with no SAS files. By default, the ENGINE option is set to V9. For more information, see “ENGINE System Option” on page 509.

Using Data Libraries

Specifying a Libref

The libref is a label or alias that is assigned to a folder so that the storage location (the full path, including drive and folder) is in a form that is recognized by SAS. It is a logical concept describing a physical location, rather than something physically stored with the file.

If a libref is created from within a SAS program, it exists only during the session in which it is created. If a libref is created interactively, by using the New Library dialog box, you can select **Enable at Startup** to make it a permanent libref.

A libref follows the same rules of syntax as any SAS name. See the SAS language rules section in *SAS Language Reference: Concepts* for more information about SAS naming conventions.

There are several ways to specify a libref:


- Use the New Library dialog box that is described in SAS Help and Documentation.
- Use the LIBNAME statement or function as described in “Assigning SAS Libraries Using the LIBNAME Statement or Function” on page 128
- Define an environment variable as described in “Assigning SAS Libraries Using Environment Variables” on page 130.

Note: You can eliminate the LIBNAME statement by directly specifying the drive name and the DATA set name within quotes. An example follows:

```
data "d:\mydata";
```

△

Assigning SAS Libraries Using the Graphical User Interface

To assign librefs and specify engines using the graphical user interface (GUI), use either the New Library toolbar button , the LIBASSIGN command, or Explorer to open the New Library dialog box.

- From the toolbar, click the New Library icon.
- In the command bar, type either **libassign** or **libname**.
When the LIBNAME window opens, click the **New** toolbar button.
- Within Explorer
 - 1 Select the Library folder.
 - 2 Select **File** ► **New** or right-click the Library folder and select **New** from the menu.

Note: When a second Explorer window is open on the right side of the SAS workspace, you can open the New Library dialog box if you right-click the **Libraries** folder and select **New**. Δ

For more information about the New Library window and Explorer, see the SAS Help and Documentation.

Assigning SAS Libraries Using the LIBNAME Statement or Function

LIBNAME Statement Syntax

You can use the LIBNAME statement or function to assign librefs and engines to one or more folders, including the working folder. The examples in this section use the LIBNAME statement. For information about the LIBNAME function, see *SAS Language Reference: Dictionary*.

The LIBNAME statement has the following basic syntax:

```
LIBNAME libref <engine-name> 'SAS-data-library'
```

An explanation of all the arguments in this statement can be found in *SAS Language Reference: Dictionary*.

Note: The words AUX, CON, NUL, LPT1 - LPT9, COM1 - COM9, and PRN are reserved words under Windows. Do not use these reserved words as librefs. Δ

Assigning a Libref to a Single Folder

If you have SAS 9.2 data sets stored in the C:\MYSASDIR folder, you can submit the following LIBNAME statement to assign the libref TEST to that folder:

```
libname test v9 'c:\mysasdir';
```

This statement indicates that the libref TEST accesses SAS 9.2 files stored in the folder C:\MYSASDIR. Remember that the engine specification is optional.

Assigning a Libref to the Working Folder

The current working folder is shown in the status bar of the main SAS window. If you want to assign the libref MYCURR to your current SAS working folder, use the following LIBNAME statement:

```
libname mycurr '.';
```

Assigning a Libref to Multiple Folders

If you have SAS files located in multiple folders, you can treat these folders as a single SAS library by specifying a single libref and concatenating the folder locations, as in the following example:

```
libname income ('c:\revenue' 'd:\costs');
```

This statement indicates that the two folders, **C:\REVENUE** and **D:\COSTS**, are to be treated as a single SAS library. When you concatenate SAS libraries, SAS uses a protocol for accessing the libraries, depending on whether you are accessing the libraries for read, write, or update.

You can concatenate multiple libraries by specifying only their librefs, as in the following example:

```
libname sales (income revenue);
```

This statement indicates that two libraries that are identified by librefs **INCOME** and **REVENUE** are treated as a single SAS library whose libref is **SALES**.

For more information, see “Understanding How Multi-Folder SAS Libraries Are Accessed” on page 133 and *SAS Language Reference: Dictionary*.

Note: The concept of library concatenation also applies when specifying system options, such as the **SASHELP** and **SASMSG** options. For information about how to specify multiple folders by using system options, see “Syntax for Concatenating Libraries in SAS System Options” on page 478. Δ

Assigning Engines

If you want to use another access method, or engine, instead of the V9 engine, you can specify another engine name in the **LIBNAME** statement. For example, if you want to access only Version 6.12 SAS data sets from your SAS 9.2 session, you can specify the V612 engine in the **LIBNAME** statement, as in the following example:

```
libname oldlib V612 'c:\sas612';
```

Another example is if you plan to share SAS files between SAS 9.2 under Windows and Version 6 under Windows, use the V6 engine when assigning a libref to the SAS library. Here is an example of specifying the V6 engine in a **LIBNAME** statement:

```
libname lib6 V6 'c:\sas6';
```

Remember that while SAS 9.2 can read Version 6 SAS data sets, Release 6 cannot read SAS 9.2 data sets. For methods of regressing a SAS 9.2 data set to a version 6 data set, see information in the Migration focus area at <http://support.sas.com/migration/planning/files/regression.html>.

For more information about using engine names in the **LIBNAME** statement, see “Using SAS Files from Other Versions with SAS 9.2 for Windows” on page 137 and “Reading BMDP, OSIRIS, and SPSS Files” on page 142. You can also see the **LIBNAME** statement in *SAS Language Reference: Dictionary*.

Making Librefs Available When SAS Starts

Instead of assigning the same librefs each time that you start SAS, you can specify a libref each time that SAS starts. In the New Library dialog box, select **Enable at startup**. The libref is available as soon as SAS initializes. Libraries that are enabled at startup are stored in the SAS Registry under the entry [CORE\OPTIONS\LIBNAMES].

Assigning Multiple Librefs and Engines to a Folder

If a folder contains SAS files that were created by several engines, only those SAS files that were created with the engine that is assigned to the given libref can be accessed by using that libref. You can assign multiple librefs with different engines to a folder. For example, the following statements are valid:

```
libname one v8 'c:\mydir';
libname two v9 'c:\mydir';
```

Data sets that are referenced by the libref ONE are created and accessed using the compatibility engine (V8), whereas data sets that are referenced by the libref TWO are created and accessed using the default engine (V9). You can also have multiple librefs (using the same engine) for the same SAS library. For example, the following two LIBNAME statements assign the librefs MYLIB and INLIB (both using the V9 engine) to the same SAS library:

```
libname mylib v9 'c:\mydir\datasets';
libname inlib v9 'c:\mydir\datasets';
```

Because the engine names and the Windows pathnames are the same, the librefs MYLIB and INLIB are identical and can be used interchangeably.

Assigning SAS Libraries Using Environment Variables

Types of Environment Variables

You can also assign a libref using environment variables instead of the LIBNAME statement or function. An environment variable equates one string to another within the Windows environment. SAS recognizes two kinds of environment variables:

- SAS environment variables
- Windows environment variables.

When you use a libref in a SAS statement, SAS resolves libref assignments in this order:

- 1 a libref assigned by a LIBNAME statement, a LIBNAME function, or by using the New Library dialog box, with the last assignment taking precedence
- 2 a libref assigned by a SAS environment variable
- 3 a libref assigned by a Windows environment variable.

For example, if the Windows environment variable TEMP is assigned to C:\WINNT\TEMP and you use the following LIBNAME statement:

```
libname temp c:\public
```

the LIBNAME resolves to **c:\public**.

There are two ways of defining an environment variable to SAS:

- Use the SET system option. This option defines a SAS (internal) environment variable.
- Issue a Windows SET command. This command defines a Windows (external) environment variable. Alternatively under Windows, you can define environment variables using the System Properties dialog box accessed from the Control Panel, or by right-clicking **My Computer** and selecting **Properties** from the menu.

CAUTION:

You cannot assign engines to environment variables. If you use environment variables as librefs, you must accept the default engine. \triangle

The availability of environment variables makes it simple to assign resources to SAS before invocation.

Using a SAS Environment Variable as a Libref

You can use the SET system option to define a SAS environment variable. For example, if you store your permanent SAS data sets in the C:\SAS\MYSASDATA folder, you can use the following SET option in the SAS command when you start SAS or in your SAS configuration file to assign the environment variable TEST to this SAS library:

```
-set test c:\sas\mysasdata
```

When you assign an environment variable, SAS does not resolve the environment reference until the environment variable name is actually used. For example, if the TEST environment variable is defined in your SAS configuration file, the environment variable TEST is not resolved until it is referenced by SAS. Therefore, if you make a mistake in your SET option specification, such as misspelling a folder name, you do not receive an error message until you use the environment variable in a SAS statement.

Because Windows filenames can contain spaces or single quotation marks as part of their names, you should enclose the name of the physical path in double quotation marks when specifying the SET option. If you use the SET option in an OPTIONS statement, you must use quotation marks around the filename. For complete syntax of the SET system option, see “SET System Option” on page 561.

Any environment variable name that you use as a value for a system option in your SAS configuration file must be defined as an environment variable before it is used. For example, the following SET option must appear before the SASUSER option that uses the environment variable TEST:

```
-set test "d:\mysasdir"  
-sasuser "!test"
```

In the following example, environment variables are used with concatenated libraries:

```
-set dir1 "c:\sas\base\sashelp"  
-set dir2 "d:\sas\stat\sashelp"  
-sashelp (!dir1 !dir2)
```

Note that when you reference environment variables in your SAS configuration file or in a LIBNAME statement in your SAS programs, you must precede the environment variable name with an exclamation point (!).

It is recommended that you use the SET system option in your SAS configuration file if you invoke SAS through a Windows shortcut.

Using Windows Environment Variables

You can execute a Windows SET command before invoking SAS to create a Windows environment variable. You must define the environment variable before invoking SAS; you cannot define environment variables for SAS use from a Command Prompt window from within a SAS session.

SAS can recognize environment variables only if they have been assigned in the same context that invokes the SAS session. You must define the environment variable in the Windows AUTOEXEC.BAT file that runs when Windows starts (thus creating a global variable), or define the variable in either a Command Prompt window from which you then start SAS or from the System Properties dialog box.

If you define an environment variable in a Command Prompt window, and then start SAS from the Start menu (or with another shortcut), SAS will not recognize the environment variable.

The environment variables that you define with the SET command can be used later within SAS as librefs. In the following example, the Windows SET command is used to define the environment variables PERM and BUDGET:

```
SET PERM=C:\MYSASDIR
SET BUDGET=D:\SAS\BUDGET\DATA
```

Listing Libref Assignments

Listing Librefs Using the Explorer Window

If you are running SAS interactively, use the Explorer window to view the active librefs. The Explorer window lists all the librefs that are active for your current SAS session, along with the engine and the physical path for each libref. Any environment variables that you have defined as librefs are listed, provided you have used them in your SAS session. If you have defined an environment variable as a libref but have not used it yet in a SAS program, the SAS Explorer window does not list it.

Listing Librefs Using the LIBNAME Command

In any SAS session, you can use the LIBNAME command to invoke the LIBNAME window. The LIBNAME window lists the active libraries. Using the LIBNAME window, you can view the contents of all your libraries.

Listing Librefs Using the LIBNAME Statement

The following LIBNAME statement writes the active librefs to the SAS log:

```
libname _all_ list;
```

Clearing Librefs

You can clear a libref by using one of the following methods:

- the SAS Explorer window
- the LIBNAME window
- the LIBNAME statement
- the LIBNAME function .

SAS automatically clears the association between librefs and their respective libraries at the end of your job or session. If you want to associate the libref with a different SAS library during the current session, you do not have to end the session or clear the libref. SAS automatically reassigns the libref when you use it to name a new library.

SAS Explorer Window

To clear a libref by using the SAS Explorer window:

- 1 Right-click on the node of the libref that you want to clear.
- 2 Select **Delete**.

For more information about using the SAS Explorer window to manage libraries, see *The Little SAS Book* or the SAS Help and Documentation.

LIBNAME Window

To clear a libref by using the LIBNAME window:

- 1 Issue the LIBNAME command in the command bar. The LIBNAME window opens.
- 2 Right-click on the node of the libref that you want to clear.
- 3 Select **Delete**.

LIBNAME Statement

To clear a libref by using the LIBNAME statement, submit a LIBNAME statement using this syntax:

```
LIBNAME libref|_all_ <clear>;
```

If you specify a libref, only that libref is cleared. If you specify the keyword `_all_`, all the librefs you have assigned during your current SAS session are cleared. (Maps, Sasuser, Sashelp, and Work remain assigned.)

Note: When you clear a libref defined by an environment variable, the variable remains defined, but it is no longer considered a libref, and it is not listed in the Explorer window. You can use the variable in another LIBNAME statement to create a new libref. Δ

LIBNAME Function

To clear a libref by using the LIBNAME function, the only argument to the function is the libref:

```
libname(libref);
```

Understanding How Multi-Folder SAS Libraries Are Accessed

Protocols for Accessing Folders

When you use the concatenation feature to specify more than one physical folder for a libref, SAS uses the following protocol for determining which folder is accessed:

- Input and update access
- Output access
- Accessing data sets with the same name.

The protocol illustrated by the following examples applies to all SAS statements and procedures that access SAS files, such as the DATA, UPDATE, and MODIFY statements in the DATA step and the SQL and APPEND procedures.

Input and Update Access

When a SAS file is accessed for input or update, the first SAS file found by that name is the one that is accessed. For example, if you submit the following statements and the file OLD.SPECIES exists in both folders, the one in the C:\MYSASDIR folder is printed:

```
libname old ('c:\mysasdir', 'd:\saslib');
proc print data=old.species;
run;
```

The same would be true if you opened OLD.SPECIES for update with the FSEDIT procedure.

Output Access

If the data set is accessed for output, it is always written to the first folder, provided that the folder exists. If the folder does not exist, an error message is displayed. For example, if you submit the following statements, SAS writes the OLD.SPECIES data set to the first folder (C:\MYSASDIR), replacing any existing data set with the same name:

```
libname old ('c:\mysasdir', 'd:\saslib');
data old.species;
    x=1;
    y=2;
run;
```

If a copy of the OLD.SPECIES data set exists in the second folder, it is not replaced.

Accessing Data Sets with the Same Name

One possibly confusing case involving the access protocols for SAS files occurs when you use the DATA and SET statements to access data sets with the same name. For example, suppose you submit the following statements and TEST.SPECIES originally exists only in the second folder, D:\MYSASDIR:

```
libname test ('c:\sas', 'd:\mysasdir');
data test.species;
    set test.species;
    if value1='y' then
        value2=3;
run;
```

In this case, the DATA statement opens TEST.SPECIES for output according to the output rules; that is, SAS opens a data set in the first of the concatenated libraries (C:\SAS). The SET statement opens the existing TEST.SPECIES data set in the second (D:\MYSASDIR) folder, according to the input rules. Therefore, the original TEST.SPECIES data set is not updated; rather, two TEST.SPECIES data sets exist, one in each folder.

Using the Sasuser Data Library

SAS automatically creates a SAS library with the libref Sasuser. This library contains, among other SAS files, your user Profile catalog.

By default under Windows, the Sasuser libref points to the following folders:

Table 4.4 Folders for the Sasuser Libref

Windows Vista	C:\Users\ <i>user ID</i> \Documents\My SAS Files\9.2
Windows 7	C:\Users\ <i>user ID</i> \Documents\My SAS Files\9.2
Windows XP	C:\Documents and Settings\ <i>user ID</i> \My Documents\My SAS Files\9.2
Windows Server 2003	SAS Files\9.2

You can use the SASUSER system option to make the Sasuser libref point to a different SAS library. If a Sasuser folder does not exist, SAS creates one. If you use a folder other than the default folder, you can add the SASUSER system option to the sasv9.cfg configuration file.

SAS stores other files besides the Profile catalog in the Sasuser folder. For example, sample data sets are stored in this folder.

The Sasuser data library is always associated with the V9 engine. You cannot change the engine associated with the Sasuser data library. If you try to assign another engine to this data library, you receive an error message. Therefore, even if you have set the ENGINE system option to another engine, any SAS files that are created in the Sasuser data library are SAS 9.2 files.

For more information about your Profile catalog, see “Profile Catalog” on page 20. For more information about the SASUSER system option, see “SASUSER System Option” on page 560.

Using the Work Data Library

Using Temporary Files

The Work data library is the storage place for temporary SAS files. By default under Windows, the Work data library is created as a subfolder of !TEMP\SAS Temporary Files folder. This subfolder is named `_TDnnnnnnnnnnnn`, as discussed in “Work Data Library” on page 21. Temporary SAS files are available only for the duration of the SAS session in which they are created. At the end of that session, they are deleted automatically. If SAS terminates abnormally, you might need to delete the temporary files.

By default, any file that is not assigned a two-level name is automatically considered to be a temporary file. A special libref of Work is automatically assigned to any temporary SAS data sets created. For example, if you run the following SAS DATA step to create the data set Sports, a temporary data set named Work.Sports is created:

```
data sports;
  input @1 sport $10. @12 event $20.;
  datalines;
volleyball co-recreational
swimming 100-meter freestyle
soccer    team
;
```

If you display the SAS Explorer window now, you will see the Sports data set in the Work folder.

You can display all the temporary data sets that are created during this session from:

- the SAS Explorer window. Double-click the Libraries folder icon and then double-click the Work folder icon.
- the LIBNAME window. Type `libname` in the command bar and double-click the Work folder icon.

The Work data library is always associated with the V9 engine. You cannot change the engine associated with the Work data library. If you try to assign another engine to this data library, you receive an error message. Therefore, even if you have set the ENGINE system option to a different engine, any SAS files that are created in the Work data library are SAS 9.2 files.

Using an Environment Variable

You can use an environment variable in your Work data library specification, similar to the method illustrated earlier with the SASUSER system option. Use this technique when you do not want to use the default location for your Work data library. You can put something similar to the following in your SAS configuration file to set up an environment variable to use for your Work data library:

```
-set myvar c:\ tempdir
-work !myvar
```

The SET option associates the MYVAR environment variable with the C:\TEMPDIR folder. Then the WORK option tells SAS to use that folder for the Work data library. When you exit your SAS session, the temporary folders and any files they contain are removed.

Using the User Libref

Although by default SAS files with one-level names are temporary and are deleted at the end of your SAS session, you can use the User libref to cause SAS files with one-level names to be stored in a permanent SAS library. For example, the following statement causes all SAS files with one-level names to be permanently stored in the C:\MYSASDIR folder:

```
libname user 'c:\mysasdir';
```

When you set the User libref to a folder as in the previous example and you want to create or access a temporary data set, you must specify a two-level name for the data set, with Work as the libref.

Alternatively, you can assign the User libref when you invoke SAS by using the USER system option or by creating a Windows environment variable named USER. If you have a Windows environment variable named USER, the USER libref is automatically assigned when you invoke SAS. For more information about the USER system option, see “USER System Option” on page 581 and *SAS Language Reference: Dictionary*.

Note: You can assign other engines to the User libref if you want the data sets that are saved with one-level names to be stored in a format for use with other releases of SAS. \triangle

Using Large Data Sets with Windows and NTFS

If you run SAS under Windows using the Windows NT file system (NTFS), SAS automatically takes advantage of the 64-bit file I/O features. Two terabytes is the practical limit for physical and logical volumes using NTFS.

Accessing SAS Files from Multiple SAS Sessions

If you are running multiple SAS sessions, whether on a single machine or across a network, you can have multiple access to the same SAS file when you are reading from it.

If you have SAS/SHARE installed, the VIEWTABLE window and the FSEEDIT or FSVIEW windows allow multiple users to edit the same SAS file. When you edit a data set using the VIEWTABLE window, you can set the editing mode to either Table Level Edit Access or Row Level Edit Access. When you select Table Level Edit Access, only you have access to the data set. Row Level Edit access allows multiple users to access

the same SAS file, but only one user can access and make changes to a single record (observation) at a time.

To open a data set in the VIEWTABLE window, from the SAS Explorer window:

- 1 double-click the Libraries icon
- 2 double-click the library containing the data set
- 3 double-click the data set.

To edit the data set, select **Edit ► Edit Mode** and then select either **Table Level Edit** or **Row Level Edit**.

When you edit a data set using FSEEDIT or FSVIEW, you can set the update mode to either MEMBER or RECORD. When you select MEMBER mode, only you have access to the data set. When you select RECORD mode, multiple users can write to the same SAS file but only one user can update a single record (observation) at a time.

To open a data set using FSEEDIT or FSVIEW:

- 1 type FSEEDIT or FSVIEW in the command bar
- 2 double-click the library name in the Select a Member dialog box
- 3 double-click the data set name.

To edit the data set, select **Edit ► Update** and then select either the **MEMBER** or **RECORD** radio button.

The RSASUSER system option, described in “RSASUSER System Option” on page 555 allows you to share the Sasuser data library. If multiple users need update access to common SAS data sets, use SAS/SHARE software.

For details about rules for multiple user access to the same data set and its members, see the SAS Help and Documentation and *SAS/SHARE User’s Guide*.

Using SAS Files from Other Versions with SAS 9.2 for Windows

Introduction to Using SAS Files from Other Versions with SAS 9.2 for Windows

SAS files that were created in Versions 8, 7, and 6 can be processed, with some restrictions, without having to convert files to the SAS 9.2 format.

SAS 9.2 file formats are the same as Version 7 and 8 file formats with the exception of a few new features. Table 4.5 on page 138 summarizes the actions that you need to take in order to use SAS files from a previous release, if the files in the SAS library are for the same release of SAS.

If you want to use SAS 9.2 to access catalogs that were created with earlier releases of SAS for Windows, you might have to convert the catalogs from the earlier releases to the SAS 9.2 format before you can use the catalogs in a SAS 9.2 program.

The following table provides information about data set and catalog conversion.

Table 4.5 Summary of Using Version 6, 7, and 8 Data Sets and Catalogs in SAS 9.2

Version or Release	Data Sets	Catalogs
Version 7 and 8	In 32-bit environments, no action is necessary. SAS reads, updates, and writes to Version 7 and Version 8 data sets. In 64-bit environments there are no updates to read and write.	In 32-bit environments, no action is necessary. SAS reads, updates, and writes to Version 7 and Version 8 catalogs. In 64-bit environments, migrate to SAS 9 by using the MIGRATE procedure with the SLIBREF option.
Releases 6.08 - 6.12	The V6 engine is automatically detected. In 32-bit environments, no action is necessary. SAS reads, updates, and writes to Version 6 data sets. In 64-bit environments. SAS can read a V6 data set but cannot write to a V6 data set.	In 32-bit environments, SAS can read a Version 6 catalog but cannot write to it. In 64-bit environments, convert to SAS 9 by using the CPORT and CIMPORT procedures.
Releases 6.03 and 6.04	Use the V604 engine to read data. You cannot write to Release 6.03 and 6.04 data sets.	not supported

As the table shows, in 32-bit environments, except for Release 6.04 and Release 6.03 data sets, Version 6 (32-bit environments) and Version 7 and 8 data sets do not need to be converted to SAS 9.2 data sets in order for SAS 9.2 to read, update, and write to the data sets. In 64-bit environments, the cross-environment data access (CEDA) facility imposes some restrictions.

In 32-bit environments, Version 7 and 8 catalogs also do not need to be converted to V9 catalogs. Only Version 6 SAS catalogs can be read. If a Version 6 catalog is to be updated, you must convert it to a SAS 9.2 catalog.

The Migration focus area at <http://support.sas.com/migration> discusses in detail how to use or convert SAS files that were created in Release 6.08 through Version 8. See the *SAS/CONNECT User's Guide* for information about accessing Version 6 SAS files if you use Remote Library Services to access SAS files on a server.

To use SAS files that were created under an operating environment other than Windows, you will need to transport those files to the Windows environment. A separate document, *Moving and Accessing SAS Files*, discusses transporting files from one operating environment to another operating environment.

Using Release 6.08 through Release 8.2 Data Sets

If your SAS library contains SAS files from only a single release of SAS, such as Release 6.12 or Version 8, SAS automatically determines the appropriate engine to use for these SAS data sets. If your SAS files are in a mixed mode library that possibly contains SAS data sets from multiple releases, you must specify the engine parameter in the LIBNAME statement. The default engine is V9.

For example, if you know that the 'c:\mydata' SAS library contains only Version 6 files, the following SAS statements print a Version 6 SAS data set that is named WINDATA.SALEFIGS created under Windows:

```
libname windata 'c:\mydata';
proc print data=windata.salefigs;
    title 'Sales Figures';
run;
```

Where all SAS files in the library are Version 6 SAS files, you can omit the engine parameter because SAS automatically detects the V6 engine.

Using the same example, suppose you are unsure of the file's version or suppose you know that the SAS library is a mixed mode library. In those cases, you must specify the engine name in the LIBNAME statement in order to access the V6 files:

```
libname windata v6 'c:\mydata';
proc print data=windata.salefigs;
    title 'Sales Figures';
run;
```

Release 6.03 and Release 6.04 SAS files require a specific engine. For more information, see "Using Release 6.03 and Release 6.04 SAS Data Sets" on page 139.

Using Release 6.03 and Release 6.04 SAS Data Sets

The V604 engine enables you to read from Release 6.03 and Release 6.04 SAS data sets directly from your 32-bit Windows SAS 9.2 session. Release 6.03 and Release 6.04 SAS data sets are not compatible with the x64 64-bit environment and the Itanium 64-bit environment. (Remember that there is no difference between Release 6.03 and Release 6.04 SAS data sets.) This feature is useful when you have SAS data sets that you want to share between Release 6.04 for PCs and SAS 9.2 under Windows. The V604 engine is supported only for SAS data sets (member type DATA). For example, if you have a Release 6.04 SAS data set that is named MYLIB.FRUIT that you want to print, you can submit the following statements from a SAS 9.2 session:

```
libname mylib v604 'c:\sas604';
proc print data=mylib.fruit;
run;
```

Converting Release 6.08 through Release 6.12 SAS Data Sets

You should convert your Version 6 SAS data sets to the SAS 9.2 format if you access them often and do not need to read the files from Version 6. The data set format of SAS 9.2 is more efficient than the Version 6 format, and there are new SAS 9.2 features that cannot be used unless the data sets are converted. You should migrate Release 6.12 libraries by using the MIGRATE procedure. For information about how to convert libraries before 6.12, see *Moving and Accessing SAS Files*.

Note: For more information about conversion, you can access information from the Migration focus area at: <http://support.sas.com/migration> △

Using Version 7 and 8 Catalogs in SAS 9.2

Because SAS 9.2 file formats are basically the same as Version 7 and 8 file formats, a 32-bit platform can read, update, and write to Version 7 and 8 catalogs without having to convert them to SAS 9.2 catalogs.

However, when SAS is running under 64-bit Windows operating environments, it cannot read 32-bit catalogs.

Converting Version 6 SAS Catalogs in SAS 9.2

Because of the differences in the internal structures of the operating environments, you can use the CPORT and CIMPORT procedures to convert Version 6 SAS catalogs that were created under Windows to SAS 9.2 format before you can use the catalogs in your SAS 9.2 session under Windows. Follow these steps:

- 1 Using the CPORT procedure in your Version 6 SAS session, create a transport file that contains the SAS catalog to be converted.
- 2 Transfer the file (perhaps on a network or disk) to a location that your SAS 9.2 session can read.
- 3 Use the CIMPORT procedure from your SAS 9.2 session to read the transport file and create a converted SAS catalog.

For information about using the CPORT and CIMPORT procedures, see *Moving and Accessing SAS Files* and the *Base SAS Procedures Guide*.

There are other conversion methods. For information see *Moving and Accessing SAS Files*.

Converting Release 6.08 SAS Catalogs to SAS 9.2

If you are converting directly from Release 6.08 to SAS 9.2, you can use the CPORT procedure in Release 6.08 to create a transport file, and then use the SAS 9.2 CIMPORT procedure to convert the catalog to a SAS 9.2 catalog. However, the HSERVICE and TOOLBOX catalog entries are not portable if you use CPORT from a Release 6.08 session.

An alternative way to convert Release 6.08 catalogs is to use the C16PORT procedure that is provided in Release 6.10 through Release 6.12. SAS provided the C16PORT procedure to convert the 16-bit catalogs that were created with Release 6.08 under Windows to a 32-bit format that SAS can use. You can use the C16PORT procedure from within one of these earlier releases of SAS to create a catalog that can later be read by SAS 9.2. (The C16PORT procedure is not available in SAS 9.2.)

To convert your SAS catalogs from Release 6.08 under Windows to SAS 9.2:

- 1 While in your Release 6.10, Release 6.11, or Release 6.12 session, use the C16PORT procedure (described in the documentation for those releases) to create a transport file that contains the SAS catalog from Release 6.08.
- 2 Transfer the file (perhaps on a network or by using binary FTP) to a location where SAS 9.2 can read it.
- 3 Use the 9.2 CIMPORT procedure to read the transport file and create a converted SAS V9.2 catalog.

If you want to convert a catalog that currently exists on another machine running Release 6.08 for Windows, you must first transfer the file (perhaps on a network or by using binary FTP) to a place where your SAS 9.2 session can read it.

The following example uses the C16PORT procedure in Release 6.12 to create a transport file from the INLIB.CAT catalog, and then creates a Release 6.12 catalog (OUTLIB.CAT) using the CIMPORT procedure.

```

/* Folder where catalog      */
/* 'cat.sc2' resides         */
libname inlib 'c:\cat608';

```



```

/* Folder where catalog */
/* 'cat.sc8' will reside */
libname outlib 'c:\cat612';
proc c16port file='transprt' c=inlib.cat;
run;

/* Move the transport file to a location where SAS can read it */
/* Once the file is accessible, run the following procedure. */

proc cimport infile='transprt' c=outlib.cat;
run;

```

The Release 6.12 SAS catalog can now be read by SAS 9.2. For information about the CPORT and CIMPORT procedures, see the *Base SAS Procedures Guide* and *Moving and Accessing SAS Files*.

Converting Release 6.03 and Release 6.04 SAS Catalogs to SAS 9.2

If you want to convert Release 6.04 SAS catalogs to their SAS 9.2 counterparts, see *Moving and Accessing SAS Files*.

Creating Release 6.08 through Release 6.12 Data Sets

You might need to create Release 6.08 through Release 6.12 data sets from your SAS session under Windows. This action is similar to reading Version 6 data sets in that you use the V6 engine. For example, the following SAS statements use the V6 engine to create a SAS data set named QTR1. The raw data are read from the external file that is associated with the fileref MYFILE.

```

libname windata v6 'c:\mydata';
filename myfile 'c:\qtr1data.dat';
data windata.qtr1;
  infile myfile;
  input saledate amount;
run;

```

Using SAS 9.2 Files with Previous Releases

Do not use the CPORT and CIMPORT procedures for regressing a SAS file to a previous release. You will experience errors when you try to import the transport file. For more information about transporting files, see *Moving and Accessing SAS Files*.

If a SAS 9 file is created under a 32-bit platform for Windows, then the file is fully compatible in a Version 7 or 8 session as long as you do not use any new SAS 9 file features that are not supported under Version 7 or 8. SAS 9 files are not supported under Version 6 but are usable after regression to Version 6 format.

To learn about these compatibility issues and the best methods for regressing a SAS 9 file to a previous release, see “Using a SAS 9 File Under a Previous Version of SAS” in the Migration focus area at <http://support.sas.com/migration/planning/files/regression.html>.

Using Remote Host SAS Files in SAS 9.2

In SAS 9.2, you can directly access SAS 9.2 data sets that were created on a remote host under any previous version of SAS. For example, you might have a Version 5 SAS data set under VSE or a Version 8 data set under UNIX. Alternatively, you can create a transport data set and transport your file from the host to Windows.

A complete explanation of using remote host SAS files in SAS 9.2 can be found in *Moving and Accessing SAS Files*. For cross-release compatibility, see the Migration focus area at <http://support.sas.com/migration>

Reading BMDP, OSIRIS, and SPSS Files

SAS 9.2 provides three interface library engines that enable you to access external data files directly from a SAS program: the BMDP, OSIRIS, and SPSS engines. These engines are all read-only. Because they are sequential engines (that is, they do not support random access of data), these engines cannot be used with the POINT= option in the SET statement or with the FSBROWSE, FSEEDIT, or FSVIEW procedures. When using BMDP and OSIRIS engines, you can use PROC COPY or a DATA step to copy the system file to a SAS data set and then perform these functions on the SAS data set. When using the SPSS engine, PROC COPY or a DATA step will support the portable file format. Also, because they are sequential engines, some procedures (such as the PRINT procedure) give a warning message that the engine is sequential. With these engines, the physical filename that is associated with a libref is an actual filename, not a folder. This action is an exception to the rules concerning librefs.

You can also use the CONVERT procedure to convert BMDP, OSIRIS, and SPSS files to SAS data files. For more information, see “CONVERT Procedure” on page 433.

BMDP Engine

The BMDP interface library engine enables you to read BMDP DOS files from the BMDP statistical software package directly from a SAS program. The following sections assume that you are familiar with the BMDP save file terminology.

To read a BMDP save file, you must issue a LIBNAME statement that explicitly specifies that you want to use the BMDP engine:

```
LIBNAME libref BMDP <'filename'>;
```

In this form of the LIBNAME statement, *libref* is a SAS libref and *filename* is the BMDP physical filename. If the libref appears previously as a fileref, you can omit *filename* because the physical filename that is associated with the fileref is used. This engine can read only BMDP save files created under DOS.

Because there can be multiple save files in a single physical file, you reference the CODE= value as the member name of the data set within the SAS language. For example, if the save file contains CODE=ABC and CODE=DEF and the libref is MYLIB, you reference them as MYLIB.ABC and MYLIB.DEF. All CONTENT types are treated the same. Therefore, even if member DEF is CONTENT=CORR, it is treated as CONTENT=DATA.

If you know that you want to access the first save file in the physical file, or if there is only one save file, you can refer to the member name as `_FIRST_`. This convention is convenient if you do not know the CODE= value.

BMDP Engine Examples

In the following example, the physical file MYBMDP.DAT contains the save file ABC. This example associates the libref MYLIB with the BMDP physical file, and then runs the CONTENTS and PRINT procedures on the save file:

```
libname mylib bmdp 'mybmdp.dat';
proc contents data=mylib.abc;
run;
proc print data=mylib.abc;
run;
```

The following example uses the LIBNAME statement to associate the libref MYLIB2 with the BMDP physical file. Then it prints the data for the first save file in the physical file:

```
libname mylib2 bmdp 'mybmdp.dat';
proc print dat=mylib2._first_;
run;
```

OSIRIS Engine

Because the Inter-University Consortium on Policy and Social Research (ICPSR) uses the OSIRIS file format for distribution of its data files, SAS provides the OSIRIS interface library engine to support ICPSR data users and to be compatible with PROC CONVERT, which is described in “CONVERT Procedure” on page 433.

The read-only OSIRIS engine enables you to read OSIRIS data and dictionary files directly from a SAS program. These files must be stored in EBCDIC format. This action assumes that you downloaded the OSIRIS files from your host computer in binary format. The following section assumes that you are familiar with the OSIRIS file terminology. *

To read an OSIRIS file, you must issue a LIBNAME statement that explicitly specifies you want to use the OSIRIS engine. In this case, the LIBNAME statement takes the following form:

```
LIBNAME libref OSIRIS 'data-filename' DICT='dictionary-filename';
```

In this form of the LIBNAME statement, *libref* is a SAS libref, *data-filename* is the physical filename of the OSIRIS data file, and *dictionary-filename* is the physical filename of the OSIRIS dictionary file. The *dictionary-filename* argument can also be an environment variable name or a fileref. (Do not use quotation marks if it is an environment variable name or fileref.) The DICT= option must appear because the engine requires both files.

OSIRIS data files do not have member names. Therefore, you can use whatever member name you like. You can use the same OSIRIS dictionary file with different OSIRIS data files. Write a separate LIBNAME statement for each one.

The layout of an OSIRIS data dictionary is consistent across operating environments. The reason is that the OSIRIS software does not run outside the z/OS environment, but the engine is designed to accept an z/OS data dictionary on any other operating environment under which SAS runs. It is important that the OSIRIS dictionary and data files not be converted from EBCDIC to ASCII; the engine expects EBCDIC data. There is no specific file layout for the OSIRIS data file. The file layout is controlled by the contents of the OSIRIS dictionary file.

* See documentation provided by the Institute for Social Research for more information.

OSIRIS Engine Example

In the following example, the data file is MYOSIRIS.DAT, and the dictionary file is MYOSIRIS.DIC. The example associates the libref MYLIB with the OSIRIS files and then runs PROC CONTENTS and PROC PRINT on the data:

```
libname mylib osiris 'myosiris.dat'
        dict='myosiris.dic';
proc contents data=mylib._first_;
run;
proc print data=mylib._first_;
run;
```

SPSS Engine

The SPSS interface library engine enables you to read SPSS export files directly from a SAS program. The SPSS export file must be created by using the SPSS EXPORT command. *The SPSS engine is a read-only engine.

To read an SPSS export file you must issue a LIBNAME statement that explicitly specifies that you want to use the SPSS engine. In this case, the LIBNAME statement takes the following form:

```
LIBNAME libref SPSS <'filename'>;
```

In this form of the LIBNAME statement, the *libref* argument is a SAS libref, and *filename* is the SPSS physical filename, including the file extension. If the libref appears also as a fileref, you can omit *filename* because the physical filename that is associated with the fileref is used. The SPSS native file format is not supported. Export files can originate from any operating environment.

Because SPSS files do not have internal names, you can refer to them by any member name that you like. (The example in this discussion uses `_FIRST_ .`)

Note: SPSS can have system-missing and user-defined missing data. When you use the SPSS engine or PROC CONVERT, the missing values (user-defined or system) are converted to system-missing values. User-defined missing values have to be recoded as valid values. When the data set is converted, you can use PROC FORMAT to make the translation. For example, `-1` to `.A` and `-2` to `.B`. Δ

SPSS Engine Example

The following example associates the libref MYLIB with the physical file MYSPSS.POR in order to run PROC CONTENTS and PROC PRINT on the portable file:

```
libname mylib spss 'myspss.por';
proc contents data=mylib._first_;
run;
proc print data=mylib._first_;
run;
```

Reformatting SPSS Files

SAS cannot use an SPSS file that contains a variable that has a numeric format which has a larger number of decimal places than the width of the entire variable. For example, if an SPSS file has a variable that has a width of 17 and also has 35 decimal

* See documentation provided by SPSS Inc. for more information.

places, SAS will return errors when you try to run a DATA step on the file or when you try to view it with the table viewer. To use the SPSS file with SAS, you must reformat the variable.

You can reformat the variable by reducing the number of decimal spaces to a value that fits within the width of the variable. In the following code, the statement `revision=cat(format,format1, '.2');` converts the number of decimal spaces to 2. This value reduces the number of decimal spaces so that it is not greater than the width of the variable.

```
libname abc spss 'FILENAME.POR';
proc contents data=abc._all_ out=new; run;
filename sascode temp;
data _null_; set new; file sascode;
    if formatd > formatl then do;
        revision=cat(format,format1, '.2');
        put 'format' +1 name +1 revision ';' ;
    end;
run;
data temp; set abc._all_;
    %inc sascode/source2;
run;
```

Note: The OPTIONS NOFMterr statement does not allow SAS to use a data set that has a DATA step or the table viewer. You must reformat numeric variables that have a larger decimal space value than their width before you can use a DATA step or the table viewer. △

Transferring SAS Files between Operating Environments

For complete information on transferring SAS files between operating environments, see *Moving and Accessing SAS Files*.

Accessing Database Files with SAS/ACCESS Software

SAS/ACCESS software provides an interface between SAS and several database management systems (DBMS) that run under Windows. The interface consists of three procedures and an interface view engine, which can perform the following tasks:

LIBNAME statement

by assigning the engine to a specific database engine, the LIBNAME statement lets you reference a DBMS object directly in a DATA step or SAS procedure, enabling you to read from and write to a DBMS object as though it were a SAS data set.

SQL Procedure Pass-Through Facility

accesses data from several relational DBMSs, including Oracle and SQLServer.

interface view engine

enables you to use descriptor files in SAS programs to access DBMS data directly and enables you to specify descriptor files in SAS programs to update, insert, or delete DBMS data directly.

For more information about using SAS/ACCESS software under Windows, consult *SAS/ACCESS Interface to PC Files: Reference* and other available SAS/ACCESS documentation.

Using the SAS ODBC Driver to Access SAS Data from Other Applications

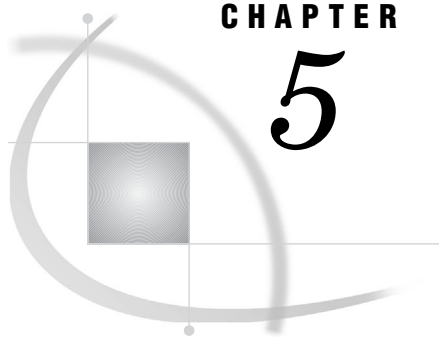
The SAS ODBC driver is an implementation of the open database connectivity (ODBC) standard that enables you to access, manipulate, and update SAS data sources. These data sources can include SAS data sets, flat files, VSAM files, as well as data from any database management system (DBMS) for which you have licensed SAS/ACCESS software. For information about how to access data from other Windows applications that comply with the ODBC standard, see the SAS Help and Documentation.

The SAS ODBC Driver accesses data by communicating with either a local or remote (SAS/SHARE) SAS server session using the TCP/IP protocol. The TCP/IP protocol enables users to access remote SAS servers on a variety of host platforms. A SAS server is a SAS procedure (either PROC SERVER or PROC ODBCSEVER) that runs in its own SAS session; it accepts input and output requests from other SAS sessions and from the SAS ODBC driver on behalf of the ODBC-compliant application. For remote access to SAS data, a SAS server must be installed on the server machine, but not on the client machine.

The SAS ODBC Driver is included with Base SAS. Remote server configurations that use the SAS ODBC driver require that these SAS products be installed:

- Base SAS
- SAS/SHARE.

For details about installing and configuring the SAS ODBC Driver, see the installation documentation for SAS under Windows. For more information on configuring and using the SAS ODBC Driver, see *SAS Drivers for ODBC: User's Guide*.



CHAPTER

5

Using External Files

<i>About External Files</i>	148
<i>Referencing External Files</i>	148
<i>Accessing External Files</i>	148
<i>Using a Fileref</i>	149
<i>Assigning File Shortcuts</i>	149
<i>Using the FILENAME Statement</i>	149
<i>Using Environment Variables</i>	150
<i>Using the SET System Option</i>	151
<i>Using the SET Command</i>	151
<i>Assigning a Fileref to a Directory</i>	151
<i>Assigning a Fileref to Concatenated Directories</i>	153
<i>Summary of Rules for Resolving Member-Name Syntax</i>	153
<i>Assigning a Fileref to Concatenated Files</i>	154
<i>Referencing External Files with Long Filenames</i>	154
<i>Referencing Files Using UNC Paths</i>	154
<i>Listing Fileref Assignments</i>	155
<i>Clearing Filerefs</i>	155
<i>Understanding How Concatenated Directories Are Accessed</i>	155
<i>Input</i>	156
<i>Output</i>	156
<i>Understanding How Concatenated Files Are Accessed</i>	156
<i>Input</i>	156
<i>Output</i>	156
<i>Using a Quoted Windows Filename</i>	157
<i>Using Reserved Operating System Physical Names</i>	157
<i>Using a File in Your Working Directory</i>	158
<i>Accessing External Files with SAS Statements</i>	158
<i>Using the FILE Statement</i>	158
<i>Using the INFILE Statement</i>	159
<i>Using the %INCLUDE Statement</i>	160
<i>Accessing External Files with SAS Commands</i>	161
<i>Using the FILE Command</i>	161
<i>Using the INCLUDE Command</i>	161
<i>Using the GSUBMIT Command</i>	162
<i>Advanced External I/O Techniques</i>	162
<i>Altering the Record Format</i>	162
<i>Appending Data to an External File</i>	163
<i>Determining Your Drive Mapping</i>	163
<i>Reading External Files with National Characters</i>	164
<i>Reading Data from the Communications Port</i>	164
<i>Communications Port Timeouts</i>	165

About External Files

External files are files that contain data or text, such as SAS programming statements, records of raw data, or procedure output. SAS can use these files, but they are not managed by SAS.

SAS Language Reference: Concepts contains basic, platform-independent information on external files.

For information on how to access external files containing transport data libraries, see the SAS Customer Support Center Web page, <http://support.sas.com>.

Referencing External Files

Accessing External Files

To access external files, you must tell SAS how to find the files. Use the following statements to access external files:

FILENAME

associates a fileref with an external file that is used for input or output.

FILE

opens an external file for writing data lines. Use the PUT statement to write lines.

INFILE

opens an external file for reading data lines. Use the INPUT statement to read lines.

%INCLUDE

opens an external file and reads SAS statements from that file. (No other statements are necessary.)

These statements are discussed in the section “SAS Statements under Windows” on page 449, and in the SAS statements section in *SAS Language Reference: Dictionary*.

You can also specify external files in various SAS dialog box entry fields (for example, as a file destination in the Save As dialog box), the FILENAME function, and in SAS commands, such as FILE and INCLUDE.

Depending on the context, SAS can reference an external file by using:

- a fileref assigned with the FILENAME statement or function
- an environment variable defined with either the SET system option or the Windows SET command
- a Windows filename enclosed in quotation marks
- member-name syntax (also called aggregate syntax)
- a single filename within quotation marks (a file in the working directory).

The following sections discuss these methods of specifying external files.

Because there are several ways to specify external files in SAS, SAS uses a set of rules to resolve an external file reference and uses this order of precedence:

- 1 Check for a standard Windows file specification enclosed in quotation marks.
- 2 Check for a fileref defined by a FILENAME statement or function.

- 3 Check for an environment variable fileref.
- 4 Assume that the file is in the working directory.

In other words, SAS assumes that an external file reference is a standard Windows file specification. If it is not, SAS checks to determine whether the file reference is a fileref (defined by either a FILENAME statement, FILENAME function, or an environment variable). If the file reference is none of these filerefs, SAS assumes it is a filename in the working directory. If the external file reference is not valid for one of these choices, SAS issues an error message indicating that it cannot access the external file.

Using a Fileref

One way to reference external files is with a *fileref*. A fileref is a logical name associated with an external file. You can assign a fileref with a File Shortcut in the SAS Explorer window, the My Favorite Folders window, the FILENAME statement, the FILENAME function, or you can use a Windows environment variable to point to the file. This section discusses the different ways to assign filerefs and also shows you how to obtain a listing of the active filerefs and clear filerefs during your SAS session.

Assigning File Shortcuts

In an interactive SAS session, you can use the SAS Explorer window or the My Favorite Folders window to create filerefs. The SAS Explorer File Shortcuts folder contains a listing of active filerefs. To create a new fileref from SAS Explorer:

- 1 Select the File Shortcuts folder and then select **File ► New**
- 2 In the File Shortcut Assignment window, enter the name of the shortcut (fileref) and the path to the SAS file that the shortcut represents.
- 3 You can also check **Enable at Startup** to reassign the shortcut for all subsequent SAS sessions.

To assign a file shortcut using the My Favorite Folders window:

- 1 Open the folder that contains the file.
- 2 Position the cursor over the file, right mouse click and select **Create File Shortcut**.
- 3 In the Create File Shortcut dialog box, type the name of the file shortcut and press Enter or click **OK**.

You can then use these file shortcuts in your SAS programs.

Note: File Shortcuts are active only during the current SAS session. △

Using the FILENAME Statement

The FILENAME statement provides a means to associate a logical name with an external file or directory.

Note: The syntax of the FILENAME function is similar to the FILENAME statement. For information about the FILENAME function, see *SAS Language Reference: Dictionary*. △

The simplest syntax of the FILENAME statement is as follows:

```
FILENAME fileref "external-file";
```

For example, if you want to read the file C:\MYDATA\SCORES.DAT, you can issue the following statement to associate the fileref MYDATA with the file C:\MYDATA\SCORES.DAT:

```
filename mydata "c:\mydata\scores.dat";
```

Then you can use this fileref in your SAS programs. For example, the following statements create a SAS data set named TEST, using the data stored in the external file referenced by the fileref MYDATA:

```
data test;
  infile mydata;
  input name $ score;
run;
```

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use these words as filerefs. Δ

You can also use the FILENAME, FILE, and INFILE statements to concatenate directories of external files and to concatenate multiple individual external files into one logical external file. These topics are discussed in “Assigning a Fileref to Concatenated Directories” on page 153 and “Assigning a Fileref to Concatenated Files” on page 154.

The * and ? wildcards can be used in either the external filename or file extension for matching input filenames. Use * to match one or more characters and the ? to match a single character. Wildcards are supported for input only in the FILENAME and INFILE statements, and in member-name syntax (aggregate syntax). Wildcards are not valid in the FILE statement. The following filename statement reads input from every file in the current directory that begins with the string **wild** and ends with **.dat**:

```
filename wild 'wild*.dat';
data;
  infile wild;
  input;
run;
```

The following example reads all files in the current working directory:

```
filename allfiles '*.*';
data;
  infile allfiles;
  input;
run;
```

The FILENAME statement accepts various options that enable you to associate device names, such as printers, with external files and to control file characteristics, such as record format and length. Some of these options are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the FILENAME statement, refer to “FILENAME Statement” on page 453.

Using Environment Variables

Just as you can define an environment variable to serve as a logical name for a SAS library (see “Assigning SAS Libraries Using Environment Variables” on page 130), you can also use an environment variable to refer to an external file. You can choose either to define a SAS environment variable using the SET system option or to define a Windows environment variable using the Windows SET command. Alternatively, you

can define environment variables using the System dialog box, accessed from the Control Panel.

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use these words as environment variables. △

The availability of environment variables makes it simple to assign resources to SAS before invocation. However, the environment variables you define (using the SET system option) for a particular SAS session are not available to other applications.

Using the SET System Option

For example, to define a SAS environment variable that points to the external file **C:\MYDATA\TEST.DAT**, you can use the following SET option in your SAS configuration file:

```
-set myvar c:\mydata\test.dat
```

Then, in your SAS programs, you can use the environment variable MYVAR to refer to the external file:

```
data mytest;
  infile myvar;
  input name $ score;
run;
```

It is recommended that you use the SET system option in your SAS configuration file if you invoke SAS using the Windows Start menu.

Using the SET Command

An alternative to using the SET system option to define an environment variable is to use the Windows SET command. For example, the Windows SET command that equates to the previous example is

```
SET MYVAR=C:\MYDATA\TEST.BAT
```

You can also define SET commands by using System Properties dialog box that you access from the Control Panel.

You must issue all the SET commands that define your environment variables before you invoke SAS. If you define an environment variable in an MS-DOS window, and then start SAS from the Start menu, SAS will not recognize the environment variable.

Assigning a Fileref to a Directory

You can assign a fileref to a directory and then access individual files within that directory using member-name syntax (also called aggregate syntax).

For example, if all your regional sales data for January are stored in the directory **C:\SAS\MYDATA**, you can issue the following FILENAME statement to assign the fileref JAN to this directory:

```
filename jan "c:\sas\mydata";
```

Now you can use this fileref with a member name in your SAS programs. In the following example, you reference two files stored in the JAN directory:

```
data westsale;
  infile jan(west);
  input name $ 1-16 sales 18-25
         comiss 27-34;
```

```

run;
data eastsale;
  infile jan(east);
  input name $ 1-16 sales 18-25
         comiss 27-34;
run;

```

When you use member-name syntax, you do not have to specify the file extension for the file you are referencing, as long as the file extension is the expected one. For example, in the previous example, the INFILE statement expects a file extension of .DAT. The following table lists the expected file extensions for the various SAS statements and commands:

Table 5.1 Default File Extensions for Referencing External Files with Member-Name Syntax

SAS Command or Statement	SAS Window	File Extension
FILE statement	EDITOR	.DAT
%INCLUDE statement	EDITOR	.SAS
INFILE statement	EDITOR	.DAT
FILE command	EDITOR	.SAS
FILE command	LOG	.LOG
FILE command	OUTPUT	.LST
FILE command	NOTEPAD	none
INCLUDE command	EDITOR	.SAS
INCLUDE command	NOTEPAD	none

For example, the following program submits the file **C:\PROGRAMS\TESTPGM.SAS** to SAS:

```

filename test "c:\programs";
%include test(testpgm);

```

SAS searches for a filename TESTPGM.SAS in the directory C:\PROGRAMS.

If your file has a file extension different from the default file extension, you can use the file extension in the filename, as in the following example:

```

filename test "c:\programs";
%include test(testpgm.xyz);

```

If your file has no file extension, you must enclose the filename in quotation marks, as in the following example:

```

filename test "c:\programs";
%include test("testpgm");

```

To further illustrate the default file extensions SAS uses, here are some more examples using member-name syntax. Assume that the following FILENAME statement has been submitted:

```

filename test "c:\mysasdir";

```

The following example opens the file **C:\MYSASDIR\PGM1.DAT** for output:

```

file test(pgm1);

```

The following example opens the file `C:\MYSASDIR\PGM1.DAT` for input:

```
infile test(pgm1);
```

The following example reads and submits the file `C:\MYSASDIR\PGM1`:

```
%include test("pgm1");
```

These examples use SAS statements. SAS commands, such as the `FILE` and `INCLUDE` commands, also accept member-name syntax and have the same default file extensions as shown in Table 5.1 on page 152.

Another feature of member-name syntax is that it enables you to reference a subdirectory in the working directory without using a fileref. As an example, suppose you have a subdirectory named `PROGRAMS` that is located beneath the working directory. You can use the subdirectory name `PROGRAMS` when referencing files within this directory. For example, the following statement submits the program stored in *working-directory* \PROGRAMS\PGM1.SAS:

```
%include programs(pgm1);
```

The next example uses the `FILE` command to save the contents of the active window to *working-directory* \PROGRAMS\TESTPGM.DAT:

```
file programs(testpgm);
```

Note: If a directory name is the same as a previously defined fileref, the fileref takes precedence over the directory name. △

Assigning a Fileref to Concatenated Directories

Member-name syntax is also handy when you use the `FILENAME` statement to concatenate directories of external files. For example, suppose you issue the following `FILENAME` statement:

```
filename progs ("c:\sas\programs",
               "d:\myprogs");
```

This statement tells SAS that the fileref `PROGS` refers to all files stored in both the `C:\SAS\PROGRAMS` and the `D:\MYPROGS` directories. When you use the fileref `PROGS` in your SAS program, SAS looks in these directories for the member you specify. When you use this concatenation feature, you should be aware of the protocol SAS uses, which depends on whether you are accessing the files for read, write, or update. For more information, see “Understanding How Concatenated Directories Are Accessed” on page 155.

Summary of Rules for Resolving Member-Name Syntax

SAS resolves an external file reference that uses member-name syntax by using a set of rules. For example, suppose your external file reference in a SAS statement or command is the following:

```
progs(member1)
```

SAS uses the following set of rules to resolve this external file reference. This list represents the order of precedence:

- 1 Check for a fileref named `PROGS` defined by a `FILENAME` statement.
- 2 Check for a SAS or Windows environment variable named `PROGS`.
- 3 Check for a directory named `PROGS` beneath the working directory.

The member name must be a valid physical filename. If no extension is given (as in the previous example), SAS uses the appropriate default extension, as given in Table

5.1 on page 152. If the extension is given or the member name is quoted, SAS does not assign an extension, and it looks for the filename exactly as it is given.

Assigning a Fileref to Concatenated Files

You can specify concatenations of files when reading external files from within SAS. Concatenated files consist of two or more file specifications (which might contain wildcard characters) separated by blanks or commas. Here are some examples of valid concatenation specifications:

- `filename allsas ("one.sas", "two.sas", "three.sas");`
- `filename alldata ("test1.dat" "test2.dat" "test3.dat");`
- `filename allinc "test*.sas";`
- `%include allsas;`
- `infile alldata;`
- `include allinc;`

When you use this concatenation feature, you should be aware of the protocol SAS uses, which depends on whether you are accessing the files for read, write, or update. For more information, see “Understanding How Concatenated Files Are Accessed” on page 156.

Note: Do not confuse concatenated file specifications with concatenated directory specifications, which are also valid and are illustrated in “Assigning a Fileref to Concatenated Directories” on page 153. \triangle

Referencing External Files with Long Filenames

SAS supports the use of long filenames. (For more information about valid long filenames, see your Windows operating environment documentation.) You can use long filenames whenever you specify a filename as an argument to a dialog box, command, or any aspect of the SAS language.

When specifying external filenames with the SAS language, such as in a statement or function, you should enclose the filename in double quotation marks to reduce ambiguity (since a single quotation mark is a valid character in a long filename). When you need to specify multiple filenames, enclose each filename in double quotation marks and delimit the names with a blank space.

Here are some examples of valid uses of long filenames within SAS:

- `libname abc "My data file";`
- `filename myfile "Bernie's file";`
- `filename summer ("June sales" "July sales" "August sales");`
- `include "A really, really big SAS program";`

Referencing Files Using UNC Paths

SAS supports the use of the Universal Naming Convention (UNC) paths. UNC paths let you connect your computer to network devices without having to refer to a network drive letter. SAS supports UNC paths to the extent that Windows and your network software support them. In general, you can refer to a UNC path anywhere in SAS where you would normally refer to a network drive.

UNC paths have the following syntax:

```
\\SERVER\SHARE\FOLDER\FILEPATH
```

where

SERVER

is the network file server name.

SHARE

is the shared volume on the server.

FOLDER

is one of the directories on the shared volume.

FILEPATH

is a continuation of the file path, which might reference one or more subdirectories.

For example, the following command includes a file from the network file server ZAPHOD:

```
include "\\zaphod\universe\galaxy\stars.sas";
```

Listing Fileref Assignments

If you have assigned several filerefs during a SAS session and need to refresh your memory as to which fileref points where, you can use either the SAS Explorer window or the FILENAME statement to list all the assigned filerefs.

To use the SAS Explorer window to list the active filerefs, double-click on File Shortcuts. The Explorer window lists all the filerefs active for your current SAS session. Any environment variables you have defined as filerefs are listed, provided you have used them in your SAS session. If you have defined an environment variable as a fileref but have not used it yet in a SAS program, the fileref is not listed in the Explorer window.

You can use the following FILENAME statement to write the active filerefs to the SAS log:

```
filename _all_ list;
```

Clearing Filerefs

You can clear a fileref by using the following syntax of the FILENAME statement:

```
FILENAME fileref | _ALL_ <CLEAR>;
```

If you specify a fileref, only that fileref is cleared. If you specify the keyword `_ALL_`, all the filerefs you have assigned during your current SAS session are cleared.

To clear filerefs using the SAS Explorer File Shortcuts:

- 1 select the File Shortcuts you want to delete. To select all File Shortcuts, select **Edit ► Select All**
- 2 press the Delete key or select **Edit ► Delete**
- 3 Click **OK** in the message box to confirm deletion of the File shortcuts.

Note: You cannot clear a fileref that is defined by an environment variable. Filerefs that are defined by an environment variable are assigned for the entire SAS session. △

SAS automatically clears the association between filerefs and their respective files at the end of your job or session. If you want to associate the fileref with a different file during the current session, you do not have to end the session or clear the fileref. SAS automatically reassigns the fileref when you issue a FILENAME statement for the new file.

Understanding How Concatenated Directories Are Accessed

When you associate a fileref with more than one physical directory, which file is accessed depends upon whether it is being accessed for input or output.

Input

If the file is opened for input or update, the first file found that matches the member name is accessed. For example, if you submit the following statements, and the file PHONE.DAT exists in both the C:\SAMPLES and C:\TESTPGMS directories, the one in C:\SAMPLES is read:

```
filename test ("c:\samples","c:\testpgms");
data sampdat;
  infile test(phone.dat);
  input name $ phonenum $ city $ state $;
run;
```

Output

When you open a file for output, SAS writes to the file in the first directory listed in the FILENAME statement, even if a file by the same name exists in a later directory. For example, suppose you input the following FILENAME statement:

```
filename test ("c:\sas","d:\mysasdir");
```

Then, when you issue the following FILE command, the file SOURCE.PGM is written to the C:\SAS directory, even if a file by the same name exists in the D:\MYSASDIR directory:

```
file test(source.pgm);
```

Understanding How Concatenated Files Are Accessed

When you associate a fileref with more than one physical file, the behavior of SAS statements and commands depends on whether you are accessing the files for input or output.

Input

If the file is opened for input, data from all files are input. For example, if you issue the following statements, the %INCLUDE statement submits four programs for execution:

```
filename mydata ("qtr1.sas","qtr2.sas",
                "qtr3.sas","qtr4.sas");
%include mydata;
```

Output

If the file is opened for output, data are written to the first file in the concatenation. For example, if you issue the following statements, the PUT statement writes to MYDAT1.DAT:

```
filename indata "dogdat.dat";
filename outdata ("mydat1.dat","mydat2.dat",
                 "mydat3.dat","mydat4.dat");
data _null_;
  infile indata;
  input name breed color;
  file outdata;
  put name= breed= color=;
run;
```


Using a Quoted Windows Filename

Instead of using a fileref to refer to external files, you can use a quoted Windows filename. For example, if the file C:\MYDIR\ORANGES.SAS contains a SAS program you want to invoke, you can issue the following statement:

```
%include "c:\mydir\oranges.sas";
```

When you use a quoted Windows filename in a SAS statement, you can omit the drive and directory specifications if the file you want to reference is located in the working directory. For example, if in the previous example the working directory is C:\MYDIR, you can submit this statement:

```
%include "oranges.sas";
```

Using Reserved Operating System Physical Names

You can use several reserved names as quoted physical filenames. Reserved operating system physical names enable you to do a variety of things, such as read data directly from the communications port (such as COM1). The following table lists these physical names and their corresponding device-type keywords:

Table 5.2 Reserved Windows Physical Names

Physical Name	Device Type	Use
COM1–COM9	COMMPORT	Read/write from the communications port.
NUL	DUMMY	Discard data. This name is useful in testing situations.

You can specify operating system physical names with or without a colon. For example, you can specify either COM1: or COM1. For additional information, see your Windows documentation.

The following example demonstrates how to capture data from an external device or application that is transmitting data via a serial (RS-232C port).

```
options noxwait xsync;
data _null_;
  if symget("sysscpl") = "XP_PRO" then
    rc = system("mode COM1:9600,n,8,1,xon=on");
  stop;
run;

filename commdata commport "COM1:";

data fruit;
  keep num type;
  infile commdata unbuffered;
  file commdata;
  put "ready";
  input totrecs records $;
  if totrecs = . or records ne "RECORDS" then
    do;
      file log;
      put "ERROR: Unable to determine
        number of records to read.";
    end;
end;
```

```

        stop;
    end;
do i = 1 to totrecs;
    input num type $;
    output;
    put "NEXT";
end;
stop;
run;

```

Note the use of the device-type keyword `COMMPORT` in the `FILENAME` statement in this example. Because the access protocols for devices are slightly different from the access protocols for files, you should always use the appropriate device-type keyword in combination with the reserved physical name in the `FILENAME` statement. If you do not use a device-type keyword, SAS defaults to using the access protocols for files, not for devices.

For more information about available device-type keywords in the `FILENAME` statement, see “SAS Statements under Windows” on page 449. “Reading Data from the Communications Port” on page 164 discusses the access protocols for using a communications port device.

Using a File in Your Working Directory

If you store the external files you need to access in your working directory and they have the expected file extensions (see Table 5.1 on page 152), you can simply refer to the filename, without quotation marks or file extensions, in a SAS statement. For example, if you have a filename `ORANGES.SAS` stored in your working directory and `ORANGES` is not defined as a fileref, you can submit the file with the following statement:

```
%include oranges;
```

Remember, though, that using this type of file reference requires that

- the file is stored in the working directory
- the file has the correct file extension
- the filename is not also defined as a fileref.

For more information about how to determine and change the SAS working directory, see “Determining the Current Folder When SAS Starts” on page 9 and “Changing the SAS Current Folder” on page 39.

Accessing External Files with SAS Statements

This section presents simple examples of using the `FILE`, `INFILE`, and `%INCLUDE` statements to access external files. For more complex examples of using these statements under Windows, see “Advanced External I/O Techniques” on page 162.

Using the `FILE` Statement

The `FILE` statement enables you to direct lines written by a `PUT` statement to an external file.*

Here is an example using the FILE statement. This example reads the data in the SAS data set MYLIB.TEST and writes only those scores greater than 95 to the external file C:\MYDIR\TEST.DAT:

```
filename test "c:\mydir\test.dat";
libname mylib "c:\mydata";
data _null_;
  set mylib.test;
  file test;
  if score ge 95 then
    put score;
run;
```

The previous example illustrates writing the value of only one variable of each observation to an external file. The following example uses the `_ALL_` option in the PUT statement to copy all variables in the current observation to the external file if the variable REGION contains the value `west`.

```
libname us "c:\mydata";
data west;
  set us.pop;
  file "c:\sas\pop.dat";
  where region="west";
  put _all_;
run;
```

This technique of writing out entire observations is particularly useful if you need to write variable values in a SAS data set to an external file so that you can use your data with another application that cannot read data in a SAS data set format.

Note: This example uses the `_ALL_` keyword in the PUT statement. This code generates *named output*, which means that the variable name, an equal sign (=), and the variable value are all written to the file. For more information about named output, see the description of the PUT statement in *SAS Language Reference: Dictionary*. Δ

The FILE statement also accepts several options. These options enable you to control the record format and length. Some of these options are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the FILE statement, see “FILE Statement” on page 451.

Note: The default record length used by the FILE statement is 256 characters. If the data you are saving contains records that are longer than 256 characters, you must use the FILENAME statement to define a fileref and either use the LRECL= option in the FILENAME statement to specify the correct logical record length or specify the LRECL= option in the FILE statement. For details about the LRECL= option, see LRECL= in “FILE Statement” on page 451. Δ

Using the INFILE Statement

Use the INFILE statement to specify the source of data read by the INPUT statement in a SAS DATA step. The INFILE statement is always used in conjunction with an INPUT statement, which defines the location and type of data being read.

* You can also use the FILE statement to direct PUT statement output to the SAS log or to the same destination as procedure output. For more information, see *SAS Language Reference: Dictionary*.

Here is a simple example of the INFILE statement. This DATA step reads the specified data from the external file and creates a SAS data set named SURVEY:

```
filename mydata "c:\mysasdir\survey.dat";
data survey;
  infile mydata;
  input fruit $ taste looks;
run;
```

You can use a quoted Windows filename instead of a fileref:

```
data survey;
  infile "c:\mysasdir\survey.dat";
  input fruit $ taste looks;
run;
```

The INFILE statement also accepts other options. These options enable you to control the record format and length. Some of these options are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the INFILE statement, see “INFILE Statement” on page 461.

Note: The default record length used by the INFILE statement is 256 characters. If the data you are reading have records longer 256 characters, you must use the FILENAME statement to define a fileref and either use the LRECL= option in the FILENAME statement to specify the correct logical record length or specify the LRECL= option in the INFILE statement. For details about the LRECL= option, see LRECL= in “INFILE Statement” on page 461. Δ

Using the %INCLUDE Statement

When you submit an %INCLUDE statement, it reads an entire file into the current SAS program you are running and submits that file to SAS immediately. A single SAS program can have as many individual %INCLUDE statements as necessary, and you can nest up to ten levels of %INCLUDE statements. Using the %INCLUDE statement makes it easier for you to write modular SAS programs.

Here is an example that submits the statements stored in C:\SAS\MYJOBS\PROGRAM1.SAS using the %INCLUDE statement and member-name syntax:

```
filename job "c:\sas\myjobs";
%include job(program1);
```

The %INCLUDE statement also accepts several options. These options enable you to control the record format and length. Some of these options are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the %INCLUDE statement, see “%INCLUDE Statement” on page 459.

Note: The default record length used by the %INCLUDE statement is 256 characters. If the program you are reading has records longer 256 characters, you must use the FILENAME statement to define a fileref and either use the LRECL= option in the FILENAME statement to specify the correct logical record length or specify the LRECL= option in the %INCLUDE statement. For details about the LRECL= option, see LRECL= in “%INCLUDE Statement” on page 459. Δ

Accessing External Files with SAS Commands

This section illustrates how to use the FILE and INCLUDE commands to access external files. Commands provide the same service as the Save As and Open dialog boxes. The method that you use to access external files depends on the needs of your SAS application and your personal preference.

Using the FILE Command

The FILE command has a different use than the FILE statement; the FILE command writes the current contents of a window to an external file rather than merely specifying, for example, a destination for PUT statement output in a DATA step.

For example, if you want to save the contents of the LOG window to an external filename C:\SASLOGS\TODAY.LOG, you can issue the following FILE command from the Command dialog box; however, the LOG window must be active:

```
file "c:\saslogs\today.log"
```

If you have already defined the fileref LOGS to point to the SASLOGS directory, you can use the following FILE command:

```
file logs(today)
```

In this case, the file extension defaults to .log, as shown in Table 5.1 on page 152.

If you use the FILE command to attempt to write to an already existing file, a dialog box enables you to replace the existing file, append the contents of the window to the existing file, or cancel your request.

If you issue the FILE command with no arguments, the contents of the window are written to the file that is referenced in the last FILE command. This action is useful if you are editing a program and want to save it often. However, the dialog box that prompts you about replacing or appending appears only the first time that you issue the FILE command. Thereafter, unless you specify the filename in the FILE command, it uses the parameters that you specified earlier (replace or append) without prompting you.

Choosing **Save As** from the SAS main window File menu displays the Save As dialog box. This dialog box performs the same function as the FILE command, but it is more flexible in that it gives you more choices and is more interactive than the FILE command. For more information, see “Saving Files” in “Saving Files” on page 88 and “Using the Program Editor” on page 111.

The FILE command also accepts several options. These options enable you to control the record format and length. Some of these options are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the FILE command, see “FILE Command” on page 347.

Using the INCLUDE Command

The INCLUDE command, like the %INCLUDE statement, can be used to copy an entire external file into the Editor window, the NOTEPAD window, or whatever window is active. In the case of the INCLUDE command, however, the file is simply copied to the window and is not submitted.

For example, suppose you want to copy the file C:\SAS\PROG1.SAS into the Editor window. If you have defined a fileref SAMPLE to point to the correct directory, you can use the following INCLUDE command from the Command dialog box (if the Editor is the active window) to copy the member PROG1 into the Editor window:

```
include sample(prog1);
```

Another way to copy files into your SAS session is to use the Open dialog box. In addition to copying files, the Open dialog box gives you other choices, such as invoking the program that you are copying. The Open dialog box is the most flexible way for you to copy files into the Editor window. For more information, see “Opening Files” in “Using the Enhanced Editor” on page 86 and “Using the Program Editor” on page 111.

The INCLUDE command also accepts several arguments. These arguments enable you to control the record format and length. Some of these arguments are illustrated in “Advanced External I/O Techniques” on page 162. For the complete syntax of the INCLUDE command, see “INCLUDE Command” on page 351.

Issuing the INCLUDE command with no arguments includes the that is file referenced in the last INCLUDE command. If no previous INCLUDE command exists, you receive an error message.

Using the GSUBMIT Command

The GSUBMIT command can be used to submit SAS statements that are stored in the Windows clipboard. To submit SAS statements from the clipboard, use the following command:

```
gsubmit buffer=default;
```

You can also use the GSUBMIT command to submit SAS statements that are specified as part of the command. For more information about the GSUBMIT command, see the SAS Help and Documentation.

Note: SAS statements in the Windows clipboard will not be submitted using the GSUBMIT command if a procedure that you submitted using the Enhanced Editor is still running.

You can copy the SAS statements to a new Enhanced Editor window and then submit them. \triangle

Advanced External I/O Techniques

This section illustrates how to use the FILENAME, FILE, and INFILE statements to perform more advanced I/O tasks, such as altering the record format and length, appending data to a file, using the DRIVEMAP device-type keyword to determine which drives are available.

Altering the Record Format

Using the RECFM= option in the FILENAME, FILE, %INCLUDE, and INFILE statements enables you to specify the record format of your external files. The following example shows you how to use this option.

Usually, SAS reads a line of data until a carriage return and line feed combination ('0D0A'x) are encountered or until just a line feed ('0A'x) is encountered. However, sometimes data do not contain these carriage-control characters but do have fixed-length records. In this case, you can specify RECFM=F to read your data.

To read such a file, you need to use the LRECL= option to specify the record length and the RECFM= option to tell SAS that the records have fixed-length record format. Here are the required statements:

```
data test;
  infile "test.dat" lrecl=60 recfm=f;
  input x y z;
run;
```

In this example, SAS expects fixed-length records that are 60 bytes long, and it reads in the three numeric variables X, Y, and Z.

You can also specify RECFM=F when your data contains carriage returns and line feeds, but you want to read these values as part of your data instead of treating them as carriage-control characters. When you specify RECFM=F, SAS ignores any carriage controls and line feeds and simply reads the record length you specify.

Appending Data to an External File

Occasionally, you might not want to create a new output file, but rather append data to the end of an existing file. In this case, you can use the MOD option in the FILE statement as in the following example:

```
filename myfile "c:\sas\data";
data _null_;
  infile myfile(newdata);
  input sales expenses;
  file myfile(jandata) mod;
  put sales expenses;
run;
```

This example reads the variables SALES and EXPENSES from the external data file C:\SAS\DATA\NEWDATA.DAT and appends records to the existing data file C:\SAS\DATA\JANDATA.DAT.

If you are going to append data to several files in a single directory, you can use the MOD option in the FILENAME statement instead of in the FILE statement. You can also use the FAPPEND function or the PRINTTO procedure to append data to a file. For more information, see the SAS functions section in *SAS Language Reference: Dictionary* and the PRINTTO procedure in *Base SAS Procedures Guide*.

Determining Your Drive Mapping

You can use the DRIVEMAP device-type keyword in the FILENAME statement to determine which drives are available for use.

You might use this technique in SAS/AF applications, where you could build selection lists to let a user choose a hard drive. You could also use the DRIVEMAP keyword to enable you to assign macro variables to the various available hard drives.

Using the DRIVEMAP device-type keyword in the FILENAME statement implies you are using the fileref for read-only purposes. If you try to use the fileref associated with the DRIVEMAP device-type keyword in a write or update situation, you receive an error message indicating you do not have sufficient authority to write to the file.

Here is an example using this keyword:

```
filename myfile drivemap;
data mymap;
  infile myfile;
  input drive $;
```

```

put drive;
run;

```

The information written to the SAS log looks similar to the information in Output 5.1.

Output 5.1 Drive Mapping Information

```

50 filename myfile drivemap;
51
52 data mymap;
53   infile myfile;
54   input drive $;
55   put drive;
56 run;
NOTE: The infile MYFILE is:
      FILENAME=DRIVEMAP,
      RECFM=V,LRECL=256
A:
C:
D:
J:
K:
L:
M:
N:
R:
S:
T:
U:
NOTE: 12 records were read from the infile MYFILE.
      The minimum record length was 2.
      The maximum record length was 2.
NOTE: The data set WORK.MYMAP has 12 observations
      and 1 variables.
NOTE: The DATA statement used 2.04 seconds.

```

Reading External Files with National Characters

SAS under Windows, like most Windows applications, reads and writes character data using ANSI character codes. In SAS 9.2, SAS does not provide the option to read or write files using OEM character sets.

Characters such as the \hat{A} are considered national characters. Windows represents each character with a hexadecimal number. If your external file was created with a Windows editor (including applications such as WordPerfect) or in SAS, you do not need to do anything special. Simply read the file using the FILENAME or FILE statements, as you would normally do.

Reading Data from the Communications Port

You can read data directly from the communications (serial) port on your machine. To set the serial communications parameters, use the port configuration tools in the Windows Control Panel to set up the communications port. The communications parameters you specify are specific to each data collection device.

After you invoke SAS, submit a FILENAME statement to associate a fileref with the communications port, as in the following example:

```
filename test commport "com1:";
```


This FILENAME statement defines the fileref TEST, uses the COMMPORT device-type keyword that specifies you are going to use a communications port, and specifies the COM1: reserved physical name.

Next, read the data from COM1: into a SAS data set using the TEST fileref. The following DATA step reads in the data, 1 byte at a time, until SAS encounters an end-of-file (the hexadecimal value of end-of-file is '1a'x):

```
data acquire;
  infile test lrecl=1 recfm=f unbuffered;
  input i $;
  /* Read until you find an end-of-file. */
  if i='1a'x then stop;
run;
```

The communications port can be accessed multiple times. However, while multiple reads are allowed, only one user at a time can write to the port.

Two useful functions in data acquisition applications are SLEEP and WAKEUP. These functions enable you to control when your program is invoked. For example, you can use the WAKEUP function to start your program at exactly 2:00 a.m. For more information about these two functions, see “SLEEP Function” on page 413 and “WAKEUP Function” on page 415.

Communications Port Timeouts

By default, if you are reading from a communications port and a timeout occurs, an end-of-file (EOF) is returned to the program. You can specify how communications port timeouts are handled by using the COMTIMEOUT= option. The COMTIMEOUT= option is valid in the FILENAME statement and must be used in conjunction with the COMMPORT device-type keyword in the FILENAME statement.

The COMTIMEOUT= option accepts the following values:

EOF	returns an end-of-file when a timeout occurs. This behavior is the default. This behavior causes the current DATA step to terminate.
WAIT	instructs the communications port to wait forever for data. This value overrides the timeout. In this case, no record is returned to the DATA step until data are available. This action can cause your program to go into a loop, so use this value with caution.
ZERO	does not wait if there is no incoming data.

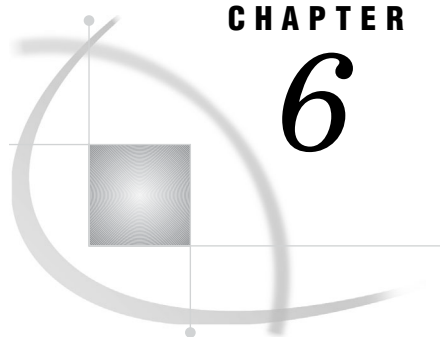
Here is an example of a FILENAME statement specifying that a record length of 0 bytes be returned to the program when a timeout occurs:

```
filename test commport "com1" comtimeout=eof;
data test;
  infile test length=linelen recfm=F eof=eof;
  input @;
eof: if linelen ne 0 then input value;
  else put 'Timeout reading from COM1:';
run;
```

Options that Relate to Communications Port Timeouts

These options relate to the communications port timeouts.

RMULTI	specifies the multiplier, in milliseconds, that is used to calculate the total timeout period for read operations. For each read operation, this value is multiplied by the requested number of bytes to be read.
RCONST	specifies the constant, in milliseconds, that is used to calculate the total timeout period for read operations. For each read operation, this value is added to the product of RMULTI and the requested number of bytes.
WMULTI	specifies the multiplier, in milliseconds, that is used to calculate the total timeout period for write operations. For each write operation, this value is multiplied by the number of bytes to be written.
WCONST	specifies the constant, in milliseconds, that is used to calculate the total timeout period for write operations. For each write operation, this value is added to the product of the WMULTI member and the number of bytes to be written.
RINT	specifies the maximum time, in milliseconds, that is allowed to elapse between the arrival of two characters on the communications line.



CHAPTER

6

Managing SAS Output

<i>Printing</i>	168
<i>Introduction to Printing in SAS within the Windows Environment</i>	168
<i>Printing from within a SAS Window</i>	168
<i>Overview of Printing From Within a SAS Window</i>	168
<i>Setting Print Options</i>	169
<i>Windows That Can Be Printed</i>	170
<i>Printing a Window</i>	170
<i>Changing the Printer</i>	171
<i>Changing the Print Font</i>	171
<i>Setting Up the Printed Page</i>	172
<i>Print Options That Affect the Line Size and Page Size</i>	175
<i>Printing Line Numbers, Page Numbers, and in Color</i>	175
<i>Printing a Window as a Bitmap</i>	176
<i>Setting the Number of Copies to Print</i>	176
<i>Setting the Page Range to Print</i>	176
<i>Previewing Your Output Before You Print</i>	176
<i>How to Preview a Window</i>	176
<i>Features of the Print Preview Window</i>	177
<i>Print Preview Shortcut Keys</i>	177
<i>Using SAS Print Forms</i>	177
<i>Setting Print Options to Use Forms</i>	177
<i>Specifying the Current Print Form</i>	178
<i>Creating a Print Form</i>	178
<i>Printing with SAS Commands</i>	179
<i>Sending DATA Step Output to a Printer</i>	179
<i>Sending Printed Output to a File</i>	179
<i>Using the Print Dialog Box to Print to a File</i>	179
<i>Using the FILENAME Statement to Print to a File</i>	180
<i>Using the FILE Printer Option in Windows</i>	180
<i>Printing in Batch Mode</i>	180
<i>Default Printer Details</i>	180
<i>Canceling a Print Job</i>	181
<i>Routing Procedure Output to a Web Browser</i>	181
<i>Introduction to Routing Procedure Output to a Web Browser</i>	181
<i>Configuring Preferences for HTML Output</i>	182
<i>Using the Results Viewer Window</i>	182
<i>Configuring the Internal Browser</i>	182
<i>Using the Toolbar</i>	183
<i>Viewing HTML Files</i>	183
<i>Routing Procedure Output and the SAS Log to a File</i>	184
<i>Introduction to Routing Procedure Output and the SAS Log to a File</i>	184

<i>Using the Save As Dialog Box</i>	184
<i>Using the PRINTTO Procedure</i>	184
<i>Using SAS System Options</i>	185
<i>Using the SAS Logging Facility to Write Log Messages to the Windows Event Viewer</i>	186
<i>Producing Graphics</i>	186
<i>Producing Graphics on Your Display</i>	186
<i>Printing Graphics</i>	187
<i>Using the SAS/GRAPH Generic (WINPxxx) Drivers</i>	188
<i>Using the SAS/GRAPH Native Printer Drivers</i>	189
<i>Printing and Previewing from the GRAPH Window</i>	190
<i>Choosing between a SAS/GRAPH Native Driver and the WINPxxx Driver</i>	190
<i>Importing Graphics from Other Applications</i>	190
<i>Pasting Graphics from the Windows Clipboard</i>	191
<i>Importing a Graphics File from within a SAS/GRAPH Window</i>	191
<i>Exporting Graphics for Use with Other Applications</i>	192
<i>Exporting a Graphic to a File from a SAS/GRAPH Window</i>	192
<i>Pasting Graphics from SAS/GRAPH into other Windows Applications</i>	193
<i>Creating CGM Files for Export to Other Applications</i>	194
<i>Creating WMF (Windows Metafile) Files for Export to Other Applications</i>	195
<i>Additional Resources</i>	195

Printing

Introduction to Printing in SAS within the Windows Environment

By default, SAS under Windows uses Microsoft Windows print settings so that you can manage your output in the same manner as you manage output from other Windows applications. When you use Windows print settings, you use Windows TrueType fonts and fonts that are supported by your printers.

You can also use Universal Printing with the Output Delivery System. In the Windows environment, you enable Universal Printing by specifying the UNIVERSALPRINT option and the UPRINTMENUSWITCH option. The information in this section focuses on using Windows printing. For information about using Universal Printing, see *SAS Language Reference: Concepts* and “UPRINTMENUSWITCH System Option” on page 581.

For details about using Windows printing, see your Windows documentation. “Producing Graphics” on page 186 discusses how to route graphics from your SAS session to printers.

Printing from within a SAS Window

Overview of Printing From Within a SAS Window

Printing from SAS for Windows is much like printing in other Windows applications where you print using a toolbar button or a dialog box. You specify printing options using the Print, Print Setup, and Page Setup dialog boxes. As in other Windows applications, you can preview a printed page using the preview facility.

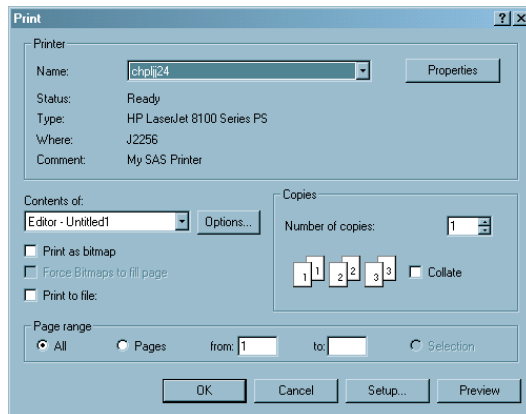
Setting Print Options

Use the Print dialog box to set the following print options:

- Change a printer destination
- Specify the window to print
- Print line numbers, page numbers, and in color
- Print as a bitmap
- Print to a file
- Print the contents of the clipboard
- Print multiple copies
- Print a range of pages or selected text
- Collate copies.

To access the Print dialog box, select **File ► Print**

Display 6.1 The Print Dialog Box

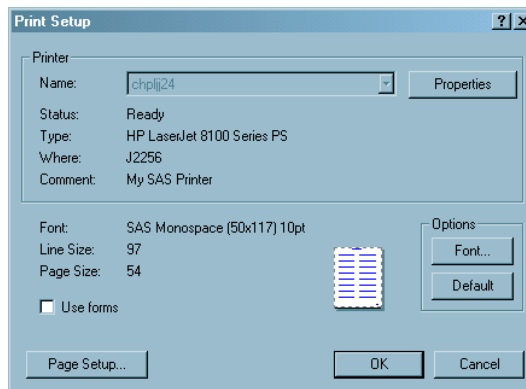


Use the Print Setup dialog box to set the following print options:

- Change fonts
- Use Forms.

To access the Print Setup dialog box, select **File ► Page Setup**

Display 6.2 The Print Setup Dialog Box

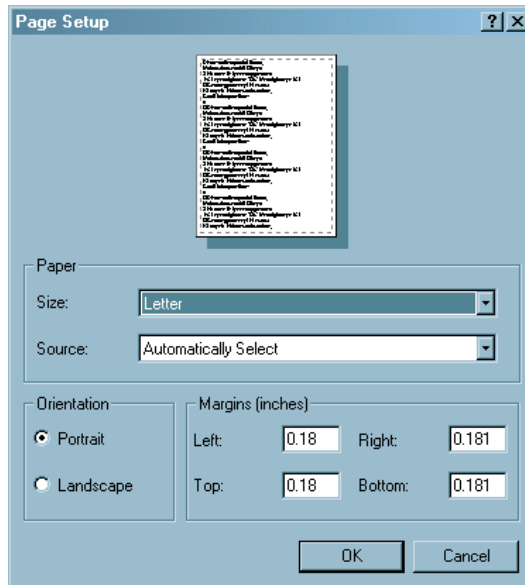


Use the Page Setup dialog box to set the following print options:

- Change the paper size
- Change the paper source
- Specify the orientation (portrait or landscape)
- Set the margin sizes.

To access the Page Setup dialog box, select **File ► Page Setup**

Display 6.3 Page Setup Dialog Box



You can specify document properties for the selected printer by selecting **File ► Print ► Properties**

Windows That Can Be Printed

Not all SAS windows can be printed. To determine whether a SAS window can be printed, make the window the active window. If the Print toolbar button or the Print command in the File menu is active, the window can be printed.

The print output is a bitmap of the window if the Print toolbar button is active and the Print command in the File menu is not. An example of a window that would be printed as a bitmap is the SAS System Options window.

Printing a Window

To print the contents of a window, make the window the active window and do one of the following:

- To print using the current print settings, click the Print toolbar button.
- To change the print options and then print, select **File ► Print** and select your printing options.

The Print dialog box might differ somewhat from what you see on your system, depending on which Windows operating environment you use to run SAS, and on the active SAS window.

Changing the Printer

SAS consults these sources for default printer settings, in order of precedence:

- 1 the value of the SYSPRINT system option
- 2 the Windows default printer.

The destination printer is determined by the value of the SYSPRINT system option, which is displayed in the **Name** box of the Print dialog box.

To change the printer:

- 1 Select **File ► Print**.
- 2 Click in the **Name** list box and select a printer.

Using the SYSPRINT and PRTPERSISTDEFAULT system options, you can specify a printer when you start SAS as shown in the following table:

Table 6.1 Specifying a Printer When You Start SAS

Printer	Action
the Windows default printer	Do not specify the SYSPRINT system option when you start SAS.
a specific printer	Start SAS with the SYSPRINT system option.
the printer specified in the previous SAS session	Start SAS with the PRTPERSISTDEFAULT system option each time you start SAS.

If both SYSPRINT and PRTPERSISTDEFAULT system options are specified when SAS starts, the destination printer is determined by the value of the SYSPRINT system option. For more information about these system options, see “SYSPRINT System Option” on page 576 and “PRTPERSISTDEFAULT System Option” on page 551.

Alternatively, you can change the destination printer by using an OPTIONS statement or by using the SAS System Options window. To change the printer using the SAS System Options window:

- 1 Select **Tools ► Options ► System**.
- 2 Select the **Log and procedure output control** folder and then select the **Procedure output** folder.
- 3 Double-click **Sysprint**.
- 4 Type a printer name as it appears in the Windows Printer folder in the **New Value** box and click **OK**. The printer name is case-sensitive.

The information about the printer in the Print dialog box, the **Status**, **Type**, **Where**, and **Comment** fields, displays information that is obtained from the Windows operating environment.

Changing the Print Font

The print font options enable you to change the font, the font style, the point-size, and the script. When you change the font size, SAS recalculates the maximum LINESIZE and PAGESIZE values that are displayed in the Print Setup dialog box.

To specify a print font:

- 1 Select **File ► Print Setup ► Font**
- 2 Select **Font**, **Font Style**, and **Size**.
- 3 Click **OK**.

Note: SAS formats tabular and columnar reports assuming the use of a monospace font. Use of a proportionally spaced font might produce improperly formatted reports. △

Alternatively, you can change the font using the SYSPRINTFONT system option when you start SAS, using an OPTIONS statement, or using the SAS System Option window. Using the SYSPRINTFONT system options requires an exact match of the font face-name and printer names.

To modify SYSPRINTFONT using the SAS System Option window,

- 1 Select **Tools** \blacktriangleright **Options** \blacktriangleright **System**.
- 2 Select the **Log and procedure output control** folder and then select the **Procedure output** folder.
- 3 Right-click **Sysprintfont** and select **Modify Value** from the pop-up menu.
- 4 Type the font value in the **New Value** text box. Enclose the value in parentheses.
- 5 Click **OK**.

The following SYSPRINTFONT system option sets the font to Arial, bold, and italic for the printer named "second-floor":

```
sas -sysprintfont="Arial" bold italic named "second-floor";
```

For more information, see “SYSPRINTFONT System Option” on page 578.

Setting Up the Printed Page

Setting up a page involves specifying the paper, the orientation of the paper, and the margins. You can set up the page by using the Page Setup dialog box or by using system options.

To open the Page Setup dialog box select **File** \blacktriangleright **Page Setup**.

The following table describes the Page Setup dialog box options and their related system options.

Table 6.2 Options for Setting Up a Printed Page

Page Setup Option	Description	Setting the Option	Related System Option
Orientation	Specifies to print the page vertically or horizontally.	To print the page vertically, select Portrait . To print the page horizontally, select Landscape .	ORIENTATION
Margins	Specifies the amount of space to leave blank from the top, bottom, left, and right edges of the paper.	Type the number of inches in the Left , Right , Top , and Bottom fields.	LEFTMARGIN, RIGHTMARGIN, TOPMARGIN, BOTTOMMARGIN

Page Setup Option	Description	Setting the Option	Related System Option
Paper size	Specifies the size of paper to print on. See the table below for a list of some paper types.	Click the Size box and select a paper size.	PAPERSIZE
Paper source	Specifies the source of the paper, such as a printer tray, envelope or manual feeder, or specifies to automatically select the paper source.	Click the Source box and select a paper source.	PAPERSOURCE

Alternatively, you can set the page setup options using system options in the `OPTIONS` statement or from the SAS System Options window. To set page setup options from the SAS System Options window:

- 1 Select **Tools** \blacktriangleright **Options** \blacktriangleright **System** \blacktriangleright **Log and procedure output control** \blacktriangleright **ODS printing**.
- 2 Place the cursor over the appropriate system option and double-click the right mouse button.
- 3 Type a new value and click **OK**.

CAUTION:

Modifying print options by using the Windows printing dialog boxes might change the values of SAS printing system options, which might cause unpredictable output. If you set printing options using SAS system options such as `LINESIZE` and `PAGESIZE`, and then use the Windows printing dialog boxes to set printing options, the SAS system options are set to the values specified in the Windows print dialog boxes. Δ

Support for a particular paper size is printer dependent. The following is a list of some paper size names:

LETTER	Letter, 8-1/2-by-11-inch paper
LEGAL	Legal, 8-1/2-by-14-inch paper
A4	A4 Sheet, 210-by-297-millimeter paper
CSHEET	C Sheet, 17-by-22-inch paper
DSHEET	D Sheet, 22-by-34-inch paper
ESHEET	E Sheet, 34-by-44-inch paper
LETTERS <small>SMALL</small>	Letter Small, 8-1/2-by-11-inch paper
T <small>ABLOID</small>	Tabloid, 11-by-17-inch paper
L <small>EDGER</small>	Ledger, 17-by-11-inch paper
S <small>TATEMENT</small>	Statement, 5-1/2-by-8-1/2-inch paper
E <small>XECUTIVE</small>	Executive, 7-1/4-by-10-1/2-inch paper
A3	A3 sheet, 297-by-420-millimeter paper
A4 <small>SMALL</small>	A4 small sheet, 210-by-297-millimeter paper
A5	A5 sheet, 148-by-210-millimeter paper

B4	B4 sheet, 250-by-354-millimeter paper
B5	B5 sheet, 182-by-257-millimeter paper
FOLIO	Folio, 8-1/2-by-13-inch paper
QUARTO	Quarto, 215-by-275-millimeter paper
10X14	10-by-14-inch paper
11X17	11-by-17-inch paper
NOTE	Note, 8-1/2-by-11-inch paper
ENV_9	#9 Envelope, 3-7/8 by 8-7/8 inches
ENV_10	#10 Envelope, 4-1/8 by 9-1/2 inches
ENV_11	#11 Envelope, 4-1/2 by 10-3/8 inches
ENV_12	#12 Envelope, 4-3/4 by 11 inches
ENV_14	#14 Envelope, 5 by 11-1/2 inches
ENV_DL	DL Envelope, 110 by 220 millimeters
ENV_C5	C5 Envelope, 162 by 229 millimeters
ENV_C3	C3 Envelope, 324 by 458 millimeters
ENV_C4	C4 Envelope, 229 by 324 millimeters
ENV_C6	C6 Envelope, 114 by 162 millimeters
ENV_C65	C65 Envelope, 114 by 229 millimeters
ENV_B4	B4 Envelope, 250 by 353 millimeters
ENV_B5	B5 Envelope, 176 by 250 millimeters
ENV_B6	B6 Envelope, 176 by 125 millimeters
ENV_ITALY	Italy Envelope, 110 by 230 millimeters
ENV_MONARCH	Monarch Envelope, 3-7/8 by 7-1/2 inches
ENV_PERSONAL	6-3/4 Envelope, 3-5/8 by 6-1/2 inches
FANFOLD_US	U.S. Standard Fanfold, 14-7/8-by-11-inch paper
FANFOLD_STD-	German Standard Fanfold, 8-1/2-by-12-inch paper
_GERMAN	
FANFOLD_LGL-	German Legal Fanfold, 8-1/2-by-13-inch paper
_GERMAN	

Print Options That Affect the Line Size and Page Size

The line size is the number of characters that can fit on one line. The page size is the number of lines on a page. The line size and the page size that appear in the Print Setup dialog box are automatically calculated based on these print options:

Table 6.3 Print Options That Affect The Line Size and Page Size

From the Print Setup Dialog Box	From the Page Setup Dialog Box	From the Font Dialog Box
<input type="checkbox"/> the printer	<input type="checkbox"/> paper size	<input type="checkbox"/> font
	<input type="checkbox"/> paper source	<input type="checkbox"/> font style
	<input type="checkbox"/> orientation	<input type="checkbox"/> size
	<input type="checkbox"/> margin settings	

Although you cannot set the line size and page size from the dialog box, you can adjust them by changing these print settings. The `LINESIZE` and `PAGESIZE` system options also change when you modify these print options.

CAUTION:

Modifying print options by using the Windows printing dialog boxes might change the values of SAS printing system options, which might cause unpredictable output. If you set printing options using SAS system options such as `LINESIZE` and `PAGESIZE`, and then use the Windows printing dialog boxes to set printing options, the SAS system options are set to the values specified in the Windows print dialog boxes. Δ

Printing Line Numbers, Page Numbers, and in Color

Options for printing line numbers, page numbers, and in color are available in the Additional Printing Options dialog box. To open this dialog box, click **Options** in the Print dialog box.

The **Options** button is enabled only for windows that allow the printing of these options.

It is not necessary for you to turn on line numbers in your window or specify the `NUMBER` system option in order to print line numbers and page numbers. Color printing is available when you print to a color printer and the window that you are printing supports color printing.

Printing a Window as a Bitmap

The following table lists the bitmap forms that are available and how to print them:

Table 6.4 Printing Bitmap Forms

Bitmap Form	Print Dialog Box Selection
Print the active SAS window	Select Print as bitmap
Print the SAS window	<ol style="list-style-type: none"> 1 Select Print as bitmap 2 In the Contents of box, select AWS windows (bitmap).
Print the entire screen	<ol style="list-style-type: none"> 1 Select Print as bitmap 2 In the Contents of box, select Entire screen(bitmap).
Fill an entire page with the bitmap	Select Force Bitmaps to fill page

Setting the Number of Copies to Print

In the Print dialog box **Number of copies** box, you can either type in the number of copies that you want or you can use the up and down arrows to select the number of copies that you want. If your printer supports collation, the **Collate** box is active.

You can also set the number of copies to print by setting the **COPIES** system option either in an **OPTIONS** statement or in the SAS System Options window.

To set the number of copies by using the SAS System Options window:

- 1 Select **Log and procedure output control ► ODS Printing**.
- 2 Double-click **Copies**.
- 3 In the **New value** box, type the number of copies and click **OK**.

Setting the Page Range to Print

Use these settings in the Print dialog box to select the pages that you want to print:

- To print all pages, select **All**.
- To print a range of pages:
 - Select **Pages**.
 - Type the beginning page in the **from** box.
 - Type the ending page in the **to** box.
- To print only what you have selected in the window, select **Selection**. The **Selection** option is available only when you have made a selection.

Previewing Your Output Before You Print

How to Preview a Window

To see how the contents of a window will appear as printed output:

- 1 Select the window you want to preview.
- 2 Select **File ► Print Preview**

Alternatively, you can click the Print Preview toolbar button or type **dlgpptpreview** in the command bar.

Features of the Print Preview Window

The following table lists the features of the Print Preview window.

Table 6.5 Features of the Print Preview Window

Task	Action
Navigate through the pages	Use Next or Previous
Zoom in or out	Click Zoom or the page.
Determine the current page	The status bar displays the current page and total number of pages in the document.
Get help	Click Help
Print the window	Click Print
Close the Print Preview window	Click Close

For a list of keyboard shortcuts that you can use in the Print Preview windows, see “Keyboard Shortcuts within Print Preview” on page 629.

Print Preview Shortcut Keys

In the Print Preview window, you can navigate by using the following shortcut keys:

Key	Action in Full Page Mode	Action in Zoom Mode
PgDn	Advance to next page	Scroll down on current page
PgUp	Go back to previous page	Scroll up on current page
Ctrl+PgDn	none	Scroll right on current page
Ctrl+PgUp	none	Scroll left on current page
Ctrl+Home	Go to first page	Go to first page
Ctrl+End	Go to last page	Go to last page

Not all SAS windows support the Print Preview feature.

Using SAS Print Forms

Setting Print Options to Use Forms

To use a form to print from SAS:

- 1 Select **File ► Print Setup**
- 2 Select the **Use Forms** check box.

If the **Use Forms** check box does not appear in the Print Setup dialog box, use the PRTSETFORMS system option to enable it. For more information, see “PRTSETFORMS System Option” on page 552.

When you print, SAS prints your output with the current print form.

To use forms in a batch SAS session, use the NOHOSTPRINT system option. When NOHOSTPRINT is specified, the **Use Forms** check box is selected and SAS uses the line size, page size, and font settings that are specified in your SAS form.

Specifying the Current Print Form

To specify a print form as the current print form, do one of the following:

- Type `FORMNAME CLEAR` in the command bar to use the default form.
- Type `FORMNAME form-name` in the command bar to use a specific form.
- Specify the `FORMS` system option in your SAS configuration file or in the SAS System Options window.

To learn the name of the current form, issue the `FORMNAME` command with no parameters. The form name is displayed in the message area of the status bar.

The `FORMNAME` command is not supported for all windows. If it is not supported, SAS displays the following message in the status bar:

```
ERROR: Unrecognized command FORMNAME
```

Creating a Print Form

The `FSFORM` command opens the FORM window, in which you can define print forms to use when you print SAS output. You can specify printer, page formats, margins, fonts, and printer control language in a FORM entry.

SAS print forms are especially useful when you use the `PRINT` command from within an interactive SAS session and when you print from SAS/AF windows.

To invoke the FORM window, issue the following command:

```
FSFORM catalog-name.form-name;
```

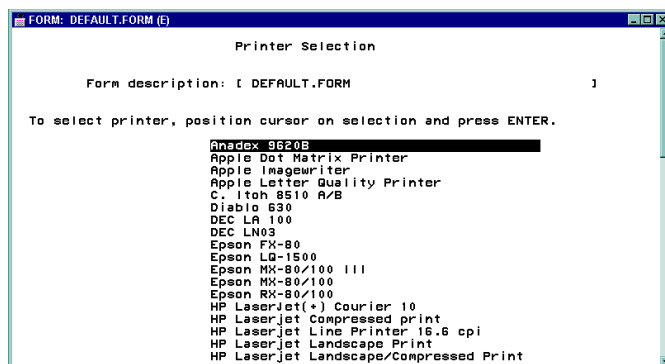
See the SAS Help and Documentation for more information about the `FSFORM` command.

Although the majority of the frames in the FORM window are the same across all operating environments, the first frame that you see after issuing the `FSFORM` command is the Printer Selection frame, which lists the printers that you are able to use under Windows. Display 6.4 on page 178 shows the default information for this frame.

To navigate through the FORM window frames for a printer:

- 1 Click a printer name or select a printer and press `ENTER`.
- 2 From the Tools menu, select **Next Screen** and **Previous Screen** to move through the frames.

Display 6.4 Printer Selection Frame



The information in the Printer Selection frame is also site-dependent, so the printer list at your site will be different from the one shown in Display 6.4 on page 178.

The Printer Selection frame appears only when you create a new print form. After you create a form, it is stored in your user profile catalog or in the catalog that was specified with the FSFORM command (entry type FORM). The next time you modify this form, the Printer Selection frame is skipped. You cannot return to the Printer Selection frame from the second FORM window frame.

Printing with SAS Commands

If you prefer typing commands to using menus, you can use the PRINT or SPRINT command to print the contents of the active window. The SPRINT command is not available for all windows. For more information on these commands, refer to the SAS Help and Documentation.

These SAS commands open the print dialog boxes:

Table 6.6 SAS Commands That Open Print Dialog Boxes

Command	Dialog Box
DLGPRT	Print
DLGPAGESETUP	Page Setup
DLGPRTSETUP	Print Setup
DLGPRTPREVIEW	Print Preview

Sending DATA Step Output to a Printer

You can spool your DATA step output to a printer instead of to a file. Use the FILENAME statement and the PRINTER device-type keyword to accomplish this action, as in the following example:

```
filename myfile printer;
data _null_;
  set sashelp.shoes;
  file myfile;
  where stores ge 25;
  put _all_;
run;
```

In this example, the PRINTER device-type keyword specifies to print the output to the printer that is specified in the SYSPRINT system option. For more information, see “SYSPRINT System Option” on page 576.

Sending Printed Output to a File

Using the Print Dialog Box to Print to a File

You can send your printed output to a file by selecting the **Print to File** check box in the Print dialog box, and then specifying the name of a file to print to. This action is not the same as a Save operation; the resulting printer file contains all the printer control language that is necessary to support whatever options you have chosen with the Printer Setup dialog box, such as fonts and page orientation. In most cases, this printer file is not readable with a text editor; it is meant only to be sent to the printer.

Using the FILENAME Statement to Print to a File

You can route printed output to a file by using the FILENAME statement, which is useful for routing DATA step output. Here is an example:

```
filename myfile printer altdest='c:\results.dat';
data _null_;
  set sashelp.shoes;
  file myfile;
  where stores ge 25;
  put _all_;
run;
```

In this example, the output from the DATA step is routed to a file, yet still contains all the printer control information that is necessary for you to use your printer to produce formatted output.

Using the FILE Printer Option in Windows

Another method of sending printed output to a file is to direct the output to the **FILE:** device instead of to a printer in the Windows printer Properties dialog box **Ports** page. If you assign the **FILE:** device to a printer, Windows prompts you for a filename each time that you print. When you send output to a file, the contents of the file are overwritten if the file already exists. For more information about changing printer properties, see your Windows documentation.

Printing in Batch Mode

When you run SAS jobs in batch mode, you do not have access to the Print and Printer Setup dialog boxes, but you can still use the Windows printer. Use the SYSPRINT system option to specify your default printer (and the SYSPRINTFONT system option to specify your printer font, if you want) as described in “SYSPRINT System Option” on page 576. For example, suppose your SAS configuration file contains the following option:

```
-sysprint "f2hp5"
```

Then, your SAS program might contain the following statements:

```
filename myfile printer;
data _null_;
  set sashelp.shoes;
  file myfile;
  where stores ge 25;
  put _all_;
run;
```

When you submit your job, SAS uses the SYSPRINT printer specification to spool your output from the DATA step to the Windows printer.

Default Printer Details

SAS looks for a default printer as follows (in order of precedence, first to last):

- the SYSPRINT system option value
- the Windows system default printer.

To see the value of the SYSPRINT system, open the Print Setup dialog box either by

- selecting **File ► Print Setup**
- entering DLGPRTSETUP in the command bar.

If you start SAS with the P RTPERSISTDEFAULT system option and not with the SYS PRINT system option, SAS sets the SYS PRINT system option to the name of the destination printer from the previous SAS session.

For information about changing the printer, see “Changing the Printer” on page 171.

Canceling a Print Job

You can cancel a print job while SAS is spooling a print file to a folder or to the Windows Printer by clicking **Cancel** in the Print Abort dialog box. The Print Abort dialog box appears only while SAS is spooling a print file to its destination. Small files spool to a destination quickly and the Print Abort dialog box dismisses before you have a chance to cancel the print job.

You can specify when you want to enable or suppress the Print Abort dialog box by using the PRTABORTDLGS system option. See the following table for valid PRTABORTDLGS values.

When to Display the Print Abort Dialog Box	PRTABORTDLGS Value
Printing either to a file or to a printer	BOTH
Never	NEITHER
Only when printing to a file	FILE
Only when printing to a printer	PRINTER

For more information, see “PRTABORTDLGS System Option” on page 550.

Routing Procedure Output to a Web Browser

Introduction to Routing Procedure Output to a Web Browser

The Output Delivery System (ODS) can create your procedure output in HTML to be viewed in any Web browser. The ODS system also has the ability to create RTF procedure output. If you have Microsoft Internet Explorer 4.0 (IE) or later installed, you can view HTML and RTF procedure output within the SAS main window by using the Results Viewer. Viewing RTF procedure output also requires an RTF viewer, such as Microsoft Word.

If you are not using IE, HTML procedure output is displayed in the preferred browser that is specified in the Preferences dialog box **web** sheet. Having IE installed enables you to view the HTML output from within the main SAS window.

For more information about using the Output Delivery System, see *SAS Output Delivery System: User’s Guide*.

Configuring Preferences for HTML Output

To create and view HTML output, you configure the **Results** and **Web** tabs of the Preferences dialog box.

To open the Preferences dialog box, select **Tools** \blacktriangleright **Options** \blacktriangleright **Preferences**.

To configure the **Results** page of the Preferences dialog box:

- 1 Click on the Results tab.
- 2 Select the **Create HTML** check box.
- 3 Select where to save your HTML file. To save HTML files only while the current SAS session is active, select the **Use WORK folder** check box. Saving HTML files to a temporary folder is useful when you are testing a procedure and creating a multitude of HTML files. For example, when you exit SAS, all temporary files are deleted.

To save HTML files to a folder other than the Work folder, ensure that the **Use WORK folder** check box is not selected. Then type a path in the **Folder** text box or click on **Browse** to search for a folder.

- 4 Click in the **Style** box and highlight a style. The style defines colors and fonts to display your output. You define styles by using the **TEMPLATE Procedure** in *SAS Output Delivery System: User's Guide*.
- 5 Select **View results as they are generated** to view the results immediately.
- 6 Under **View results using**, select **Internal browser** to view HTML output in the Results Viewer or select **Preferred browser** to view the HTML output in the Web browser specified on the **Web** tab. If you do not have Microsoft Internet Explorer installed, you must select **Preferred web browser**.

To configure the **Web** page of the Preferences dialog box:

- Click on the Web tab.
- Choose which browser you want to use:
 - Select the **Use default browser** radio button to view the HTML output in the default browser that is configured in the Windows Registry. For information about how to view the Windows Registry, see your Windows documentation.
 - Select the **Other browser** radio button to view HTML from a Web browser other than the default browser. Then type the browser's path and filename, or click **Browse** to find the browser filename.

Using the Results Viewer Window

Configuring the Internal Browser

When you select **Internal browser** from the **Results** tab of the Preferences dialog box, SAS uses the Results Viewer window to display HTML output that is created by the Output Delivery System. You can open any HTML output that is listed in the Results window or any HTML file that is located on your system.

Using the Toolbar

The following toolbar buttons are available in the Results Viewer for HTML output:

Go Back

Select the left arrow button to cycle back through files that you opened in the Results Viewer.

Go Forward

Select the right arrow button to move forward through files that you opened in the Results Viewer.

Stop download

Select the traffic light button to stop loading a file.

Refresh content

Select the arrow circle button to reload the current file.

Cycle font

Select the double-A button to change the font size. Five font sizes are available.

Viewing HTML Files

You can view HTML procedure output by opening the file from the Results window. If you want to see your procedure output as it is generated, set an option in the **Results** tab of the Preferences dialog box:

- 1 Select **Tools ► Options ► Preferences**.
- 2 Select the **Results** tab.
- 3 Select **View results as they are generated**.
- 4 Click **OK**.

To open additional Results Viewer windows from the Results window:

- 1 Select the **Results** window.
- 2 Click on the output data set name with the right mouse button.
- 3 Select **Open in New Window**.

To open an HTML file that is on your system:

- 1 Make the Results Viewer window the active window.
- 2 Select the Open toolbar button.
- 3 Specify the HTML file in the Open dialog box.
- 4 Click **OK**.

To edit your HTML output:

- 1 From the Results window, click with the right mouse button on the output data set name.
- 2 Select **Edit Source**.
- 3 Make changes to the HTML file.
- 4 Select the Save toolbar button.
- 5 Select the Refresh content toolbar button to view the updated HTML file in the Results Viewer.

Routing Procedure Output and the SAS Log to a File

Introduction to Routing Procedure Output and the SAS Log to a File

This section provides examples of the most common methods of routing SAS procedure output and the SAS log to a file. Generally, this task is the same across operating environments and is discussed in the SAS Help and Documentation. However, the specification of external filenames and devices is system dependent. For complete information about the various ways to reference external files, see “Referencing External Files” on page 148.

You can route your SAS procedure output or the SAS log to a file in one of several ways. The method that you choose depends on the method you use to run SAS, the moment at which you make your decision to route the output or SAS log, and your personal preference.

Some methods of sending SAS procedure output or the SAS log to a file include using

- the Save As dialog box, invoked either from the File menu, the pop-up menu for the window that you want to save, or by typing DLGSAVE in the command bar.
- the FILE command.
- the PRINTTO procedure.
- various system options, including PRINT and ALTLOG.

Using the Save As Dialog Box

The easiest way to save the contents of the active window to a file is to select **File** ► **Save As** from the main SAS window, making sure that the active window (for example, Log or Output) contains the output that you want to save. For more information about the Save As dialog box, see “Saving Files” on page 88 within the Enhanced Editor or “Saving Files” on page 117 within the Program Editor.

Using the PRINTTO Procedure

In batch SAS sessions, the SAS procedure output and the SAS log are written by default to files named *filename.LST* and *filename.LOG*, respectively, where *filename* is the name of your SAS job. For example, if your SYSIN file is MYPROG.SAS, the procedure output file is named MYPROG.LST, and the log file is named MYPROG.LOG. However, you can override these default filenames and send your output to any file that you choose. For example, suppose that your job contains the following statements, which assign the fileref MYOUTPUT to the file C:\SAS\FIRST.TXT. Then the PROC PRINTTO statement tells SAS to send any upcoming SAS procedure output to the file that is associated with MYOUTPUT.

```
filename myoutput 'c:\sas\first.txt';
proc printto print=myoutput;
run;
data uspres;
  input pres $ party $ number;
  datalines;
Adams F 2
;
run;
```

```
proc print;
run;
```

Any PROC or DATA statements that follow these statements and that generate output send their output to the C:\SAS\FIRST.TXT file, not to the default procedure output file. If you want to return to the default file, issue an empty PROC PRINTTO statement like the following example:

```
proc printto;
run;
data uspres2;
  input pres $ party $ number;
  datalines;
Lincoln R 16
Grant R 18
;
run;
proc print;
run;
```

Issuing these statements redirects the SAS procedure output to the default destination (*filename.LST*). In this way, you can send the output and log from different parts of the same SAS job to different files.

Note: If you route procedure output to a file, the resulting file can contain carriage-control characters. To suppress these control characters when you include the file in the Program Editor, set the RECFM= option to P in the FILENAME statement. Note that this action affects the way the file is read into the Program Editor, not the file itself. Δ

If you want to send the SAS log to a specific file, use the LOG= option instead of the PRINT= option in the PROC PRINTTO statement. For more information about the PRINTTO procedure, see “PRINTTO Procedure” on page 440 and *Base SAS Procedures Guide*.

Note: When you use the PRINTTO procedure to route SAS procedure output or the SAS log, the Status window does not reflect any rerouting of batch output but indicates that it is routing the procedure output file and log to *filename.LST* and *filename.LOG*. Δ

Using SAS System Options

You can use SAS system options to route your SAS output or SAS log to a file. For example, if you want to override the default behavior and send your procedure output from a batch SAS job to the file C:\SASOUTPUT\PROG1.TXT, you can invoke SAS with the following command:

```
SAS -SYSIN C:\SASPROGS\PROG1
  -PRINT C:\SASOUTPUT\PROG1.TXT
```

This SAS command executes the SAS program PROG1.SAS and sends the procedure output to the file C:\SASOUTPUT\PROG1.TXT. You can treat the SAS log similarly by using the LOG system option instead of the PRINT system option. Two other related system options, the ALTPRINT and ALTLOG options, are explained in “ALTPRINT System Option” on page 493 and “ALTLOG System Option” on page 493.

Note: The Status window does reflect the PRINT and LOG system options values when recording where the procedure output and log are being sent. Δ

Using the SAS Logging Facility to Write Log Messages to the Windows Event Viewer

The SAS 9.2 logging facility makes it possible to categorize, collect, and filter log events and write them to a variety of output devices. The logging facility supports problem diagnosis and resolution, performance and capacity management, and auditing and regulatory compliance. The logging facility has following features:

- Log events are categorized using a hierarchical naming system that enables you to configure logging at a broad or a fine-grained level.
- Log events can be directed to multiple output destinations, including files, operating system facilities, databases, and client applications. For each output destination, you can specify:
 - the categories and levels of events to report
 - the message layout, including the types of data to be included, the order of the data, and the format of the data
 - filters based on criteria such as diagnostic levels and message content
- Logging diagnostic levels can be adjusted dynamically without starting and stopping processes.
- Performance-related events can be generated for processing by the Application Response Measurement (ARM) 4.0 server.

The logging facility is used by most SAS server processes. You can also use the logging facility within SAS programs.

For Windows, log messages can be written to the Windows event viewer.

For information about using the logging facility in your operating environment, see *SAS Logging: Configuration and Programming Reference*

Producing Graphics

Producing Graphics on Your Display

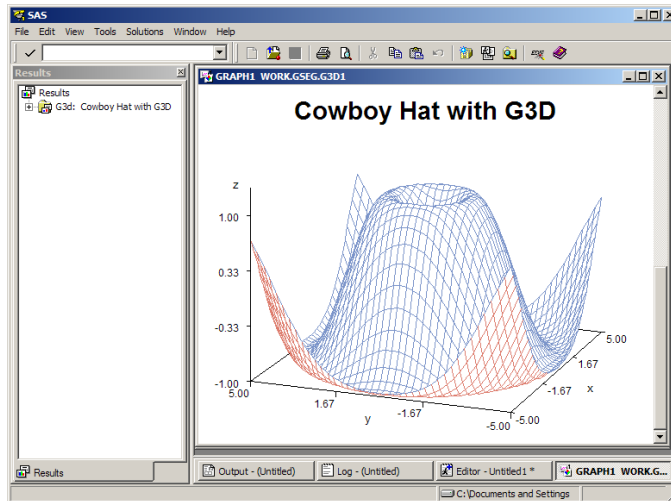
In most cases, output is automatically displayed on your monitor when you run a SAS/GRAPH procedure; it is not necessary to specify a SAS/GRAPH device driver. Information about your graphics display is stored in a Windows information file and is automatically used by SAS during an interactive SAS session.

Here is a simple example of how to produce a graphic:

```
data hat;
  do x=-5 to 5 by .25;
    do y=-5 to 5 by .25;
      z=sin(sqrt(x*x+y*y));
      output;
    end;
  end;
proc g3d data=hat;
  plot y*x=z;
  title 'Cowboy Hat with G3D';
run;
quit;
```

The following display shows the output for this program:

Display 6.5 Cowboy Hat Program Output



If you use the `DEVICE=` option in the `GOPTIONS` statement to route your graphics to a hard-copy device, and then you want to return to using your monitor to display graphics, you must specify a driver. Submit the following statement to display graphics output on your monitor:

```
goptions device=win;
```

You should also use the `WIN` device driver to produce graphics on your display when you run your SAS job in batch mode.

If you specify that your program output is to be displayed in HTML, your graphic is converted to a `.GIF` file and stored in the same folder as your SAS data set. For more information, see *SAS Output Delivery System: User's Guide*.

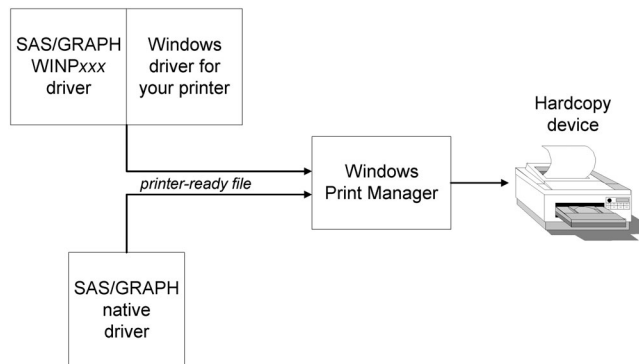
Printing Graphics

You can use two methods to print output from SAS/GRAPH:

- Use the SAS/GRAPH generic driver with the Windows printer driver for your device (supplied with Windows or with your output device). This method allows SAS/GRAPH to send generic graphics commands to the Windows printer driver, which then translates the commands to a format that the printer can use.
- Use a SAS/GRAPH printer driver to create a printer-specific graphics stream that can be sent directly to the device. When you use a SAS/GRAPH printer driver, SAS bypasses the Windows printer drivers and creates printer-ready output for your device. The SAS/GRAPH printer driver is also called a SAS/GRAPH native print driver, which means that the driver creates output by using the printer language that is native to the target device. SAS/GRAPH printer drivers under Windows are similar to those drivers used by SAS on mainframe and UNIX operating environments.

After SAS prepares output for a printer (by using either Windows printer drivers or a SAS/GRAPH printer driver), the output is sent to the Windows printer, which then queues it for printing on the device of your choice. Figure 6.1 on page 188 illustrates how you can use the two sets of printer drivers within SAS/GRAPH to produce output for a given device.

Figure 6.1 SAS/GRAPH Generic Printer Drivers Compared with SAS/GRAPH Native Printer Drivers



The method that you choose depends on the output device that you are using. For more information, see “Choosing between a SAS/GRAPH Native Driver and the WINPxxx Driver” on page 190. You can control both graphics printing methods by using either the Print and Print Setup dialog boxes or the `SYSPRINT=` option and the `GOPTIONS DEVICE=` statement.

Using the SAS/GRAPH Generic (WINPxxx) Drivers

To print a graphic by using the SAS/GRAPH generic device drivers with the Windows printer drivers:

- 1 From the File menu, select **Print Setup** and verify that the **Printer** field in the Print Setup dialog box lists the correct Windows printer driver and port. You can use the Print Setup dialog box to select any printer driver/port combinations that you have installed. (To install new drivers and port combinations, you can use the Add Printer Wizard in Windows.)

Alternatively, you can use the `SYSPRINT` system option to assign the destination printer. For example,

```
options sysprint='HP LaserJet III';
```

Note that you can assign only printer driver names that have been previously configured in Windows.

- 2 Run your SAS/GRAPH program with the following graphic options:

```
goptions device=winp xxx;
```

The value of `WINPxxx` you specify depends on the type of output device that you use to print your graph:

WINPRTM
for black and white (monochrome) printers

WINPRTG
for gray scale printers

WINPRTC
for color printers

WINPLOT for plotters.

The orientation of graphics output is determined by the following:

- If you specify the ROTATE= graphic option, the output is oriented according to the value that you specify for ROTATE. For example, suppose you specify

```
goptions rotate=landscape
```

Then the output is oriented as landscape, regardless of the settings in the Print Setup dialog box.

- If you do not use the ROTATE= graphic option, the output is oriented according to the settings in the Print Setup dialog box.

Note: Graphics printing is affected by the margins that are specified in the Page Setup dialog box. If you modify the margins when printing graphics and your intention is to keep the graphic proportional, you must change the top and bottom margins by the same amount you change the left and right margins. △

Using the SAS/GRAPH Native Printer Drivers

SAS/GRAPH native drivers produce output in the native language of the target device. Examples of SAS/GRAPH native drivers include:

PS	produces Postscript output.
HPLJS3	produces output in the PCL5 language that is used by Hewlett Packard LaserJet III printers.
HP7550	produces HPGL output that is used by Hewlett–Packard 7550 plotters.

After the SAS/GRAPH native printer driver has produced output in the native language of the target device, SAS then routes the output to the device using the Windows printer. SAS bypasses the Windows driver that is currently associated with the target device, but it does respect the destination that is specified in the Print Setup dialog box when deciding where to send the output.

To print a graph by using a SAS/GRAPH printer driver, run your SAS/GRAPH program with the following graphic options:

```
goptions device=driver-name;
```

where *driver-name* is the name of a valid SAS/GRAPH device driver. Consider this example,

```
goptions device=hplj5p3;
```

This statement formats the graph for the Hewlett Packard LaserJet Series V printer. You can view the complete list of SAS/GRAPH drivers by submitting the PROC GDEVICE statement.

To print a graph to a printer file (also called a graphics stream file, or GSF) instead of directly to a printer, use the GSFNAME option in the GOPTIONS statement and use a filename or a fileref to specify where you want the output. For example:

```
filename graphout "graphic.prn";
goptions gsfname=graphout gsfmode=replace
        device=hpljs2;
```

Printing and Previewing from the GRAPH Window

You can preview a graph that you create and, at the same time, format it for optimal display on the device of your choice. To preview the graph before you print it, run your SAS/GRAPH program with the following GOPTIONS statement:

```
goptions targetdevice=driver-name;
```

where *driver-name* is either one of the WINPxxx drivers or a SAS/GRAPH native driver.

By specifying a target device, SAS/GRAPH can format the graph with colors and attributes that are appropriate for the target printer. To print the graph after it is displayed, select the File menu and then select **Print**.

Note: If you do not specify a target device before you create the graph, SAS/GRAPH will prompt you (in the Print dialog box) for a device driver name when you attempt to print the graph that you are previewing. (In most cases the WINPRTM or WINPRTC driver is specified by default. The graph colors, orientation, and sizing might not be optimal for the output device you specify. Δ

Choosing between a SAS/GRAPH Native Driver and the WINPxxx Driver

When deciding whether to use SAS/GRAPH native drivers or the WINPxxx series of drivers, consider such factors as the device that you are using and the type of output that you want to produce. Note the following specific considerations:

- If no Windows printer driver is available for your device, use a SAS/GRAPH native driver.
- If you have a device for which there is no SAS/GRAPH native driver, use the WINPxxx driver, if there is a Windows printer driver available for the device. In cases where a new model of hard-copy device becomes available between releases of SAS and the hardware vendor provides a new Windows driver that uses new features of the device, you can use a WINPxxx driver to take advantage of those features.
- If you want to use options such as HSIZE= or VSIZE= to customize the size specifications used in your graph, using SAS/GRAPH native drivers usually produces more reliable results.
- To use TrueType fonts in your SAS/GRAPH output, use one of the WINPxxx drivers and specify the font just as you would specify one of the installed hardware fonts for your printer. For more information about TrueType fonts, see “Using TrueType Fonts with SAS/GRAPH Software” on page 621.

Importing Graphics from Other Applications

SAS/GRAPH lets you import bitmap and vector graphics that were created by other software applications. SAS/GRAPH provides these benefits:

- You can create your graphic using another graphics editor, then import the graphic into SAS/GRAPH to produce output on a specialized device.
- You can merge clip art and graphs from other applications with the graphs that you create in SAS/GRAPH.

You can import bitmap graphics into these SAS windows:

- GRAPH window. The imported graphic becomes a new GRSEG entry in the current catalog.
- Graphics Editor. The imported graphic becomes part of the current graph.
- Image editor window. The imported graphic becomes a new image.

SAS provides two ways to import bitmap graphics into SAS/GRAPH:

- From the application that you used to create the graphic, copy the graphic to the Windows clipboard; then switch to your SAS Session and paste the graphic into the SAS/GRAPH window, as described in “Pasting Graphics from the Windows Clipboard” on page 191.
- From the SAS/GRAPH window (or the Graphics Editor or Image Editor) import the graphics file by using the Import Image dialog box, as described in “Importing a Graphics File from within a SAS/GRAPH Window” on page 191.

To import vector graphics, use the GIMPORT procedure to import computer graphics metafile (CGM) files. The imported files are stored as GRSEG catalog entries. This method preserves the individual graphic objects in the imported graph, whereas the other methods treat the imported graphic as a single (uneditable) bitmap. For more information about PROC GIMPORT, see *SAS/GRAPH: Reference*.

Pasting Graphics from the Windows Clipboard

If the tool that you use to create the source graphics is a Windows application, then you can use the Windows clipboard to copy the graphics to your SAS session as follows:

- 1 From the application that you used to create the graphic, select the graphic and copy it to the clipboard using the copy procedures for your graphics tool.
- 2 Switch to your SAS session (or start your SAS session, if it is not already running).
- 3 With the SAS/GRAPH window active, select **Paste** from the Edit menu. The graphic is pasted into the SAS/GRAPH window.

Importing a Graphics File from within a SAS/GRAPH Window

SAS/GRAPH provides import filters to translate graphics files that were created in other applications to a format that you can use with SAS.

You can import graphics from other applications that produce files in any of the formats that are shown in the following table:

Table 6.7 Graphics Import File Formats

Graphics File Format	File Extension
Microsoft Windows bitmap	BMP
Microsoft Windows metafile	WMF
enhanced metafile	EMF
Device independent bitmap	DIB
JPEG format	JPG
graphic interchange format (GIF)	GIF
tag image file format (TIFF)	TIF
PC Paintbrush	PCX
Truevision Targa	TGA
Encapsulated PostScript Interchange (EPSI)	PS
Portable Network Graphics	PNG
Photo CD image	PCD
Portable Pixmap	PBM

Graphics File Format	File Extension
X Window bitmap	XBM
X Window dump	XWD

To import bitmap graphics into SAS/GRAPH:

- 1 Make the GRAPH window the active window and then select **Import Image** from the File menu.
- 2 Use the Import Image dialog box to select the source directory and graphics file. The **Format** field must show the correct source format; the field indicates which import filter SAS/GRAPH will use. You can have SAS automatically detect the file format of the file to import by selecting AUTO as the format. Click **OK**.

Note: Automatic file format detection using AUTO does not detect the DIB, EMF, and WMF file formats Δ

You can also include IMAGE catalog entries in your graphs. For information about including IMAGE catalog entries, see SAS Help and Documentation.

Exporting Graphics for Use with Other Applications

SAS provides the following methods of exporting graphics created in SAS/GRAPH for use with other word processing or desktop publishing packages, or for display on the Internet or intranet:

- Export the graphics to a file from the GRAPH window, Graphics Editor, or Image Editor, as described in “Exporting a Graphic to a File from a SAS/GRAPH Window” on page 192.
- Pasting the contents of the Windows clipboard into the target application (as a bitmap), as described in “Pasting Graphics from SAS/GRAPH into other Windows Applications” on page 193.
- Create a computer graphics metafile (CGM) file for use with a specific graphics package, using drivers that are included with SAS, as described in “Creating CGM Files for Export to Other Applications” on page 194.
- Create a Windows metafile for use with another Windows application, as described in “Creating WMF (Windows Metafile) Files for Export to Other Applications” on page 195.

You can also use SAS/GRAPH to create GIF and VRML files for use with Web browsers, PDF files for use with the Adobe Acrobat reader, and many other useful types of graphics files. For more information about how to create these types of files, see *SAS/GRAPH: Reference* and SAS/GRAPH in SAS Help and Documentation.

Exporting a Graphic to a File from a SAS/GRAPH Window

SAS/GRAPH provides export filters to translate graphics that were generated in SAS/GRAPH into formats that you can use with other applications, such as spreadsheet and desktop publishing programs.

You can export graphics from SAS/GRAPH in any of the formats that are shown in the following table:

Table 6.8 Graphics Export File Formats

Graphics File Format	File Extension
Microsoft Windows bitmap	BMP
Microsoft Windows metafile	WMF
enhanced metafile	EMF
Device independent bitmap	DIB
JPEG format	JPG
graphic interchange format (GIF)	GIF
tag image file format (TIFF)	TIF
Adobe PostScript	PS
Encapsulated PostScript Interchange (EPSI)	PS
Portable Network Graphics	PNG
Portable Pixmap	PBM

To export a graph from the GRAPH window:

- 1 Make the GRAPH window the active window and select **Export Image** from the File menu.
- 2 In the Export Image dialog box, select the target file format.
- 3 Specify the directory and filename for the exported graphic. Click **OK**.

For more information about exporting graphics to a SAS IMAGE catalog entry from the Image editor, see SAS Help and Documentation for SAS/GRAPH.

Pasting Graphics from SAS/GRAPH into other Windows Applications

A quick way to export graphics from SAS to another Windows application is to use the Windows clipboard. When you copy information from SAS/GRAPH to the clipboard, you can then paste that information into any application that accepts DIB, BMP or WMF input.

To copy information from SAS/GRAPH to the clipboard:

- 1 From the GRAPH window, hold down the left mouse button and drag the mouse over the portion of the graph that you want to copy. A selection box marks off the selected area as you move the mouse. When you are finished, release the mouse button.

If you do not select an area of the graph to copy, the next step will copy the entire graph to the clipboard.

- 2 With the GRAPH window still active, press CTRL+C (or select **Copy to Paste Buffer** from the Edit menu).

This action copies the graph to the clipboard. You can then return to the target application and paste the graph (typically by using the **Paste** or **Paste Special** options in the target Windows application). For more information about how to paste information from the clipboard, see the documentation for the other Windows application.

Creating CGM Files for Export to Other Applications

You can export graphs from SAS/GRAPH to other graphics packages by using drivers that were developed specifically for those packages. When you use computer graphics metafiles (CGMs) as the medium of transport between packages, the graph retains its separate components so that you can independently edit and size it. The editing capabilities that you can use depend on the target graphics package.

To create a CGM from SAS/GRAPH, set GOPTIONS as follows:

```
filename fileref 'filename.cgm';
goptions device=cgmxxxx gsfname=fileref
         gsfmode=replace;
```

where CGMxxxx is the appropriate CGM driver for your target application, and *filename.CGM* is the name of the file that you want to create. CGMDFML and CGMDFMP are the recommended device drivers for all CGM output. If CGMDFML and CGMDFMP are not adequate for the receiving software, then you can use the devices in Table 6.9 on page 194. This table lists the graphics packages to which you can export CGMs and the appropriate drivers to use.

The driver names that are marked with an asterisk (*) are already provided with SAS 9.2. Some of the drivers have been disabled and are designated, in the table, by the phrase, *disabled in dgdevice catalog*. To enable a device driver, do the following:

- 1 Point the library GDEVICE0 to a new location. For example:

```
LIBNAME GDEVICE0 'directory';
```

- 2 Use PROC CATALOG to copy some or all of the entries to the GDEVICE0 location. For example:

```
PROC CATALOG C=SASHELP.DGDEVICE;
COPY OUT=GDEVICE0.DEVICES;
RUN;
```

For more information about how to use the CGM drivers and graphics packages, contact SAS Institute's Technical Support Division.

Table 6.9 CGM Drivers for Popular Graphics Packages

Package	Suggested Driver
Aldus PageMaker	CGMAPMA* (disabled in dgdevice catalog)
Aldus Persuasion	CGMAPSA* (disabled in dgdevice catalog)
BPS 35 MM Express	CGM35 (disabled in dgdevice catalog)
Borland Quattro Pro (Windows)	CGMBQWC (disabled in dgdevice catalog)
Borland Quattro Pro (DOS)	CGMBQA* (disabled in dgdevice catalog)
Frame Tech FrameMaker	CGMFRCA* (disabled in dgdevice catalog) CGMFRGA* (disabled in dgdevice catalog) CGMFRMA* (disabled in dgdevice catalog)
Harvard Graphics 2.12 for DOS	CGHHG (disabled in dgdevice catalog)
Harvard Graphics 3.0 for DOS	CGMHG3A* (disabled in dgdevice catalog)
Harvard Graphics for Windows	CGMHGWA* (disabled in dgdevice catalog)
ImageBuilder	CGMIMG (disabled in dgdevice catalog)

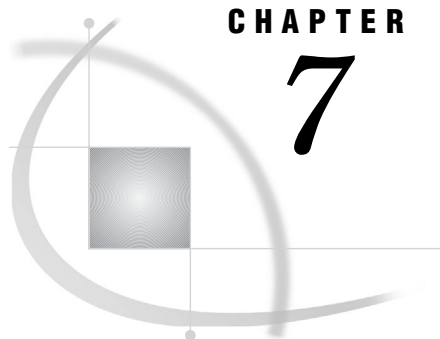
Package	Suggested Driver
Interleaf 5	CGMCILFC* (disabled in dgdevice catalog) CGMGILFC* (disabled in dgdevice catalog) CGMMILFM* (disabled in dgdevice catalog)
Lotus Ami Pro 3.0	CGMAM3C* (disabled in dgdevice catalog)
Lotus Freelance for DOS	CGMFLALJ* (disabled in dgdevice catalog) CGMFLAPL* (disabled in dgdevice catalog) CGMFLAPT* (disabled in dgdevice catalog)
Lotus Freelance for Windows 2.0	CGMFL2C* (disabled in dgdevice catalog)
Lotus Freelance for Windows 1.0	CGMFLWA* (disabled in dgdevice catalog)
Lotus 1-2-3 4.0	CGM123C* (disabled in dgdevice catalog)
Lotus Office 97	CGMLT97L CGMLT97P
Microsoft Word for Windows 6.0	CGMMW6C* (disabled in dgdevice catalog)
Microsoft Word for Windows 2.0	CGMMWWC* (disabled in dgdevice catalog)
Microsoft PowerPoint	CGMMPPA (disabled in dgdevice catalog)
Microsoft Office 97	CGMOF97L or CGMOFML, CGMOF97P or CGMOFMP
Polaroid CI3000	CI3000 (disabled in dgdevice catalog)
WordPerfect 5.1 for DOS	CGMWPCA (disabled in dgdevice catalog) CGMWPCAP* (disabled in dgdevice catalog) CGMWPGA (disabled in dgdevice catalog) CGMWPGAP* (disabled in dgdevice catalog) CGMWPPMA (disabled in dgdevice catalog) CGMWPPMAP* (disabled in dgdevice catalog)
WordPerfect 5.2 for Windows	CGMWPPWA* (disabled in dgdevice catalog)
WordPerfect Presents for DOS	CGMWPCA* (disabled in dgdevice catalog) CGMWPGA* (disabled in dgdevice catalog) CGMWPPMA* (disabled in dgdevice catalog)
Zenographics Pixie	CGMPIX (disabled in dgdevice catalog)

Creating WMF (Windows Metafile) Files for Export to Other Applications

To learn how to export WMF files from SAS/GRAPH software, contact SAS Institute's Technical Support Division and ask for information for your target software application.

Additional Resources

For full details about using SAS/GRAPH software, see *SAS/GRAPH: Reference*. For further details about using graphics and fonts with SAS under Windows, see "Using TrueType Fonts with SAS/GRAPH Software" on page 621.



CHAPTER

7

Performance Considerations

<i>Hardware Considerations</i>	197
<i>Processor Speed</i>	198
<i>Memory</i>	198
<i>Disk Space for I/O</i>	199
<i>Graphics Adapter</i>	199
<i>Windows Features That Optimize Performance</i>	200
<i>Controlling SAS Responsiveness</i>	200
<i>Overview of Controlling SAS Responsiveness</i>	200
<i>Optimizing Application Performance under Windows Vista</i>	200
<i>Optimizing Application Performance under Windows 7</i>	200
<i>Optimizing Application Performance under Windows XP</i>	201
<i>Optimizing Application Performance under Windows Server 2003</i>	201
<i>I/O Enhancements for Multiple Processors</i>	201
<i>Memory-Based Libraries</i>	201
<i>Memory-Based Libraries Overview</i>	201
<i>Setup Requirements for Using Memory-Based Libraries under Windows 2003 Servers and Later</i>	202
<i>Setup Requirements for Using Memory-Based Libraries under Windows XP Professional</i>	203
<i>Specifying the MEMLIB and MEMCACHE Options in 64-Bit Windows Environments</i>	203
<i>Specifying the Local Security Settings</i>	204
<i>Processing SAS Libraries as Memory-Based Libraries</i>	204
<i>Using a Memory-Based Library as a SAS File Cache</i>	205
<i>SAS Features That Optimize Performance</i>	206
<i>Network Performance Considerations</i>	207
<i>Advanced Performance Tuning Methods</i>	208
<i>Improving Performance of the SORT Procedure</i>	208
<i>SORTSIZE Option</i>	208
<i>TAGSORT Option</i>	208
<i>Choosing a Location for the Sorted File</i>	208
<i>Calculating Data Set Size</i>	209
<i>Increasing the Efficiency of Interactive Processing</i>	211

Hardware Considerations

The following hardware factors might affect SAS performance:

- the processor speed
- the amount of physical memory that is available

- the amount of disk space that is available for I/O
- the graphics adapter.

Not all of these factors will apply to your particular configuration or to the way in which you run SAS. Consult your system administrator for details.

Processor Speed

In general, a faster processor enables the computer to perform more operations per second. The more operations that can be performed, the more performance will improve.

The amount of processor cache that is available also influences performance. More processing cache will result in better performance.

The processor required to run SAS depends on the operating environment.

- In 32-bit environments, you must have a PC that contains an Intel or Intel-compatible Pentium 4 class processor.
- In x64 64-bit environments, you must have an Intel64 or AMD64 processor.
- In Itanium 64-bit environments, you must have an Intel Itanium II processor.

Memory

In general, more physical memory will result in better performance. Systems that have large amounts of available memory are capable of handling large amounts of data without swapping. Swapping uses the temporary space on the hard drive to store the data that could not be loaded into memory. However, memory is faster than the hard drive in manipulating temporary files and other system operations. Consequently, the more memory that is available, the less the hard drive will need to be accessed for these types of operations.

The minimum amount of memory that is required depends on the operating environment.

Table 7.1 Memory Requirements for 32-Bit Environments

Operating Environment	Memory Requirements
Windows XP Professional	512 MB minimum (More memory is recommended for improved performance.) 512 MB minimum of swap file space
Windows Vista and Windows 7	2 GB minimum (More memory is recommended for improved performance.) 2 GB minimum of swap file space

Table 7.2 Memory Requirements for 64-Bit Environments

Operating Environment	Memory Requirements
Windows Server 2003	1 GB minimum (More memory is recommended for improved performance.) 1 GB minimum of swap file space

Disk Space for I/O

An application uses I/O for data storage and data access. Therefore, faster I/O results in faster overall performance. The three factors that influence I/O performance are the disk controller and bus, the hard drive, and the hard drive configuration.

disk controller and bus

In general, hard drive disk controllers that use their memory buffers to cache data have better throughput than conventional controllers. This configuration can improve I/O performance.

The type of I/O controller can affect I/O performance. SCSI and EIDE controllers generally offer higher bus speeds. A fast SCSI or EIDE bus used with the appropriate SCSI or EIDE drive can offer improved performance over other hard drives and controller types. Currently, SCSI controllers offer the best I/O performance.

hard drive

Since SAS is heavily I/O oriented, access time and transfer rate are important to system performance. SCSI and EIDE drives generally have faster access times than MFM or IDE drives.

Low disk space or a heavily fragmented disk can hinder I/O performance. It is recommended that you defragment your hard drive regularly to keep I/O performance from degrading.

hard drive configuration

The hard drive configuration can have the greatest impact on I/O performance, especially on large server systems. Generally, a RAID configuration has better I/O performance than a non-RAID system. Consult your system administrator to determine the appropriate configuration for your computer.

Graphics Adapter

Since some SAS features use a significant amount of graphics memory, the type of graphics adapter that you use can make a difference in performance. Generally, if the same amount of graphics memory is available, AGP adapters are faster than PCI adapters. However, the type of adapter that you can use depends on your motherboard.

The amount of memory that is available on the adapter can impact the speed at which graphics are rendered. More memory usually results in better performance.

Windows Features That Optimize Performance

Controlling SAS Responsiveness

Overview of Controlling SAS Responsiveness

You can control the relative responsiveness of your SAS session by altering the application performance level. Using Windows performance options, you can specify which type of programs, interactive or background, receive more processor time. Use these guidelines to determine the application performance level:

- If you are running SAS interactively and you want your session to have the best response time, set the performance options for programs or applications.
- If you are running SAS in batch mode and you want your batch jobs to execute more quickly, set the performance options for background services.

To analyze the performance of your SAS applications, you can specify SAS performance counters within the Windows performance monitor. For more information, see “Performance Tools” on page 228.

Optimizing Application Performance under Windows Vista

Under Windows Vista, follow these steps to optimize application performance:

- 1 Open the Control Panel.
- 2 Click **System and Maintenance**.
- 3 Select the **System**.
- 4 Click **Advanced system settings task**.
- 5 Select the **Advanced** tab.
- 6 In the Performance box, click **Settings** and then select the **Advanced** tab.
- 7 To optimize performance of an interactive SAS session, select **Programs**.
- 8 To optimize performance of a batch SAS session, select **Background services**.
- 9 Click **OK**.

Optimizing Application Performance under Windows 7

Under Windows 7, follow these steps to optimize application performance:

- 1 Open the Control Panel.
- 2 Click **System and Security**.
- 3 Select the **System**.
- 4 Click **Advanced system settings task**.
- 5 Select the **Advanced** tab.
- 6 In the Performance box, click **Settings** and then select the **Advanced** tab.
- 7 To optimize performance of an interactive SAS session, select **Programs**.
- 8 To optimize performance of a batch SAS session, select **Background services**.
- 9 Click **OK**.

Optimizing Application Performance under Windows XP

Under Windows XP, follow these steps to optimize application performance:

- 1 Open the Control Panel.
- 2 Click **System**.
- 3 Select the **Advanced** tab.
- 4 In the Performance box, click **Settings** and then select the **Advanced** tab.
- 5 To optimize performance of an interactive SAS session, select **Programs**.
- 6 To optimize performance of a batch SAS session, select **Background services**.
- 7 Click **OK**.

Optimizing Application Performance under Windows Server 2003

Under Windows Server 2003, follow these steps to optimize application performance:

- 1 Open the Control Panel.
- 2 Click **System**.
- 3 Select the **Advanced** tab.
- 4 In the Performance box, click **Settings**.
- 5 To optimize performance of an interactive SAS session, select **Programs** in the Processor Scheduling box.
- 6 To optimize performance of a batch SAS session, select **Background services** in the Processor Scheduling box.
- 7 Click **OK**.

I/O Enhancements for Multiple Processors

If your PC has multiple processors, SAS uses symmetric multiprocessing (SMP) using I/O enhancements. More read-ahead processing is done for procedures that have large amounts of sequential data access on data that is stored on a Windows server. This processing occurs more on systems that have extra processing power to serve Windows and its disk cache.

The following is generally true in multiprocessing SMP environments:

- Machines that are used as servers for multiple applications perform best if they are SMP-based.
- SAS/CONNECT remote computing environments perform best if they are SMP-based.
- The supporting hardware in SMP boxes (RAID, RAM) generally help any application to perform better.

Memory-Based Libraries

Memory-Based Libraries Overview

Using the MEMLIB and MEMCACHE options, you can create memory-based SAS libraries. Depending on your operating environment, extended memory or conventional memory is used to support these memory-based libraries.

Thirty-two bit processing in Windows operating environments uses 2 gigabytes (GB) of physical memory for the operating environment, leaving 2 GB of physical memory

available for use by applications. When a PC or server has more than 4 GB of memory, extended memory is defined as the memory that is above 4 GB, all of which is available for use by applications. Extended memory can be used to support memory-based libraries.

Some Windows operating environments do not support extended memory. In operating environments where extended memory is not supported or installed, SAS uses conventional memory to support the MEMLIB and MEMCACHE options. Conventional memory is defined as the memory that is below 4 GB in 32-bit environments and all of the memory in 64-bit environments.

Using memory-based libraries reduces I/O to and from disk, therefore improving SAS performance. Memory-based libraries can be used in several ways:

- as storage for the Work library
- for processing SAS libraries that have a high volume of input and output
- as a cache for very large SAS libraries

Extended memory can be used to support memory-based libraries in 32-bit versions of the Windows Server 2003 Family.

Conventional memory is used to support the MEMLIB and MEMCACHE system options in these environments:

- 32-bit and 64-bit versions of Windows XP Professional
- 64-bit versions of the Windows Server 2003 Family
- Windows Vista
- Windows 7

The servers allow multiple processes to access memory-based libraries simultaneously.

After you have completed the setup for your operating environment, you use the MEMLIB and MEMCACHE system options and the MEMLIB option in the LIBNAME statement to access memory-based libraries.

Setup Requirements for Using Memory-Based Libraries under Windows 2003 Servers and Later

The Windows 2003 memory manager can access up to 8 GB of physical RAM in the Windows 2003 Enterprise Server and up to 32 GB of physical RAM in the Windows 2003 Datacenter Server.

To use extended memory under Windows 2003 Servers or above, ensure that your operating environment meets the following requirements:

- Intel or Intel-compatible 32-bit processor (Pentium Pro or later).
- More than 4 GB of RAM; you might have better performance if you use 8 GB or more.
- The parameter **/PAE** has been added to the server start-up line in the boot.ini file.
- SAS 9.2 for Windows.

Then follow these steps:

- Set the total amount of memory to be used for memory-based libraries by using the MEMMAXSZ system option. See “MEMMAXSZ System Option” on page 534.
- Set the memory block size for memory-based libraries by using the MEMBLKSZ system option. See “MEMBLKSZ System Option” on page 532.

SAS 9.2 for Windows uses the available memory to support the MEMLIB and MEMCACHE options.

CAUTION:

It is possible to exhaust system memory, and thus cause system failure. You can use the MEMMAXSZ option to limit the amount of system memory that SAS allocates to the MEMLIB and MEMCACHE options. Δ

Setup Requirements for Using Memory-Based Libraries under Windows XP Professional

Windows XP Professional is limited to 4 GB of physical RAM. Memory-based libraries are designed to optimize performance in server environments where more than 4 GB of physical memory is present. In these operating environments, conventional memory is used to support the MEMLIB and MEMCACHE options. Specifying these options in Windows XP Professional, Windows Vista, and Windows 7 environments might or might not improve performance.

To use memory-based libraries under Windows XP Professional, Windows Vista, and Windows 7 ensure that your operating environment meets the following requirements:

- Intel or Intel-compatible 32-bit processor (Pentium Pro or later)
- 4 GB of RAM
- SAS 9.2 for Windows

Then follow these steps:

- Set the total amount of memory for memory-based libraries by using the MEMMAXSZ system option. See “MEMMAXSZ System Option” on page 534.
- Set the memory block size for memory-based libraries by using the MEMBLKSZ system option. See “MEMBLKSZ System Option” on page 532.

SAS 9.2 for Windows uses the available memory to support the MEMLIB and MEMCACHE options.

CAUTION:

It is possible to exhaust system memory, and thus cause system failure. You can use the MEMMAXSZ option to limit the amount of system memory that SAS allocates to the MEMLIB and MEMCACHE options. Δ

Specifying the MEMLIB and MEMCACHE Options in 64-Bit Windows Environments

Sixty-four bit processing in Windows operating environments uses 16 terabytes (TB) of virtual address space, so in these environments, extended memory is not needed. SAS uses the conventional memory that is available to support the MEMLIB and MEMCACHE options.

CAUTION:

It is possible to exhaust system memory, and thus cause system failure. You can use the MEMMAXSZ option to limit the amount of system memory that SAS allocates for the MEMLIB and MEMCACHE options. Δ

To use the MEMLIB and MEMCACHE options, ensure that the operating environment meets the following requirements:

- Intel or Intel-compatible 64-bit processor (Itanium or later).
- Any 64-bit version of Windows.
- 4 GB of RAM or more; you might have better performance if you use more than 8 GB.
- SAS 9.2 for Windows.

Then follow these steps:

- Set the total amount of memory for memory-based libraries by using the MEMMAXSZ system option. See “MEMMAXSZ System Option” on page 534.
- Set the memory block size for memory-based libraries by using the MEMBLKSZ system option. See “MEMBLKSZ System Option” on page 532.

Specifying the Local Security Settings

In 32-bit environments starting with Windows XP Professional and above, the **Lock pages in memory security** setting must be set, so that each user who is running SAS has access to the extended memory. If a user does not have the correct permissions, then SAS will issue a warning message to the log.

System administrators can set the local security settings through the Start Menu. To set this value

- 1 Open the Control Panel.
- 2 Double click **Administrative Tools**.
- 3 Double click **Local Security Policy**. The Local Security Settings window will open.
- 4 Double click **Local Policies**.
- 5 Double click **User Rights Assignment**.
- 6 Double click **Lock pages in memory**. The Local Security Policy Setting window will open.
- 7 Click **Add**. The Select User or Groups window will open.
- 8 Select the user IDs or name of the group of users who need to run SAS with access to the extended memory.
- 9 Click **OK** in the Select User or Groups window.
- 10 Click **OK** in the Local Security Policy window.

Note: In the Local Security Policy window, you might see two check boxes: the Local Security Setting check box and the Effective Policy Setting check box. If the Effective Policy Setting check box is not selected for the users that you added, you will need to reboot your computer so that the new security settings will take effect. \triangle

Processing SAS Libraries as Memory-Based Libraries

SAS libraries that are well suited for memory-based processing have data that is referenced or updated multiple times within a SAS session.

Using a Work library that is memory-based is beneficial for procedures such as PROC SORT that write multiple times to large temporary files. To designate the Work library as memory-based, specify the MEMLIB system option when you start SAS.

You designate a library as memory-based by using the MEMLIB option in the LIBNAME statement. All librefs, including a libref to the Work directory, must have a valid disk directory.

After the library is designated as memory-based, your SAS program needs to copy the library from disk to memory. After processing the library in memory, the library must be copied back to disk.

CAUTION:

Copy the library that is in memory to disk after processing is complete. If you do not, you will lose any changes that were made to the library. The changes are lost when the SAS session ends \triangle

The following example shows how to use the LIBNAME statement and the PROC COPY statement to copy a library to and from memory.

```

/* Set up two librefs, one to the library in memory
and the other to the SAS library on disk. The library on
disk contains dataset1, dataset2, dataset3 and dataset4. */

libname inmemory 'g:\memlib' memlib;
libname ondisk 'g:\disk';

/* Copy dataset1, dataset2, dataset3, and dataset4 to memory */

proc copy in=ondisk out=inmemory;
run;

/* ...Assume dataset1 and dataset4 are updated */

/* Save the updated datasets back to disk */

proc copy in=inmemory out=ondisk;
  select dataset1 dataset4;
run;

```

You can also copy a data set to memory by using a DATA statement, as shown in the following example:

```

data ondisk.dataset1;
  set inmemory.dataset1;
run;

```

For more information, see “MEMLIB System Option” on page 534 and the LIBNAME Statement MEMLIB option “LIBNAME Statement” on page 464.

Using a Memory-Based Library as a SAS File Cache

A SAS file cache is most useful in multiple references of data. For example, a SAS file cache improves performance in SAS programs that make multiple passes of the data. SAS file caching improves performance in the following situations:

- Repeated read operations of a file while other files are being written. Writing to a file clears the Windows file system (NTFS) cache.
- Repeated read operations of a file when Scatter Gather I/O is active. Scatter Gather I/O operates outside the NTFS cache. Without the SAS file cache, there is no data cache and all read operations access the disk.

To use memory as a SAS file cache, specify the MEMCACHE system option when you start SAS or when you submit an OPTIONS statement. If you set MEMCACHE to 4, SAS uses the memory to cache all files. If you set MEMCACHE to 1, only files that are currently in memory are cached to memory. When you use the MEMCACHE system option in the OPTIONS statement, you can control which data sets use the SAS file cache, as shown in the following example.

```

/* Example of controlling cached files with the options statement */

/* Assume cachelib contains 2 data sets, ds1 and ds2. */
/* Also assume ds1 and ds2 are large enough that they cannot exist */
/* in the cache together. ds1 is read many times, so caching is */
/* desired. ds2 is accessed only once, so caching is of no */

```

```

/* benefit. When you use the memcache option, ds1 is cached, and ds2  */
/* is not cached.                                                    */

libname cachelib "e:\tmp";

/* Turn on full caching */

options memcache = 4;

/* Read ds1 and place the data in the cache. This read operation could be a */
/* more useful read operation of the file in a real case.                */

data _null_;
  set cachelib.ds1;
run;

/* Change memcache setting to use the cache only for files that */
/* already exist in the cache.                                     */

options memcache = 1;

/* Data from ds1 will come from the cache and ds2 will not be */
/* cached.                                                       */

proc sort data=cachelib.ds1 out=cachelib.ds2;
  by j;
run;

/* Other access of ds1...                                         */

/* All use of the cache can be ended with a memcache system */
/* option value of 0.                                           */

options memcache = 0;

/* Neither ds1 or ds2 will access the cache.                   */

proc sort data=cachelib.ds1 out=cachelib.ds2;
  by j;
run;

```

For more information about the MEMCACHE system option, see “MEMCACHE System Option” on page 533. For more information about Scatter Gather I/O, see “SAS Features That Optimize Performance” on page 206 and “SGIO System Option” on page 563.

SAS Features That Optimize Performance

The following are some additional features of SAS that you can control to improve system performance and make efficient use of your computer’s resources. For additional information about optimizing SAS performance, see the chapter on optimizing system performance in *SAS Language Reference: Concepts*.

- Create SAS data sets instead of accessing flat ASCII files. SAS can access a SAS data set more efficiently than it can read flat files.
 - Also, you should convert existing data sets that you use frequently to SAS 9.2 format.
- In your SAS code, use IF-THEN-ELSE conditional structures instead of multiple IF-THEN structures. When one condition in the IF-THEN-ELSE structure is met, control returns to the top of the structure (skipping the ELSE clause, which might contain subsequent IF-THEN structures). With multiple IF-THEN structures, each condition must be checked.
- When using arrays, make them `_TEMPORARY_` if possible. This action requires less memory and less time for memory allocation.
- Use programming structures that reduce file I/O, the most time-intensive aspect of SAS processing. Some ideas for reducing file I/O are:
 - Use the WHERE statement in a procedure to reduce extra data processing.
 - Use indexed data sets to speed access to the desired observations.
 - Use the SQL procedure to subset and group your data.
- Experiment with the value of the CATCACHE system option, which specifies the number of SAS catalogs to keep open at one time. By default, no catalogs are cached in memory (and CATCACHE is set to 0). Caching catalogs is an advantage if one SAS application uses catalogs that are subsequently needed by another SAS application. The second SAS application can access the cached catalog more efficiently.

Note: Storing catalogs in memory can consume considerable resources. Use this technique only if memory issues are not a concern. Δ

- Store your data sets in a compressed format (using the COMPRESS data set option). This action can improve the performance of your SAS application, though it might require more CPU time to decompress observations as SAS needs them. The COMPRESS data set option is described in the data set options section of *SAS Language Reference: Dictionary*.
- If you specify the Scatter-read/Gather-write system option, SGIO, SAS bypasses intermediate buffer transfers when reading or writing data. SAS will read ahead the number of pages specified by the BUFNO system option and place the data in memory before it is needed. When the data is needed it is already in memory, and is in effect a direct memory access. Different values for the BUFNO system option should be tried for each SAS job to find the maximum performance benefit.

Scatter-read / gather-write is active only for SAS I/O opened in INPUT, OUTPUT mode, and UPDATE mode if the access pattern is sequential. If any SAS I/O files are opened in UPDATE or RANDOM mode, SGIO is inactive for that process. Compressed and encrypted files can also be read ahead using scatter-read/gather-write. For more information on the SGIO system option, see “SGIO System Option” on page 563.

Network Performance Considerations

Under Windows, loading application DLL (dynamic link library) files from a network drive can result in slower performance than loading the DLL files from a local drive.

Advanced Performance Tuning Methods

This section presents some advanced performance topics, such as improving the performance of the SORT procedure and calculating data set size. Use these methods only if you are an experienced SAS user and you are familiar with the way SAS is configured on your machine.

Improving Performance of the SORT Procedure

Two options for the PROC SORT statement are available under Windows, the SORTSIZE= and TAGSORT options. These two options control the amount of memory the SORT procedure uses during a sort and are discussed in the next two sections. Also included is a discussion of determining where the sorting process occurs for a given data set and determining how much disk space you need for the sort. For more information about the SORT procedure, see “SORT Procedure” on page 441.

SORTSIZE Option

The PROC SORT statement supports the SORTSIZE= option, which limits the amount of memory available for PROC SORT to use.

If you do not use the SORTSIZE option in the PROC SORT statement, PROC SORT uses the value of the SORTSIZE system option. If the SORTSIZE system option is not set, PROC SORT uses the amount of memory specified by the REALMEMSIZE system option. If PROC SORT needs more memory than you specify, it creates a temporary utility file in your SAS Work directory to complete the sort.

The default value of this option is 64 megabytes (MB).

TAGSORT Option

The TAGSORT option is useful in single-threaded situations where there might not be enough disk space to sort a large SAS data set. The TAGSORT option is not supported for multi-threaded sorts.

When you specify the TAGSORT option, only sort keys (that is, the variables specified in the BY statement) and the observation number for each observation are stored in the temporary files. The sort keys, together with the observation number, are referred to as tags. At the completion of the sorting process, the tags are used to retrieve the records from the input data set in sorted order. Thus, in cases where the total number of bytes of the sort keys is small compared with the length of the record, temporary disk use is reduced considerably. However, you should have enough disk space to hold another copy of the data (the output data set) or two copies of the tags, whichever is greater. Note that although using the TAGSORT option can reduce temporary disk use, the processing time might be much higher.

Choosing a Location for the Sorted File

Where the physical sort occurs for a given data set depends on how you reference the data set name and whether you use the OUT= option in the PROC SORT statement. You might want to know where the sort occurs if you think there might not be enough disk space available for the sort.

When you sort a SAS data set, SAS creates a temporary utility file. If the sort uses multiple threads, you can specify the location of the utility file by using the UTILLOC system option. The default location for utility files is the Work data library. If two or more locations are specified for the UTILLOC option, the second location is used as the

location for the utility file. For sorts that use a single thread, the temporary utility file is opened in the Work data library if there is not enough memory to hold the data set during the sort. The utility file has a .sas7butl file extension. Before you sort, ensure that your Work data library has room for this temporary utility file.

If you specify the OVERWRITE option in the PROC SORT statement, SAS replaces the input data set with the sorted data set.

If you do not specify the OVERWRITE option in the PROC SORT statement, a second file that has a .sas7butl file extension is created. If the sort completes successfully, this file is renamed to the data set name of the file being sorted (with a .sas7bdat file extension). The original data set is deleted after the sort is complete. Before you sort a data set, be sure that you have space for this .sas7butl file.

Use the following rules to determine where the .sas7butl file and the resulting sorted data set are created:

- If you omit the OUT= option in the PROC SORT statement, the data set is sorted on the drive and in the directory or subdirectory where it is located. For example, if you submit the following statements (note the two-level data set name), the .sas7butl file is created on the C: drive in the MYDATA subdirectory:

```
libname mylib 'c:\sas\mydata';
proc sort data=mylib.report;
  by name;
run;
```

Similarly, if you specify a one-level data set name, the .sas7butl file is created in your Work data library.

- If you use the OUT= option in the PROC SORT statement, the .sas7butl file is created in the directory associated with the libref used in the OUT= option. If you use a one-level name (that is, no libref), the .sas7butl file is created in the Work data library. For example, in the following SAS program, the first sort occurs in the SAS Work subdirectory, while the second occurs on the F: drive in the JANDATA directory:

```
proc sort data=report out=newrpt;
  by name;
run;
libname january 'f:\jandata';
proc sort data=report out=january.newrpt;
  by name;
run;
```

Calculating Data Set Size

In single-threaded environments, you always need free disk space that equals three to four times the data set size. For example, if your data set takes up 1MB of disk space, you need 3 to 4MB of disk space to complete the sort.

In multi-threaded environments, if you use the OVERWRITE option in the PROC SORT statement, you need space equal to the data set size. If you do not specify the OVERWRITE option, the space you need is equal to two times the data set size. For more information about the OVERWRITE option, see the SORT procedure in *Base SAS Procedures Guide*.

To estimate the amount of disk space that is needed for a SAS data set:

- 1 create a dummy SAS data set that contains one observation and the variables you need
- 2 run the CONTENTS procedure using the dummy data set

- 3 determine the data set size by performing simple math using information from the CONTENTS procedure output.

For example, for a data set that has one character variable and four numeric variables, you would submit the following statements:

```
data oranges;
  input variety $ flavor texture looks;
  total=flavor+texture+looks;
  datalines;
navel 9 8 6
;
proc contents data=oranges;
  title 'Example for Calculating Data Set Size';
run;
```

These statements generate the output shown in the following output:

Output 7.1 Example for Calculating Data Set Size with PROC CONTENTS

Example for Calculating Data Set Size				1
				19:39 Wednesday, February 12, 2003
The CONTENTS Procedure				
Data Set Name	WORK.ORANGES	Observations	1	
Member Type	DATA	Variables	5	
Engine	V9	Indexes	0	
Created	Wednesday, October 3, 2007 07:41:04	Observation Length	40	
Last Modified	Wednesday, October 10, 2007 07:41:04	Deleted Observations	0	
Protection		Compressed	NO	
Data Set Type		Sorted	NO	
Label				
Data Representation	WINDOWS_32			
Encoding	wlatin1 Western (Windows)			
Engine/Host Dependent Information				
Data Set Page Size	4096			
Number of Data Set Pages	1			
First Data Page	1			
Max Obs per Page	101			
Obs in First Data Page	1			
Number of Data Set Repairs	0			
File Name	C:\TEMP\SAS Temporary Files_TD246\oranges.sas7bdat			
Release Created	9.0201B0			
Host Created	XP_PRO			
Alphabetic List of Variables and Attributes				
#	Variable	Type	Len	
2	flavor	Num	8	
4	looks	Num	8	
3	texture	Num	8	
5	total	Num	8	
1	variety	Char	8	

The size of the resulting data set depends on the data set page size and the number of observations. The following formula can be used to estimate the data set size:

$$\begin{aligned}\text{number of data pages} &= 1 + (\text{floor}(\text{number of obs} / \text{Max Obs per Page})) \\ \text{size} &= 1024 + (\text{Data Set Page Size} * \text{number of data pages})\end{aligned}$$

(*floor* represents a function that rounds the value down to the nearest integer.)

Taking the information shown in Output 7.1, you can calculate the size of the example data set:

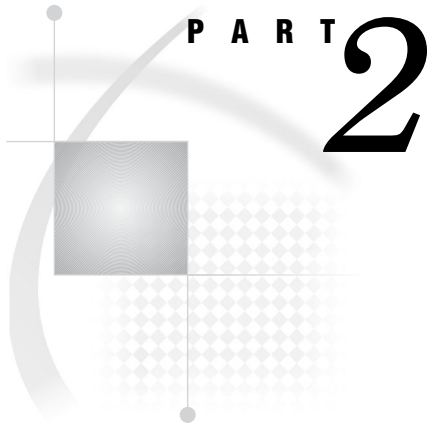
$$\begin{aligned}\text{number of data pages} &= 1 + (\text{floor}(1/101)) \\ \text{size} &= 1024 + (4096 * 1) = 5120\end{aligned}$$

Thus, the example data set uses 5,120 bytes of storage space.

Increasing the Efficiency of Interactive Processing

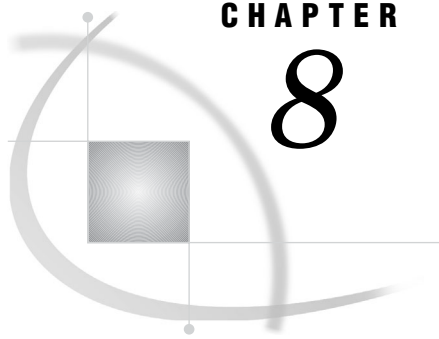
If you are running a SAS job using SAS interactively and the job generates numerous log messages or extensive output, consider using the AUTOSCROLL command to suppress the scrolling of windows. This action makes your job run faster because SAS does not have to use resources to update the display of the LOG and OUTPUT windows during the job. For example, issuing **autoscroll 0** in the LOG window causes the LOG window not to scroll until your job is finished. (For the OUTPUT window, AUTOSCROLL is set to 0 by default.)

Minimizing the LOG window also might make your job run faster, especially if SAS is generating numerous log messages.



Using SAS with Other Windows Applications

- Chapter 8*..... **Using Lotus Notes to Distribute SAS Data** 215
- Chapter 9*..... **Using Windows System Tools with SAS** 223
- Chapter 10*..... **Using OLE in SAS/AF Software** 243
- Chapter 11*..... **Controlling SAS from Another Application Using OLE** 267
- Chapter 12*..... **Using Dynamic Data Exchange** 275
- Chapter 13*..... **Using Unnamed and Named Pipes** 285
- Chapter 14*..... **Accessing External DLLs from SAS** 297
- Chapter 15*..... **Special Considerations for SAS/AF Programmers** 317



CHAPTER

8

Using Lotus Notes to Distribute SAS Data

<i>Introduction to Using Lotus Notes with SAS</i>	215
<i>The NOTESDB Engine</i>	215
<i>Client Requirements</i>	215
<i>Populating a Lotus Notes Database Using the DATA Step and SCL Code</i>	216
<i>Creating New Notes Documents</i>	216
<i>SAS Statements to Interact with Notes</i>	216
<i>Syntax for Populating a Lotus Notes Database</i>	216
<i>Examples of Populating Lotus Notes Databases</i>	218
<i>Preparing SAS/GRAPH Output for a Notes Document</i>	220
<i>Using SAS with the NotesSQL ODBC Driver</i>	221
<i>Retrieving Information from Preexisting Notes Documents</i>	221

Introduction to Using Lotus Notes with SAS

The NOTESDB Engine

SAS provides an access engine, NOTESDB, that enables client users to add new Notes documents to an existing Notes database. This engine is compatible with Lotus Notes client version 7.0.2 or later.

The NOTESDB access engine cannot create a new database and does not provide a way to retrieve information from existing Notes documents. However, the NotesSQL ODBC driver allows for retrieval of data from Notes databases. See “Retrieving Information from Preexisting Notes Documents” on page 221 for these details.

Do not schedule a program using the NOTESDB engine as a batch job because the server prompts for a password.

Client Requirements

The following are requirements for using Lotus Notes with SAS:

- A client version of Lotus Notes and a valid Notes user ID certification must be installed on the machine that will be using the NOTESDB engine. However, Lotus Notes does not have to be running in order for SAS to access it. You will be prompted for a password to access the Notes server through SAS.
- The Lotus Notes directory must be in the system path. You update the system path by adding to the PATH system environment variable in the **Advanced** tabbed page of the System Properties dialog box.

Populating a Lotus Notes Database Using the DATA Step and SCL Code

Creating New Notes Documents

SAS Statements to Interact with Notes

DATA step and SCL code that interacts with a Notes database has the following components:

- a FILENAME statement that includes the NOTESDB device-type keyword
- PUT statements that contain data directives and the data to place in the Notes database
- PUT statements that contain action directives to control when to send the data to the Notes database.

Syntax for Populating a Lotus Notes Database

FILENAME *fileref* NOTESDB;

where:

fileref

is a valid fileref.

NOTESDB

is the device-type keyword that indicates that you want to use a Lotus Notes database.

In your DATA step, use PUT statements that have data directives to define which database you want to use and the data you want to send.

Note: Although the directives that you specify to access a Notes database are not case-sensitive, the fields that you specify using those directives are. Also, only one directive per PUT statement is permitted. Each directive should be delimited with an exclamation point and surrounded with single quotes. Δ

Use these data directives to specify the database location and the data to add to the database:

!NSF_SERVER! *server-name*

indicates the Notes server to access, where *server-name* represents a Lotus Notes server. If you do not specify this directive, SAS uses your local system as the source for the databases. If you specify this directive more than once, the server that was specified in the most recent PUT statement is used.

Note: If you attempt to access a Notes server through SAS, you will be prompted for your password to the server. Δ

!NSF_DB! *database-filename*

indicates the Notes database file to access. When accessing a database locally, SAS looks for the database in the Notes data directory. If it is not found there, SAS

searches the system path. Alternatively, you can specify the fully qualified path for the database. You must specify a Notes database file that has this directive before you can access a Notes database from SAS. If you specify this directive more than once, the database that was specified in the most recent PUT statement is used.

!NSF_FORM! *form-name*

specifies the form that Notes should use when displaying the added note. If this directive is not specified, Notes uses the default database form. If you specify this directive more than once, the form that was specified in the most recent PUT statement that has the !NSF_FORM! directive is used.

!NSF_ATTACH! *filename*

attaches a file to the added note. SAS looks for the file in the Notes data directory. If it is not found there, SAS searches the system path. Alternatively, you can specify the fully qualified path for the file. You can attach only one file in a single PUT statement that has the !NSF_ATTACH! directive. To attach multiple files, use separate PUT statements that have !NSF_ATTACH! directives for each file.

!NSF_FIELD! *field-name!field value*

adds the value to the field name specified. SAS detects the correct format for the field and formats the data accordingly. Note that SAS extracts all line feeds or carriage returns; you should not insert any of these control characters as they affect the proper display of the document in Notes. Multiple PUT statements that have the !NSF_FIELD! directive and the same field name will concatenate the information in that field. Also, PUT statements that have no directives are concatenated to the last field name submitted, or they are ignored if no PUT statements that have !NSF_FIELD! directives have previously been submitted.

You can populate fields, which can be edited, of the following types:

- text
- numeric
- keywords.

You can add text which will be formatted by Lotus Notes. You can also add a bitmap (in Windows bitmap format) using the following form:

!NSF_FIELD! *field-name* <bitmap-filename>

Use these action directives to perform actions on the Notes database:

!NSF_ADD!

immediately adds a document to the Notes database within the DATA step program.

!NSF_ABORT!

indicates not to add the note when closing the data stream. By default, the driver attempted to add a note at the end of a SAS program for every FILE statement used.

!NSF_CLR_FIELDS!

clears all the field values that were specified by the !NSF_FIELD! directive. This directive in conjunction with !NSF_ADD! facilitates writing DATA step programs with loops that add multiple notes to multiple databases.

!NSF_CLR_ATTACHES!

clears all the field values that were specified by the !NSF_ATTACH! directive. This directive in conjunction with !NSF_ADD! facilitates writing DATA step programs with loops that add multiple notes to multiple databases.

Note: The contents of PUT statements that do not contain directives are concatenated to the data that is associated with the most recent field value. Δ

Examples of Populating Lotus Notes Databases

The following example uses the Business Card Request database that is supplied by Lotus Notes. This DATA step creates a new document in the database and supplies values for all of its fields.

Example Code 8.1 Using the Business Card Request Database

```

01 filename reqcard NOTESDB;
02 data _null_;
03 file reqcard;
04 put '!NSF_DB! examples\buscard.nsf';
05 put '!NSF_FIELD!Status! Order';
06 put '!NSF_FIELD!Quantity! 500';
07 put '!NSF_FIELD!RequestedBy! Systems';
08 put '!NSF_FIELD!RequestedBy_CN! Jane Doe';
09 put '!NSF_FIELD!NameLine_1! Jane Doe';
10 put '!NSF_FIELD!NameLine_2! Developer';
11 put '!NSF_FIELD!AddressLine_1! Software R Us';
12 put '!NSF_FIELD!AddressLine_2! 123 Silicon Lane';
13 put '!NSF_FIELD!AddressLine_3! Garner, NC 27123';
14 put '!NSF_FIELD!AddressLine_4! USA';
15 put '!NSF_FIELD!PhoneLine_1! (910) 777-3232';
16 run;

```

Line 1 assigns a fileref by using the FILENAME statement to point to Notes instead of to an ordinary file. NOTESDB is the device type for Lotus Notes. Line 3 uses the assigned fileref to direct output from the PUT statement. Line 4 indicates which Notes database to open. Lines 5 to 15 specify the field and the value for that field for the new Notes document that is being created. Status is the field name and Order is the value that is placed in the Status field for the particular document. Line 16 executes these SAS statements. A new Notes document is created in the Business Card Request database.

The next example uses each observation in the SALES data set to create a new document in the **qrtsales.nsf** database and fills in the **Sales**, **Change**, and **Comments** fields for the documents.

Example Code 8.2 Creating a New Document from a Data Set

```

01 data sasuser.sales;
02   length comment $20;
03   format comment $char20.;
04   input sales change comment $ 12-31;
05 datalines;
06 123472 342 Strong Increase
07 423257 33 Just enough
09 218649 4 Not high enough
09 ;
10 run;
11 filename sales NOTESDB;
12 data _null_;
13   file sales;
14   set sasuser.sales;
15   put '!NSF_DB! qrtsales.nsf';
16   put '!NSF_FORM! Jansales';
17   put '!NSF_ADD!';
18   put '!NSF_FIELD!Sales !' sales;

```

```

19   put '!NSF_FIELD!Change!' change;
20   put '!NSF_FIELD!Comments!' comment;
21   put '!NSF_CLR_FIELDS!';
22 run;

```

Line 11 assigns a fileref by using the FILENAME statement to point to Notes instead of to an ordinary file. NOTESDB is the device type for Lotus Notes. Line 13 uses the assigned fileref to direct the output from the PUT statement. In line 15, the NSF_DB data directive indicates which Notes database to open. Lines 18, 19, and 20 specify the field and its value for the new Notes document that is being created. **Sales** is the field name and **sales** is the value that is placed in the Status field for the particular document. Line 22 executes these SAS statements. A new Notes document is created in the Sales database.

Expanding on the Business Card Request database example, you can create multiple Notes documents within a single DATA step or within SCL code by using action directives as well as data directives. The following example shows how to create multiple Notes documents within a single DATA step.

Example Code 8.3 Creating Multiple Notes Documents within a Single DATA Step

```

01 filename reqcard NOTESDB;
02 data _null_;
03   file reqcard;
04   put '!NSF_DB!Examples\buscard.nsf';
05   put '!NSF_FIELD!Status! Order';
06   put '!NSF_FIELD!Quantity! 500';
07   put '!NSF_FIELD!RequestedBy!Systems';
08   put '!NSF_FIELD!RequestedBy_CN! Jane Doe';
09   put '!NSF_FIELD!NameLine_1! Jane Doe';
10   put '!NSF_FIELD!NameLine_2! Developer';
11   put '!NSF_FIELD!AddressLine_1! Software R Us';
12   put '!NSF_FIELD!AddressLine_2! 123 Silicon Lane';
13   put '!NSF_FIELD!AddressLine_3! Garner, NC 27123';
14   put '!NSF_FIELD!AddressLine_4! USA';
15   put '!NSF_FIELD!PhoneLine_1! (910) 555-3232';
16   put '!NSF_ADD!';
17   put '!NSF_CLR_FIELDS!';
18   put '!NSF_FIELD!Status! Order';
19   put '!NSF_FIELD!Quantity! 10';
20   put '!NSF_FIELD!RequestedBy! Research and Development';
21   put '!NSF_FIELD!RequestedBy_CN! John Doe';
22   put '!NSF_FIELD!NameLine_1! John Doe';
23   put '!NSF_FIELD!NameLine_2! Analyst';
24   put '!NSF_FIELD!AddressLine_1! Games Inc';
25   put '!NSF_FIELD!AddressLine_2! 123 Software Drive';
26   put '!NSF_FIELD!AddressLine_3! Cary, NC 27511';
27   put '!NSF_FIELD!AddressLine_4! USA';
28   put '!NSF_FIELD!PhoneLine_1! (910) 555-3000';
29 run;

```

Line 1 assigns a fileref by using the FILENAME statement to point to Notes instead of to an ordinary file. NOTESDB is the device type for Lotus Notes. Line 3 uses the assigned fileref to direct the output from the PUT statement. Line 4 indicates which Notes database to open. Lines 5 to 15 specify the field and the value for that field for the new Notes document that is being created. **Status** is the field name and **Order** is the value placed in the **Status** field for this particular document. Line 16 forces the

creation of a new Notes document. Line 17 clears the values for the fields that are used with the `!NSF_FIELD!` data directives in the previous lines. Lines 18 to 28 specify the field and the value for that field for the second Notes document that is being created. **Status** is the field name and **Order** is the value placed in the **Status** field for the second document. Line 29 executes these SAS statements. A second Notes document is created in the Business Card Request database.

Only one `!NSF_DB!` data directive is issued in the preceding example. By default, the second Notes document is created in the same database as the one referenced in the `!NSF_DB!` data directive on line 4. In order to create the second Notes document in another database, you would have to issue another `!NSF_DB!` data directive with the new database filename before executing line 18. The key additions to this example are the action directives on lines 16 and 17.

Note: All directives are not case sensitive. However, the values following the data directives, such as form name and field name, are case sensitive. Δ

Preparing SAS/GRAPH Output for a Notes Document

SAS/GRAPH output can be passed to a Notes document through the NOTESDB access engine. A slight variation of the syntax for the `!NSF_FIELD!` data directive enables SAS/GRAPH output to be directed to a rich text format field in a Notes document. The procedure is:

- Export the SAS/GRAPH output to a bitmap file format.
- Use the modified `!NSF_FIELD!` data directive syntax to assign the value of the bitmap filename to an RTF field. Syntax is:

!NSF_FIELD! *RTF-field-name* < *bitmap-filename*

The following example uses the modified syntax.

Note: This example uses the Electronic Library sample database. Δ

Example Code 8.4 Exporting SAS/GRAPH Output into a Notes Document

```
01 filename myfile 'test1.bmp';
02 goptions device=bmp gsfname=myfile gsfmode=replace;
03 title1 'US Energy Consumption for 1955-1988';
04 proc gplot data=3Dsampsio.energy1;
05 plot consumed*year / des=3D'D0319U01-1';
06 run;
07 quit;

08 filename newdoc NOTESDB;
09 data _null_;
10 file newdoc;
11 put '!NSF_DB!Examples\hrdocs.nsf';
12 put '!NSF_FIELD!Subject! US Energy Consumption';
13 put '!NSF_FIELD!Categories! Office Services';
14 put '!NSF_FIELD!Body! US Energy Consumption for 1955-1988';
15 put '!NSF_FIELD!Body<c:\usenergy.bmp';
16 run;
```

Lines 1 to 6 contain code that is taken from the SAS/GRAPH samples by using a sample data set to generate SAS/GRAPH output. Line 8 assigns a fileref by using the `FILENAME` statement to point to Notes instead of to an ordinary file. NOTESDB is the

device type for Lotus Notes. Line 10 uses the assigned fileref to direct the output from the PUT statement. Line 11 indicates which Notes database to open. Lines 12 to 14 specify the field and the value for that field for the new Notes document that is being created. **Subject** is the field name and **US Energy Consumption** is the value that is placed in the **Subject** field for this particular document. Line 15 indicates a display of **usenenergy.bmp** bitmap file in the **Body** field because the less than symbol (<) rather than exclamation point (!) is used to separate the field value from the field name. Line 16 executes these SAS statements. A new Notes document is created in the Electronic Library database.

In the preceding example, the **Detailed** field is an RTF field. When using RTF fields, you can intersperse data and bitmaps.

Using SAS with the NotesSQL ODBC Driver

SAS also provides a SAS/ACCESS to ODBC pass-through engine that enables you to retrieve information about existing Notes documents in a Notes database. You can retrieve text fields only. Graphical data cannot be retrieved.

Note: You must have configured a Notes ODBC driver and data source. Δ

The following software is required:

- Lotus Notes Client Version 7.0.2 or later (32-bit only)
- ODBC Driver NotesSQL 3.02 (32-bit).

NotesSQL is an ODBC driver that is provided by Lotus. It can be downloaded free of charge from <http://www.lotus.com>.

After you have the software, you must

- 1 Set up the NotesSQL ODBC driver.

Lotus provides a file (.nfs) that explains how to set up the driver.

- 2 Configure the ODBC data source.

You must complete the Lotus Notes ODBC 2.0 Setup screen. Add the appropriate information to these fields:

Note: Examples are in parentheses. Δ

- Data Source name (**buscard**)
- Description (**Test Notes Access**)
- Server or Database name (**c:\notes\data\buscard.nsf**)
- NotesSQL Options Setup, which contains these fields:
 - Max Length of Text Fields (254)
 - Max Number of Tables (20)
 - Max Number of Subqueries (20)
 - Max Length of Rich Text Fields (512)
 - SQL Statement Length (4096)
 - Thread Timeout in seconds (60).

Click **OK** after you have completed the Setup screen.

Retrieving Information from Preexisting Notes Documents

The SAS/ACCESS to ODBC pass-through engine enables you to retrieve information about existing Notes documents in a Notes database. Example Code 8.5 on page 222

shows an example of how to use the DATA step to retrieve information from the Business Card Request database.

Example Code 8.5 Using ODBC to Retrieve Information from Preexisting Notes Documents

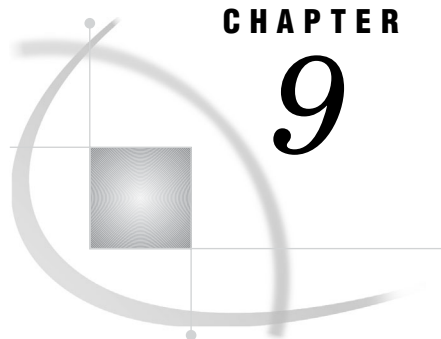
```
01 proc sql;
02   connect to ODBC ("dsn=3Dbuscard");
03   create table sasuser.buscard as
04   select * from connection to
05   ODBC (select * from All_Requests_By_Organization);
06   disconnect from ODBC;
run;
```

Line 1 processes SQL statements to manipulate SQL views and tables. Line 2 connects to ODBC, which establishes a connection to Notes through the SAS/ACCESS to ODBC driver and the NotesSQL ODBC driver by using the 3Dbuscard data source. Lines 3, 4, and 5 create a table and sasuser.buscard from the data that is retrieved from the Notes Business Card Request database table that is called

All_Requests_By_Organization. This is the default view that is assigned to the Business Card Request database. Line 6 disconnects from ODBC and closes the connection to the Notes database. Line 7 executes these SAS statements. A new data set named **buscard** is created in the Sasuser library.

As another alternative, you can view the available tables within Notes databases by using the SQL Query Window. The SQL Query Window, a component of SAS, is an interactive interface that enables you to easily build queries without writing programming statements. You can invoke it by issuing the QUERY command from the command line.

For more information about PROC SQL, see *Base SAS Procedures Guide*.



CHAPTER

9

Using Windows System Tools with SAS

<i>Introduction to Using Windows System Tools with SAS</i>	223
<i>Event Viewer Application Log</i>	224
<i>Accessing the Application Log Using Windows Vista</i>	224
<i>Accessing the Application Log Using Windows 7</i>	224
<i>Accessing the Application Log Using Windows Server 2003</i>	224
<i>Accessing the Application Log Using Windows XP</i>	225
<i>Viewing a SAS Event</i>	225
<i>Sending Messages to the Application Log Using a User-Written Function</i>	225
<i>Specifying the Function's First Parameter</i>	225
<i>Examples of Using the User-Written Function to Write to the Event Log</i>	226
<i>Sending Messages to the Application Log Using LOGEVENT.EXE</i>	227
<i>Performance Tools</i>	228
<i>Why Use a Performance Monitor?</i>	228
<i>Starting the Windows Performance Monitors</i>	228
<i>Performance Counters and Objects</i>	229
<i>SAS Counters in the Performance and System Monitors</i>	229
<i>Selecting SAS Counters to Monitor</i>	230
<i>Examples of Monitoring the DATA Step, PROC SORT, and PROC SQL</i>	230
<i>Configuring the Performance Monitors</i>	230
<i>Examining the Performance between the DATA and PROC SORT Steps</i>	231
<i>Examining a PROC SQL Query</i>	232
<i>Starting SAS as a Windows Service</i>	234
<i>Overview of Starting SAS as a Windows Service</i>	234
<i>Starting the SAS Service Configuration Utility</i>	234
<i>Creating an Initialization File</i>	234
<i>Overview of the Initialization File</i>	234
<i>Creating an Initialization File Using the SAS Service Configuration Utility</i>	235
<i>Creating the Initialization (INI) File Using a Unicode Text Editor</i>	238
<i>Installing a SAS Service</i>	240
<i>Starting a SAS Service</i>	242
<i>Removing a SAS Service</i>	242

Introduction to Using Windows System Tools with SAS

Advanced users and system administrators can start SAS by using Windows services and monitor SAS by using Windows event logging and performance tools.

SAS supports logging of error messages to the Windows Event Viewer's Application Log. Abnormal termination of SAS tasks (such as an access violation) can be viewed in the Application Log in addition to the SAS Log. Also, informational messages from

SAS/CONNECT software can be viewed in the Application Log. For more information, see “Event Viewer Application Log” on page 224.

Using the Windows System Monitor under Windows XP and Windows Server 2003, you can monitor your SAS sessions to obtain the information that you need to diagnose problems and tune your session. For more information, see “Performance Tools” on page 228.

You can start SAS as a Windows service, which enables you to start SAS automatically and to specify recovery procedures if SAS fails. For more information, see “Starting SAS as a Windows Service” on page 234.

Event Viewer Application Log

Accessing the Application Log Using Windows Vista

To open the Application Log:

- 1 Open the Control Panel.
- 2 Select **System and maintenance**.
- 3 Under **Administrative tools**, select **Event Viewer**.

Note: Select **Continue** if you receive a message stating that Windows needs your permission to continue. △

- 4 In the tree view, select **Windows logs**.
- 5 Select **Application log**.

Accessing the Application Log Using Windows 7

To open the Application Log:

- 1 Open the Control Panel.
- 2 Select **System and security**.
- 3 Under **Administrative tools**, select **Event Viewer**.

Note: Select **Continue** if you receive a message stating that Windows needs your permission to continue. △

- 4 In the tree view, select **Windows logs**.
- 5 Select **Application log**.

Accessing the Application Log Using Windows Server 2003

Using Windows Server 2003, you access the Application Log from the Event Viewer tree view:

- 1 Select **Start ► Settings ► Control Panel**.
- 2 Double-click **Administrative Tools**.
- 3 Double-click **Event Viewer**.
- 4 In the Tree view, select **Application Log**.

An alternate method of starting the Event Viewer is to type `eventvwr` in the Run dialog box and click **OK**.

Accessing the Application Log Using Windows XP

Using Windows XP, you access the Application Log from the Event Viewer tree view:

- 1 Select **Start ► Control Panel**.
- 2 Double-click **Administrative Tools**.
- 3 Double-click **Event Viewer**.
- 4 In the Tree view, select **Application Log**.

An alternate method of starting the Event Viewer is to type `eventvwr` in the Run dialog box and click **OK**.

Viewing a SAS Event

If a SAS task ends abnormally, information about the task is placed in the Application Log. The **source** column shows “SAS” as the event source. Messages from SAS/CONNECT display “SAS Job Spawner” as the event source. Double-clicking a SAS event opens the Event Properties window that contains information about the event.

Sending Messages to the Application Log Using a User-Written Function

Specifying the Function’s First Parameter

SAS events can be sent to the Application Log by using a user-written function in either SAS code or SAS Component Language (SCL). Input to the function is a specific text string. This text string corresponds to the type of event and to the text string that will appear in the Event Viewer:

```
yourfunction("type_of_event", "text_string");
```

The following table lists the types of events that are available for the first parameter.

Table 9.1 Types of SAS Events

Type of Event	First Parameter Value
Error	“ERROR”
Warning	“WARNING”
Information	“INFORMATION”

Success Audit	"SUCCESSAUDIT"
Failure Audit	"FAILUREAUDIT"

Although the first parameter values that are displayed in the table are shown in uppercase, mixed case is also allowed. The second parameter of the function is a string that will appear in the Windows Event Viewer.

Examples of Using the User-Written Function to Write to the Event Log

In the following example, the existence of a semaphore file is checked before SAS performs lengthy processing:

```
%macro pdata(file);
  %let cmdstr = "dir &file";
  options noxwait;
  data _null_;
    call system(&cmdstr);
  run;
  %put &sysrc = sysrc;
  %put &file;
  %if &sysrc=0 %then %do;
    filename indata "&file";
    /* Your data step code for this file. */
    DATA a;
      infile indata length=linelen;
      length line $ 200;
      input @1 line $ varying200. linelen;
    PROC print;
    run;
  %end;
  %else %do;
    /* Log an Event of type Error. */
    %let cmdstr = %str("The file &file did not exist
                      so no data step ran.");
    %put &cmdstr;
    DATA _null_;
      x=ntlog("INFORMATION",&cmdstr);
    run;
  %end;
%mend;

%pdata(c:\config.syss)
```

The following is SCL code to write to the Application Log:

```
/* Build a frame and add a pushbutton. Change the Attribute
Name 'name' to 'object1'. In the Source window, add the
following code. */
object1:

x=ntlog("INFORMATION", "This is an INFORMATION event.");
x=ntlog("WARNING", "This is a WARNING event.");
x=ntlog("ERROR", "This is an ERROR event.");
```

```
x=ntlog("SUCCESSAUDIT", "This is a SUCCESSAUDIT event.");
x=ntlog("FAILUREAUDIT", "This is a FAILUREAUDIT event.");

return;
```

Sending Messages to the Application Log Using LOGEVENT.EXE

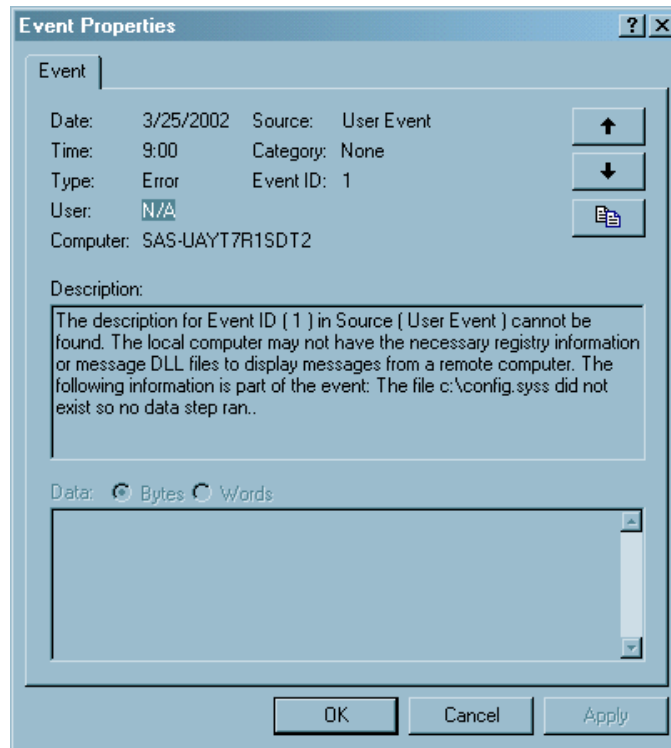
Using the Windows LOGEVENT.EXE utility that is provided by the Windows Resource Kit, you can send your own information messages to the Application Log from within SAS code.

In the following example, the existence of a semaphore file is checked before SAS performs some lengthy processing.

```
%macro pdata(file);
  %local cmdstr;
  %let cmdstr = "dir &file";
  options noxwait;
  DATA _null_;
    call system(&cmdstr);
  run;
  %if &sysrc=0 %then %do;
    filename indata "&file";
    /* Your data step code for this file. */
    DATA a;
      infile indata length=linelen;
      length line $ 200;
      input @1 line $ varying200. linelen;
    PROC print;
      run;
  %end;
  %else %do;
    /* Log an Event of type Error. */
    %let cmdstr = %bquote(c:\support\sasset2\logevent.exe -s E
      "The file &file did not exist so no data step ran.");
    DATA _null_;
      %sysexec &cmdstr;
    run;
  %end;
%mend;

%pdata(c:\config.syss)
```

When you double-click the event in the Application Log, the Event Properties window will display the message in the **Description** box.

Display 9.1 Displaying a User Message in The Event Detail Dialog Box

For information about LOGEVENT.EXE, see the documentation for the Windows Resource Kit.

Performance Tools

Why Use a Performance Monitor?

The Windows performance monitors are useful for tuning and diagnosing problems in your application or computer system. The monitors include System Monitor under Windows XP, Windows Vista, Windows 7, and Windows Server 2003. By correlating the information from SAS counters with other operating environment counters, you can more easily troubleshoot performance problems.

For example, suppose that your SAS job appears not to be running. Perhaps the job is performing a long and complicated DATA step that generates a very large data set on a network drive. You can be certain that the job is still running by monitoring the Disk WriteFile Bytes Written/Sec and Disk WriteFile Bytes Written Total counters.

Starting the Windows Performance Monitors

When you type `perfmon` in the Run dialog box, you open the Performance window when you use Windows Vista, Windows 7, and Windows XP.

You can also access the Performance Monitor and the Performance window from the Administrative Tools folder.

Note: If you run SAS v9.1.3 or the 32-bit version of SAS 9.2 on a Windows x64 system, you will not be able to use the SAS performance counters. The reason for this is that the Performance Monitor (PERFMON) is a 64-bit application on Windows x64 systems, but SAS v9.1.3 and the 32-bit version of SAS 9.2 are 32-bit applications and run in compatibility mode. If you want to use the performance counters for 32-bit versions of SAS on Windows x64 systems, then you will need to invoke the 32-bit version of PerfMon after the 32-bit versions of SAS has been invoked. To invoke the 32-bit version of PerfMon, bring up a Windows Explorer and open the folder: **c:\Windows\SysWOW64** which contains the 32-bit applications. In this folder, you will see the 32-bit version of PerfMon. Invoking this version of PerfMon will allow you to see and use the 32-bit versions of SAS performance counters. △

Performance Counters and Objects

A counter is a piece of information that the system monitors. Performance objects represent individual processes, sections of shared memory, and physical devices, such as Memory and LogicalDisk. Counters are grouped by objects. For example, the Memory object contains counters such as Available Bytes, Committed Bytes, and Page Faults/sec. The Processor object has counters such as %Processor Time and %User Time.

By observing various system counters and application-defined counters, you can determine performance problems. You can search for problems in your system and isolate them to areas such as hardware, system software, or your application. For more information about the System Monitor, see the Windows XP Resource Kit.

SAS Counters in the Performance and System Monitors

SAS includes the following application-defined counters in the SAS object:

Virtual Alloc'ed Memory

specifies the amount of committed virtual memory that SAS allocates through the VirtualAlloc() API.

Disk ReadFile Bytes Read Total

specifies the total number of bytes that SAS reads from disk files through the ReadFile() API.

Disk ReadFile Bytes Read/Sec

specifies the number of bytes that SAS reads per second from disk files through the ReadFile() API.

Disk WriteFile Bytes Written Total

specifies the total number of bytes that SAS writes to disk files through the WriteFile() API.

Disk WriteFile Bytes Written/Sec

specifies the number of bytes that SAS writes per second to disk files through the WriteFile() API.

Disk SetFilePointer/Sec

specifies the number of times per second that SAS successfully calls the SetFilePointer() API on disk files.

Memlib/Memcache Current Usage K

specifies in bytes the amount of Extended Server Memory that is currently in use.

Memlib/Memcache Peak Usage K

specifies in bytes the maximum amount of Extended Server Memory that is used in the current SAS session.

Selecting SAS Counters to Monitor

Use the following procedures to monitor SAS counters in your respective operating environment:

Table 9.2 Procedure for Selecting SAS Counters

Using Windows XP

- 1 Start SAS.
 - 2 Open the Performance window.
 - 3 Click the **Add (+)** button.
 - 4 From the **Performance object** list, select **Process**.
 - 5 From the Instances list, select **SAS**.
 - 6 For each counter that you want to monitor, select the counter from the list and click **Add**.
 - 7 Click **Close** when you have completed selecting counters.
-

The performance monitor immediately collects and displays information about the counters that you selected.

Multiple SAS counters can be monitored. You can see multiple instances monitored, where each instance is a separate SAS process. SAS instances are listed in the form SAS PID *number*. The PID number is the process identifier of the SAS session. You can see a list of all processes by using the Task Manager.

Examples of Monitoring the DATA Step, PROC SORT, and PROC SQL

Configuring the Performance Monitors

Configure the Performance Monitor and the System Monitor for all examples as follows:

- 1 Invoke SAS and the Performance Monitor or the System Monitor.
- 2 Open the Add Chart window or the Add Counters window and select the SAS object.
- 3 Add these SAS counters:
 - Disk ReadFile Bytes Read/Sec
 - Disk WriteFile Bytes Written/Sec
 - Disk SetFilePointer/Sec
- 4 Select the Process object.
- 5 Add these Process counters:
 - %Processor Time
 - %User Time
 - %Privileged Time
- 6 Click **Done** or **Close**.

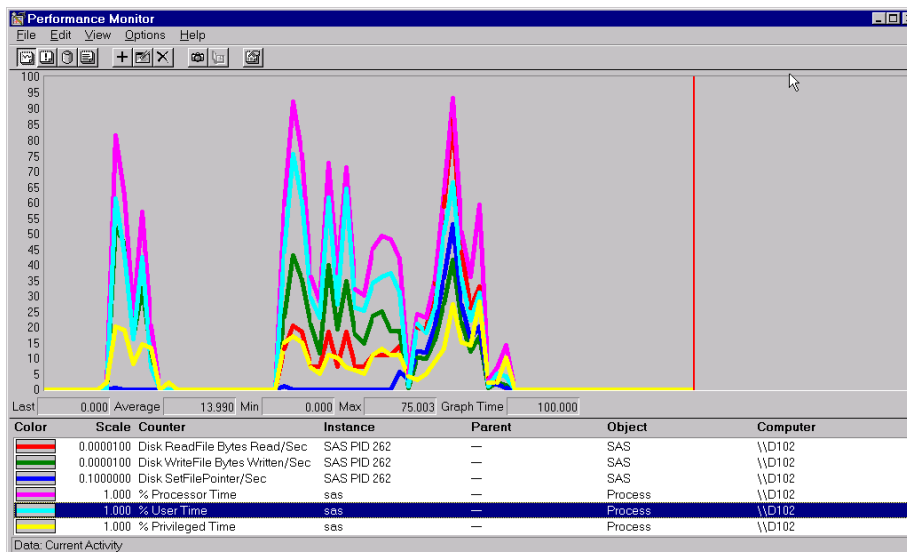
Examining the Performance between the DATA and PROC SORT Steps

To see the difference in performance between the DATA step and the PROC step, submit this code:

```
options fullstimer;
  /* Create a test data set with some random data. */
DATA a (drop=s);
  do i = 1 to 500000;
    x = ranuni(i);
    y = x*2;
    z = exp(x*y);
    output;
  end;
  /* The sleep helps to delineate the subsequent */
  /* sort in the Performance Monitor graph      */
  s = sleep(15);
run;
PROC sort data = a noduplicates;
  by z y x i;
run;
```

After you submit this code, the Performance Monitor or System Monitor will generate results similar to those results in Display 9.2 on page 231. You might have to adjust the scale factor of the different counters.

Display 9.2 Performance of the DATA Step and the PROC SORT Step



The DATA step in the display shows that there is very little activity from Disk ReadFile Bytes Read/Sec or Disk SetFilePointer/Sec. Notice that in the subsequent PROC SORT output there is much more activity from these two counters. The output indicates that the data set is being read (Disk Readfile Bytes Read/Sec) in order to be sorted, and that a certain amount of random I/O is performed by the sort (Disk SetFilePointer/Sec).

The pause in the activity is caused by the SLEEP function that follows the DATA step. The Disk WriteFile Bytes Written/Sec counter is active in both the DATA step and in the PROC SORT step.

Finally, you can correlate the counters from the Process object with the user and system CPU times in your SAS log.

Examining a PROC SQL Query

To examine the performance of a PROC SQL query with an index, submit the following code:

- 1 Submit the code in Step 1 and Step 2. Step 2 creates an index.

```

/* Step 1                                     */
/* Create a test data set with some random data. */
/* Do this twice - once with Step 2 and once   */
/* without Step 2.                             */

libname sample 'c:\';
DATA sample.a;
  do i = 1 to 500000;
    x = ranuni(i);
    y = x*ranuni(i);
    z = exp(y);
    output;
  end;
run;

/* Step 2                                     */
/* Create a simple index on variable x.       */
/* Submit this step once.                    */

PROC DATASETS library = sample;
  modify a;
  index create x;
quit;

```

- 2 Clear the graph by selecting **Clear Display** from the Edit menu or the **Clear Display** toolbar button.
- 3 Submit the code in Step 3 to see a graph such as Display 9.3 on page 233.

```

/* Step 3                                     */
/* Perform a query on the data. Do this twice - */
/* once with an index and once without an index */
/* The query should select about 50% of the     */
/* observations in the data set.                */

PROC SQL;
  create table sample.yz as
  select y,z
    from sample.a
   where x > 0.5;
quit;

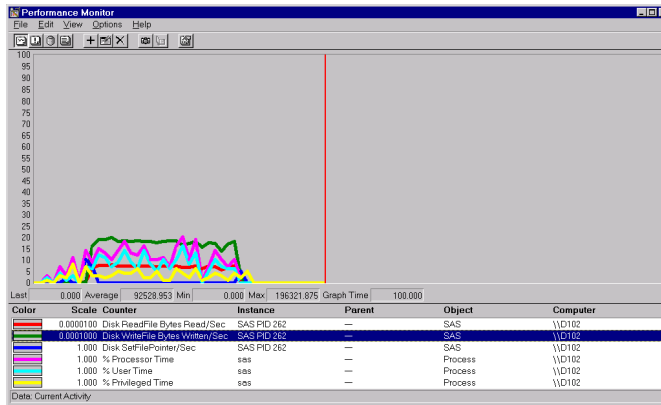
```

To perform a PROC SQL query without an index:

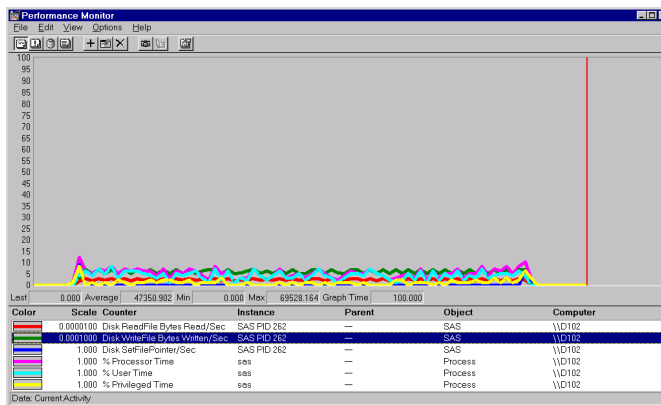
- 1 Resubmit Step 1.

- 2 Clear the graph.
- 3 Resubmit Step 3 to see a graph such as Display 9.4 on page 233.

Display 9.3 Performance of PROC SQL Query with an Index



Display 9.4 Performance of PROC SQL Query without an Index



In Display 9.4 on page 233, the counters averaged under 10% on the scale, whereas in Display 9.3 on page 233, several of the counters averaged more than 10%, and the Disk WriteFile Bytes Written/Sec counter rose more than 25%. A higher value for these counters implies good overall throughput for the operation.

Note that to make a valid comparison with the Performance Monitor graph or with the System Monitor graph, you must ensure that the counters are using the same scale. You can confirm the counters by observing the absolute values. The Average value for Disk WriteFile Bytes Written/Sec in Display 9.3 on page 233 was 92528.953. Contrast this value with the same counter in Display 9.4 on page 233, in which the Average value was 47350.902. For this operation, bytes were written almost twice as fast when the data set was indexed.

Starting SAS as a Windows Service

Overview of Starting SAS as a Windows Service

Starting SAS as a Windows service enables you to start SAS automatically or manually, define recovery procedures if SAS fails, and enable users to log on and log off a PC without interrupting SAS. When SAS is defined to start manually, you can start SAS either from an application by using the **net start** command or by using the Windows Services dialog box.

The general process for configuring SAS as a Windows service is as follows:

- 1 Create an initialization (.INI) file.
- 2 Install the .INI file to register SAS as a Windows service.
- 3 If SAS is configured to start automatically, restart your machine. If SAS is configured to start manually, you can start SAS either from an application or the Services window in all Windows operating environments. For more information, see “Starting a SAS Service” on page 242.

If you have multiple SAS configurations, you can create an initialization file for each configuration.

SAS provides the SAS Service Configuration Utility (SAS SCU) to configure the service and install the .INI file.

Starting the SAS Service Configuration Utility

To start the SAS SCU, do one of the following:

- Select **Start** \blacktriangleright **Programs** \blacktriangleright *your-SAS-System-folder* \blacktriangleright **SAS 9.2 License Renewal & Utilities** \blacktriangleright **SAS Service Configuration Utility**
- From the SAS SCU directory, type **sasservicemngr.exe**. The default SAS SCU directory is **c:\Program Files\SAS\SASFoundation\9.2\core\sasscu**.

Creating an Initialization File

Overview of the Initialization File

Before you can start SAS as a Windows Service, you need to configure and install an initialization (.INI) file. The .INI file is a Unicode file that

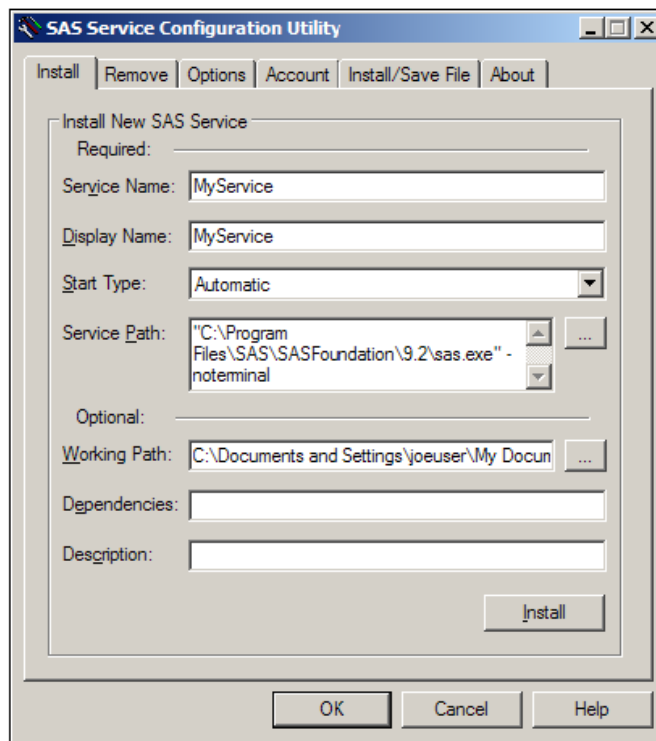
- names the SAS service
- specifies if the service is to start automatically or manually
- defines paths to SAS and SAS working paths
- specifies the level of access that an application has to the SAS service
- names other Windows services that must be started before this service can be started
- defines the actions that Windows is to complete if SAS fails to start as a service
- specifies whether the SAS service is a system account or a local account
- specifies whether the user can interact with the SAS desktop.

You create the initialization file either by using the SAS SCU graphical user interface (GUI) or by using a Unicode-capable text editor, such as Notepad. If you use the SAS SCU GUI, you specify only the required values and the SAS SCU creates the .INI file for you. If you use a text editor to create the .INI file, you must specify the SAS service settings and their values. You must save the file as a Unicode file, not as an ANSI or ASCII-encoded file. Table 9.4 on page 238 explains the settings that you specify to create a SAS service .INI file with a text editor.

Creating an Initialization File Using the SAS Service Configuration Utility

Use the SAS Service Configuration Utility (SAS SCU) that is shown in the following display to create the .INI file. After configuring the settings, click the **Install/Save File** tab to save and install the .INI file.

Display 9.5 SAS Service Configuration Utility



To configure the INI file, select the following tab and modify the appropriate settings:

Install tab

Service Name

is the service name that is registered to Windows when the service is installed. The service name is also the name that is used when a net start or a net stop command is issued. This field is required. The default is **SASService**.

Display Name

is the name of the service that is displayed to user-interface applications. This field is required. The default is **A SAS Service**.

Start Type

specifies whether the SAS service is started manually, automatically, or is disabled. This field is required. The default is **Manual**. **Manual** specifies that the service can be started by another process. **Automatic** specifies that the service is started automatically during system startup. **Disabled** specifies that the service cannot be started.

Service Path

contains both the directory path in which SAS is installed and also the SAS command that is used to start the service. This field is required. For a new installation, the default path is the SAS installation path, followed by the command **sas.exe -noterminal**. If the SAS SCU has been installed previously, the default path is **c:\Program Files\SAS\SASFoundation\9.2** followed by **sas.exe -noterminal**. The NOTERMINAL system option is required. To start a SAS program as a service, add the SYSIN system option followed by the program pathname and filename to the Service Path. To select a service path, click ... (ellipse button).

Working Path

is the working path that is used by applications that use the SAS Service to create directories, store files, and log information. This field is optional. The default is the user's profile directory. Under Windows Vista and Windows 7, the user's profile is located at **c:\Users\user ID\Documents\My SAS Files\9.2**. Under all other Windows operating environments, the user profile is located at **c:\Documents and Settings\user ID\My Documents\My SAS Files\9.2**. To select a working path, click ... (ellipse button).

Dependencies

specifies one or more Windows services that must be started before this service is started. If a dependent service is installed and enabled, the service is started before this service is started. If a service is installed but disabled, this service will not be started.

To specify dependencies, type one or more service names separated by the pipe (|) character. For example, NetDDE|NetDDEdsdm.

Description

Type a description of the service. The description appears in the Windows Services window.

Remove tab**Remove Existing Service**

specifies the name of the installed SAS service that you want to remove.

Options tab**Error Control**

determines the error severity if the SAS Service fails to start. Select one of the following error controls:

Table 9.3

Error Control	Description
Ignore	The error is logged. Startup operations continue.
Normal	The error is logged and a message is displayed. Startup operations continue.

Error Control	Description
Severe	The error is logged and startup operations continue by using the last successfully installed INI file.
Critical	An attempt to log the error is made. If the startup operation is using the last known successful INI file, startup operations fail. If the startup operation is not using the last known successful INI file, it will attempt to restart the service by using the last successful INI file.

Access

is the level of access that an application has to the SAS Service. When you select an access level, such as Read, Write, or Execute, certain access type settings are set to **1 (TRUE)** in the INI file. To further configure all access types settings, select the appropriate boxes. For a description of access type settings, see Table 9.4 on page 238. The access levels are

Read

enables an application to set the **Interrogate**, **Query Configuration** and **Query Status** access type settings. Selecting this access level sets the AccessInterrogate=, AccessQryCfg=, and AccessQryStatus= settings in the .INI file to **1 (TRUE)**.

Write

enables an application to set the **Change Configuration** access type. Selecting this access level sets the AccessChgCfg= setting in the .INI file to **1 (TRUE)**.

Execute

enables an application to set the **Interrogate**, **Pause/Continue**, **Start Service**, **Stop Service**, and **Define Control** access types. Selecting this access level sets the AccessInterrogate=, AccessPauseCont=, AccessStart=, AccessStop, and AccessUserDefCtrl= settings in the .INI file to **1 (TRUE)**.

Account tab

System Account

specifies that the service is shared for all users that log on to this machine. To enable the service to interact with the user from the desktop, select **Allow this Service to interact with the Desktop**. When you select **System Account**, the ServiceStartName= setting in the INI file is set to **LocalSystem**.

This Account

specifies that the service is for a specific user only. When you select **This Account**, type the account name in the box. Then type the password in the **Password** and **Confirm Password** boxes.

Install/Save File tab

Install from file

Click the **Install from file** button to specify an initialization (INI) file to install.

Save settings to file

Click the **Save settings to file** button to save the settings that you have specified in the SAS Service Configuration Utility GUI to a file.

Show file contents

Select the **Show file contents** box if you want to display the initialization file that you want to install or save in the **File Contents** box.

About tab

displays the copyright information for the SAS Service Configuration Utility.

Creating the Initialization (INI) File Using a Unicode Text Editor

To create a SAS Service INI file by using any Unicode-capable text editor, such as Notepad, create a new file in the editor and assign a valid value to each of the settings in the following table. Type only one setting per line:

Table 9.4 SAS Service INI File Settings and Default Values

Setting Name	Required	Explanation	Valid Values	Defaults	Related SAS SCU Field
Service Name=	Yes	The SAS Service name registered to Windows.	Can contain up to 32 characters (/ and \ are not valid). The name is not case sensitive and it must be contained in quotation marks.	"SASService"	Service Name
Display Name=	Yes	The name of the service that is displayed to user-interface applications.	Can contain up to 256 characters, is not case sensitive, and must be contained in quotation marks.	"A SAS Service"	Display Name
Binary Pathname=	Yes	Contains the directory path in which the SAS Service INI file is installed, followed by the SAS command to start the service.	The pathname must be contained in both brackets and quotation marks.	["SAS <i>installation path</i> \sas.exe -noterminal"]	Service Path
Start Type=	Yes	Specifies whether the SAS Service is to start manually or automatically.	SERVICE_AUTO_START SERVICE_DEMAND_START SERVICE_DISABLED	SERVICE_DEMAND_START	Start Type
Dependencies=	No	Specifies Windows services that must be started before this service is started.	One or more Windows service names, separated by the pipe () character. Enclose dependences in quotation marks.	none	Dependencies
Description	No	A description of the service	The description can contain alphanumeric characters and must be enclosed in quotation marks.	none	Description

Setting Name	Required	Explanation	Valid Values	Defaults	Related SAS SCU Field
WorkDir=	No	The directory used by applications to store files created and used by the SAS Service.	The path to the working directory must be contained in quotation marks.	"Under Windows Vista and Windows 7 - c:\Users\user ID" or Under Windows XP and 2003 - "c:\Documents and Settings\user ID"	Working Path
ErrorControl=	Yes	Determines the error severity if the SAS Service fails to start.	SERVICE_ERROR_IGNORE SERVICE_ERROR_NORMAL SERVICE_ERROR_SEVERE SERVICE_ERROR_CRITICAL	SERVICE_ERROR_NORMAL	Error Control
Interactive=	Yes	Specifies whether the service allows a user to interact with the SAS desktop.	1(TRUE) 0(FALSE)	0(FALSE)	Interactive Process
AccessChgCfg=	Yes	Modifies the SAS Service configuration.	1(TRUE) 0(FALSE)	1(TRUE)	Change Configuration
Access Interrogate=	Yes	Requests that the SAS Service immediately update its current status.	1(TRUE) 0(FALSE)	1(TRUE)	Interrogate
Access PauseCont=	Yes	Pauses and resumes the SAS Service.	1(TRUE) 0(FALSE)	1(TRUE)	Pause/Continue
AccessQryCfg=	Yes	Makes queries about the SAS Service configuration.	1(TRUE) 0(FALSE)	1(TRUE)	Query Configuration
AccessQry Status=	Yes	Queries Windows about the status of the SAS Service.	1(TRUE) 0(FALSE)	1(TRUE)	Query Status
AccessStart=	Yes	Starts the SAS Service.	1(TRUE) 0(FALSE)	1(TRUE)	Start Service
AccessStop	Yes	Stops the SAS Service.	1(TRUE) 0(FALSE)	1(TRUE)	Stop Service
AccessUser DefCtrl=	Yes	Specifies a user-defined control code.	1(TRUE) 0(FALSE)	1(TRUE)	Define Control

Setting Name	Required	Explanation	Valid Values	Defaults	Related SAS SCU Field
ServiceStart Name=	No	The Windows user account with proper user rights to run the SAS Service.	LocalSystem or Windows account name	LocalSystem	This Account
Password=	No	The Windows account password.	an encrypted password	none	Password

When you create an .INI file by using a text editor and you want to specify ServiceStartName for a specific user, the Windows account name must be of the format *domainname\username* and you must include an encrypted password in the PASSWORD setting name. You can use the PWENCODE procedure to create an encrypted password. For example, the following PWENCODE procedure specifies **mypw** as the input password:

```
proc pwencode in='mypw';
run;
```

The SAS log displays the encrypted password **{sas001}bX1wdw==**. You then specify **{sas001}bX1wdw==** as the value for the Password= setting in your .INI file. An encrypted password is necessary only if you specify Password= in an .INI file. In comparison, when you create an .INI file by using the SAS SCU, you specify a text password. The SAS SCU encrypts the password for you.

For more information about the PWENCODE procedure, see *Base SAS Procedures Guide*.

Installing a SAS Service

When you have created the initialization file, you use the initialization file to install SAS as a service. A SAS service can be installed either from the SAS SCU, from the command prompt, or from within an application.

To install a SAS Service by using the SAS SCU:

- 1 Select the Install/Save File tab.
- 2 Select **Install from file**.
- 3 From the Open dialog box, select an INI file.
- 4 Click **Open**.

To install a SAS Service from the command prompt, ensure that both the SAS Service Configuration Utility directory and the directory that contains the INI file are accessible from your system path. From the command prompt type **sasservicemngr.exe path/filename.ini**. When you install a SAS Service from the command prompt, user messages are disabled.

Note: You can also install a service from the Install Tab for SAS SCU GUI. △

When a SAS Service is installed from an application, the command to install the service is `sasservicemngr.exe path/filename.ini`. The following table lists the return codes that can be passed back to the calling application:

Table 9.5 Return Codes from Installing or Running a SAS Service

Numeric Code	Error Code	Description
0	SUCCESS	The service has successfully been installed.
5	ERROR_ACCESS_DENIED	Access to the Service Control Manager is denied.
6	ERROR_INVALID_HANDLE	Error loading the Service Control Manager.
25	ERROR_NOT_FULL_PATH_CREATED	The full path could not be created.
26	USER_CANCELED_INSTALL	The user canceled the installation.
30	SUCCESS_NO_REG_DIR	The service was installed but failed to register the working directory.
35	ERROR_BINPATH_NOTFOUND	The service file was not found, no installation
40	ERROR_USER_CANCEL_NOSRVC	The user canceled the installation because an INI file was not found.
50	ERROR_MISSING_FILE_ARGUMENT	A required argument in the INI file is missing.
51	ERROR_INVLAID_FILE_ARGUMENT	An INI file argument contains an incorrect value.
55	ERROR_OPENFILE	The INI file could not be opened.
60	ERROR_ITEMTOOLARGE	A string value exceeds the maximum character limit.
65	ERROR_PASSED_DECRYPT_FAILED	The password could not be decrypted.
87	ERROR_INVALID_PARAMETER	A service parameter is incorrect.
123	ERROR_INVALID_NAME	The specified service name is not valid.
1057	ERROR_INVALID_SERVICE_ACCOUNT	The account name is incorrect or does not exist.
1060	ERROR_SERVICE_DOES_NOT_EXIST	The specified service does not exist as an installed service.
1065	ERROR_DATABASE_DOES_NOT_EXIST	The specified database does not exist.

Numeric Code	Error Code	Description
1072	ERROR_SERVICE_MARKED_FOR_DELETE	The specified service has been marked for deletion.
1073	ERROR_SERVICE_EXISTS	A duplicate service name exists on the network.
1078	ERROR_DUPLICATE_SERVICE_NAME	A duplicate display name exists on the network.

Starting a SAS Service

A SAS Service can be started automatically or manually. If the SAS Service is configured to start automatically, the service starts when the system starts. If the SAS Service is configured to start manually, the service can be started either from an application by using the **net start** command or by using the Services dialog box.

To start a SAS Service using the Services dialog box:

- Under Windows Vista, select **Start ► Settings ► Control Panel ► System and maintenance ► Administrative tools ► Services**

Under Windows 7, select **Start ► Settings ► Control Panel ► System and security ► Administrative tools ► Services**

Under all other Windows operating environments, select **Start ► Settings ► Control Panel ► Administrative Tools ► Services**

- From the **Services** list box, select the SAS service.
- Click **Start**.

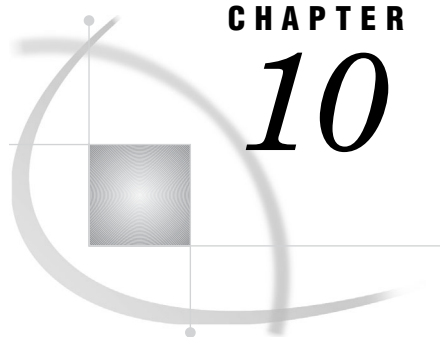
Removing a SAS Service

A SAS Service can be removed as a Windows service from the SAS SCU or from the command prompt.

To remove a SAS Service by using the SAS SCU:

- 1 Open the SAS SCU and click the **Remove** tab.
- 2 Select the SAS Service from the **Remove Existing Services** box.
- 3 Click **Remove**.
- 4 Select **Yes** to confirm the removal of the service from the **Remove Service** dialog box.

To remove a SAS Service from the command prompt, type **sasservicemngr.exe / remove <servicename>**.



CHAPTER

10

Using OLE in SAS/AF Software

<i>About OLE</i>	244
<i>SAS/AF Catalog Compatibility</i>	244
<i>Inserting an OLE Object in a FRAME Entry</i>	244
<i>Introduction to Inserting an OLE Object in a FRAME Entry</i>	244
<i>Inserting an OLE Object</i>	245
<i>Pasting an OLE Object from the Clipboard</i>	245
<i>Reading an OLE Object from an HSERVICE Entry</i>	246
<i>Inserting an OLE Object by Dragging It</i>	246
<i>Dragging OLE Objects During Run Time</i>	247
<i>Changing the Drag Action</i>	247
<i>Editing an OLE Object within a FRAME Entry</i>	248
<i>Invoking OLE Verbs</i>	249
<i>Using Linked OLE Objects</i>	249
<i>Updating a Linked Object with the Links Dialog Box</i>	250
<i>Updating a Linked Object Programmatically</i>	251
<i>Converting OLE Objects</i>	251
<i>Automating OLE Objects and Applications</i>	252
<i>Accessing Array Values Returned by the OLE Automation Server</i>	253
<i>Using Value Properties</i>	254
<i>Specifying Optional Parameters in OLE Server Methods</i>	255
<i>Creating an External OLE Automation Instance</i>	255
<i>Example: Populating a Microsoft Excel Spreadsheet with SAS Data</i>	257
<i>Using OLE Custom Controls (OCXs) in Your SAS/AF Application</i>	259
<i>Inserting an OLE Control in a FRAME Entry</i>	260
<i>Registering OLE Controls</i>	260
<i>Accessing OLE Control Properties</i>	260
<i>Accessing the OLE Control Properties Page</i>	260
<i>Accessing Properties Using SCL Code</i>	261
<i>Interacting with the OLE Control Using SCL Methods</i>	261
<i>Responding to OLE Control Events</i>	262
<i>Assigning SCL Code to an OLE Control Event</i>	262
<i>Retrieving Argument Values from Events</i>	263
<i>Example: Mapping OLE Control Events to SCL Code</i>	263
<i>Example: Subclassing an OLE Custom Control</i>	264
<i>Adding an Item to a Combo Box List</i>	264
<i>Finding an Item in a Combo Box</i>	265
<i>Retrieving the Text Value of the Control</i>	265

About OLE

OLE is a means of integrating multiple sources of information from different applications into a unified document. These objects can include text, graphics, charts, sound, video clips, and much more.

OLE 1.0, which the SAS has supported since Release 6.08, allowed you to link and embed OLE objects into SAS/AF FRAME entries and SAS/EIS applications. OLE 2.0, which SAS 9.2 supports, provides many new features that you can use to enhance your SAS/AF frames and SAS/EIS applications.

Note: SAS under Windows (and OLE 2.0 in general) still supports all the features from OLE 1.0. \triangle

SAS can function as an object container or *client*. The applications that create (and update) the objects you place in a FRAME entry are known as *servers*. You can also use SAS as a server from within other applications through OLE automation. For more information, see Chapter 11, “Controlling SAS from Another Application Using OLE,” on page 267 .

For more information about OLE in general, see the documentation for the Windows operating environment. For descriptions of the error messages you might receive while using OLE features in SAS/AF software, see “Using OLE” on page 616.

SAS/AF Catalog Compatibility

SAS/AF catalogs that contain OLE HSERVICE entries can be ported from Release 6.09 for Windows NT and Release 6.10 or later for Windows transparently, just by assigning librefs to those catalogs in your SAS 9.2 session.

Note: SAS/AF catalogs created in SAS 9.2 that contain HSERVICE entries can be ported back to Release 6.08 using the V608 option of the CPORT procedure, but the features that are ported are limited to those features that are available in Release 6.08. \triangle

HSERVICE entries must be used on the platform in which they were created. Any OLE feature that you include in your SAS/AF applications using SAS under Windows cannot be ported to another operating environment. (For portability purposes, all variations of Microsoft Windows are considered a single platform.)

Inserting an OLE Object in a FRAME Entry

Introduction to Inserting an OLE Object in a FRAME Entry

SAS provides three items on the object Selection List to facilitate OLE:

OLE - Insert Object

inserts an OLE object as a new object of the type associated with a registered server application, as an object created from an existing file, or as an OLE control.

OLE - Paste Special

pastes an OLE object to the FRAME entry from the Windows clipboard.

OLE - Read Object

creates an object that references an existing HSERVICE entry in a SAS catalog.

These three items correspond to the three OLE classes in SAS/AF software: INSERT, PASTE, and READOLE.

In addition to using the Selection List to insert objects, you can select and drag objects from other Windows applications and drop them onto an open FRAME entry (in BUILD mode, or during run time if the frame or work area object is registered as a drop site for the SAS_DND_OLEOBJ representation).

Inserting an OLE Object

To insert an OLE object in a FRAME entry:

- 1 From the COMPONENTS window, select the **V6 objects** item to expand the object tree.
- 2 Scroll through the list of objects in the Selection List and select and hold down the left mouse button on **OLE - Insert Object**.
- 3 Drag **OLE - Insert Object** to a position for the object in the FRAME entry. Release the mouse button to place the object. The Insert Object dialog box appears.
- 4 Select the type of object that you want to insert. The list of objects that are available to you depends on which OLE-capable applications are registered on your system. Selecting a type of object will insert an object of that type into the FRAME entry.

Alternatively, you can create an object from a file by clicking on **Create from File**. The file you specify must have been created by one of the applications you have available to supply OLE objects. For example, if you have Microsoft Excel installed on your system, you can create an object from an Excel spreadsheet file. You also have the option of making it a linked object (instead of embedded). For more information about linked objects, see “Using Linked OLE Objects” on page 249.

When you have selected the type of object or filename to insert, click **OK**. SAS inserts the object into the FRAME entry.

- 5 With the BUILD window active, select **View ► Properties Window**

In the Properties windows, select the object and select **Object Attributes**.

Enter a name for the object entry in the **Entry** field. Two-level HSERVICE names are allowed, defaulting to the current catalog. You can also change the **Name** of the object. The HSERVICE entry is not created until you **Save** or **End** the FRAME editing session.

Click **OK**.

Pasting an OLE Object from the Clipboard

To paste an OLE object from the Windows clipboard:

- 1 From another Windows application, copy or cut to the Windows clipboard the object or data you want to include in your FRAME entry.
- 2 From the COMPONENTS window, select the **V6 objects** item to expand the object tree.
- 3 Scroll through the list of objects in the Selection List and select and hold down with the left mouse key **OLE - Paste Special**. Drag **OLE - Paste Special** to the frame. The Paste Special dialog box appears.

- 4 Select the type of OLE object you would like to insert based on the clipboard contents. The object is determined by the application from which you copied the data. (For example, you would typically paste Microsoft Word data as a Microsoft Word object.)
- 5 If you want the OLE object to link to the data instead of embed the actual data in the FRAME entry, choose **Paste Link** on the Paste Special dialog box. For more information about linked objects, see “Using Linked OLE Objects” on page 249.

Note: If you paste data from a temporary source (such as a document that you did not save), SAS will be unable to locate the data source when it attempts to link to it later when it no longer exists. You should save your data file before copying it to the Windows clipboard. Δ

- 6 After you select the type of object to paste, click **OK**. SAS pastes the object into the FRAME entry.
- 7 Select **View ► Properties Window**. Select the object from the **Properties** box and click on **Object Attributes**.
- 8 Enter a name for the object entry in the **Entry** field. Two-level HSERVICE names are allowed, defaulting to the current catalog. You can also change the **Name** of the object. The HSERVICE entry is not created until you **Save** or **End** the FRAME editing session.

Click **OK**.

Reading an OLE Object from an HSERVICE Entry

To read an existing OLE object stored as an HSERVICE entry in a SAS catalog:

- 1 From the COMPONENTS window, select the **v6 objects** item to expand the object tree.
- 2 Scroll through the list of objects in the selection list and select and drag **OLE - Read Object** to the BUILD window.
- 3 With the cursor over the blank object, right mouse click and select **Object Attributes**.
- 4 In the OLE-Read Object Attributes window, enter the name of the HSERVICE entry in the **Entry** field. Two-level HSERVICE names are allowed, defaulting to the current catalog. To use the Select window to find the entry, click on the arrow next to the **Entry** field.

Click **OK**. SAS inserts the object in the FRAME entry, displaying a representation of the object at the position you selected.

Note: You cannot change the name of an HSERVICE entry that you read in. If you want to assign a different name to the HSERVICE entry, copy the HSERVICE entry to a new name before you read the object. Δ

Inserting an OLE Object by Dragging It

To insert an OLE object into a FRAME entry by dragging and dropping it:

- 1 Create the object using the server application. For example, if you want to embed a Microsoft Excel chart object into your FRAME entry, use Microsoft Excel to create the object. Or, you can select an OLE object that is embedded in another application.
- 2 With both SAS and the server application running, arrange the application windows so that both the server application (with the object) and the SAS BUILD: DISPLAY window (with the FRAME entry) are visible on the screen.

- 3 Select the object in the server application. Press the mouse button and drag the object from the server application to the position in the FRAME entry where you want to place the object. The cursor changes to a box with an arrow, indicating that the FRAME entry is a valid place to drop the object. You do not need to draw a region in the FRAME to insert the object. You can also use drag modifier keys, as discussed in “Changing the Drag Action” on page 247 to control the drag and drop behavior.

When you release the mouse button ("dropping" the object), SAS inserts the object into the FRAME, automatically creating a name and an HSERVICE entry for the OLE object. SAS displays a representation of the object at the position you selected.

Dragging OLE Objects During Run Time

You can allow the dragging and dropping of OLE objects while your SAS/AF application is running. To enable this action, you must register the OLE object type with a valid drag and drop representation.

OLE objects must be registered with the SAS_DND_OLEOBJ representation. For more information about registering objects for drag and drop, see the SAS/AF online documentation for information about working with the FRAME application development environment and for information about the Widget class.

Changing the Drag Action

By default, dragging an OLE object from another application into SAS moves the object (unless the object is of a type that can only be read and not removed). You can override this default action by using a *drag modifier*; a key press that indicates you want to perform a different drop action:

- To copy an object from the server application, hold down the Ctrl key when you drop the object on the target window. When you press the Ctrl key, the cursor changes to an arrow with a box and a plus (+) sign.
- To create a link to the data in a SAS/AF FRAME entry, hold down the Ctrl and Shift keys when you drop the object on the BUILD window. When you press the Ctrl and Shift keys, the cursor changes to an arrow with a box and a plus (+) sign. (This feature might vary based on the other application.) Remember not to paste a linked object from a temporary source, because SAS cannot locate a data source when it no longer exists.

Alternatively, you can initiate a *nondefault* drag and drop action (if the server application supports it). Use the *right* mouse button to select the object and drag and drop it into the FRAME entry. When you release the mouse button, SAS displays a pop-up menu allowing you to select whether to move, copy, or link to the object. The choices in the pop-up menu might vary among different types of OLE objects.

Editing an OLE Object within a FRAME Entry

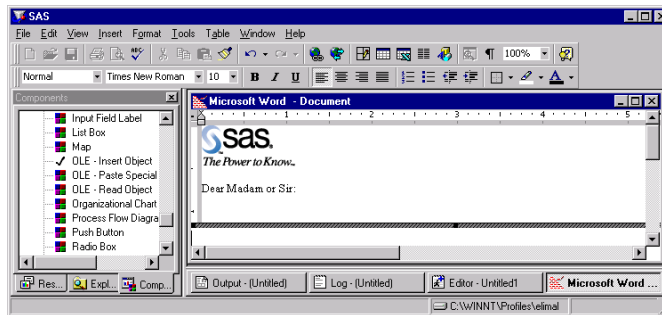
One of the most impressive features of OLE 2.0 is visual editing—the ability to edit an embedded object in-place, without explicitly changing to another application.

To activate visual editing for an OLE object in your FRAME entry at build time, click the right mouse button and select Edit. To activate visual editing at run time, simply double-click on the object. If the object's application supports visual editing as a server application, then the following occurs:

- The object's representation in the FRAME entry changes to an editing session of the actual object. The object's borders might change to accommodate the tools supplied by the server application.
- The SAS menu bar changes to accommodate the menu bar of the server application. The File and Window menus remains the same, but the remainder of the menu bar changes to the server application.
- If the server application normally provides any tools, such as toolbar icons or a floating toolbox, those items also become available.

For example, Display 10.1 on page 248 shows a SAS/AF FRAME entry with a Microsoft Word object activated.

Display 10.1 SAS/AF FRAME Entry with Word Object Activated



After this transformation, you can edit the object using all of the tools and menus provided by the server application.

To end your visual editing session, click elsewhere inside the FRAME entry and outside the object. SAS resumes control of the session, and returns to the default SAS menus and tools.

Note:

- 1 The HSERVICE entry is automatically updated at the end of a visual editing session *only* if the object has been saved previously (an HSERVICE entry has been created for it). Otherwise, you must select **Save** (or **End**) from the File menu in SAS/AF software to create the HSERVICE entry.

Also, if you modify the object during TESTAF mode and you want to save the modifications in the HSERVICE entry, you must update the object's contents by selecting **Update** from the Locals menu before returning to BUILD mode.

- 2 If you move the OLE object within the FRAME entry during visual editing (in BUILD mode), the object returns to its original position when you click outside of it (ending the visual editing session). If you want to move the object to another position in the FRAME entry, end the visual editing session and then move the object region.

- 3 Most OLE objects require that you double-click on them to activate them. However, a few types of objects require only a single-click to activate them.
- 4 If you attempt to edit a linked object or an OLE object whose server application does not support visual editing, the server application launches as a separate instance and allows you to edit the object. This action is known as *open editing* and is consistent with the behavior of linked objects and all OLE 1.0 objects.

△

Invoking OLE Verbs

Each OLE object (except OLE controls) has a default action that it performs when you double-click on it. For many objects, the default action is **Edit** (invoking a visual editing session for OLE 2.0 or an open editing session for linked objects and all OLE 1.0 objects). However, there are some objects for which the **Edit** action is secondary (for example, a Media Clip object, where **Play** is the primary action). Also, many objects have more than one action that they can perform, so they understand more than one OLE verb. (Double-clicking on an OLE object in BUILD: DISPLAY mode does not perform the default action, but double-clicking on the object in TESTAF mode does.)

To access the menu of OLE verbs for an OLE object in BUILD mode, click on the object with the *right* mouse button. The name of the OLE object is located at the bottom of the pop-up menu. In the cascading menu, there is a list of valid OLE verbs for the object. Select a verb from this menu to perform that action. The default verb appears first in the list of verbs.

For example, a Microsoft Excel object understands **Edit** (for visual editing) and **Open** (for open editing). A Media Clip object understands **Play** and **Edit**.

You can also access the list of valid verbs by clicking on the **Associated Verbs** item in the Object Attributes dialog box for the object. This list just contains the names of the verbs; you cannot initiate the verbs from here. Again, the verb at the top of the list is the default verb.

Using SCL, you can invoke any verb that a particular OLE object understands by using the `_EXECUTE_` method with the verb as an argument. For example, this code would invoke the verb **Play** on the OLE object `mediaobj`:

```
call notify('mediaobj', '_EXECUTE_', 'Play');
```

You can specify multiple verbs in a single call to `_EXECUTE_`. For more information about the `_EXECUTE_` method, see “`_EXECUTE_`” on page 606.

Using Linked OLE Objects

A linked OLE object contains information about the object’s server application and points to the data file that resides on disk, but does not contain data for the object itself. The object contains a static picture that represents the contents of the linked source.

Using the Links dialog box, you can specify to update a linked object:

- automatically, whenever you update the source file that the object points to. (You must reload the **FRAME** entry before it reflects the change.)
- manually, by choosing **Update Now** in the Links dialog box or by using the `_UPDATE_` method in SCL.
- manually, by pointing the object to a different source file using either the Links dialog box or the `_UPDATE_` method in SCL.

Linked OLE objects that you include in a FRAME entry:

- support open editing only (as opposed to visual editing, described in “Editing an OLE Object within a FRAME Entry” on page 248). When you double-click on the object’s representation in the FRAME, the server application is invoked in a separate window with the object’s data file open.

You can also update the data of a linked object by using the server application to open the data file the object points to.

- must point to existing data files. If you change the location of a data file to which an object is linked, you must update the links information for the object.

If you create a linked object using **OLE - Paste Special**, the data source that you paste from must be permanent (you must have saved it to disk). If you create a linked object from a temporary data source, SAS will be unable to locate the data to update the object when the data source no longer exists.

Updating a Linked Object with the Links Dialog Box

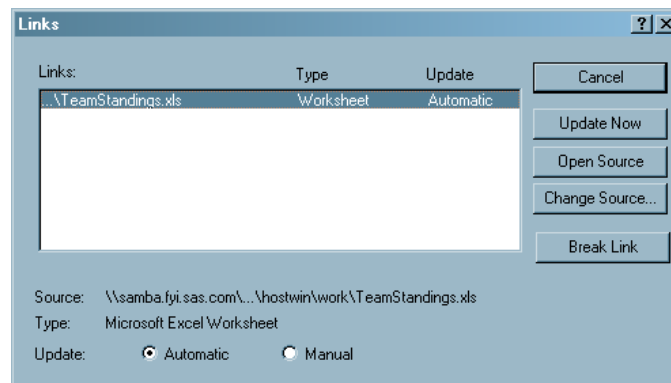
To update the links information with the Links dialog box (shown in Display 10.2 on page 250):

- 1 Click on the object with the right mouse button. A pop-up menu appears, with the object type listed as the bottom menu item.
- 2 Click on the bottom menu item. A cascading menu containing valid OLE verbs for the object appears.
- 3 Click **Links**. The Links dialog box appears, containing link information for all of the linked objects in the FRAME entry. (If there are no linked objects in the FRAME, then the **Links** item is disabled.)
- 4 Use the Links dialog box to change information about the object as necessary. For example, if the data file resides in a different location, you can change the source for the object link.

An alternate way to open the Links dialog box for a linked OLE object is to use the DLGLINKS command from the command line. You can also use the `_EXECUTE_` method in SCL to invoke the DLGLINKS command. For example:

```
call notify('linkobj','_execute_','dlglinks');
```

Display 10.2 Links Dialog Box



Updating a Linked Object Programmatically

To change the source of a linked object programmatically with SCL, use the `_UPDATE_` method to specify a new HSERVICE entry to associate with the object. The `_UPDATE_` method for OLE objects accepts the name of an HSERVICE entry as a third argument. (This method overrides the Widget class `_UPDATE_` method.) For the syntax of the OLE `_UPDATE_` method, see “`_UPDATE_`” on page 611.

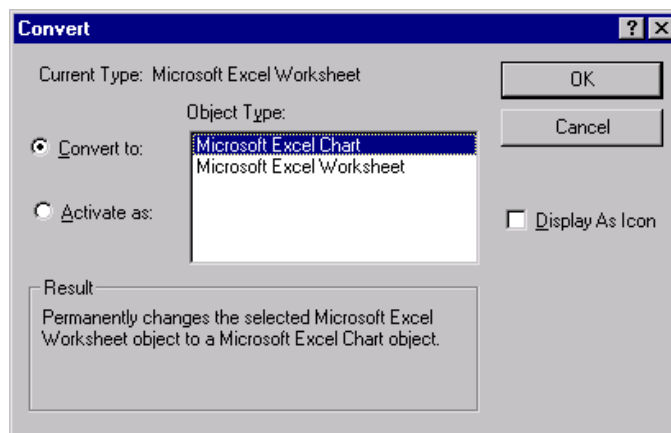
Converting OLE Objects

An OLE object can be associated with only one server application, but some OLE objects can be converted for use with a different server application than the one that created them.

You can convert an object by using the Convert dialog box (shown in Display 10.3 on page 251). This dialog box lets you:

- change the object’s view from an icon to object content and vice-versa.
- change the object’s type from one server application to another. For example, you can convert a Microsoft Excel object to a Lotus 1-2-3 object, provided that you have the server application that can convert the object on your system. This type of conversion is permanent.
- activate the object with a different server application than originally created it, without altering the object type. For example, you can choose to activate a Lotus 1-2-3 object using Microsoft Excel as a server. This action allows you to edit the object as if it were an Excel object. The object continues to be a Lotus 1-2-3 object. All subsequent Lotus 1-2-3 OLE objects you create will use Excel as an OLE server, unless you change the conversion settings again.

Display 10.3 Convert Dialog Box



To convert an OLE object within a SAS/AF FRAME entry:

- 1 Click on the object with the *right* mouse button.
- 2 At the bottom of the pop-up menu, select the object’s name (thus revealing the cascading menu).
- 3 In the cascading menu, select **Convert**. The Convert dialog box appears, listing the valid object types to which you can convert the selected object.

- 4 If you want to actually convert the object to another type, select the desired target object type and click **OK**.

If you want to toggle the object between icon view and content view, check **Display As Icon**.

If you want to activate the object using another server, click on **Activate as** and then select the server application to use.

- 5 Click **OK**.

An alternate way to open the Convert dialog box for an OLE object is to select the object and issue the DLGCONVERT command on the command line. Also, you can use the `_EXECUTE_` method in SCL to invoke the DLGCONVERT command. For example:

```
call notify('sheetobj','_execute_',
           'dlgconvert');
```

Automating OLE Objects and Applications

Some Windows applications provide a scripting language that allows you to control and update objects and external applications through automation. In SAS/AF software, you can use SAS Component Language (SCL) for OLE automation. Using SCL code to send instructions to the OLE object, you can update the object's data based on a user's actions in your SAS/AF application.

In SAS/AF software, you can automate:

- OLE objects embedded in a FRAME entry, using the OLE class
- OLE objects linked to a FRAME entry, using the OLE class
- OLE applications not associated with a FRAME entry, using the OLE Automation class.

Using SCL, you can communicate with any OLE object or application that supports OLE automation as a server. In this communication, SAS acts as a client while the automation application acts as a server. The server provides OLE automation objects, which you can control with SCL code. Using SCL methods, you can send OLE methods to the server for execution. You can also get and set the properties of the objects you control. OLE automation servers can support multiple types of objects, each of which can have a unique set of methods and properties. The SCL methods you can use are listed in Table 10.1 on page 253 and described in detail in "Summary of OLE Class Methods" on page 603.

Note: Do not confuse the SCL OLE automation methods (listed in the table) with the methods provided by the OLE automation server. In SAS/AF software, the `_COMPUTE_` and `_DO_` SCL methods provide access to the methods supported by the OLE automation server. Each OLE automation server supports different methods, but you must always use the `_COMPUTE_` or `_DO_` method in SCL to invoke them. (You can use subclassing to create new methods that encapsulate these methods, such as the methods listed in this table.) Δ

Table 10.1 OLE Automation Class Methods

OLE Automation Method	Description
<code>_COMPUTE_</code>	invokes a method supported by the OLE automation server and returns a value
<code>_DO_</code>	invokes a method supported by the OLE automation server (with no return value)
<code>_GET_PROPERTY_</code>	retrieves the value of a property exposed by the OLE automation server
<code>_GET_REFERENCE_ID_</code>	returns the reference identifier of an object provided by the OLE automation server
<code>_IN_ERROR_</code>	returns an object's ERROR status
<code>_NEW_</code>	assigns an SCL identifier to an external instance of an OLE automation server
<code>_SET_PROPERTY_</code>	sets the value of a property exposed by the OLE automation server

Note: The return values and arguments passed between the automation server and SAS using the OLE automation methods are passed by value, not by reference—including those arguments that the server defines as pass-by-reference. The arguments contain actual static values, not pointers to values that you can modify. Δ

Accessing Array Values Returned by the OLE Automation Server

Using SCL methods and the OLE automation server, SAS lets you receive a single-dimensional array that is passed to SAS as an SCL list send or receive multi-dimensional SCL arrays.

In this first example, the SCL code creates and populates a list box in a Microsoft Excel worksheet and stores the contents of the list box in an SCL list:

```
list=makelist(); /* create the SCL list */
  /* Add a Listbox in a worksheet */
call send(worksht, '_COMPUTE_', 'Listboxes',
         listbox);
call send(listbox, '_DO_', 'Add', 20, 50,
         40, 100);
call send(worksht, '_COMPUTE_', 'Listboxes',
         1, listone);
  /* Fill the Listbox with a range of */
  /* values from the worksheet      */
call send(listone, '_SET_PROPERTY_',
         'ListFillRange', 'A1:A3');
  /* Get the contents of the Listbox */
call send(listone, '_GET_PROPERTY_',
         'List', list);
```

Using several SCL arrays, the following SCL code creates and populates another Microsoft Excel worksheet:

```
Init:
/* Initialization */
```

```

HostClass = loadclass('sashelp.fsp.hauto');

/* Instantiate the Excel object and make it visible */
call send (Hostclass, '_NEW_', ExcelObj, 0, 'Excel.Application');
call send (ExcelObj, '_SET_PROPERTY_', 'Visible', -1);

/* Get the Workbook Object, add a new Sheet and get the Sheet object */
call send (ExcelObj, '_GET_PROPERTY_', 'Workbooks', WkBkObj);
call send (WkBkObj, '_DO_', 'Add');
call send (ExcelObj, '_GET_PROPERTY_', 'ActiveSheet', WkShtObj);

dcl char names{3,2} = ('Lucy', 'Ricky',
                    'Julliette', 'Romeo',
                    'Elizabeth', 'Richard');

/* Set the range to be A1:A4 and fill that range with names */
call send(WkShtObj, '_COMPUTE_', 'Range', 'A1', 'B3', RangeObj);
call send(RangeObj, '_SET_PROPERTY_', 'Value', names);

dcl num primes{2,4} = ( 1, 3, 5, 7,
                    11, 13, 17, 23);

/* Set the range to be A5:D6 and fill that range with ints values */
call send(WkShtObj, '_COMPUTE_', 'Range', 'A5', 'D6', RangeObj);
call send(RangeObj, '_SET_PROPERTY_', 'Value', primes);

dcl char totals{1,4} = ('=SUM(A5,A6)',
                    '=SUM(B5,B6)',
                    '=SUM(C5,C6)',
                    '=SUM(D5,D6)');

/* Set the range to be A1:A4 and fill that range with totals */
call send(WkShtObj, '_COMPUTE_', 'Range', 'A7', 'D7', RangeObj);
call send(RangeObj, '_SET_PROPERTY_', 'Value', totals);

dcl char vals{7,4};

call send(WkShtObj, '_COMPUTE_', 'Range', 'A5', 'D7', RangeObj);
call send(RangeObj, '_GET_PROPERTY_', 'Value', vals);
return;

```

Using Value Properties

OLE automation servers (including OLE custom controls) can designate one of their properties or methods as a *value property*, which is used as the default property or method when the automation code accesses an object provided by the server without explicitly specifying a property or method name.

In SCL, you can access the value property of a server by specifying an empty string in place of the property name when invoking `_GET_PROPERTY_` or `_SET_PROPERTY_`, or in place of the method name when using `_DO_` or `_COMPUTE_`. For example, if the Text property is the value property, then the following code:

```

call notify('sascombo', '_set_property_', '',
          'An excellent choice');

```

is equivalent to:

```
call notify ('sascombo', '_set_property_',
           'Text', 'An excellent choice');
```

Both the SAS ComboBox and SAS Edit controls (supplied with SAS) designate Text as their value property.

Specifying Optional Parameters in OLE Server Methods

Some OLE server applications expose methods that have optional parameters. If you do not specify a value for one or more of the parameters that a method supports, the OLE server uses a default value for those parameters. Refer to the documentation for the OLE server application you are using for information about which parameters are optional.

SAS supports the use of optional parameters by letting you specify a SAS missing value in place of the parameter you want to omit. The default missing value character is a period (but that can be changed by using the MISSING system option).

For example, Microsoft Excel supports a ChartWizard method that accepts 11 arguments, most of which are optional. This SCL code invokes this method with all of its arguments:

```
call send(chart, '_DO_', 'ChartWizard', hcell,
          -4098, 6, 1, 0, 0, 1,
          "Automation at work!",
          'Column', 'Value', 'Row');
```

Here is the equivalent SCL code that omits the optional parameters (substituting the missing value character):

```
call send(chart, '_DO_', 'ChartWizard', hcell,
          ., ., ., ., ., .,
          "Automation at work!",
          ., ., .);
```

Note: Your SCL code must still respect the position of the optional parameters when invoking methods. When you specify a missing value character as an argument, it must be in place of a parameter that is optional to the OLE server's method. Δ

Creating an External OLE Automation Instance

External OLE Automation Instances can be for an application on your local machine or an application on a remote machine. Before you can automate an external OLE application, you must create an instance of the OLE Automation class. (This action is not necessary when you automate objects that you embed or link in your FRAME entry, because placing them in the FRAME entry creates the instance for you.) Unlike the OLE class, the OLE Automation class is not derived from the Widget class and, therefore, has no visual component to include in a FRAME entry. Instead, you must load an instance of the HAUTO class (using the LOADCLASS function) in the SCL code that drives the automation. For example:

```
hostcl=loadclass('sashelp.fsp.hauto');
```

After you create an instance of the OLE Automation class, you must associate the new instance with an SCL object identifier (which you need to use when calling methods with CALL SEND) and an OLE server application. To obtain the identifier, use the `_NEW_` method on the newly created instance of the OLE Automation class.

This example stores the object identifier in `oleauto` and associates the object with Microsoft Excel (which has the identifier `Excel.Application` in the Windows registry) on the local machine.

```
call send(hostcl, '_NEW_', oleauto, 0,
         'Excel.Application');
```

To create an instance of the OLE Automation class for a remote machine, the remote machine must be configured to permit the user to start remote instances using Distributed COM Configuration Properties (DCOMCNFG.EXE). The DCOMCNFG.EXE is located in the `\WINNT\SYSTEM32` folder. For more information on Distributed COM Configuration Properties, see your Windows documentation. The following example creates an instance of Microsoft Excel on a remote machine. Once created, the method and property calls to that instance work as if it were on a local machine.

```
Init:
  HostClass = loadclass('sashelp.fsp.hauto');
  ExcelObj = 0;

  /* Define the machine name and put it in a list */

  machineName = '\\Aladdin';
  inslist = makelist();
  attrlist = makelist ();

  rc = insertc (attrlist, machineName, -1, 'remoteServer');
  rc = insertl (inslist, attrlist, -1, '_ATTRS_');

  /* Instantiate the Excel object and make it visible */

  call send (HostClass, '_NEW_', ExcelObj, inslist,
            'Excel.Application');
  call send (ExcelObj, '_SET_PROPERTY_', 'Visible', -1);
return;
```

For more information about the `_NEW_` method, see “`_NEW_`” on page 610.

After you create an instance of an OLE Automation object, you can automate that object in much the same way you would automate an object that you have embedded or linked in your frame. The following table notes some key differences between the types of objects.

SAS OLE Objects	SAS OLE Automation Objects
Are derived from the Widget class.	Are derived from the Object class.
Have a visual component (the object you place in the FRAME entry).	Have no visual component within the FRAME entry.
Are created by placing the object in a region in the FRAME entry (using drag and drop).	Are created by using the LOADCLASS statement and the <code>_NEW_</code> method in SCL.

SAS OLE Objects	SAS OLE Automation Objects
Represent the specific type of data object (which you choose) supported by the OLE server.	Represent the top-level application object supported by the OLE server, which you then might use to open objects of specific data types.
Allow you to call methods with CALL NOTIFY by passing in the object name from the FRAME entry.	Require you to call methods with CALL SEND, passing in the object identifier returned by the _NEW_, _GET_PROPERTY_, or _COMPUTE_ methods.

Example: Populating a Microsoft Excel Spreadsheet with SAS Data

The following table contains SCL code to populate a Microsoft Excel spreadsheet with data from a SAS data set.

Table 10.2 SCL Code for Populating a Microsoft Excel Spreadsheet

Action	SCL Code
Load an instance of the OLE Automation class and invoke Excel. Set the object to Visible so you can see the automation in progress.	<pre> LAUNCHXL: hostcl = loadclass('sashelp.fsp.hauto'); call send(hostcl, '_NEW_', excelobj, 0, 'Excel.Application'); call send(excelobj, '_SET_PROPERTY_', 'Visible', 'True'); return; </pre>
Get the identifier for the current Workbooks property and add a worksheet. Then get the identifier for the new worksheet.	<pre> CREATEWS: call send(excelobj, '_GET_PROPERTY_', 'Workbooks', wbsobj); call send(wbsobj, '_DO_', 'Add'); call send(excelobj, '_GET_PROPERTY_', 'ActiveSheet', wsobj); </pre>
Open a SAS data set.	<pre> dsid=open('sasuser.class','i'); call set(dsid); rc=fetch(dsid); nvar=attrn(dsid, 'NVAR'); nobs=attrn(dsid, 'NOBS'); </pre>

Action	SCL Code
Traverse the data set and populate the cells of the Excel worksheet with its data, row by row.	<pre> do col=1 to nvar; call send(wsobj, '_COMPUTE_', 'Cells',1,col,retcell); var=varname(dsid,col); call send(retcell,'_SET_PROPERTY_', 'Value',var); end; do while (rc ne -1); do row = 1 to nobs; do col = 1 to nvar; r=row+1; call send (wsobj, '_COMPUTE_', 'Cells', r ,col,retcell); if vartype(dsid,col) eq 'N' then do; varn=getvarn(dsid,col); call send(retcell, '_SET_PROPERTY_', 'Value' ,varn); end; else do; varc=getvarc(dsid,col); call send(retcell, '_SET_PROPERTY_', 'Value' ,varc); end; end; rc=fetch(dsid); end; end; dsid=close(dsid); return; </pre>
Close the worksheet and end the Excel session. The <code>_TERM_</code> method deletes the OLE automation instance.	<pre> QUITXL: call send(excelobj, '_GET_PROPERTY_', 'ActiveWorkbook', awbobj); call send(awbobj, '_DO_', 'Close', 'False'); call send(excelobj, '_DO_', 'Quit'); call send(excelobj, '_TERM_'); return; </pre>

As you can see from this example, automating an application object requires some knowledge of the object's properties and methods. To help you decide which SCL commands to use for an Excel automation object, you can use the Macro Recorder in Excel to perform the task you want to automate, then look at the Visual Basic code that is generated. It is then relatively simple to map the Visual Basic code to comparable SCL statements and functions.

The following table shows some excerpts of Visual Basic code and their SCL equivalents.

Table 10.3 Visual Basic Code Samples and Their SCL Equivalents

Visual Basic Code	OLE Automation in SCL
<i>Launch Excel and make it visible</i>	
<code>Set excelobj = CreateObject("Excel.Application") excelobj.Visible = True</code>	<code>hostc1 = loadclass('sashelp.fsp.hauto'); call send (hostc1, '_NEW_', excelobj, 0, 'Excel.Application'); call send (excelobj, '_SET_PROPERTY_', 'Visible', 'True');</code>
<i>Create a new worksheet</i>	
<code>Dim wbsobj, wsobj As Object Set wbsobj = excelobj.Workbooks wbsobj.Add Set wsobj = excelobj.ActiveSheet</code>	<code>call send(excelobj, '_GET_PROPERTY_', 'Workbooks', wbsobj); call send(wbsobj, '_DO_', 'Add'); call send(excelobj, '_GET_PROPERTY_', 'ActiveSheet', wsobj);</code>
<i>Set the value of a cell</i>	
<code>wsobj.Cells(row + 1, col).Value =var</code>	<code>r=row+1; call send(wsobj, '_COMPUTE_', 'Cells', r, col, retcell); call send(retcell, '_SET_PROPERTY_', 'Value', var);</code>
<i>Close the Excel application object</i>	
<code>excelobj.ActiveWorkbook.Close ("False") excelobj.Quit</code>	<code>call send(excelobj, '_GET_PROPERTY_', 'ActiveWorkbook', awbobj); call send(awbobj, '_DO_', 'Close', 'False'); call send(excelobj, '_DO_', 'Quit'); call send(excelobj, '_TERM_');</code>

Using OLE Custom Controls (OCXs) in Your SAS/AF Application

An OLE custom control is a special type of OLE object or collection of OLE objects that has an interface to expose its own properties and methods. You can control these objects through its graphical interface and with SCL code.

OLE custom controls differ from other OLE objects in these ways:

- They generate events based on user actions, which you can respond to in your FRAME entry. Note that the object's SCL label is not run by default when you activate an OLE control.
- They assume ambient properties (such as color and font) based on the environment in which they are used.

OLE controls are packaged in their own dynamic linked library (with a file extension of OCX). Using SCL code, your FRAME entry can respond to events generated by the OLE control (mouse clicks, key presses, and so on). The events exposed by OLE controls vary among controls. For a list of events, see the documentation for the control you are using. After inserting the control into the FRAME entry, you can view the event map by selecting **Object Attributes** for the OLE control object and then **Event Map**.

Note: The OLE controls that SAS provides require 32-bit containers, which makes them unusable with Windows applications that offer only 16-bit container support. Also, because SAS is a 32-bit container, you cannot use 16-bit controls with it. Δ

Inserting an OLE Control in a FRAME Entry

To insert an OLE control in a FRAME entry:

- 1 From the COMPONENTS window, select the **v6 objects** item to expand the object tree.
- 2 Double-click on **OLE - Insert Object** from the Selection List. The Insert Object dialog box opens. You can also drag **OLE - Insert Object** from the Selection List to the BUILD window. When you release the mouse button the Insert Object dialog box opens.
- 3 Select the **Create Control** radio button to display a list of registered OLE custom controls. If the OLE control you want to use is not listed here and you have it on your system, you need to register the control (see “Registering OLE Controls” on page 260).
- 4 Select the name of the OCX control you want to insert.

Registering OLE Controls

Before you can use any OLE control in Windows, the control must be registered with Windows. SAS ComboBox and SAS Edit, the two OLE controls provided with SAS, are automatically registered when you install SAS.

If you want to install other controls for use with SAS or other applications, you must register the control with Windows (unless the control was installed by a process that performed the registration for you). The OLE control will not be available from the Insert Object dialog box until it is registered.

To register an OLE control:

- 1 Complete steps 1-4 as described in “Inserting an OLE Control in a FRAME Entry” on page 260 to invoke the Insert Object dialog box with the list of registered controls.
- 2 Click on **Add Control** to invoke the Browse file selection dialog box.
- 3 Use the dialog box to select the control (which usually has a file extension of OCX) that you want to register.

When you click **OK**, the control is added to the list of registered controls in the Insert Object dialog box.

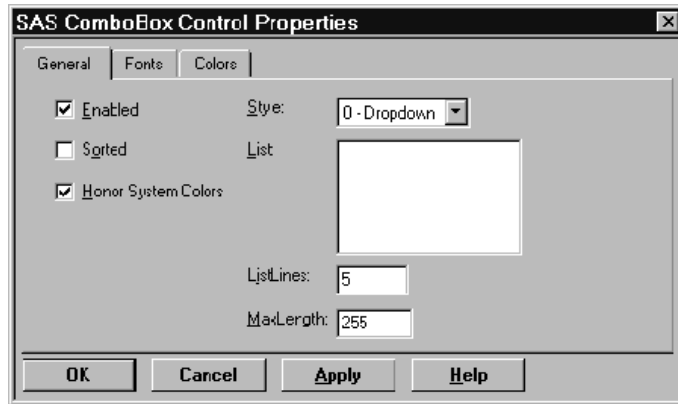
Accessing OLE Control Properties

OLE controls have properties that you can set or retrieve using SCL methods. Some controls make some of their properties available through a properties page, which lets you set or retrieve the data interactively.

Accessing the OLE Control Properties Page

To invoke the properties page for a control, click on the right mouse button within the control’s region in the BUILD: DISPLAY window and then select **Properties** from the pop-up menu. The properties page for the control appears. Display 10.4 on page 261 shows an example of a properties page for an OLE control.

OLE controls provide a Properties verb, which you can use with the `_EXECUTE_` method in SCL to bring up the Properties page for the control. Or, you can access the pop-up menu for the control, then choose the cascading menu with the control’s name. The Properties verb is available off that cascading menu.

Display 10.4 An Example Properties Page

You can use the properties page to view or change settings for some of the exposed properties.

Note that the control is not active (you cannot interact with its interface) while you are in DISPLAY mode. The control becomes active in TESTAF mode.

Accessing Properties Using SCL Code

When you use OLE controls in a SAS/AF application, you can access the properties of the control programmatically. Also, an OLE control might not expose all of its properties in a properties page. You can access the properties of a control by using the `_SET_PROPERTY_` and `_GET_PROPERTY_` methods.

Before you can access a property, you must know:

- the object label of the OLE control in your SAS/AF FRAME entry
- the name of the property you want to access
- the type of data that the property holds.

For example, suppose you have a combo box control named **sascombo** in your FRAME entry, and you want to set the list style to **simple** (represented by the integer 1):

```
call notify ('sascombo', '_set_property_',
            'Style', 1);
```

If you want to retrieve data from a property, you must use a variable that is of the same type as the data you want to read. For example, if you want to learn what text the user specified in the edit portion of a combo box, include the following code:

```
length text $ 200;
call notify ('sascombo', '_get_property_',
            'Text', text);
```

Interacting with the OLE Control Using SCL Methods

OLE controls support methods that control their content and behavior. You use either the `_DO_` or `_COMPUTE_` SCL methods to send a message to an OLE control telling it to implement one of its methods.

- Use the `_DO_` method in SCL when the OLE control method performs some action but does not return a value. For example, the SAS ComboBox OLE control has a method that clears all items from the list:

```
call notify('sascombo', '_DO_', 'Clear');
```

- Use the `_COMPUTE_` method in SCL when the OLE control method returns a value. You specify a variable in the SCL code that will contain the return value when the method ends. For example, the SAS ComboBox OLE control has a method that returns an item at a specified position in the list:

```
length item $ 80;
call notify('sascombo', '_COMPUTE_',
           'GetItem', 2, item);
```

When this call returns, *item* contains the text of the item at position 2 (the third item in the list).

Responding to OLE Control Events

OLE controls generate events that you can respond to in your SCL code. You can create a label in your SCL code for OLE events just like you do for SAS/AF events.

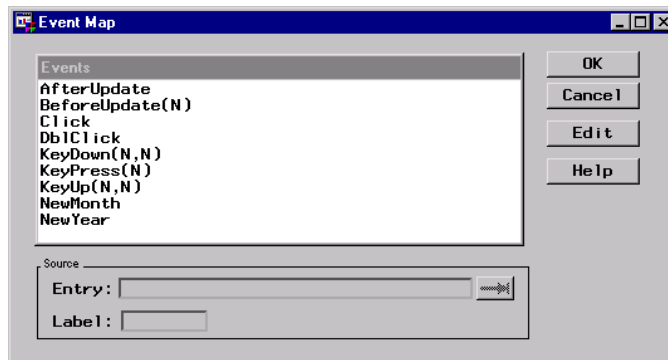
Assigning SCL Code to an OLE Control Event

To assign SCL code to run when an OLE control event occurs:

- 1 Select the OLE control object in the BUILD window.
- 2 Select **Object Attributes** from the pop-up menu for the object.
- 3 Select **Event Map** from the Object Attributes dialog box. The Event Map dialog box appears (shown in Display 10.5 on page 262).
- 4 In the Event Map dialog box, select the event that you want to respond to using SCL code.
- 5 Specify the SCL, FRAME, or PROGRAM source entry and (if applicable) the SCL label where the event-handling code resides.

Note: You can specify the same SCL source entry that is stored with the FRAME entry; however, in addition to compiling the code with the FRAME entry, you must also compile the SCL entry outside of the FRAME context (outside of the BUILD: SOURCE and BUILD: DISPLAY windows) in order for the event handler to recognize the SCL label. It is more efficient to store event-handling code for OLE controls in an SCL source entry that is not associated with a FRAME entry. \triangle

Display 10.5 Event Map Dialog Box



Note: Many OLE controls include a `LostFocus` event, which they generate when the control loses window focus. Because of the way that SAS/AF software communicates with the control, mapping the `LostFocus` event sometimes has the effect of placing focus

back on the control that just lost it. Although you can still respond to the LostFocus event in your FRAME entry, this action might cause unusual focus behavior. Δ

Retrieving Argument Values from Events

Some OLE control events also include parameters you might find useful. For example, the SAS ComboBox control generates a KeyPress event that also reports the ASCII value of the key that was pressed. If a particular event passes an argument back to the FRAME entry, the type of value returned is indicated in the Event Map dialog box. A numeric value is indicated with an **N**; a character value is indicated with a **C**.

To retrieve the value returned by an OLE control event, you must define a method (using the METHOD statement in SCL) in the event-handling code. In the argument list for the METHOD statement, specify a variable of the type that you expect the OLE control to return. This variable contains the value returned by the event. You can then use that variable inside your event-handler.

For example, suppose you want to retrieve the value of the key that triggered the KeyPress event in the SAS ComboBox control and then report it as an ASCII character. The KeyPress event returns an integer that represents the ASCII value of the key pressed. Your event-handling code would look like the following:

```

/* Label specified in Event Map dialog box */
KEYPRESS:
/* Define a method with an
   integer argument */
method keyval 8;
/* Convert the integer to an
   ASCII character */
keychar=byte(keyval);
put keychar=; /* Output the character */
endmethod;

```

Example: Mapping OLE Control Events to SCL Code

When mapping OLE control events, you can do one of the following:

- Map each event in the Event Map window to a different labeled section of SCL code, with each piece of code performing different actions.
- Map all of the events in the Event Map window to a single labeled section of SCL code, use the `_GET_EVENT_` method to detect which event was triggered, and act accordingly.
- Use a combination of these strategies by assigning one event (such as the Click event) to SCL code that runs the object's label (using the `_OBJECT_LABEL_` method), and map the remaining events to a single label that uses the `_GET_EVENT_` method to determine the event and appropriate action. The object's label is not run by default for OLE controls.

The following example shows how to structure the SCL code when all events for an OLE control are mapped to a single label, which in turn runs the object's label to determine the event and act accordingly:

```

length event $ 80;
/* All OLE control events are mapped to
   this label */
RUNLABEL:
/* Call the object's label */
call send(_self_, '_OBJECT_LABEL_');
return;

```

```

/* This is the label of the OLE control */
OBJ1:
    /* Determine the last event */
    call notify('obj1', '_GET_EVENT_', event);
    select (event);
        when('Click') put 'Click received';
        when('DblClick') put 'DblClick received';
        otherwise put event=;
    end;
return;

```

Example: Subclassing an OLE Custom Control

If you create SAS/AF applications that make frequent use of one or more OLE custom controls, you might want to write your own methods to abstract the methods that the control recognizes without having to specify the intermediate `_DO_` and `_COMPUTE_` methods in SCL.

You can write methods by creating a subclass of the OLE class and adding methods to your derived class. When you insert the OLE control into your FRAME entry, be sure to insert it as an instance of the new class that you define (instead of **OLE - Insert Object**). The examples provided here contain sample code you can use to abstract the methods of a control. They do not include details about how to create subclasses. For information about creating subclasses of a SAS/AF class, see the online documentation for SAS/AF software.

Adding an Item to a Combo Box List

You can use this method to add a new item to the list portion of the SAS ComboBox control. The SAS ComboBox control uses zero-based numbering to indicate the positions of the list items (the first item is at position 0, the second is at position 1, and so on). The following method lets you specify the position numbers such that position 1 holds the first item.

```

/* Add a new item to a ComboBox list. */
ADDITEM:
method text $200 row 8 rc 8;
    /* adjust for zero-based index */
    ocxrow = row-1;
    call send(_self_, '_COMPUTE_', 'AddItem',
             text, ocxrow, rc);
    if ( rc = 0 ) then
        _MSG_="ERROR: Could not add item to list.";
    endmethod;

```

Assuming you mapped this code to a new method called `ADD_ITEM`, you would use this syntax to add a new item to the control:

```

/* Adds 'Item 1' at the first position */
/* in the control */
length success 8;
call notify('sascombo', 'ADD_ITEM',
           'Item 1', 1, success);

```

Finding an Item in a Combo Box

The following method finds the specified item and returns its position in the list. As in the previous example, this method adjusts the position number to be one-based instead of zero-based.

```
FINDITEM:
method text $200 row 8;
  call send(_self_, '_COMPUTE_', 'FindItem',
           text, row);
  row = row + 1; /* adjust for zero-based */
endmethod;      /* index          */
```

Assuming you mapped this code to the `FIND_ITEM` method, you would then use it as in this example:

```
length position 8;
call notify('sascombo', 'FIND_ITEM',
           'Lost Item', position);
```

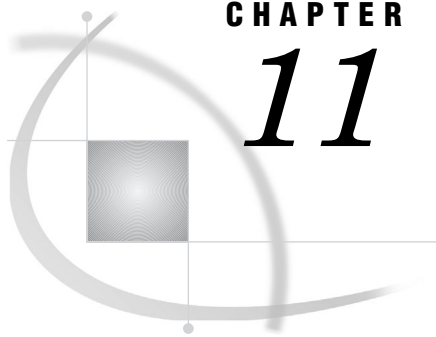
Retrieving the Text Value of the Control

Both the SAS ComboBox and SAS Edit controls have Text properties, which you can access using the `_GET_PROPERTY_` method with the property name. For easier and more intuitive access from your OLE subclass, you can override the `_GET_TEXT_` method and map it to this code:

```
GETTEXT:
method text $200;
  call send(_self_, '_GET_PROPERTY_',
           'Text', text);
endmethod;
```

You would then access the Text property of a control the same way you access the text of other SAS/AF widget objects:

```
length text $ 200;
call notify('sasedit', '_GET_TEXT_', text);
```

CHAPTER

11

Controlling SAS from Another Application Using OLE

<i>Introduction to Automating SAS</i>	267
<i>Creating an Instance of SAS</i>	267
<i>Getting Feedback from the SAS Session</i>	268
<i>Examples of Automating SAS with OLE</i>	269
<i>Creating a SAS Automation Object</i>	269
<i>Determine Whether the SAS Session is Busy</i>	269
<i>Toggle the SAS Session between Visible and Invisible</i>	269
<i>Set the Main SAS Window Title of the SAS Session</i>	269
<i>Assign a SAS Library and Run a SAS Procedure</i>	269
<i>End the SAS Session</i>	270
<i>Methods and Properties for Use with a SAS OLE Automation Object</i>	270
<i>Command Method</i>	270
<i>QueryWindow Method</i>	270
<i>Quit Method</i>	271
<i>Submit Method</i>	271
<i>Top Method</i>	272

Introduction to Automating SAS

SAS can perform as an OLE automation server. This means that you can use an application that can act as an OLE automation controller (such as Visual Basic) to create a SAS session and control it using the methods and properties that SAS makes available.

Many Windows applications use Visual Basic or Visual Basic for Applications as the scripting language for automation. All examples that are provided in this document use Visual Basic, but you can achieve the same results with any application that can act as an OLE automation controller.

Creating an Instance of SAS

To create an instance of SAS (that is, invoke a SAS session), you must create an OLE object by using the SAS program identifier as it is listed in the Windows registry. The SAS program identifier is **SAS.Application**. Here is a Visual Basic example that instantiates (creates an instance of) a SAS session:

```
Dim OleSAS as Object
Set OleSAS = CreateObject("SAS.Application")
```

Examples of Automating SAS with OLE

The following examples use Visual Basic as the scripting language to control SAS with OLE automation. You can use any scripting language from any Windows application that can act as an OLE automation controller.

Creating a SAS Automation Object

This Visual Basic code defines an object and creates an instance of SAS to associate with that object.

```
Dim OleSAS As Object
Set OleSAS = CreateObject("SAS.Application")
```

Determine Whether the SAS Session is Busy

This Visual Basic code queries the SAS session (using the Busy property) to test whether the session is busy processing code.

```
If (OleSAS.Busy) Then
    Response = MsgBox("SAS Session is Busy",
        vbOKOnly, "SAS Session", 0, 0)
Else
    Response = MsgBox("SAS Session is Idle",
        vbOKOnly, "SAS Session", 0, 0)
End If
```

Toggle the SAS Session between Visible and Invisible

This Visual Basic code hides or unhides the SAS session based on its current state.

```
OleSAS.Visible = false
```

Set the Main SAS Window Title of the SAS Session

This Visual Basic code assigns a title to the main SAS window of the SAS session and then displays the title in a message box.

```
OleSAS.Title = "Automation Server"
Response = MsgBox(OleSAS.Title, vbOKOnly,
    "Title Is", 0, 0)
```

Assign a SAS Library and Run a SAS Procedure

This Visual Basic code submits SAS code to the SAS session, assigning a SAS library and running the INSIGHT procedure on sample data.

```
OleSAS.Submit("libname insamp
    'c:\sas\insight\sample';
proc insight data=insamp.drug;
run;")
```

End the SAS Session

This Visual Basic code ends the SAS session provided that there are no other OLE automation controllers making use of it.

```
OleSAS.Quit  
Set OleSAS = Nothing
```

Methods and Properties for Use with a SAS OLE Automation Object

Once instantiated, the SAS OLE automation object supports these methods as well as several properties:

- “Command Method” on page 270
- “QueryWindow Method” on page 270
- “Quit Method” on page 271
- “Submit Method” on page 271
- “Top Method” on page 272
- “Properties for Controlling a SAS Automation Object” on page 272

Command Method

Invokes a command as if it was entered from the SAS command line.

Syntax

```
Command(“sas-command”)
```

Details

By default, the active window receives the command. You can change which window receives the command by changing the CommandWindow property.

Example

This Visual Basic code invokes a SAS session and opens the BUILD window:

```
Set OleSAS = CreateObject("SAS.Application")  
OleSAS.Command("build")
```

QueryWindow Method

Queries whether a specified window exists within the SAS session.

Syntax

QueryWindow(*“window-name”*)

Details

QueryWindow returns either True or False based on whether the specified window is open in the automated SAS session. If the window exists but is not visible, QueryWindow still returns True.

The window name that you specify must match the exact spelling of the window name in SAS. The *window-name* argument is not case sensitive.

Example

This Visual Basic code gets an existing SAS session and checks whether the BUILD window is open. If the window is not open, this code invokes BUILD:

```
Dim OleSAS as Object
Set OleSAS = GetObject(,"SAS.Application")
If (Not OleSAS.QueryWindow("build")) Then
    OleSAS.Command("build")
EndIf
```

Quit Method

Ends the SAS session.

Syntax

Quit

Details

If the automation controller that issues the Quit method is the only controller that is using that particular SAS session, then the SAS session ends. If at least one other automation process is still using the SAS session, then the session remains running.

Submit Method

Submits DATA step or procedure code for processing.

Syntax

Submit(*“SAS-program-code”*)

Details

The string of text that you specify as *SAS-program-code* can contain multiple SAS statements separated by semicolons. The contents of the string are submitted to SAS for processing.

Example

The following example references a data library and invokes a SAS/AF application:

```
Dim OleSAS as Object
Set OleSAS = CreateObject("SAS.Application")
OleSAS.Visible = True
OleSAS.Submit("libname afapp 'f:\sas\afapp';")
OleSAS.Command("af c=afapp.bigapp.main.frame")
```

Top Method

Brings the SAS session to the foreground.

Syntax

Top

Details

The Top method works only if the Visible property is set to True.

Example

The following example invokes a SAS session, makes it a visible window, and then brings it to the foreground.

```
Dim OleSAS as Object
Set OleSAS = CreateObject("SAS.Application")
OleSAS.Visible = True
OleSAS.Top
```

Properties for Controlling a SAS Automation Object

Specify various properties of the SAS automation object.

Properties and Descriptions

Busy

indicates whether SAS is idle or working (for example, running a procedure, DATA step, and so on). This property is read only.

CommandWindow

sets the window (based on the window title) to receive commands you specify using the Command method. The name you specify must match the spelling of the window name exactly (though this property is not case sensitive). Once set, the window receives subsequent commands you specify with the Command method until CommandWindow is changed or set to Null (by specifying ""). If Null, which is the default, the currently active window receives the command. This property is read/write.

CommandWindowVisible

controls whether the window specified by the CommandWindow property is visible. If set to False, the window specified by the CommandWindow property is set to invisible. If the CommandWindow property is Null, this property has no effect. This property is read/write.

ConfirmExit

controls the behavior of how SAS exits. A value of 0 means that no confirmation box is displayed before SAS exits. A value of 1 means that a confirmation box is displayed before SAS exits. A value of 2 selects the default action, which is controlled by an alternative method that defines how SAS exits; for example, the Preferences dialog box.

Height

sets the height, in pixels, of the SAS application window. This property is read/write.

Parent

sets the name of the parent window that contains the SAS application window. If you change this value to another window, the SAS application window resizes to fit in the new frame. This property is read/write.

RC

returns the return code passed by a user function. You can set this property from within the SAS session by using the SETRC function. This property is read-only from the automation controller.

ResultString

returns a string passed by a user function. You can set this property from within the SAS session by using the SETRC function. This property is read-only from the automation controller.

Title

sets the main SAS window title. This property is read/write.

Visible

controls whether SAS is visible. This property is read/write.

Width

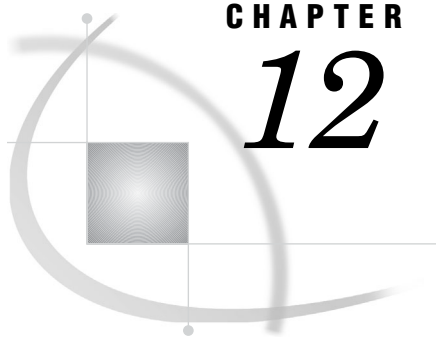
sets the width, in pixels, of the SAS application window. This property is read/write.

X

sets the horizontal coordinate, in pixels, for the top left corner of the SAS application window. This property is read/write.

Y

sets the vertical coordinate, in pixels, for the top left corner of the SAS application window. This property is read/write.



CHAPTER

12

Using Dynamic Data Exchange

<i>Overview of Dynamic Data Exchange (DDE)</i>	275
<i>DDE Syntax within SAS</i>	276
<i>Referencing the DDE External File</i>	276
<i>Using the DDE Triplet</i>	277
<i>Controlling Another Application Using DDE</i>	278
<i>DDE Examples</i>	278
<i>Using the X Command to Open a DDE Server</i>	278
<i>Using DDE to Write Data to Microsoft Excel</i>	278
<i>Using DDE to Write Data to Microsoft Word</i>	279
<i>Using DDE to Read Data from Microsoft Excel</i>	279
<i>Using DDE to Read Data from Microsoft Word</i>	279
<i>Using DDE and the SYSTEM Topic to Invoke Commands in an Application Using Excel</i>	280
<i>Using the NOTAB Option with DDE</i>	281
<i>Using the DDE HOTLINK</i>	282
<i>Using the !DDE_FLUSH String to Transfer Data Dynamically</i>	283
<i>Using Macro Variables to Issue DDE Commands</i>	283
<i>Reading Missing Data</i>	284

Overview of Dynamic Data Exchange (DDE)

Dynamic Data Exchange (DDE) is a method of dynamically exchanging information between Windows applications. DDE uses a client/server relationship to enable a client application to request information from a server application. SAS is always the client. In this role, SAS requests data from server applications, sends data to server applications, or sends commands to server applications.

You can use DDE with the DATA step, the SAS macro facility, SAS/AF applications, or any other portion of SAS that requests and generates data. DDE has many potential uses, one of which is to acquire data from a Windows spreadsheet or database application.

Note: Many Windows programs, including SAS, now support OLE to facilitate communication between applications. If you need to share data with an application that supports OLE, you might prefer to use the OLE support that is built into SAS. For more information, see “About OLE” on page 244. △

DDE Syntax within SAS

To use DDE in SAS, issue a FILENAME statement with the following syntax:

```
FILENAME fileref DDE 'DDE-triplet' <DDE-options>;
```

where:

fileref

is a valid fileref (as described in “Referencing External Files” on page 148).

DDE

is the device-type keyword that tells SAS you want to use Dynamic Data Exchange.

'DDE-triplet'

is the name of the DDE external file.

DDE-options

can be any of the following:

COMMAND

allows remote commands to be issued to DDE server applications. For more information, see “Controlling Another Application Using DDE” on page 278.

HOTLINK

instructs SAS to use the DDE HOTLINK. For an example of using this option, see “Using the DDE HOTLINK” on page 282.

LRECL=record-length

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

NOTAB

instructs SAS to ignore tab characters between variables. For an example of using this option, see “Using the NOTAB Option with DDE” on page 281.

RECFM=record-format

controls the record format. The following are valid values under Windows:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
V D	indicates variable format. This is the default.

CAUTION:

Use caution when using DDE with data values that are blank or missing. For sample code, see “Reading Missing Data” on page 284. Δ

Referencing the DDE External File

When you define a fileref to use with DDE, the *DDE-triplet* argument refers to the DDE external file.

Using the DDE Triplet

The DDE triplet is application-dependent and is different for every application you run. For information on an application's DDE triplet, see the application's documentation.

The triplet takes the following form:

'application-name | topic!item'

where:

application-name

is the executable filename of the server application. For example, the *application-name* for Microsoft Word is **winword**, and for Microsoft Excel it is **excel**.

topic

is the topic of conversation (between SAS and the DDE server application). This is typically the full path filename of the document or spreadsheet with which you want to share data.

item

is the range of conversation specified between the client and server applications. In spreadsheet applications, this is usually a range of cells. For document-based applications (for example, Microsoft Word), the item is something that defines a location in the document, such as a bookmark.

Valid values for all of these arguments vary depending on the server application. A software application supporting DDE as a server should list acceptable values for the triplet information in documentation supplied with the application.

Note: The server application must be started before trying to communicate with it using DDE. Also, the DDE triplet format might differ among different applications and among different versions of the same application. △

For example, in order to place text into a Microsoft Word document TESTDDE.DOC located at C:\TEMP with a bookmark named NUMBER, you could use this code:

```
filename test dde 'winword|"c:\temp\testdde.doc"
                !NUMBER' notab;
```

The application-name is **winword**, the topic is "**c:\temp\testdde.doc**", and the range is **!NUMBER**.

The following example assumes you are using Microsoft Excel 5.0 or greater.

Suppose you want to use SAS to populate the first four rows and two columns of the Microsoft Excel spreadsheet named Sales Data stored in **C:\EXCEL\SALES.XLS**. You would use the following code:

```
filename test dde 'Excel|c:\excel\
                [Sales.xls]Sales Data!R1C1:R4C2'
```

The application-name is **Excel**, the topic is **c:\excel\[Sales.xls] Sales Data**, and the range is **R1C1:R4C2**.

If your server application is able to copy the DDE-triplet to the Windows clipboard, you can display the DDE-triplet in SAS. To do this, select the information in the server application and copy it to the Windows Clipboard. Return to SAS and select **Solutions ► Accessories ► DDE triplet**.

Controlling Another Application Using DDE

DDE server applications support certain commands that you can issue by using a DDE link to control the application. To use these commands, use the special topic name SYSTEM in the DDE triplet and leave the item name blank. You can then use the INPUT statement for input from an application and the PUT statement to issue commands to the server application.

For those DDE server applications that do not recognize the SYSTEM topic name, you can specify the COMMAND option in the FILENAME statement you use to define the DDE link. When you specify the COMMAND option, you do not specify the item name in the DDE triplet.

Note: With SAS/AF software and OLE automation, you can automate any Windows application that supports OLE 2.0 as a server. For more information about using SAS and OLE, see “Automating OLE Objects and Applications” on page 252. \triangle

DDE Examples

This section provides several examples of using DDE with SAS under Windows. These examples use Microsoft Excel and Microsoft Word as DDE servers, but any application that supports DDE as a server can communicate with SAS.

Before you run these examples, you must first invoke Microsoft Excel and Microsoft Word, and open the spreadsheet or document used in the example.

Note: DDE examples are included in the host-specific sample programs that you access from the Help menu. \triangle

Using the X Command to Open a DDE Server

A DDE server application can be opened using the X command within SAS code. The XWAIT and XSYNC options must be turned off.

```
options noxwait noxsync;
x "c:\microsoft office\office\excel.exe";
```

Double quotation marks are required around the path if the path contains a space. The single quotation marks are for the X command.

Using DDE to Write Data to Microsoft Excel

The first example sends data from a SAS session to an Excel spreadsheet. The target cells are rows 1 through 100 and columns 1 through 3. To send the data, submit the following program:

```
/* The DDE link is established using */
/* Microsoft Excel SHEET1, rows 1 */
/* through 100 and columns 1 through 3 */
filename random dde
    'excel|sheet1!r1c1:r100c3';
data random;
    file random;
    do i=1 to 100;
        x=ranuni(i);
```

```

        y=10+x;
        z=x-10;
        put x y z;
    end;
run;

```

Using DDE to Write Data to Microsoft Word

This example sends a text string to a Microsoft Word document at a given bookmark. Note the difference between using DDE with Microsoft Word and Microsoft Excel.

```

filename testit dde 'winword|"c:\temp\testing.doc"
                    !MARK' notab;

data _null_;
    file testit;
    put 'This is a test.';
run;

```

Note: If you are writing to Microsoft Word97, use Visual Basic commands such as FileOpen.Name, FileSave, FileClose, and Insert. If the PUT statement contains a macro that Word97 does not understand, you will see this message:

```
Ambiguous name detected: TmpDDE
```

Δ

Using DDE to Read Data from Microsoft Excel

You can also use DDE to read data from an Excel application into SAS, as in the following example:

```

/* The DDE link is established using */
/* Microsoft Excel SHEET1, rows 1   */
/* through 10 and columns 1 through 3 */
filename monthly
    dde 'excel|sheet1!r1c1:r10c3';
data monthly;
    infile monthly;
    input var1 var2 var3;
run;
proc print;
run;

```

Using DDE to Read Data from Microsoft Word

This example reads data from a Microsoft Word document at a given bookmark.

```

filename testit dde 'winword|"c:\temp\testing.doc"
                    !MARK' notab;

libname workdir 'c:\temp';

/* Get ready to read the first bookmark. */

```

```

data workdir.worddata;
  length wordnum $5;
  infile testit;
  input wordnum $;
run;

proc print;
run;

```

Using DDE and the SYSTEM Topic to Invoke Commands in an Application Using Excel

You can issue commands to Excel or other DDE-compatible programs directly from SAS using DDE. In the following example, the Excel application is invoked using the X command; a spreadsheet called SHEET1 is loaded; data are sent from SAS to Excel for row 1, column 1 to row 20, column 3; and the commands required to select a data range and sort the data are issued. The spreadsheet is then saved and the Excel application is terminated.

```

/* This code assumes that Excel      */
/* is installed on the current        */
/* drive in a directory called EXCEL. */

options noxwait noxsync;
x '''c:\microsoft office\office\excel.exe''';

/* Sleep for 60 seconds to give */
/* Excel time to come up.      */

data _null_;
  x=sleep(60);
run;

/* The DDE link is established using */
/* Microsoft Excel SHEET1, rows 1    */
/* through 20 and columns 1 through 3 */

filename data
  dde 'excel|sheet1!r1c1:r20c3';
data one;
  file data;
  do i=1 to 20;
    x=ranuni(i);
    y=x+10;
    z=x/2;
    put x y z;
  end;
run;

/* Microsoft defines the DDE topic */
/* SYSTEM to enable commands to be */
/* invoked within Excel.           */

filename cmds dde 'excel|system';

```

```

/* These PUT statements are          */
/* executing Excel macro commands */

data _null_;
  file cmds;
  put '[SELECT("R1C1:R20C3")]';
  put '[SORT(1,"R1C1",1)]';
  put '[SAVE()]';
  put '[QUIT()]';
run;

```

Using the NOTAB Option with DDE

SAS expects to see a TAB character placed between each variable that is communicated across the DDE link. Similarly, SAS places a TAB character between variables when data are transmitted across the link. When the NOTAB option is placed in a FILENAME statement that uses the DDE device-type keyword, SAS accepts character delimiters other than tabs between variables.

The NOTAB option can also be used to store full character strings, including embedded blanks, in a single spreadsheet cell. For example, if a link is established between SAS and the Excel application, and a SAS variable contains a character string with embedded blanks, each word of the character string is normally stored in a single cell. To store the entire string, including embedded blanks in a single cell, use the NOTAB option as in the following example:

```

/* Without the NOTAB option, column1 */
/* contains 'test' and column2       */
/* contains 'one'.                   */

filename test
  dde 'excel|sheet1!r1c1:r1c2';
data string;
  file test;
  a='test one';
  b='test two';
  put a $15. b $15.;
run;

/* You can use the NOTAB option to store */
/* each variable in a separate cell. To  */
/* do this, you must force a tab        */
/* ('09'x) between each variable, as in */
/* the PUT statement.                   */
/* After performing this DATA step, column1*/
/* contains 'test one' and column2      */
/* contains 'test two'.                 */

filename test
  dde 'excel|sheet1!r2c1:r2c2' notab;
data string;
  file test;
  a='test one';
  b='test two';

```

```

    put a $15. '09'x b $15.;
run;

```

Using the DDE HOTLINK

If the HOTLINK option is specified, the DDE link is activated every time the data in the specified spreadsheet range are updated. In addition, DDE enables you to poll the data when the HOTLINK option is specified to determine whether data within the range specified have been changed. If no data have changed, the HOTLINK option returns a record of 0 bytes. In the following example, row 1, column 1 of the spreadsheet SHEET1 contains the daily production total. Every time the value in this cell changes, SAS reads in the new value and outputs the observation to a data set. In this example, a second cell in row 5, column 1 is defined as a status field. Once the user completes data entry, typing any character in this field terminates the DDE link:

```

/* Enter data into Excel SHEET1 in      */
/* row 1 column 1. When you            */
/* are through entering data, place    */
/* any character in row 5              */
/* column 1, and the DDE link is      */
/* terminated.                         */

filename daily
  dde 'excel|sheet1!r1c1' hotlink;
filename status
  dde 'excel|sheet1!r5c1' hotlink;
data daily;
  infile status length=flag;
  input @;
  if flag ne 0 then stop;
  infile daily length=b;
  input @;

/* If data have changed, then the */
/* incoming record length          */
/* is not equal to 0.              */

  if b ne 0 then
    do;
      input total $;
      put total=;
      output;
    end;
run;

```

It is possible to establish multiple DDE sessions. The previous example uses two separate DDE links. When the HOTLINK option is used and there are multiple cells referenced in the *item* specification, if any one of the cells changes, then all cells are transmitted.

Unless the HOTLINK option is specified, DDE is performed as a single one-time data transfer. The values currently stored in the spreadsheet cells at the time that the DDE is processed are values that are transferred.

Using the !DDE_FLUSH String to Transfer Data Dynamically

DDE also enables you to program when the DDE buffer is dumped during a DDE link. Normally, the data in the DDE buffer are transmitted when the DDE link is closed at the end of the DATA step. However, the special string '**!DDE_FLUSH**' issued in a PUT statement instructs SAS to dump the contents of the DDE buffer. This function allows you considerable flexibility in the way DDE is used, including the capacity to transfer data dynamically through the DATA step. The following example creates a Macro Sheet in Microsoft Excel. Commands are then written to the Macro Sheet, which will rename Sheet1 to NewSheet. After writing these commands, through the use of !DDE_FLUSH, the Excel Macro can be executed in the same DATA Step as it is written.

```

filename cmds dde 'excel|system';
data _null_;
file cmds;
/* Insert an Excel Macro Sheet */
put '[workbook.insert(3)]';
run;

/* Direct the Output to the Newly created Macro Sheet */
filename xlmacro dde 'excel|macro1!r1c1:r5c1' notab;

data _null_;
file xlmacro;
put '=workbook.name("sheet1","NewSheet")';
put '=halt(true)';
/* Dump the contents of the buffer, allowing us to both write and */
/* execute the macro in the same DATA Step */
put '!dde_flush';
file cmds;
/* Run Macro1 */
put '[run("macro1!r1c1")]';
put '[error(false)]';
/* delete the Macro Sheet */
put '[workbook.delete("macro1")]';
run;

```

Using Macro Variables to Issue DDE Commands

This example illustrates the use of a Macro Variable to issue a command to Microsoft Excel. In the example, the Macro Variable, excelOne, is being used in place of the Excel Workbook location **C:\test.xls**. Since macro triggers such as ampersands and percents are treated as text within single quotes, a Macro quoting function must be used. %STR is used to mask each individual apostrophe separately. Anytime you have an unmatched apostrophe or parenthesis then it must be preceded by a percent sign and since each apostrophe needs to be treated independently of each other the percents are needed. Once %STR has hidden the apostrophe the macro variable &excelOne resolves. %UNQUOTE is then used to remove what %STR has done and restores each apostrophe around the resolved value leaving the result as:

```
'[open("C:\test.xls")]'
```

```

options mprint symbolgen;
filename cmds dde 'excel|system';

%let excelOne=C:\test.xls;

data _null_;
file cmds;
put %unquote(%str(%'[open("&excelOne")]%'));
run;

```

Reading Missing Data

This example illustrates reading missing data from an Excel spreadsheet called SHEET1. This example reads the data in columns 1 through 3 and rows 10 through 20. Some of the data cells can be blank. Here is an example of what some of the data look like:

```

...
10  John    Raleigh    Cardinals
11  Jose     North Bend Orioles
12  Kurt     Yelm       Red Sox
13  Brent                    Dodgers
...

```

Here's the code that can read these data correctly into a SAS data set:

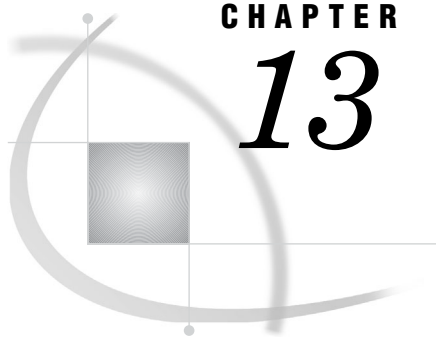
```

filename mydata
  dde 'excel|sheet1!r10c1:r20c3';
data in;
  infile mydata dlm='09'x notab
    dsd missover;
  informat name $10. town $char20.
    team $char20.;
  input name town team;
run;
proc print data=in;
run;

```

In this example, the NOTAB option tells SAS not to convert tabs that are sent from the Excel application into blanks. Therefore, the tab character can be used as the delimiter between data values. The DLM= option specifies the delimiter character, and '09'x is the hexadecimal representation of the tab character. The DSD option specifies that two consecutive delimiters represent a missing value. The default delimiter is a comma. For more information about the DSD option, see *SAS Language Reference: Dictionary*. The MISSEVER option prevents a SAS program from going to a new input line if it does not find values in the current line for all the INPUT statement variables. With the MISSEVER option, when an INPUT statement reaches the end of the current record, values that are expected but not found are set to missing.

The INFORMAT statement forces the DATA step to use modified list input, which is crucial to this example. If you do not use modified list input, you receive incorrect results. The necessity of using modified list input is not DDE specific. You would need it even if you were using data in a CARDS statement, whether your data were blank- or comma-delimited.



CHAPTER

13

Using Unnamed and Named Pipes

<i>Overview of Pipes</i>	285
<i>Using Unnamed Pipes</i>	286
<i>Introduction to Unnamed Pipes</i>	286
<i>Unnamed Pipe Syntax</i>	286
<i>Using Redirection Sequences</i>	287
<i>Unnamed Pipe Example</i>	287
<i>Using Named Pipes</i>	288
<i>Introduction to Named Pipes</i>	288
<i>Named Pipe Syntax</i>	288
<i>Using the CALL RECONNECT Routine</i>	290
<i>Using Named Pipes in SCL</i>	290
<i>Named Pipe Examples</i>	290
<i>Simple Named Pipes: One Client Connected to One Server</i>	290
<i>One Server Connected to Several Clients</i>	291
<i>The NOBLOCK Option</i>	293
<i>The CALL RECONNECT Routine</i>	295

Overview of Pipes

A pipe is a channel of communication between two processes. A process with a handle to one end can communicate with another process that has a handle to the other end. This means that you can use a specialized Windows application to provide information to your SAS session or vice versa.

Pipes can be one-way or two-way. With a one-way pipe, one application can write data only to the pipe while the other application reads from it. With a two-way pipe, both applications can read and write data. There are two types of pipes:

unnamed pipe

handles one way communication. Also called an anonymous pipe (or simply pipe), it is typically used to communicate between a parent process and a child process. Within SAS, SAS is the parent process that invokes (and reads data from) a child process.

named pipe

handles one-way or two-way communication between two unrelated processes. That is, one process is not started by the other. In fact, it is possible to have two applications communicating over a pipe on a network. You can use named pipes within SAS to communicate with other applications or even with another SAS session.

Using Unnamed Pipes

Introduction to Unnamed Pipes

Unnamed pipes enable you to invoke a program outside of SAS and redirect the program's input, output, and error messages to SAS. This capability enables you to capture data from a program external to SAS without creating an intermediate data file.

For unnamed pipes to work with Windows applications external to SAS, the application program must read data from standard input (STDIN), write output to standard output (STDOUT), and write errors to standard error (STDERR). These files have numeric file handles associated with them, as follows:

File	File Handle
STDIN	0
STDOUT	1
STDERR	2

When SAS captures STDERR from another application, the error messages are routed by default to the SAS log. If you want to write to STDIN in another application, you can use a PUT statement in a SAS DATA step. Because SAS can write to STDIN and capture from STDOUT in the same application, unnamed pipes can be used to send data to an external program, as well as to capture the output and error messages of the same program. You can use redirection sequences to redirect STDIN, STDOUT, and STDERR.

When you start SAS from the Windows desktop, STDIN and STDOUT are not available to your programs.

For more information, see “Using Redirection Sequences” on page 287 or your Windows documentation.

Unnamed Pipe Syntax

To use an unnamed pipe, issue a FILENAME statement with the following syntax:

FILENAME *fileref* PIPE '*program-name*' *option-list*;

You can use the following arguments with this syntax of the FILENAME statement:

fileref

is any valid fileref, as described in “Referencing External Files” on page 148.

PIPE

is the device-type keyword that tells SAS you want to use an unnamed pipe.

program-name

specifies the external Windows application program. This argument must fully specify the pathname to the program, or the path to the directory containing the program must be contained in the Windows PATH environment variable. This argument can also contain program options. For example, you can specify the following argument to indicate you want to invoke the STOCKMKT program on all stocks:

```
'stockmkt.exe -all'
```

option-list

can be any of the options valid in the FILENAME statement, such as the LRECL= or RECFM= options. For a complete list of options available for the FILENAME statement under Windows, see “FILENAME Statement” on page 453.

Using Redirection Sequences

Any Windows application that accommodates standard input, output, and error commands can use the unnamed pipe feature. Because many Windows system commands use standard input, output, and error commands, you can use these commands with unnamed pipes within SAS. Unless you specify otherwise, an unnamed pipe directs STDOUT and STDERR to two different files. To combine the STDOUT and STDERR into the same file, use redirection sequences. The following is an example that redirects STDERR to STDOUT for the Windows DIR command:

```
filename listing pipe 'dir *.sas 2>&1';
```

In this example, if any errors occur in performing this command, STDERR (2) is redirected to the same file as STDOUT (1). This example demonstrates SAS ability to capitalize on operating environment capabilities. This feature of redirecting file handles is a function of the Windows operating system rather than of SAS.

Unnamed Pipe Example

In the following example, you use the unnamed pipes feature of SAS under Windows to produce some financial reports. The example assumes you have a stand-alone program that updates stock market information from a financial news bureau. You need SAS to invoke a stock market report with the most recently created data from the stock market program. The following is how you create and use the pipe within your SAS session:

```
filename stocks pipe 'stockmkt.exe -all' console=min;
data report;
  infile stocks;
  input stock $ open close change;
run;
proc print;
  var stock open close change;
  sum change;
  title 'Stock Market Report';
run;
```

In this example, the PIPE device-type keyword in the FILENAME statement indicates that the fileref STOCKS is an unnamed pipe. The STOCKMKT.EXE reference is the name of the stand-alone program that generates the stock market data. The host-option CONSOLE=MIN indicates that the command prompt window that is opened

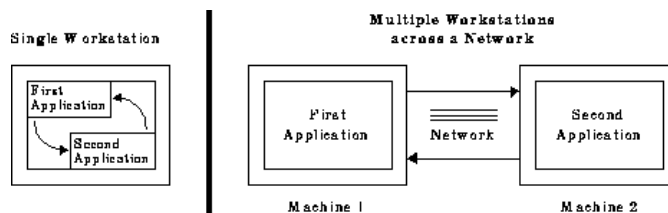
to run the STOCKMKT.EXE program is opened minimized. The INFILE statement causes SAS to invoke the STOCKMKT.EXE program and read the data in the pipe from it. The STOCKMKT.EXE program completes without you being aware that it has been implemented (except for the command prompt window button on the Windows task bar). Because the fileref STOCKS has already been defined as an unnamed pipe, the standard output from STOCKMKT.EXE is redirected to SAS and captured through the INFILE statement. The SAS program reads in the variables and uses the PRINT procedure to generate a printed report. Any error messages generated by STOCKMKT.EXE appear in the SAS log.

Using Named Pipes

Introduction to Named Pipes

The *named pipes* capability is one of the most powerful tools available in SAS under Windows for communicating with other applications. The named pipes feature enables bidirectional data or message exchange between applications on the same machine or applications on separate machines across a network. The following figure illustrates these two methods of communication.

Figure 13.1 Communication Using Named Pipes



The applications can be SAS sessions or other Windows applications. For example, you can use the PRINTTO procedure to direct the results from SAS procedures to another Windows application, using a named pipe. Therefore, you have the choice of having multiple SAS sessions that communicate with each other or one SAS session communicating with another Windows application.

Whether you are communicating between multiple SAS sessions or between a SAS session and another Windows application that supports named pipes, the pipes are defined in a client/server relationship. One process is defined as the *server*, while one or more other processes are defined as *clients*. In this configuration, you can have multiple clients send data to the server or the server send data to the various clients. Named pipes enable you to coordinate processing between the server and clients using various options.

Named Pipe Syntax

You can use a named pipe anywhere you use a fileref in SAS. To use a named pipe, issue a FILENAME statement with the following syntax:

```
FILENAME fileref NAMEPIPE 'pipe-specification' <named-pipe-options>;
```

You can use the following arguments with this syntax of the FILENAME statement:

fileref

is any valid fileref as described in “Referencing External Files” on page 148.

NAMEPIPE

is the device-type keyword that tells SAS you want to use a named pipe.

pipe-specification

is the name of the pipe.

This argument has two mutually exclusive syntaxes:

\\.PIPE*pipe-name*

indicates you are establishing a pipe on a single PC or defining a server pipe across a network. The *pipe-name* argument specifies the name of the pipe.

server-name\\.PIPE*pipe-name*

indicates you are establishing a client pipe over a network named-pipe server. Remember to include the double backslash (\\) in this situation. The *pipe-name* argument specifies the name of the client pipe. The *server-name* argument specifies the name of the named-pipe server.

named-pipe-options

can be any of the following. The default value is listed first:

SERVER | CLIENT

indicates the mode of the pipe. SERVER is the default.

BLOCK | NOBLOCK

indicates whether the client or server is to wait for data to be read if no data are currently available. BLOCK indicates to wait and is the default.

NOBLOCK indicates not to wait. Control is returned immediately to the program if no data are available in the pipe. Writing to the pipe always implies BLOCK.

BYTE | MESSAGE

indicates the type of pipe. BYTE is the default. The difference between a BYTE pipe and a MESSAGE pipe is that a MESSAGE pipe includes an encoded record length, whereas a BYTE pipe does not.

RETRY=*seconds*

indicates the amount of time the client or server is to wait to establish the pipe. The minimum value for *seconds* is 10. This option allows time for synchronization of the client and server. The default waiting period is 10 seconds.

There are two values for the *seconds* argument that indicate special cases:

-2 indicates that the client is to wait the amount of time defined by the server's RETRY= option. If this option is used, the SERVER must always be active or the pipe connection fails.

-1 indicates that the client or the server is to wait indefinitely for the pipe connection.

EOFCONNECT

is valid only when defining the server and indicates that if an end-of-file (EOF) is received from a client, the server is to try to connect to the next client.

All of these options are consistent with terminology used in Windows programmers' reference guides such as those options provided with the Microsoft Win32 SDK.

Using the CALL RECONNECT Routine

A special SAS CALL routine, CALL RECONNECT, enables the server to disconnect the current client and try to connect to the next available client. Normally, a pipe terminates when the client side of the pipe sends an end-of-file to the server. To break the pipe connection at any time, the server SAS session can issue a CALL RECONNECT statement. For an illustration of this routine, see "The CALL RECONNECT Routine" on page 295.

Using Named Pipes in SCL

To establish named pipes using SCL code, you must use the FOPEN function to open a file (or pipe) before you can access it. In doing so, you must specify the appropriate open mode for both the client and server applications so that the two can communicate over the pipe. Here is a summary of the different modes you can use:

If the server accesses the pipe as...	then the client must access it as...
I (input)	O (output)
O (output)	S (sequential)
U (update)	O (output) or S (sequential)

Named Pipe Examples

The best way to understand named pipes is to examine several different examples illustrating their use. In most of the examples in this section, the named pipe is established between two SAS sessions. However, named pipes work between SAS and other applications that support named pipes.

Simple Named Pipes: One Client Connected to One Server

The simplest named pipe configuration is one server connected to one client, as shown in Figure 13.2 on page 290.

Figure 13.2 One Server Connected to One Client



In the following example, a named pipe called WOMEN is established between two SAS sessions. The server SAS session selectively sends data to the client SAS session. You can start the server or the client first; one waits 30 seconds for the other to connect. In the first SAS session, create a named pipe as a server:

```

/* Creates a pipe called WOMEN, acting */
/* as a server. The server waits 30    */
/* seconds for a client to connect.    */
filename women namepipe '\\.\pipe\women'
        server retry=30;
/* This code writes three records into */
/* the named pipe called WOMEN.        */
data class;
  input name $ sex $ age;
  file women;
  if upcase(sex)='F' then
    put name age;
  datalines;
MOORE M 15
JOHNSON F 16
DALY F 14
ROBERTS M 14
PARKER F 13
;

```

In the second SAS session, you can use SAS statements to exchange data between the two SAS sessions. For example, you can submit the following program from the client session:

```

/* Creates a pipe called WOMEN, acting */
/* as a client. The client waits 30    */
/* seconds for a server to connect.    */
filename in namepipe '\\.\pipe\women' client
        retry=30;
data female;
  infile in;
  input name $ age;
proc print;
run;

```

The following program is another example of a single client and server. This example illustrates using the PRINTTO procedure to direct results from the SUMMARY procedure to another Windows application, using a named pipe called RESULTS:

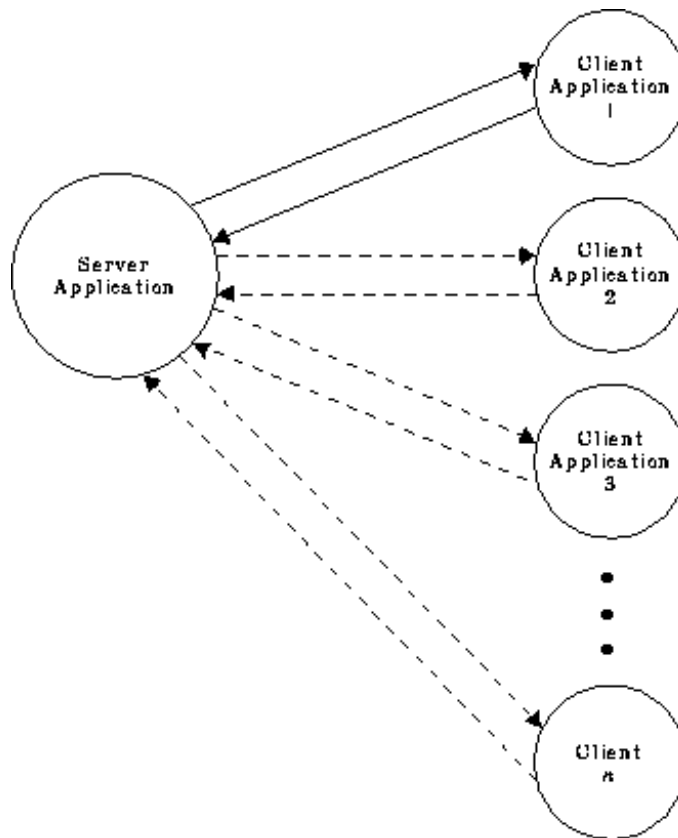
```

filename results namepipe '\\.\pipe\results'
        server retry=60;
proc printto print=results new;
run;
proc summary data=monthly;
run;

```

One Server Connected to Several Clients

You can choose to have one server connected to several clients. In this case, the named pipe configuration looks like the configuration shown in Figure 13.3 on page 292.

Figure 13.3 One Server Connected to Several Clients

In this configuration, the data connection is initially between the server and the first client. When this connection is terminated, the server connects to the second client, and so on. The connection can return to the first client after the last client's connection is broken if your program is set up to do so.

You must use the EOFCONNECT option to cause the connection to move properly from one client to the next. Here is an example of using the EOFCONNECT option with one server SAS session and two clients. The clients can be on the same PC or on a PC connected across a network.

In the first SAS session, submit the following statements:

```

/* Creates a pipe called SALES, acting */
/* as a server. The server waits 30 */
/* seconds for a client to connect. */
/* After the client has disconnected, */
/* this server SAS session tries to */
/* connect to the next available client */
filename daily namepipe '\\.\pipe\sales'
      server eofconnect retry=30;
/* This program reads in the daily */
/* sales figures sent from each client.*/
data totsales;
  infile daily;
  input dept $ item $ total;
run;

```


In the second SAS session, submit the following statements:

```

/* Creates a pipe called SALES, acting */
/* as a client. The client waits forever */
/* for a server to connect. After the */
/* first client has disconnected, the */
/* second client connects with the server.*/
/* The first client is the TOYS dept. */
filename dept1 namepipe '\\.\pipe\sales'
        client retry=-1;
data toys;
    input item $ total;
    dept='TOYS';
    file dept1;
    put dept item total;
    datalines;
DOLLS 100
MARBLES 10
BLOCKS 50
GAMES 60
CARS 40
;
/* The second client is the SPORTS dept.*/
/* These data could come from a separate */
/* SAS session. */
filename dept2 namepipe '\\.\pipe\sales'
        client retry=-1;
data sports;
    input item $ total;
    dept='SPORTS';
    file dept2;
    put dept item total;
    datalines;
BALLS 30
BATS 65
GLOVES 15
RACKETS 75
FISHING 20
TENTS 115
HELMETS 45
;

```

The NOBLOCK Option

In the following example, the NOBLOCK option is used to specify that if no data are available when the pipe is read, then the program should continue performing. If the default value of BLOCK had been used, then the pipe would wait indefinitely until data were found in the pipe. The EOFCONNECT option is used to tell the server that when a client sends an end-of-file, the server can connect with a new client. The RETRY= option tells the server to look for any new clients for 20 seconds while the client waits indefinitely on a server. The clients can be on the same PC or on a PC connected across a network. A server connects to one client at a time, and the clients queue in a serial order waiting to connect to the server.

In the first SAS session, submit the following statements:

```

/* Defines a named pipe called LINE. */
/* Use the NOBLOCK option to specify */
/* that if no data are available when */
/* the read is performed, then continue.*/
/* Use the EOFCONNECT option to tell */
/* the server to try to connect with a */
/* new client if an end-of-file is */
/* encountered. Use the RETRY= option */
/* to tell the server to look for any */
/* new clients for 20 seconds. */
filename data namepipe '\\.\pipe\line' server
      noblock eofconnect retry=20;
/* This DATA step reads in all data */
/* from any clients connected to the */
/* named pipe called LINE. */
data all;
  infile data length=len;
  input @;
  /* If the length of the incoming */
  /* record is 0, then no data were */
  /* found in the pipe; otherwise, */
  /* read the incoming data. */
  if len ne 0 then
    do;
      input machine $ width weight;
      output;
    end;
run;
proc print;
run;

```

Each of the following DATA steps below can be carried out on several PCs connected across a network:

```

/* Defines a named pipe called LINE. */
/* The RETRY= option is set such that */
/* the clients wait forever until a */
/* server is available */
/* (that is, RETRY=-1). */
filename data namepipe '\\.\pipe\line'
      client retry=-1;
/* This is information from the */
/* first machine/client. */
data machine1;
  file data;
  input width weight;
  machine='LINE_1';
  put machine width weight;
  datalines;
5.3 18.2
3.2 14.3
4.8 16.9
6.4 20.8
4.3 15.4

```

```

6.1 19.5
5.6 18.9
;
  /* This is information from the */
  /* second machine/client.      */
filename data namepipe '\\.\pipe\line'
      client retry=-1;
data machine2;
  file data;
  input width weight;
  machine='LINE_2';
  put machine width weight;
  datalines;
4.3 17.2
5.2 18.4
6.8 19.9
3.4 14.5
5.3 18.6
4.1 17.1
6.6 19.5
;

```

The CALL RECONNECT Routine

The following example demonstrates how to set up a named pipe server to establish a connection with two clients. (For this example, you need three active SAS sessions.) In this example, the CALL RECONNECT routine is used to reconnect to the next client on the named pipe if it has been at least 30 seconds since the previous client has sent any data. Each client is a data entry operator, sending data to the server SAS session.

In the server SAS session, submit the following statements:

```

filename data namepipe '\\.\pipe\orders'
      server noblock eofconnect retry=30;
data all;
  infile data length=len missover;
  input @;
  /* If the length of the incoming */
  /* record is 0, then no data were */
  /* found in the pipe; otherwise, */
  /* read the incoming data        */
  if len ne 0 then
  do;
    input operator $ item $ quantity $;
    if item='' or quantity='' then
      delete;
    else
      output;
    put operator= item= quantity=;
  end;
  /* If no data are being transmitted,*/
  /* try reconnecting to the next    */
  /* available client.                */
else
do;
  /* Use the named pipe fileref */

```

```

        /* as the argument of */
        /* CALL RECONNECT. */
        call reconnect('data');
    end;
run;

```

In the second SAS session, which is the first data entry operator, submit the following statements:

```

filename data namepipe '\\.\pipe\orders'
        client retry=-1;
data entry1;
    if _n_=1 then
        do;
            window entry_1
                #1 @2 'ENTER STOP WHEN YOU ARE FINISHED'
                #3 @5 'ITEM NUMBER - ' item $3.
                #5 @5 'QUANTITY - ' quantity $3.;
        end;
        do while (upcase(_cmd_) ne 'STOP');
            display entry_1;
            file data;
            put 'ENTRY_1' +1 item quantity;
            item='';
            quantity='';
        end;
    stop;
run;

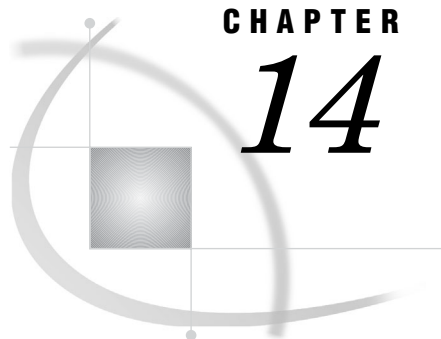
```

In the third SAS session, which is the second data entry operator, submit the following statements:

```

filename data namepipe '\\.\pipe\orders'
        client retry=-1;
data entry2;
    if _n_=1 then
        do;
            window entry_2
                #1 @2 'ENTER STOP WHEN YOU ARE FINISHED'
                #3 @5 'ITEM NUMBER - ' item $3.
                #5 @5 'QUANTITY - ' quantity $3.;
        end;
        do while (upcase(_cmd_) ne 'STOP');
            display entry_2;
            file data;
            put 'ENTRY_2' +1 item quantity;
            item='';
            quantity='';
        end;
    stop;
run;

```



CHAPTER

14

Accessing External DLLs from SAS

<i>Overview of Dynamic Link Libraries in SAS</i>	297
<i>The SASCBTBL Attribute Table</i>	298
<i>Syntax of the Attribute Table</i>	298
<i>ROUTINE Statement</i>	299
<i>ARG Statement</i>	301
<i>The Importance of the Attribute Table</i>	302
<i>Special Considerations When Using External DLLs</i>	303
<i>Using PEEKLONG Functions to Access Character String Arguments</i>	303
<i>Accessing External DLLs Efficiently</i>	304
<i>Grouping SAS Variables as Structure Arguments</i>	305
<i>Using Constants and Expressions as Arguments to MODULE</i>	306
<i>Specifying Formats and Informats to Use with MODULE Arguments</i>	307
<i>C Language Formats</i>	307
<i>FORTTRAN Language Formats</i>	307
<i>PL/I Language Formats</i>	308
<i>COBOL Language Formats</i>	308
<i>\$CSTRw. Format</i>	309
<i>\$BYVALw. Format</i>	310
<i>Understanding MODULE Log Messages</i>	311
<i>Examples</i>	312
<i>Updating a Character String Argument</i>	312
<i>Passing Arguments by Value</i>	313
<i>Using PEEKCLONG to Access a Returned Pointer</i>	314
<i>Using Structures</i>	314
<i>Invoking a DLL Routine from PROC IML</i>	315

Overview of Dynamic Link Libraries in SAS

Dynamic link libraries (DLLs) are executable files that contain one or more routines written in any of several programming languages. DLLs are a mechanism for storing useful routines that might be needed by many applications. When an application needs a routine that resides in a DLL, it loads the DLL, invokes the routine, and unloads the DLL upon completion. SAS provides routines and functions that let you invoke these external routines from within SAS. You can access the DLL routines from the DATA step, the IML procedure, and SCL code. You use the MODULE family of SAS call routines and functions (including MODULE, MODULEN, MODULEC, MODULEI, MODULEIN, and MODULEIC) to invoke a routine that resides in an external DLL. This documentation refers to the MODULE family of call routines and functions generically as the MODULE functions.

These are general steps for accessing an external DLL routine:

- 1 Create a text file that describes the DLL routine you want to access, including the arguments it expects and the values it returns (if any). This attribute file must be in a special format, as described in “The SASCBTBL Attribute Table” on page 298.
- 2 Use the FILENAME statement to assign the SASCBTBL fileref to the attribute file you created.
- 3 In a DATA step or SCL code, use a call routine or function (MODULE, MODULEN, or MODULEC) to invoke the DLL routine. The specific function you use depends on the type of expected return value (none, numeric, or character). (You can also use MODULEI, MODULEIN, or MODULEIC within a PROC IML step.) The MODULE functions are described in “MODULE Function” on page 410.

CAUTION:

Only experienced programmers should access external DLLs. By accessing a function in an external DLL, you transfer processing control to the external function. If done improperly, or if the external function is not reliable, you might lose data or have to reset your computer (or both). Δ

The SASCBTBL Attribute Table

Because the MODULE routine invokes an external function that SAS knows nothing about, you must supply information about the function’s arguments so that the MODULE routine can validate them and convert them, if necessary. For example, suppose you want to invoke a routine that requires an integer as an argument. Because SAS uses floating-point values for all of its numeric arguments, the floating-point value must be converted to an integer before you invoke the external routine. The MODULE routine looks for this attribute information in an attribute table referred to by the SASCBTBL fileref.

The attribute table is a sequential text file that contains descriptions of the routines you can invoke with the MODULE function. The function of the table is to define how the MODULE function should interpret its supplied arguments when building a parameter list to pass to the called DLL routine.

The MODULE routines locate the table by opening the file referred to by the SASCBTBL fileref. If you do not define this fileref, the MODULE routines simply call the requested DLL routine without altering the arguments.

CAUTION:

Using the MODULE functions without defining an attribute table can cause SAS to crash or force you to reset your computer. You need to use an attribute table for all external functions that you want to invoke. Δ

The attribute table should contain a description for each DLL routine you intend to call (using a ROUTINE statement) plus descriptions of each argument associated with the routine (using ARG statements).

Syntax of the Attribute Table

At any point in the attribute table file, you can create a comment using an asterisk (*) as the first nonblank character of a line or after the end of a statement (following the semicolon). You must end the comment with a semicolon.

ROUTINE Statement

The following is the syntax of the ROUTINE statement:

```
ROUTINE name MINARG=minarg MAXARG=maxarg
  <CALLSEQ=BYVALUE | BYADDR>
  <STACKORDER=R2L | L2R>
  <STACKPOP=CALLER | CALLED>
  <TRANSPPOSE=YES | NO> <MODULE=DLL-name>
  <RETURNS=SHORT | USHORT | LONG | ULONG
    | DOUBLE | DBLPTR | CHAR<n>>
  <RETURNREGS=DXAX>;
```

The following are descriptions of the ROUTINE statement attributes:

ROUTINE *name*

starts the ROUTINE statement. You need a ROUTINE statement for every DLL function you intend to call using the MODULE function. The value for *name* must match the routine name or ordinal you specified as part of the 'module' argument in the MODULE function, where *module* is the name of the DLL (if not specified by the MODULE attribute, described later) and the routine name or ordinal. For example, to be able to specify **KERNEL32,GetPath** in the MODULE function call, the ROUTINE *name* should be **GetPath**.

The *name* argument is case sensitive, and is required for the ROUTINE statement.

MINARG=*minarg*

specifies the minimum number of arguments to expect for the DLL routine. In most cases, this value will be the same as MAXARG; but some routines do allow a varying number of arguments. This is a required attribute.

MAXARG=*maxarg*

specifies the maximum number of arguments to expect for the DLL routine. This is a required attribute.

CALLSEQ=BYVALUE | BYADDR

indicates the calling sequence method used by the DLL routine. Specify BYVALUE for call-by-value and BYADDR for call-by-address. The default value is BYADDR.

FORTRAN and COBOL are call-by-address languages; C is usually call-by-value, although a specific routine might be implemented as call-by-address.

The MODULE routine does not require that all arguments use the same calling method; you can identify any exceptions by using the BYVALUE and BYADDR options in the ARG statement, described later in this section.

STACKORDER=R2L | L2R

indicates the order of arguments on the stack as expected by the DLL routine.

R2L places the arguments on the stack according to C language conventions. The last argument (right-most in the call syntax) is pushed first, the next-to-last argument is pushed next, and so on, so that the first argument is the first item on the stack when the external routine takes over. R2L is the default value.

L2R places the arguments on the stack in reverse order, pushing the first argument first, the second argument next, and so on, so that the last argument is the first item on the stack when the external routine takes over. Pascal uses this calling convention, as do some C routines.

STACKPOP=CALLER | CALLED

specifies which routine, the caller routine or the called routine, is responsible for popping the stack (updating the stack pointer) upon return from the routine. The

default value is `CALLER` (the code that calls the routine). Some routines that use Microsofts `__stdcall` attribute with 32-bit compilers, require the called routine to pop the stack.

TRANSPPOSE=YES | NO

specifies whether to transpose matrices with both more than one row and more than one column before calling the DLL routine. This attribute applies only to routines called from within PROC IML with `MODULEI`, `MODULEIC`, and `MODULEIN`.

`TRANSPPOSE=YES` is necessary when calling a routine written in a language that does not use row-major order to store matrices. (For example, FORTRAN uses column-major order.)

For example, consider this matrix with three columns and two rows:

```

                columns
                1   2   3
-----
rows  1 | 10  11  12
      2 | 13  14  15

```

PROC IML stores this matrix in memory sequentially as 10, 11, 12, 13, 14, 15. However, FORTRAN routines will expect this matrix as 10, 13, 11, 14, 12, 15.

The default value is `NO`.

MODULE=*DLL-name*

names the executable module (the DLL) in which the routine resides. The `MODULE` function searches the directories named by the `PATH` environment variable. If you specify the `MODULE` attribute here in the `ROUTINE` statement, then you do not need to include the module name in the *module* argument to the `MODULE` function (unless the DLL routine name you are calling is not unique in the attribute table). The `MODULE` function is described in “`MODULE` Function” on page 410.

You can have multiple `ROUTINE` statements that use the same `MODULE` name. You can also have duplicate `ROUTINE` names that reside in different DLLs.

RETURNS=SHORT | USHORT | LONG | ULONG | DOUBLE | DBLPTR | CHAR<*n*>

specifies the type of value that the DLL routine returns. This value will be converted as appropriate, depending on whether you use `MODULEC` (which returns a character) or `MODULEN` (which returns a number). The possible return value types are

SHORT

short integer

USHORT

unsigned short integer

LONG

long integer

ULONG

unsigned long integer

DOUBLE

double-precision floating point number

DBLPTR

a pointer to a double-precision floating point number (instead of using a floating point register). Consult the documentation for your DLL routine to determine how it handles double-precision floating point values.

CHAR_n

pointer to a character string up to n bytes long. The string is expected to be null-terminated and will be blank-padded or truncated as appropriate. If you do not specify n , the MODULE function uses the maximum length of the receiving SAS character variable.

If you do not specify the RETURNS attribute, you should invoke the routine with only the MODULE and MODULEI call routines. You will get unpredictable values if you omit the RETURNS attribute and invoke the routine using the MODULEN/MODULEIN or MODULEC/MODULEIC functions.

The ROUTINE statement must be followed by as many ARG statements as you specified in the MAXARG= option. The ARG statements must appear in the order that the arguments will be specified within the MODULE routines.

ARG Statement

The syntax for each ARG statement is

```
ARG argnum NUM|CHAR <INPUT|OUTPUT|UPDATE>
      <NOTREQD|REQUIRED> <BYADDR|BYVALUE> <FDSTART>
      <FORMAT=format>;
```

Here are the descriptions of the ARG statement attributes:

ARG *argnum*

defines the argument number. This attribute is required. Define the arguments in ascending order, starting with the first routine argument (ARG 1).

NUM | CHAR

defines the argument as numeric or character. This attribute is required.

If you specify NUM here but pass the routine a character argument, the argument is converted using the standard numeric informat. If you specify CHAR here but pass the routine a numeric argument, the argument is converted using the BEST12 informat.

INPUT | OUTPUT | UPDATE

indicates the argument is either input to the routine, an output argument, or both. If you specify INPUT, the argument is converted and passed to the DLL routine. If you specify OUTPUT, the argument is *not* converted, but is updated with an outgoing value from the DLL routine. If you specify UPDATE, the argument is converted and passed to the DLL routine *and* updated with an outgoing value from the routine.

You can specify OUTPUT and UPDATE only with variable arguments (that is, no constants or expressions).

NOTREQD | REQUIRED

indicates whether the argument is required. If you specify NOTREQD, then MODULE can omit the argument. If other arguments follow the omitted argument, indicate the omitted argument by including an extra comma as a placeholder. For example, to omit the second argument to routine XYZ, you would specify:

```
call module('XYZ',1,,3);
```

CAUTION:

Be careful when using NOTREQD; the DLL routine must not attempt to access the argument if it is not supplied in the call to MODULE. If the routine does attempt to access it, your system is likely to crash. Δ

The REQUIRED attribute indicates that the argument is required and cannot be omitted. REQUIRED is the default value.

BYADDR | BYVALUE

indicates the argument is passed by reference or by value.

BYADDR is the default value unless CALLSEQ=BYVALUE was specified in the ROUTINE statement, in that case BYVALUE is the default. Specify BYADDR when using a call-by-value routine that also has arguments to be passed by address.

FDSTART

indicates that the argument begins a block of values that is grouped into a structure whose pointer is passed as a single argument. Note that all subsequent arguments are treated as part of that structure until the MODULE function encounters another FDSTART argument.

FORMAT=*format*

names the format that presents the argument to the DLL routine. Any SAS Institute-supplied formats, PROC FORMAT-style formats, or SAS/TOOLKIT formats are valid. Note that this format must have a corresponding valid informat if you specified the UPDATE or OUTPUT attribute for the argument.

The FORMAT= attribute is not required, but is recommended, since format specification is the primary purpose of the ARG statements in the attribute table.

CAUTION:

Using an incorrect format can produce invalid results or cause a system crash. \triangle

The Importance of the Attribute Table

MODULE routines rely heavily on the accuracy of the information in the attribute table. If this information is incorrect, unpredictable results can occur (including a system crash).

Consider an example routine **xyz** that expects two arguments: an integer and a pointer. The integer is a code indicating what action takes place. For example, action 1 means that a 20-byte character string is written into the area pointed to by the second argument, the pointer.

Now suppose you call **xyz** using the MODULE routine but indicating in the attribute table that the receiving character argument is only 10 characters long:

```
routine xyz minarg=2 maxarg=2;
arg 1 input num byvalue format=ib4.;
arg 2 output char format=$char10.;
```

Regardless of the value given by the LENGTH statement for the second argument to MODULE, MODULE passes a pointer to a 10-byte area to the **xyz** routine. If **xyz** writes 20 bytes at that location, the 10 bytes of memory following the string provided by MODULE are overwritten, causing unpredictable results:

```
data _null_;
  length x $20;
  call module('xyz',1,x);
run;
```

The call might work fine, depending on which 10 bytes were overwritten. However, this action might also cause you to lose data or cause your system to crash.

Also, note that the PEEKLONG and PEEKCLONG functions rely on the validity of the pointers you supply. If the pointers are invalid, it is possible that SAS could crash. For example, this code would cause a crash:

```
data _null_;
  length c $10;
```

```

        /* trying to copy from address 0!!!*/
        c = peekclong(0,10);
run;

```

Ensure that your pointers are valid when using PEEKLONG and PEEKCLONG.

Special Considerations When Using External DLLs

Using PEEKLONG Functions to Access Character String Arguments

Because the SAS language does not provide pointers as data types, you must use the PIB4. format/informat to represent pointers. You can then use the SAS PEEKLONG functions to access the data stored at these address values.

For example, suppose you have a routine named GetPath in a library named SERVICES.DLL. It has two arguments, an integer function code and a pointer to a pointer. The function code determines what action GetPath will take, and the second argument points to a pointer that will be updated by GetPath to refer to a system character string. The calling code in C might be

```

GetPath(1,&stgptr);
printf("GetPath indicates string is
      '%s'.\n",stgptr);

```

Using MODULE, the corresponding attribute table entry would be

```

ROUTINE GetPath MINARG=2 MAXARG=2
MODULE=SERVICES;
ARG 1 NUM INPUT BYVALUE FORMAT=PIB4.;
ARG 2 NUM OUTPUT BYADDR FORMAT=PIB4.;

```

and could be invoked as follows:

```

call module('GetPath',1,stgptr);
put stgptr= stgptr=hex8.;

```

If the pointer value in STGPTR is 0035F780, STGPTR would actually be set to the decimal value 3536768, which is the decimal equivalent of 0035F780. So the PUT statement above would produce:

```

STGPTR=3536768 STGPTR=0035F780

```

However, you want the data at address 0035F780, not the value of the pointer itself. To access that data, you need to use the PEEKCLONG function.

The PEEKCLONG function is given two arguments, a pointer via a numeric variable (such as STGPTR above) and a length in bytes (characters). PEEKCLONG returns a character string of the specified length containing the characters at the pointer location.

In the example, suppose that GetPath sets the second argument's pointer value to the address of the null-terminated character string C:\XYZ. You can access the character data with:

```

call module('SERVICES,GetPath',1,stgptr);
length path $64;
path = peekclong(stgptr,64);
i = index(path,'00'x);
if i then substr(path,i)=' ';
/* path now contains the string */

```

The PEEKCLONG function copies 64 bytes starting at the location referred to by the pointer in STGPTR. Because you need only the data up to the null terminator (but not including it), you search for the null terminator with the INDEX function, then blank out all characters including and after that point.

You can also use the \$CSTR format in this scenario to simplify your code slightly:

```
call module('SERVICES,GetPath',1,stgptr);
length path $64;
path = put(peekclong(stgptr,64),$cstr64.);
```

The \$CSTR format accepts as input a character string of a specified width. It looks for a null terminator and pads the output string with blanks from that point.

For more information, see the PEEKLONG function in *SAS Language Reference: Dictionary* and “\$CSTRw. Format” on page 309.

Accessing External DLLs Efficiently

The MODULE routine reads the attribute table referenced by the SASCBTBL fileref once per step (DATA step, PROC IML step, or SCL step). MODULE parses the table and stores the attribute information for future use during the step. When you use a MODULE function, SAS searches the stored attribute information for the matching routine and module names. The first time you access a DLL during a step, SAS loads the DLL and determines the address of the requested routine. Each DLL you invoke stays loaded for the duration of the step, and is not reloaded in subsequent calls. All modules and routines are unloaded at the end of the step. For example, suppose the attribute table had the basic form:

```
* routines XYZ and BBB in FIRST.DLL;
ROUTINE XYZ MINARG=1 MAXARG=1 MODULE=FIRST;
ARG 1 NUM INPUT;
ROUTINE BBB MINARG=1 MAXARG=1 MODULE=FIRST;
ARG 1 NUM INPUT;
* routines ABC and DDD in SECOND.DLL;
ROUTINE ABC MINARG=1 MAXARG=1 MODULE=SECOND;
ARG 1 NUM INPUT;
ROUTINE DDD MINARG=1 MAXARG=1 MODULE=SECOND;
ARG 1 NUM INPUT;
```

and the DATA step looked like:

```
filename sascbtbl 'myattr.tbl';
data _null_;
  do i=1 to 50;
    /* FIRST.DLL is loaded only once */
    value = modulen('XYZ',i);
    /* SECOND.DLL is loaded only once */
    value2 = modulen('ABC',value);
    put i= value= value2=;
  end;
run;
```

In this example, MODULEN parses the attribute table during DATA step compilation. In the first loop iteration (i=1), FIRST.DLL is loaded and the XYZ routine is accessed when MODULEN calls for it. Next, SECOND.DLL is loaded and the ABC routine is accessed. For subsequent loop iterations (starting when i=2), FIRST.DLL and SECOND.DLL remain loaded, so the MODULEN function simply accesses the XYZ and ABC routines. SAS unloads both DLLs at the end of the DATA step.

Note that the attribute table can contain any number of descriptions for routines that are not accessed for a given step. This process does not cause any additional overhead (apart from a few bytes of internal memory to hold the attribute descriptions). In the above example, BBB and DDD are in the attribute table but are not accessed by the DATA step.

Grouping SAS Variables as Structure Arguments

A common need when calling external routines is to pass a pointer to a structure. Some parts of the structure might be used as input to the routine, while other parts might be replaced or filled in by the routine. Even though SAS does not have structures in its language, you can indicate to MODULE that you want a particular set of arguments grouped into a single structure. You indicate this structure by using the FDSTART option of the ARG statement to flag the argument that begins the structure in the attribute table. SAS gathers that argument and data (until encountering another FDSTART option) into a single contiguous block, and passes a pointer to the block as an argument to the DLL routine.

For example, consider the GetClientRect routine, which is part of the Win32 API in USER32.DLL. This routine retrieves the coordinates of a window's client area. This process also requires the use of another routine, GetForegroundWindow, to get the window handle for the window you want the coordinates from.

The C prototypes for these routines are

```
HWND GetForegroundWindow(VOID);
BOOL GetClientRect(HWND hWnd, LPRECT lprc);
```

In C, the code to invoke them is:

```
typedef struct tagRECT {
    int left;
    int top;
    int right;
    int bottom;
} RECT;

/* RECT is a structure variable */
....          /* other code */
/* Need the window handle first */
hWnd=GetForegroundWindow();
/* Function call, passing the address */
/* of RECT                               */
GetClientRect(hWnd, &RECT);
```

To call these routines using MODULE, you would use the following attribute table entries:

```
routine GetForegroundWindow
    minarg=0
    maxarg=0
    stackpop=called
    module=USER32
    returns=long;
routine GetClientRect
    minarg=5
    maxarg=5
    stackpop=called
    module=USER32;
```

```

arg 1 num input byvalue format=pib4.;
arg 2 num update fdstart format=ib4.;
arg 3 num update          format=ib4.;
arg 4 num update          format=ib4.;
arg 5 num update          format=ib4.;

```

with the following DATA step:

```

filename sascttbl 'sascttbl.dat';
data _null_;
  hwnd=modulen('GetForegroundWindow');
  call module('GetClientRect',hwnd,left,
             top,right,bottom);
  put left= top= right= bottom=;
run;

```

The use of the FDSTART option in the ARG statement for argument 2 indicates that argument 2 and all subsequent arguments are to be gathered together into a single parameter block.

The output in the log from the PUT statement would look like:

```
LEFT=2 TOP=2 RIGHT=400 BOTTOM=587
```

Using Constants and Expressions as Arguments to MODULE

You can pass any kind of expression as an argument to the MODULE functions. The attribute table indicates whether the argument is for input, output, or update.

You can specify input arguments as constants and arithmetic expressions. However, because output and update arguments must be able to be modified and returned, you can pass only a variable for these parameters. If you specify a constant or expression where a value that can be updated is expected, SAS issues a warning message pointing out the error. Processing continues, but the MODULE routine cannot update a constant or expression argument (meaning that the value of the argument you wanted to update will be lost).

Consider these examples. Here is the attribute table:

```

* attribute table entry for ABC;
routine abc minarg=2 maxarg=2;
arg 1 input format=ib4.;
arg 2 output format=ib4.;

```

Here is the DATA step with the MODULE calls:

```

data _null_;
  x=5;
  /* passing a variable as the      */
  /* second argument - OK          */
  call module('abc',1,x);
  /* passing a constant as the     */
  /* second argument - INVALID     */
  call module('abc',1,2);
  /* passing an expression as the  */
  /* second argument - INVALID     */
  call module('abc',1,x+1);
run;

```

In the above example, the first call to MODULE is correct because the variable **x** is updated with what the **abc** routine returns for the second argument. The second call to

MODULE is not correct because a constant is passed. MODULE issues a warning indicating you have passed a constant, and MODULE passes a temporary area instead. The third call to MODULE is not correct as an arithmetic expression is passed, causing a temporary location from the DATA step to be used, and the returned value is lost.

Specifying Formats and Informats to Use with MODULE Arguments

You specify the SAS format and informat for each DLL routine argument by specifying in the attribute table the FORMAT attribute in the ARG statement. The format indicates how numeric and character values should be passed to the DLL routine and how they should be read back upon completion of the routine.

Usually, the format you use corresponds to a variable type for a given programming language. The following sections describe the proper formats that correspond to different variable types in various programming languages.

C Language Formats

C Type	SAS Format/Informat
double	RB8.
float	FLOAT4.
signed int	IB4.
signed short	IB2.
signed long	IB4.
char *	IB4. (32 bit SAS)
char *	IB8 (x64 and Itanium SAS)
unsigned int	PIB4.
unsigned short	PIB2.
unsigned long	PIB4.
char[w]	\$CHARw. or \$CSTRw. (see “\$CSTRw. Format” on page 309)

Note: For information about passing character data other than as pointers to character strings, see “\$BYVALw. Format” on page 310. Δ

FORTRAN Language Formats

FORTRAN Type	SAS Format/Informat
integer*2	IB2.
integer*4	IB4.
real*4	FLOAT4.

FORTTRAN Type	SAS Format/Informat
real*8	RB8.
character*w	\$CHARw.

The MODULE routines can support FORTRAN character arguments only if they are not expected to be passed by descriptor.

PL/I Language Formats

PL/I Type	SAS Format/Informat
FIXED BIN(15)	IB2.
FIXED BIN(31)	IB4.
FLOAT BIN(21)	RB4.
FLOAT BIN(31)	RB8.
CHARACTER(w)	\$CHARw.

The PL/I descriptions are added here for completeness; this action does not guarantee that you will be able to invoke PL/I routines.

COBOL Language Formats

COBOL Format	SAS Format/Informat	Description
PIC Sxxxx BINARY	IBw.	integer binary
COMP-2	RB8.	double-precision floating point
COMP-1	RB4.	single-precision floating point
PIC xxxx or Sxxxx	Fw.	printable numeric
PIC yyyy	\$CHARw.	character

The following COBOL specifications might not properly match with the Institute-supplied formats because zoned and packed decimal are not truly defined for systems based on Intel architecture.

SAS		
COBOL Format	Format/Informat	Description
PIC Sxxxx DISPLAY	ZDw.	zoned decimal
PIC Sxxxx PACKED-DECIMAL	PDw.	packed decimal

The following COBOL specifications do not have true native equivalents and are usable in conjunction with the corresponding S370Fxxx informat and format, which allows for IBM mainframe-style representations to be read and written in the PC environment.

COBOL Format	SAS Format/Informat	Description
PIC xxxx DISPLAY	S370FZDUw.	zoned decimal unsigned
PIC Sxxxx DISPLAY SIGN LEADING	S370FZDLw.	zoned decimal leading sign
PIC Sxxxx DISPLAY SIGN LEADING SEPARATE	S370FZDSw.	zoned decimal leading sign separate
PIC Sxxxx DISPLAY SIGN TRAILING SEPARATE	S370FZDTw.	zoned decimal trailing sign separate
PIC xxxx BINARY	S370FIBUw.	integer binary unsigned
PIC xxxx PACKED-DECIMAL	S370FPDUw.	packed decimal unsigned

\$CSTRw. Format

If you pass a character argument as a null-terminated string, use the \$CSTRw. format. This format looks for the last nonblank character of your character argument and passes a copy of the string with a null terminator after the last nonblank character. For example, given the attribute table entry:

```
* attribute table entry;
routine abc minarg=1 maxarg=1;
arg 1 input char format=$cstr10.;
```

you can use the following DATA step:

```
data _null_;
  rc = module('abc', 'my string');
run;
```

The \$CSTR format adds a null terminator to the character string **my string** before passing it to the **abc** routine. This action is equivalent to the following attribute entry:

```
* attribute table entry;
routine abc minarg=1 maxarg=1;
arg 1 input char format=$char10.;
```

with the following DATA step:

```
data _null_;
  rc = module('abc', 'my string' || '00'x);
run;
```

The first example is easier to understand and easier to use when using variable or expression arguments.

The \$CSTR informat converts a null-terminated string into a blank-padded string of the specified length. If the DLL routine is supposed to update a character argument, use the \$CSTR informat in the argument attribute.

\$BYVAL w . Format

When you use a MODULE function to pass a single character by value, the argument is automatically promoted to an integer. If you want to use a character expression in the MODULE call, you must use the special format/informat called \$BYVAL w . The \$BYVAL w . format/informat expects a single character and will produce a numeric value, the size of which depends on w . \$BYVAL2. produces a short, \$BYVAL4. produces a long, and \$BYVAL8. produces a double. Consider this example using the C language:

```
long xyz(a,b)
  long a; double b;
  {
  static char c = 'Y';
  if (a == 'X')
    return(1);
  else if (b == c)
    return(2);
  else return(3);
  }
```

In this example, the **xyz** routine expects two arguments, a long and a double. If the long is an **x**, the actual value of the long is 88 in decimal. This value is because an ASCII **x** is stored as hexadecimal 58, and this value is promoted to a long, represented as 0x00000058 (or 88 decimal). If the value of **a** is **x**, or 88, a 1 is returned. If the second argument, a double, is **y** (which is interpreted as 89), then 2 is returned.

Now suppose that you want to pass characters as the arguments to **xyz**. In C, you would invoke them as follows:

```
x = xyz('X',(double)'Z');
y = xyz('Q',(double)'Y');
```

This action occurs because the **x** and **Q** values are automatically promoted to ints (which are the same as longs for the sake of this example), and the integer values corresponding to **Z** and **Y** are cast to doubles.

To call **xyz** using the MODULEN function, your attribute table must reflect the fact that you want to pass characters:

```
routine xyz minarg=2 maxarg=2 returns=long;
arg 1 input char byvalue format=$byval4.;
arg 2 input char byvalue format=$byval8.;
```

Note that it is important that the BYVALUE option appear in the ARG statement as well. Otherwise, MODULEN assumes that you want to pass a pointer to the routine, instead of a value.

Here is the DATA step that invokes MODULEN and passes it characters:

```
data _null_;
  x = modulen('xyz','X','Z');
  put x= ' (should be 1)';
  y = modulen('xyz','Q','Y');
  put y= ' (should be 2)';
run;
```

Understanding MODULE Log Messages

If you specify *i* in the control string parameter to MODULE, SAS prints several informational messages to the log. You can use these messages to determine whether you have passed incorrect arguments or coded the attribute table incorrectly.

Consider this example that uses MODULEIN from within the IML procedure. It uses the MODULEIN function to invoke the **changi** routine (stored in theoretical TRYMOD.DLL). In the example, MODULEIN passes the constant 6 and the matrix x2, which is a 4x5 matrix to be converted to an integer matrix. The attribute table for **changi** is as follows:

```
routine changi module=trymod returns=long;
arg 1 input num format=ib4. byvalue;
arg 2 update num format=ib4.;
```

The following IML step invokes MODULEIN:

```
proc iml;
  x1 = J(4,5,0);
  do i=1 to 4;
    do j=1 to 5;
      x1[i,j] = i*10+j+3;
    end;
  end;
  y1= x1;
      x2 = x1;
      y2 = y1;
  rc = modulein('*i','changi',6,x2);
  ....
```

The '**i*' control string causes the lines shown in Output 14.1 to be printed in the log.

Output 14.1 MODULEIN Output

```
---PARAM LIST FOR MODULEIN ROUTINE--- CHR PARM 1 885E0AA8 2A69 (*i)
CHR PARM 2 885E0AD0 6368616E6769 (changi)
NUM PARM 3 885E0AE0 0000000000001840
NUM PARM 4 885E07F0
000000000002C400000000000002E40000000000003040000000000003140000000000003240
000000000000384000000000000003940000000000003A40000000000003B40000000000003C40
0000000000004140000000000080414000000000
---ROUTINE changi LOADED AT ADDRESS 886119B8 (PARMLIST AT 886033A0)--- PARM 1 06000000 <CALL-BY-VALUE>
PARM 2 88604720
0E0000000F00000010000000110000001200000018000000190000001A0000001B0000001C000000
22000000230000002400000025000000260000002C0000002D0000002E0000002F00000030000000
---VALUES UPON RETURN FROM changi ROUTINE--- PARM 1 06000000 <CALL-BY-VALUE>
PARM 2 88604720
140000001F0000002A0000003500000040000000820000008D00000098000000A3000000AE000000
F0000000FB00000006010000110100001C0100005E01000069010000740100007F0100008A010000
---VALUES UPON RETURN FROM MODULEIN ROUTINE--- NUM PARM 3 885E0AE0 0000000000001840
NUM PARM 4 885E07F0
00000000000034400000000000003F4000000000004540000000000804A40000000000005040
00000000004060400000000000A0614000000000006340000000000606440000000000C06540
0000000000006E400000000000606F4000000000
```

The output is divided into four sections.

- 1 The first section describes the arguments passed to MODULEIN.

The 'CHR PARM *n*' portion indicates that character parameter *n* was passed. In the example, 885E0AA8 is the actual address of the first character parameter to

MODULEIN. The value at the address is hexadecimal 2A69, and the ASCII representation of that value ('*i') is in parentheses after the hexadecimal value. The second parameter is likewise printed. Only these first two arguments have their ASCII equivalents printed; the equivalents are printed because other arguments might contain unreadable binary data.

The remaining parameters appear with only hexadecimal representations of their values (NUM PARM 3 and NUM PARM 4 in the example).

The third parameter to MODULEIN is numeric, and it is at address 885E0AE0. The hexadecimal representation of the floating point number 6 is shown. The fourth parameter is at address 885E07F0, which points to an area containing all the values for the 4x5 matrix. The *i option prints the entire argument; be careful if you use this option with large matrices because the log might become quite large.

- 2 The second section of the log lists the arguments to be passed to the requested routine and, in this case, changed. This section is important for determining if the arguments are being passed to the routine correctly. The first line of this section contains the name of the routine and its address in memory. It also contains the address of the location of the parameter block that MODULEIN created.

The log contains the status of each argument as it is passed. For example, the first parameter in the example is call-by-value (as indicated in the log). The second parameter is the address of the matrix. The log shows the address, along with the data to which it points.

Note that all the values in the first parameter and in the matrix are long integers because the attribute table states that the format is IB4.

- 3 In the third section, the log contains the argument values upon return from **chang**i. The call-by-value argument is unchanged, but the other argument (the matrix) contains different values.
- 4 The last section of the log output contains the values of the arguments as they are returned to the MODULEIN calling routine.

Examples

Updating a Character String Argument

This example uses the Win32 routine GetTempPathA. This routine expects as an argument a pointer to a buffer, along with the length of the buffer. GetTempPathA fills the buffer with a null-terminated string representing the temporary path. Here is the C prototype for the GetTempPathA routine:

```
DWORD WINAPI GetTempPathA
    (DWORD nBufferLength, LPSTR lpBuffer);
```

Here is the attribute table:

```
routine GetTempPathA
    minarg=2
    maxarg=2
    stackpop=called
    returns=long;
    arg 1 input  byvalue format=pib4.;
    arg 2 update          format=$cstr200.;
```

Note that the STACKPOP=CALLED option is used; all Win32 service routines require this attribute. The first argument is passed by value because it is an input

argument only. The second argument is an update argument because the contents of the buffer are to be updated. The \$CSTR200. format allows for a 200-byte character string that is null-terminated.

Here is the SAS code to invoke the function. In this example, the DLL name (KERNEL32) is explicitly given in the call (because the MODULE attribute was not used in the attribute file):

```
filename sascttbl "sascttbl.dat";
data _null_;
  length path $200;
  n = modulen( '*i',
              "KERNEL32,GetTempPathA", 199, path );
  put n= path=;
run;
```

Note: KERNEL32.DLL is an internal DLL provided by Windows. Its routines are described in the Microsoft Win32 SDK. Δ

The code produces these log messages:

```
NOTE: Variable PATH is uninitialized.
N=7 PATH=C:\TEMP
```

The example uses 199 as the buffer length because PATH can hold up to 200 characters with one character reserved for the null terminator. The \$CSTR200. informat ensures that the null-terminator and all subsequent characters are replaced by trailing blanks when control returns to the DATA step.

Passing Arguments by Value

This example calls the Beep routine, part of the Win32 API in the KERNEL32 DLL. Here is the C prototype for Beep:

```
BOOL Beep(DWORD dwFreq, DWORD dwDuration)
```

Here is the attribute table to use:

```
routine Beep
  minarg=2
  maxarg=2
  stackpop=called
  callseq=byvalue
  module=kernel32;
arg 1 num format=pib4.;
arg 2 num format=pib4.;
```

Because both arguments are passed by value, the example includes the CALLSEQ=BYVALUE attribute in the ROUTINE statement, so it is not necessary to specify the BYVALUE option in each ARG statement.

Here is the sample SAS code used to call the Beep function:

```
filename sascttbl 'sascttbl.dat';
data _null_;
  rc = modulen("*e","Beep",1380,1000);
run;
```

The computer speaker beeps.

Using PEEKCLONG to Access a Returned Pointer

The following example uses the `lstrcat` routine, part of the Win32 API in `KERNEL32.DLL`. `lstrcat` accepts two strings as arguments, concatenates them, and returns a pointer to the concatenated string. The C prototype is

```
LPTSTR lstrcat (LPTSTR lpszString1,
               LPCTSTR lpszString2);
```

The following is the proper attribute table:

```
routine lstrcat
  minarg=2
  maxarg=2
  stackpop=called
  module=KERNEL32
  returns=ptr;
  arg 1 char format=%cstr200.;
  arg 2 char format=%cstr200.;
```

To use `lstrcat`, you need to use the SAS `PEEKCLONG` function to access the data referenced by the returned pointer. Here is the sample SAS program that accesses `lstrcat`:

```
filename sascbtbl 'sascbtbl.dat';
data _null_;
  length string1 string2 conctstr $200;
  length charptr $20;
  string1 = 'This is';
  string2 = ' a test!';
  charptr=modulec('lstrcat',string1,string2);
  conctstr = peekclong(charptr,200);
  put conctstr=;
run;
```

The following output appears in the log:

```
conctstr=This is a test!
```

Upon return from `MODULEN`, the pointer value is stored in `RC`. The example uses the `PEEKCLONG` function to return the 200 bytes at that location, using the `%CSTR200` format to produce a blank-padded string that replaces the null termination.

For more information about the `PEEKCLONG` functions, see the `PEEKCLONG` function and the `PEEKCLONG` function in *SAS Language Reference: Dictionary*.

Using Structures

“Grouping SAS Variables as Structure Arguments” on page 305 describes how to use the `FDSTART` attribute to pass several arguments as one structure argument to a DLL routine. Refer to that section for an example of the `GetClientRect` attribute table and C language equivalent. This example shows how to invoke the `GetClientRect` function after defining the attribute table.

The most straightforward method works, but generates a warning message about the variables not being initialized:

```
filename sascbtbl 'sascbtbl.dat';
data _null_;
  hwnd=modulen('GetForegroundWindow');
```

```

call module('GetClientRect',hwnd,
  left,top,right,bottom);
put _all_;
run;

```

To remove the warning, you can use the RETAIN statement to initialize the variables to 0. Also, you can use shorthand to specify the variable list in the MODULEN statement:

```

data _null_;
  retain left top right bottom 0;
  hwnd=modulen('GetForegroundWindow');
  call module('GetClientRect',hwnd,
    of left--bottom);
  put _all_;
run;

```

Note that the OF keyword indicates that what follows is a list of variables, in this case delimited by the double-dash. The output in the log varies depending on the active window and looks something like the following:

```

HWND=3536768 LEFT=2 TOP=2 RIGHT=400
BOTTOM=587

```

Invoking a DLL Routine from PROC IML

This example shows how to pass a matrix as an argument within PROC IML. The example creates a 4x5 matrix. Each cell is set to $10x+y+3$, where x is the row number and y is the column number. For example, the cell at row 1 column 2 is set to $(10*1)+2+3$, or 15.

The example invokes several routines from the theoretical TRYMOD DLL. It uses the **changd** routine to add $100x+10y$ to each element, where x is the C row number (0 through 3) and y is the C column number (0 through 4). The first argument to **changd** indicates what extra amount to sum. The **changdx** routine works just like **changd**, except that it expects a transposed matrix. The **changi** routine works like **changd** except that it expects a matrix of integers. The **changix** routine works like **changdx** except that integers are expected.

Note: A maximum of three arguments can be sent when invoking a DLL routine from PROC IML. Δ

In this example, all four matrices $x1$, $x2$, $y1$, and $y2$ should become set to the same values after their respective MODULEIN calls. Here are the attribute table entries:

```

routine changd module=trymod returns=long;
arg 1 input num format=rb8. byvalue;
arg 2 update num format=rb8.;
routine changdx module=trymod returns=long
  transpose=yes;
arg 1 input num format=rb8. byvalue;
arg 2 update num format=rb8.;
routine changi module=trymod returns=long;
arg 1 input num format=ib4. byvalue;
arg 2 update num format=ib4.;
routine changix module=trymod returns=long
  transpose=yes;
arg 1 input num format=ib4. byvalue;
arg 2 update num format=ib4.;

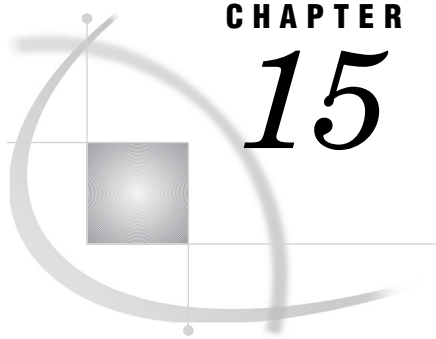
```

Here is the PROC IML step:

```
proc iml;
  x1 = J(4,5,0);
  do i=1 to 4;
    do j=1 to 5;
      x1[i,j] = i*10+j+3;
    end;
  end;
  y1= x1; x2 = x1; y2 = y1;
  rc = modulein('changd',6,x1);
  rc = modulein('changdx',6,x2);
  rc = modulein('changi',6,y1);
  rc = modulein('changix',6,y2);
  print x1 x2 y1 y2;
run;
```

The following are the results of the PRINT statement:

X1				
20	31	42	53	64
130	141	152	163	174
240	251	262	273	284
350	361	372	383	394
X2				
20	31	42	53	64
130	141	152	163	174
240	251	262	273	284
350	361	372	383	394
Y1				
20	31	42	53	64
130	141	152	163	174
240	251	262	273	284
350	361	372	383	394
Y2				
20	31	42	53	64
130	141	152	163	174
240	251	262	273	284
350	361	372	383	394



CHAPTER

15

Special Considerations for SAS/AF Programmers

<i>Controlling the Appearance and Behavior of SAS</i>	317
<i>Controlling the Main SAS Window</i>	317
<i>SAS System Options That Control the Main SAS Window</i>	317
<i>SAS Commands That Control the Main SAS Window</i>	318
<i>Accessing External DLLs from SAS</i>	320
<i>Designing, Saving, and Loading Custom Toolbar Controls</i>	321
<i>Invoking SAS/AF Applications Automatically</i>	321
<i>Associating Your Own Logo and Icons with Your SAS/AF Application</i>	321
<i>Incorporating Electronic Mail into Your SAS/AF Application</i>	322

Controlling the Appearance and Behavior of SAS

SAS under Windows provides SAS/AF programmers with extensive control over the appearance and behavior of the main SAS window. You can:

- use SAS system options and windowing environment commands to control the appearance of the main SAS window
- call external dynamic link libraries (DLLs) using the DATA step or SAS Component Language (SCL) commands
- design, save, and load custom toolbar controls
- immediately invoke SAS/AF programs when you start SAS
- distribute the minimum subset of SAS files needed to run a particular SAS/AF application
- associate your own logo and icons with your SAS/AF applications
- use SCL code to send electronic mail to other users
- invoke a web browser to view documents online.

Controlling the Main SAS Window

SAS system options and windowing environment commands make it possible to change the appearance and behavior of the main SAS window so much that end users might not recognize it as SAS.

SAS System Options That Control the Main SAS Window

The following table lists the system options that provide control over the main SAS window.

Table 15.1 SAS System Options for the Main SAS Window

Option	Description
AWSCONTROL	Remove system controls such as the title bar, system menu, and minimize and maximize buttons from the main SAS window.
AWSDEF	Specify the location and dimensions of the main SAS window when SAS initializes.
AWSMENU	Specify whether to display the main SAS window menu bar.
AWSMENUMERGE	Specify whether to embed menu items that are specific to Windows in the main menus.
AWSTITLE	Specify the text that appears in the title bar of the main SAS window.
ICON	Minimize the main SAS window at SAS initialization.
REGISTER	Specify other Windows programs to be included as options on the AWS File menu.
SASCONTROL	Remove system controls and the minimize and maximize buttons from SAS application windows.
SOLUTIONS	Include or suppress the Solutions menu in the main menu.
SPLASH	Specify whether the logo (splash screen) is displayed when SAS starts.
SPLASHLOC	Specify the location of the bitmap that contains the splash screen you want to display when SAS starts.
TOOLSMENU	Include or suppress the Tools menu in the main menu.
VIEWMENU	Include or suppress the View menu in the main menu.
WEBUI	Specifies whether the web enhancements that select objects by pointing the mouse pointer and using a single mouse-click to invoke the default action are enabled.
WINDOWSMENU	Include or suppress the Window menu in the main menu. WINDOWSMENU is valid only if NOAWSMENUMERGE is specified.

SAS Commands That Control the Main SAS Window

Table 15.2 on page 318 lists the SAS commands that you can use to control the appearance and behavior of the main SAS window.

Table 15.2 SAS Windowing Environment Commands for the Main SAS Window

Option	Description
AWSMAXIMIZE	Maximizes the main SAS window.
AWSMINIMIZE	Minimizes the main SAS window.
AWSRESTORE	Restores the main SAS window to its previous state.
COLOR	Sets the color for various components of the application windows.

Option	Description
COMMAND	Controls the appearance of the command bar or dialog box.
DLGABOUT	Invokes the About dialog box.
DLGCONVERT	Invokes the Convert dialog box for a selected OLE object.
DLGCDIR	Invokes the Change Folder dialog box.
DLGENDR	Invokes the Exit SAS confirmation dialog box.
DLGFIND	Invokes the Find dialog box.
DLGFONT	Invokes the Fonts Selection dialog box.
DLGLIB	Invokes the Libraries dialog box.
DLGLINKS	Invokes the OLE Links dialog box.
DLGOPEN	Invokes the Open dialog box for the Program Editor.
DLGPAGESETUP	Invokes the Page Setup dialog box.
DLGPREF	Invokes the Preferences dialog box.
DLGPRT	Invokes the Print dialog box.
DLGPRTPREVIEW	Invokes the Print Preview window.
DLGPRTSETUP	Invokes the Print Setup dialog box.
DLGREPLACE	Invokes the Replace dialog box.
DLGRUN	Invokes the Run dialog box.
DLGSAVE	Invokes the Save As dialog box.
DLGSMail	Invokes the E-mail dialog box.
FILEOPEN	Invokes the Open dialog box for the Enhanced Editor.
NEXTWIND	Displays the next open SAS window.
PMENU	Toggles the command lines on or off in the windowing environment.
PREVWIND	Display the previous open SAS window.
RESHOW	Redisplays the SAS windows that are currently open.
TOOLCLOSE	Closes the toolbox or toolbar.
TOOLEEDIT	Invokes the Customize dialog box for toolbars or tool boxes.
TOOLLARGE	Toggles the size of the toolbar or toolbox buttons.
TOOLLOAD	Opens the toolbox or toolbar with the specified configuration.
TOOLSWITCH	Toggles whether the toolbar or toolbox associated with the active window is automatically loaded.
TOOLTIPS	Toggles the ToolTips on or off.
WATTACH	Toggles whether the contents of the active window are attached to e-mail that you send through SAS.
WDOCKVIEW	Enables dockable windows.
WEDIT	Invokes a new Enhanced Editor window.
WEMAILFMT	Specifies the format (.RTF or .TEXT) of any text window you attach to an e-mail message.

Option	Description
WHIDECURSOR	Suppress display of the cursor.
WHSBAR	Toggles the horizontal scroll bars on or off.
WINSERT	Toggles the insert mode on or off.
WMENUPOP	Enables or disables the pop-up menus in the SAS application windows.
WMRU	Specifies how many filenames to retain in the list under the File menu.
WNEWTITLE	Clears the contents of the active window and removes its title.
WNEXTEDIT	Switches the active Enhanced Editor window to another Enhanced Editor window.
WPOPOP	Causes the pop-up menu for the active window to appear.
WSCREENTIPS	Toggles the ScreenTips on or off.
WSTATUSLN	Toggles the status bar on or off, and controls the area proportions.
WUNDO	Undoes the previous editing action.
WVSBAR	Toggles the vertical scroll bars on or off.
WWINDOWBAR	Displays the window bar at the bottom of the main SAS window.
ZOOM	Maximizes the active SAS application window.

Accessing External DLLs from SAS

You can access routines that reside in external dynamic link libraries (DLLs) by using the SAS MODULE family of functions within a DATA step or SCL. This action lets you access DLLs that you create or purchase; you can even access operating system DLLs.

To access an external DLL, you must know:

- the name of the DLL
- the function name or ordinal
- a description of the function's arguments
- a description of the return code.

CAUTION:

Only experienced programmers should access external DLLs. When you access an external DLL, you are passing control of your computer from SAS to the DLL function. If done improperly, or if the DLL function is unreliable, you might lose data or have to reset your computer (or both). \triangle

The general steps for accessing an external DLL routine are:

- 1 Create a text file that describes the DLL routine you want to access, including the arguments it expects and the values it returns (if any). This attribute file must be in a special format.
- 2 Use the FILENAME statement to assign the SASCBTBL fileref to the attribute file you created.

- 3 In a DATA step or SCL code, use MODULE, MODULEN, or MODULEC to invoke the DLL routine. The specific function you use depends on the type of expected return value (none, numeric, or character). (You can also use MODULEI, MODULEIN, or MODULEIC within a PROC IML step.)

Note: The MODULE routines can be a flexible and powerful tool, especially when used with the SASCBTBL file, SAS formats and informats, and other SAS routines. As such, you should be extremely careful when invoking external routines; if done improperly, you might lose data or have to reset your computer. Δ

For complete information about accessing DLLs from within SAS, see Chapter 14, “Accessing External DLLs from SAS,” on page 297.

Designing, Saving, and Loading Custom Toolbar Controls

You can provide the users of your SAS/AF application with easy-to-use tools by creating a custom toolbar configuration. You can assign these tools to represent any windowing environment command. For complete information about creating and saving custom toolbars, see “Customizing the Toolbar” on page 68.

If you distribute your SAS/AF application to other machines, be sure to include the catalog entry that contains your custom tool configuration.

By default, tool switching is enabled, which allows the use of a custom toolbar in your SAS/AF application. Tool switching can be disabled by issuing the TOOLSWITCH OFF command.

Invoking SAS/AF Applications Automatically

SAS provides a system option, INITCMD, that lets you invoke SAS/AF programs automatically. When you use this option, SAS does not create the PROGRAM EDITOR, LOG, or OUTPUT windows but instead runs the SAS/AF applications and windowing environment commands that you specify.

The general syntax of the INITCMD option is:

```
-INITCMD "af-command" <DM-command-1...DM-command-n>
```

where *af-command* is a command to start an AF application, and *DM-command-1* through *DM-command-n* are any windowing environment commands.

For example, the following option specification starts a SAS/AF application and loads a custom toolbar:

```
-initcmd "AF c=mylib.myapp.myfirst.frame;  
  toolload bar mylib.myapp.profile.toolbox"
```

For more information about the INITCMD system option, see *SAS Language Reference: Dictionary*.

Associating Your Own Logo and Icons with Your SAS/AF Application

You can substitute your own logo screen and icons in place of those icons provided by SAS.

Note: These procedures involve creating resources for and building your own dynamic link libraries (DLLs). For more information on creating DLLs, see the Microsoft Win32 Software Development Kit. Δ

To display your own logo when SAS starts:

- 1 Create the logo you want to display and save it either as a Windows bitmap (which has a BMP file extension), or compile it as resource and build it into a DLL.
- 2 When you invoke SAS, specify the SPLASHLOC option with the full pathname of the file that contains your bitmap. If the bitmap is in a DLL, be sure to specify the resource number as well. The default resource number is 1. For more information, see “SPLASHLOC System Option” on page 571.

Your logo will display when you start SAS.

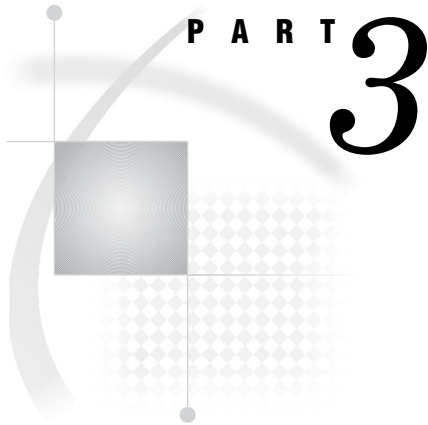
To use your own icons with your SAS/AF application:

- 1 Use the USERICON system option when you start SAS to specify the resource file that contains the icons you want to include. You must use the Windows software development tool to compile the resource file. For more information about the USERICON option, see “USERICON System Option” on page 582.
- 2 Use SAS/AF software to create a FRAME entry.
- 3 Select the buttonStyle attribute of the push button to display an icon. You can select the Large Icon from the iconStyle attributes of the push button to enlarge the icon.
- 4 Click the ellipses for the value of the icon attribute for the push button to display an icon. The Select Icon window will appear. Icon categories are displayed at the top of the window. Click on the down arrow and then select the User Icons category. The user-defined icons from your resource file will be displayed. Select an icon for your push button.

Incorporating Electronic Mail into Your SAS/AF Application

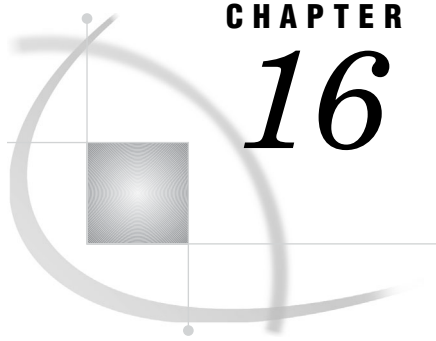
You can associate SCL code with buttons and fields in a FRAME entry to create your own interface to electronic mail. SAS provides methods to interface with VIM-, MAPI-, and SMTP-compatible electronic mail programs.

Using SCL code, you can specify who should receive mail (TO, CC, and BCC), the subject of the mail, the body of the message, and any files you want to attach to the message. “Sending E-Mail Using SAS” on page 42 describes the e-mail functions that SAS facilitates and contains examples of DATA step and SCL code.



Features of the SAS Language for Windows

<i>Chapter 16</i>	Data Set Options under Windows	<i>325</i>
<i>Chapter 17</i>	SAS Commands under Windows	<i>327</i>
<i>Chapter 18</i>	SAS Formats under Windows	<i>379</i>
<i>Chapter 19</i>	SAS Functions and CALL Routines under Windows	<i>389</i>
<i>Chapter 20</i>	SAS Informats under Windows	<i>419</i>
<i>Chapter 21</i>	SAS Procedures under Windows	<i>429</i>
<i>Chapter 22</i>	SAS Statements under Windows	<i>449</i>
<i>Chapter 23</i>	SAS System Options under Windows	<i>473</i>
<i>Chapter 24</i>	Length and Precision of Variables	<i>591</i>
<i>Chapter 25</i>	SAS Macro Facility under Windows	<i>595</i>



CHAPTER

16

Data Set Options under Windows

SAS Data Set Options under Windows 325

SGIO Data Set Option 325

SAS Data Set Options under Windows

Data set options specify actions that apply only to a SAS data set. Using data set options enables you to perform these actions:

- rename variables
- select the first or last n observations for processing
- drop variables from processing or from the output data set
- specify a password for a data set

SGIO Data Set Option

Activates the Scatter/Gather I/O feature for a data set.

Valid in: DATA steps and PROC steps

Syntax

SGIO= YES | NO

YES

specifies that SAS activate the scatter-read / gather-write feature for a SAS data set. The scatter-read / gather-write feature remains active until your SAS session ends.

NO

specifies that SAS not activate the scatter-read/gather-write feature for the SAS data set.

Details

You can specify the SGIO data set option for any SAS I/O file that is referenced within your SAS code. If you want most of your SAS I/O to be processed with SGIO, then specify the SGIO system option and disable SGIO (SGIO=no) for those data sets for which you do not want SGIO to be active.

Comparisons

The SGIO data set option specifies that SAS process the data set by using SGIO. The SGIO system option specifies that all data sets are processed by using SGIO.

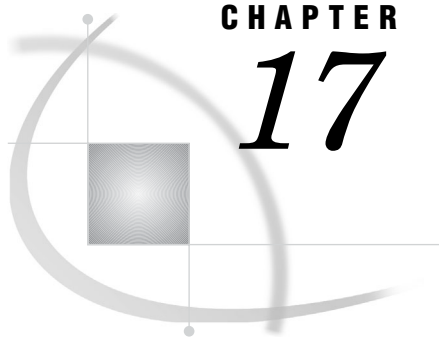
Examples

Example 1: SGIO Option You can specify the SGIO data set option for any SAS I/O file that is referenced in a SAS job. This example is a simple case for the DATA step:

```
data mike(sgio=yes);
  input x y z;
  datalines;
1 2 3
run;
```

Example 2: SGIO Option The following example is more complex:

```
data master(sgio=yes)
  merge daily1(sgio=yes) daily2(sgio=no) daily3(sgio=yes)
  ... more SAS statements ...
run;
```



CHAPTER 17

SAS Commands under Windows

<i>SAS Commands under Windows</i>	328
<i>Commands Not Supported in the Windows Operating Environment</i>	329
<i>AUTOSCROLL Command</i>	329
<i>AWSMAXIMIZE Command</i>	330
<i>AWSMINIMIZE Command</i>	330
<i>AWSRESTORE Command</i>	331
<i>CAPS Command</i>	331
<i>COLOR Command</i>	332
<i>COMMAND Command</i>	333
<i>CUT Command</i>	334
<i>DLGABOUT Command</i>	334
<i>DLGCDIR Command</i>	335
<i>DLGCOLUMNSIZE Command</i>	335
<i>DLGCOLUMNSORT Command</i>	336
<i>DLGCONVERT Command</i>	336
<i>DLGENDR Command</i>	337
<i>DLGFIND Command</i>	337
<i>DLGFONT Command</i>	337
<i>DLGLIB Command</i>	338
<i>DLGLINKS Command</i>	338
<i>DLGOPEN Command</i>	339
<i>DLGPAGESETUP Command</i>	341
<i>DLGPREF Command</i>	341
<i>DLGPRT Command</i>	341
<i>DLGPRTPREVIEW Command</i>	342
<i>DLGPRTSETUP Command</i>	343
<i>DLGREPLACE Command</i>	344
<i>DLGRUN Command</i>	344
<i>DLGSAVE Command</i>	344
<i>DLGSMALL Command</i>	346
<i>FILE Command</i>	347
<i>FILEOPEN Command</i>	348
<i>FILL Command</i>	349
<i>GSUBMIT Command</i>	349
<i>HOME Command</i>	350
<i>ICON Command</i>	350
<i>INCLUDE Command</i>	351
<i>PMENU Command</i>	353
<i>SAVE Command</i>	353
<i>STORE Command</i>	354
<i>SUBTOP Command</i>	355

<i>TOOLCLOSE Command</i>	355
<i>TOOLEDIT Command</i>	356
<i>TOOLLARGE Command</i>	356
<i>TOOLLOAD Command</i>	357
<i>TOOLSWITCH Command</i>	358
<i>TOOLTIPS Command</i>	358
<i>WATTACH Command</i>	359
<i>WATTENTION Command</i>	360
<i>WAUTOSAVE Command</i>	360
<i>WBROWSE Command</i>	361
<i>WCOPY Command</i>	361
<i>WCUT Command</i>	362
<i>WDOCKVIEW Command</i>	362
<i>WDOCKVIEWMINIMIZE Command</i>	363
<i>WDOCKVIEWRESIZE Command</i>	363
<i>WDOCKVIEWRESTORE Command</i>	364
<i>WEDIT Command</i>	364
<i>WEMAILFMT Command</i>	365
<i>WEXITSAVE Command</i>	366
<i>WFILE Command</i>	366
<i>WHIDECURSOR Command</i>	367
<i>WHSBAR Command</i>	367
<i>WINSERT Command</i>	368
<i>WMENUPOP Command</i>	368
<i>WMRU Command</i>	369
<i>WNAVKEYUNMARK Command</i>	370
<i>WNEWTITLE Command</i>	370
<i>WNEXTEDIT Command</i>	371
<i>WPASTE Command</i>	371
<i>WPGM Command</i>	372
<i>WPOPUP Command</i>	372
<i>WRTFSAVE Command</i>	373
<i>WSCREENTIPS Command</i>	373
<i>WSTATUSLN Command</i>	374
<i>WUNDO Command</i>	375
<i>WVSBAR Command</i>	376
<i>WWINDOWBAR Command</i>	376
<i>X Command</i>	377
<i>ZOOM Command</i>	378

SAS Commands under Windows

During an interactive SAS session, you can issue commands from the command bar, from the command line within a SAS window, from the keyboard, or from the toolbar. SAS supports many commands that help you to navigate your session and accomplish certain tasks. In many cases, the command is simply another way to invoke an action that you can also accomplish by using the SAS menus and windows. However, advanced users might find the supported commands to be a more efficient way to work. Commands provide a more flexible way to accomplish a task if the parameters of your task are different from what the SAS interface supports.

Most SAS windowing environment commands are described in the SAS Help and Documentation. The commands that are described here have syntax or behavior that is specific to the Windows operating environment.

For more information about issuing commands, see “Issuing SAS Commands” on page 41.

Commands Not Supported in the Windows Operating Environment

The following SAS commands are not supported under Windows:

PCLEAR
PLIST
SCROLLBAR
SMARK
WDRAG
WGROW
WMOVE
WSHRINK

These commands are not supported under Windows because it is more efficient to use Windows features. For example, the SCROLLBAR command and window sizing commands are not needed in the Windows operating environment as scroll bars and window sizing bars are an integral part of the graphical user interface.

AUTOSCROLL Command

Specifies how often the Log and Output windows scroll to display output.

Windows specifics: default values

Syntax

AUTOSCROLL <number-of-lines | PAGE | MAX>

Details

Under Windows, the default value for the AUTOSCROLL command in the OUTPUT window is 0 (meaning that no output is written to that window while statements are executing, which provides the best performance). The default value for the LOG window is half the number of lines of the LOG window when SAS is started.

Scrolling can increase the length of time that SAS takes to run your program. The less scrolling that the LOG and OUTPUT windows have to do, the faster that your program will run.

You can also set scrolling options in the Preferences dialog box **Advanced** page.

See Also

- “Setting Session Preferences” on page 59
- “AUTOSCROLL Command” in the SAS Help and Documentation

AWSMAXIMIZE Command

Maximizes the main SAS window.

Windows specifics: all

Syntax

AWSMAXIMIZE <ON | OFF>

no argument

toggles the main SAS window between the maximized and the restored state.

ON

maximizes the main SAS window. This option has the same effect as clicking on the maximize button.

OFF

restores the main SAS window to its previous state.

Details

The AWSMAXIMIZE command allows you to enlarge the main SAS window to use the complete Windows desktop.

AWSMINIMIZE Command

Minimizes the main SAS window.

Windows specifics: all

Syntax

AWSMINIMIZE <ON | OFF>

no argument

toggles the main SAS window between the minimized and the restored state.

ON

minimizes the main SAS window. This option has the same effect as clicking on the minimize button.

OFF

restores the main SAS window to its previous state.

AWSRESTORE Command

Restores the main SAS window to its previous state.

Windows specifics: all

Syntax

AWSRESTORE <ON | OFF>

no argument

toggles the main SAS window between the maximized and the restored state.

ON

restores the main SAS window to its previous state. This option has the same effect as selecting **Restore** from the main SAS window's title bar menu.

OFF

restores the main SAS window to its default state.

Details

You can use either the AWSRESTORE command or the AWSMAXIMIZE command to toggle the main SAS window between maximized and its previous state.

CAPS Command

specifies whether to write uppercase characters.

Windows specifics: all

Syntax

CAPS

Details

The CAPS command changes the case for text not yet entered or for text modified in a window.

Under Windows, characters are translated to uppercase when you move the cursor off the line *or* when you press ENTER.

See Also

- “CAPS Command” in the SAS Help and Documentation

COLOR Command

specifies the color and highlighting of selected portions of a window.

Windows specifics: affected window components

Syntax

COLOR *field-type* <color | NEXT <highlight>>

field-type

specifies the area of the window or the type of text whose color is to be changed.

color

specifies a color for the window or for selected portions of the window.

NEXT

changes the color to the next available color. The value of NEXT is based on the most recent color entered. The order of the colors depends on your monitor.

highlight

specifies the highlighting attribute.

Details

Under Windows, you cannot use the COLOR command to change the colors of the following display components: border, menu bar, pop-up menu background, and title bar. Use the Windows Control Panel to change the colors of these display components.

In addition, the HIGHLIGHT and BLINK highlight attributes are not supported for any Windows window component.

See Also

- Other COLOR commands in the SAS Help and Documentation

COMMAND Command

Specifies the options for the command bar.

Windows specifics: valid options

Syntax

```
COMMAND <<WINDOW <"title"> | BAR
      <SORT=MCU|MRU><FOCUS><MAX=max-commands><AUTOCOMPLETE |
      NOAUTOCOMPLETE>> | CLOSE>
```

no arguments

toggles the command line on and off for the active window.

WINDOW <"title">

specifies to display the command bar as a separate window that can be moved anywhere on the desktop. The "title" argument is optional and must be enclosed in double quotes. When you specify *title*, the command window appears with *title* as the title.

BAR

specifies to display the command bar in a stationary location, underneath the menu bar.

SORT=MCU|MRU

specifies how you want SAS to sort the commands in the command bar drop-down list. You can sort commands in the order that you most commonly use them (MCU) or that you most recently used them (MRU).

You must specify the WINDOW or BAR argument in the command before specifying the SORT argument.

FOCUS

specifies to place the window focus in the command bar.

MAX=*max-commands*

specifies the maximum number of commands to "remember" in the command bar drop-down list. Valid values are 0 through 50.

You must specify the WINDOW or BAR argument in the command before specifying the MAX argument.

AUTOCOMPLETE | NOAUTOCOMPLETE

specifies whether the command bar attempts to match the command that is being typed with commands that were previously typed.

You must specify the WINDOW or BAR argument in the command before specifying the SORT argument.

CLOSE

specifies to close the command bar.

Details

You can set some of these options by using the Customize Tools dialog box. However, you can specify a title for the Command window only by using this command.

If you issue COMMAND FOCUS when the command bar is closed

- The command bar is opened in the state that it was in before it was closed, either docked to the main SAS window or undocked as a separate window.
- The window focus is placed in the command bar.

See Also

- “COMMAND Command” in the SAS Help and Documentation
- “Using the Command Bar to Issue Commands” on page 41
- “View Preferences” on page 61
- “DLGPREF Command” on page 341

CUT Command

Cuts selected text from a window.

Windows specifics: supported options

Syntax

CUT <LAST | ALL>

LAST

cuts the most recently marked text and unmarks all other marks when more than one area of text is marked. To cut one area of text when more than one mark exists, you must use either the LAST or the ALL argument.

ALL

cuts all current marks when more than one area of text is marked.

Details

The CUT command removes marked text from the current window and stores it in the Windows clipboard.

Under Windows, the APPEND and BUFFER= options are not supported for the CUT command.

See Also

- “CUT Command” in the SAS Help and Documentation
- “Using the Clipboard” on page 55
- “WCUT Command” on page 362

DLGABOUT Command

Opens the About SAS System dialog box.

Windows specifics: all

Syntax

DLGABOUT

Details

To access the About SAS System dialog box from the menus, select the Help menu and then select **About SAS System**.

DLGCDIR Command

Opens the Change Folder dialog box.

Windows specifics: all

Syntax

DLGCDIR

Details

From the Change Folder dialog box, you can select a new working folder.

See Also

- “Changing the SAS Current Folder” on page 39
- “SASINITIALFOLDER System Option” on page 559

DLGCOLUMNSIZE Command

Opens the Columns Settings dialog box.

Windows specifics: all

Syntax

DLGCOLUMNSIZE

Details

When a SAS window contains a List view with details, you can specify the size of a column in pixels using the Columns Settings dialog box. An example of a window that can be a List view is the SAS Explorer window.

See Also

- “Resizing the Detail Columns of a List View” on page 82

DLGCOLUMNSORT Command

Opens the Sort Columns dialog box.

Windows specifics: all

Syntax

DLGCOLUMNSORT

Details

When a SAS window contains a List view, you can sort the columns using the Sort Columns dialog box. An example of a window that can be a List view is the SAS Explorer window.

See Also

- “Sorting Window List Views by a Specific Column” on page 82

DLGCONVERT Command

Opens the Convert dialog box.

Windows specifics: all

Syntax

DLGCONVERT

Details

You can use this command from the SAS/AF BUILD window with an OLE object selected. The Convert dialog box lets you convert the selected OLE object from one type to another, with the available types depending on what the OLE server application supports for that object.

See Also

- “Converting OLE Objects” on page 251

DLGENDR Command

Opens the Exit dialog box.

Windows specifics: all

Syntax

DLGENDR

Details

The Exit dialog box prompts you to confirm that you want to exit SAS. If you select **OK** in the dialog box, the SAS session ends. If **Confirm exit** is not selected in the Preferences dialog box **General** tabbed page, SAS closes when you enter the DLGENDR command.

See Also

- “Setting Session Preferences” on page 59

DLGFIND Command

Opens the Find dialog box.

Windows specifics: all

Syntax

DLGFIND

Details

The Find dialog box allows you to search for text strings.

See Also

- “DLGREPLACE Command” on page 344

DLGFONT Command

Opens the Fonts dialog box.

Windows specifics: all

Syntax

DLGFONT

Details

The Fonts Selection dialog box allows you to dynamically change the SAS windowing environment font.

DLGLIB Command

Opens the Libraries dialog box.

Windows specifics: all

Syntax

DLGLIB

Details

The Libraries dialog box lets you define or modify SAS libraries. The DLGLIB command is supported for compatibility with previous releases.

You can use the SAS Explorer window to browse or assign SAS libraries.

See Also

- SAS Help and Documentation for more information about using the SAS Explorer window to manage SAS libraries

DLGLINKS Command

Opens the Links dialog box.

Windows specifics: all

Syntax

DLGLINKS

Details

The DLGLINKS command opens the Links dialog box, allowing you to update a linked object.

See Also

- “Using Linked OLE Objects” on page 249

DLGOPEN Command

Opens the Open dialog box for the default editor.

Windows specifics: all

Syntax

```
DLGOPEN <LONGFILTER=“filters” | FILTER='filters' <REPLACE> >>SUBMIT |
  NOSUBMIT> <IMPORT> <VERIFY> <ALTCMD='command'>
```

no arguments

opens the Open dialog box with the default settings

LONGFILTER=*“filters”* | FILTER=*'filters'*

LONGFILTER=*“filters”* specifies one or more file filters to use as search criteria for displaying files in the Open dialog box. The first filter in the argument list is the default filter and is used as the search criteria. All of the filters in the argument list are added to the list of filters in the **Files of type:** combo box. To search for additional file types, you would select another filter from the **Files of type:** combo box.

You must enclose the filter list in double quotation marks. Note that you can specify long filenames that include spaces and single quotes. Separate each filter that you specify with a vertical bar (|). For example, if you specify

```
dlgopen longfilter="*.text|*.Bob's work|*.XX"
```

the dialog box displays all files in the current folder that have .text as their file extension, and the dialog box adds *.text, *.Bob's work and *.XX to the **Files of type:** combo box.

Note: When you are using the DLGOPEN command in the DM statement, do not use single quotation marks as part of a longfilter. The DM statement requires single quotation marks around the command it submits. A single quotation mark in the longfilter indicates to the DM statement the end of the command. △

FILTER=*'filters'* specifies one or more file filters to use as search criteria for displaying files in the Open dialog box. The first filter in the argument list is the default filter and is used as the search criteria. All of the filters in the argument list are added to the list of filters in the **Files of type:** combo box. To search for additional file types, you would select another filter from the **Files of type:** combo box. You must enclose the filter list quotation marks. Separate multiple lists with a space. For example, if you specify

```
dlgopen filter='*.bak *.txt'
```

the dialog box displays all files in the current folder that have a .BAK file extension, and adds both *.BAK and *.TXT to the **Files of Type:** combo box.

Note: The difference between LONGFILTER=*“filters”* and FILTER=*'filters'* is the use of spaces and quotation marks. Use LONGFILTER=*“filters”* if *filters* contain

spaces and single quotation marks. If you use `FILTER=filters`, *filters* cannot contain spaces and single quotation marks. \triangle

REPLACE

replaces the filter list with the specified filters instead of concatenating the list with the default filters. This option is valid only when you specify the `LONGFILTER=` or `FILTER=` argument as well. For example, the command

```
dlgopen longfilter="*.txt" replace
```

will load the **Files of type:** box with the `*.TXT` specification (instead of the default file types).

SUBMIT | NOSUBMIT

specifies whether the **Submit** check box is checked when the dialog box opens. By default, the **Submit** check box (which indicates that the contents of the opened file should be immediately submitted as a SAS program) is not checked. To automatically submit a file when it is opened, select **Submit contents of file opened** from the Preferences dialog box **General** page.

IMPORT

invokes the Import dialog box, allowing you to import graphics files into your SAS session. For more information on importing graphics, see “Importing a Graphics File from within a SAS/GRAPH Window” on page 191.

VERIFY

verifies whether the active window contains a File menu with an **Open** item. If it does, the Open dialog box invokes the Open item command instead of invoking the default `INCLUDE` command.

The `VERIFY` argument is not valid when specified with `ALTCMD` or `IMPORT`.

ALTCMD=*command*

specifies a command to be applied to the file that is selected from the Open dialog box. For example, the command

```
dlgopen altcmd='x' longfilter="*.bat"
```

allows you to select a DOS batch file, which is then run in a DOS shell. The `INCLUDE` command is the default command.

Details

The Open dialog box enables you to open files in the default editor. The default editor is determined from the **Use Enhanced Editor** option on the Preferences dialog box **Edit** tabbed page. If this option is selected, the Enhanced Editor is the default editor. Otherwise, the Program Editor is the default editor.

To access the Open dialog box from the menus, select the File menu and then select **Open**.

See Also

- “Opening Files” on page 111
- “Setting Session Preferences” on page 59
- “Importing Graphics from Other Applications” on page 190
- “FILEOPEN Command” on page 348

DLGPAGESETUP Command

Opens the Page Setup dialog box.

Windows specifics: all

Syntax

DLGPAGESETUP

Details

The Page Setup dialog box allows you to define page attributes such as paper size, source, orientation, and margins.

See Also

- “Setting Up the Printed Page” on page 172

DLGPREF Command

Opens the Preferences dialog box.

Windows specifics: all

Syntax

DLGPREF

Details

The Preferences dialog box allows you to configure your SAS session to accommodate the way that you like to work.

See Also

- “Setting Session Preferences” on page 59

DLGPRT Command

Opens the Print dialog box.

Windows specifics: all

Syntax

```
DLGPRT <NOSOURCE | ACTIVEBITMAP | SCREENBITMAP | AWSBITMAP |
        CLIPBITMAP | CLIPTEXT | ALTCMD='command' | BITMAPONLY |
        NODISPLAY | VERIFY>
```

no argument

prints the active window with the default print settings.

ACTIVEBITMAP

suppresses the Print dialog box and prints the active window as a bitmap.

ALTCMD='command'

uses the Print dialog box to issue a command other than PRINT.

AWSBITMAP

suppresses the Print dialog box and prints the main SAS window as a bitmap.

BITMAPONLY

allows only bitmap printing from the Print dialog box.

CLIPBITMAP

suppresses the Print dialog box and prints the contents of the Windows clipboard as a bitmap.

CLIPTEXT

suppresses the Print dialog box and prints the contents of the Windows clipboard as text.

NODISPLAY

suppresses the Print dialog box and prints using the default settings.

NOSOURCE

prevents the user from specifying a source (application window) from which to print.

SCREENBITMAP

suppresses the Print dialog box and prints the entire screen as a bitmap.

VERIFY

checks whether the active application window supports text printing (whether the File menu contains a **Print** item). If it does not, the Print dialog box allows only bitmap printing.

Details

The Print dialog box allows you to print the contents of the active window.

See Also

- “Printing from within a SAS Window” on page 168

DLGPRTPREVIEW Command

Invokes the Print Preview window.

Windows specifics: all

Syntax

DLGPRTPREVIEW <VERIFY>

VERIFY

checks whether the active application window supports printing (that is, whether the File menu contains a **Print** item). If it does not, the Print Preview window will not be displayed. You can still print these windows as bitmaps. Preview the output by issuing the DLGPRT VERIFY command and then clicking **Preview**.

Details

Not all SAS application windows support the Print Preview feature.

See Also

- “Previewing Your Output Before You Print” on page 176
- “Printing” on page 168

DLGPRTSETUP Command

Opens the Print Setup dialog box or programmatically sets printer settings.

Windows specifics: all

Syntax

DLGPRTSETUP <ORIENT=PORTRAIT | LANDSCAPE > <NODISPLAY>

ORIENT=PORTRAIT | LANDSCAPE

sets the default page orientation for the current printer. The orient parameter is to support backward compatibility of SAS. The preferred method to specify the orientation is with the ORIENTATION system option.

NODISPLAY

suppresses the display of the Print Setup dialog box. This option is intended to be used only when you use other options to explicitly set printer settings.

Details

The Print Setup dialog box allows you to name the printer to which you want to print, specify that you want to use SAS forms to print, and to access dialog boxes that control how SAS prints information, such as paper orientation, margins, and fonts.

See Also

- “Changing the Printer” on page 171
- “Changing the Print Font” on page 171
- “Setting Up the Printed Page” on page 172

DLGREPLACE Command

Opens the Replace dialog box.

Windows specifics: all

Syntax

DLGREPLACE

Details

The Replace dialog box allows you to find a text string and replace it with another text string.

See Also

- “DLGFIND Command” on page 337

DLGRUN Command

Opens the Run dialog box.

Windows specifics: all

Syntax

DLGRUN

Details

The Run dialog box allows you to start another application from within SAS. For example, if you typed excel.exe in the **Command line:** field of the Run dialog box, Microsoft Excel would open.

DLGSAVE Command

Opens the Save As dialog box.

Windows specifics: all

Syntax

```
DLGSAVE <LONGFILTER="filters" | FILTER='filters' <REPLACE>> <EXPORT>
<NOPROMPT> <VERIFY> <ALTCMD='command'>
```

no arguments

opens the Save As dialog box with the default settings.

LONGFILTER="filters" | FILTER='filters'

LONGFILTER="filters" specifies one or more file filters to use as search criteria for displaying files in the Save as dialog box. The first filter in the argument list is the default filter and is used as the search criteria. All of the filters in the argument list are added to the list of filters in the **Files of type:** combo box. To search for additional file types, you would select another filter from the **Files of type:** combo box.

You must enclose the filter in double quotation marks. Note that you can specify long filename extensions that include spaces and single quotes, and each filter that you specify must be separated by a vertical bar (|). For example, if you specify

```
dlgsave longfilter="*.text|*.Bob's work|*.*XX"
```

the dialog box displays all files in the current folder that have .TEXT as their file extension, and the dialog box adds *.text, *.Bob's work, and *.*XX to the **Files of type:** combo box.

Note: When you are using the DLGSAVE command in the DM statement, do not use single quotation marks as part of a longfilter. The DM statement requires single quotation marks around the command it submits. A single quotation mark in the longfilter indicates to the DM statement the end of the command. △

FILTER='filters' specifies one or more file filters to use as search criteria for displaying files in the Open dialog box. The first filter in the argument list is the default filter and is used as the search criteria. All of the filters in the argument list are added to the list of filters in the **Files of type:** combo box. To search for additional file types, you would select another filter from the **Files of type:** combo box. You must enclose the filter list in quotation marks. Separate multiple lists with a space. For example, if you specify

```
dlgsave filter='*.bak *.txt'
```

the dialog box displays all files in the current folder that have a .BAK file extension, and the dialog box adds both *.BAK and *.TXT to the **Files of type:** combo box.

Note: The difference between LONGFILTER="filters" and FILTER='filters' is that with LONGFILTER="filters" you can use spaces and quotes in the filters, where in FILTER='filters' you cannot use spaces and quotes. △

REPLACE

replaces the filter list with the specified filters instead of concatenating the list with the default filters. This option is valid only when you specify the LONGFILTER= or FILTER= arguments as well. For example, the command

```
dlgsave longfilter="*.txt" replace
```

will load the **Files of type:** combo box with only the *.TXT specification (instead of the default file types).

EXPORT

invokes the Export dialog box, allowing you to export graphics files from your SAS session. For more information about the Export dialog box, see "Exporting Graphics for Use with Other Applications" on page 192.

NOPROMPT

does not prompt the user to replace or append an existing file.

VERIFY

verifies whether the active window contains a File menu with a **Save** item. If it does, the Save As dialog box invokes the **Save** item instead of the default FILE command.

The VERIFY argument is not valid when specified with ALTCMD or EXPORT.

ALTCMD='command'

specifies the command to be applied to the file that is selected from the Save As dialog box. For example, the command

```
dlgsave altcmd='prtfile'
```

sets the file selected from the Save As dialog box as the current print file. The FILE command is the default command.

Details

The Save As dialog box lets you save the contents of the active window to a file. To access the Save As dialog box from the menus, select the File menu and then select **Save As**.

See Also

- The Enhanced Editor section, “Saving Files” on page 88
- The Program Editor section, “Saving Files” on page 117

DLGSMail Command

Opens the Send Mail dialog box.

Windows specifics: all

Syntax

DLGSMail

Details

The DLGSMail command opens the e-mail dialog box based on the value of the EMAILDLG system option. If the value of the EMAILDLG option is **sas**, the DLGSMail opens the Send Mail dialog box. If the value of the EMAILDLG option is **native**, the DLGSMail opens the MAPI-compliant e-mail dialog box.

See Also

- “Sending E-Mail Using SAS” on page 42
- “WEMAILFMT Command” on page 365
- “EMAILDLG System Option” on page 508

FILE Command

Writes the contents of the current window to an external file.

Windows specifics: valid options

Syntax

```
FILE file-specification <ENCODING='encoding-value'><portable-options>
  <host-options>
```

file-specification

specifies a valid Windows external file specification, such as a fileref, a file shortcut, a Windows filename that is enclosed in quotation marks, an environment variable, or an unquoted filename that resides in the current directory.

ENCODING=*'encoding-value'*

specifies the encoding to use when writing to the output file. The value for ENCODING= indicates that the output file has a different encoding from the current session encoding.

When you write data to the output file, SAS transcodes the data from the session encoding to the specified encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

portable-options

specifies one or more portable options, which are documented under the FILE command in SAS Help and Documentation.

host-options

BLKSIZE=*block-size*

BLK=*block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8192. The maximum is 1 megabyte.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=*record-length*

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

RECFM=*record-format*

controls the record format. Under Windows, the following values are valid:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
S370V	indicates the variable S370 record format (V).

S370VB	indicates the variable block S370 record format (VB).
S370VBS	indicates the variable block with spanned records S370 record format (VBS).
V D	indicates variable format. This is the default.

Details

The FILE command writes the entire contents of the active window to an external file without removing text from the window.

If you do not specify a *file-specification*, then SAS uses the filename from the previous FILE or INCLUDE command. In this case, SAS first asks you if you want to overwrite the file. If you have not issued any FILE or INCLUDE commands, you receive an error message indicating no default file exists.

In the Enhanced Editor, if the filename is eight characters or less, the file extension of .SAS is appended to *file-specification*. No extension is appended for a *file-specification* longer than eight characters.

See Also

- “FILE Command” in the SAS Help and Documentation
- ENCODING System Option in *SAS National Language Support (NLS): Reference Guide*
- “Referencing External Files” on page 148
- “Using the FILE Command” on page 161
- For an example of using some of these options, see “Advanced External I/O Techniques” on page 162.

FILEOPEN Command

Opens the Open dialog box for the Enhanced Editor or opens a file in the Enhanced Editor.

Windows specifics all

Syntax

FILEOPEN <“*file specification*”>

“*file specification*”

specifies a valid Windows path, filename, and file extension. If the file resides in the current working folder, the path is not required.

Details

The Open dialog box opens if you do not include a file-specification on the FILEOPEN command. If the FILEOPEN command does include a file-specification, the Open dialog box is bypassed and the file opens in the Enhanced Editor. You must include single or double quotation marks around the specified file.

Note: To open a file in the Program Editor, use the DLGOPEN command. △

See Also

- “Opening Files” on page 111
- “DLGOPEN Command” on page 339

FILL Command

Specifies the fill character.

Windows specifics: default character

Syntax

FILL *fill-character*

fill-character

specifies the character to be used to fill out a line.

Details

The fill characters are placed beginning at the current cursor position. Under Windows, the default fill character is an underscore (_).

See Also

- “FILL Command-line Command” in the SAS Help and Documentation

GSUBMIT Command

Submits SAS code stored in the Windows clipboard.

Windows specifics: valid value for *paste-buffer-name*

Syntax

GSUBMIT BUF=*paste-buffer-name* | “SAS-statement-1;...SAS-statement-n,”

Details

Under Windows, if the *paste-buffer-name* argument is specified, it must be DEFAULT. The Windows clipboard is the default paste buffer.

SAS statements in the Windows clipboard will not be submitted using the GSUBMIT command if a procedure that you submitted using the Enhanced Editor is still running.

You can copy the SAS statements to a new Enhanced Editor window and then submit them.

See Also

- “Using the GSUBMIT Command” on page 162

HOME Command

Moves the cursor position from the current position to the home position.

Windows specifics: keyboard equivalent

Syntax

HOME

Details

Under Windows, the HOME command is equivalent to the HOME key on your keyboard, which moves your cursor between the last cursor position and the home position in the window. If the Command line displays in the window, the home position is the Command line.

You can also define a function key to execute the CURSOR command, which positions the cursor at the home position in the window but has no toggle effect.

See Also

- “HOME Command” in the SAS Help and Documentation

ICON Command

Minimizes the active window.

Windows specifics: all

Syntax

ICON <ALL>, <ON>, <OFF>

no argument

specifies that the active window be minimized.

ALL

specifies that all windows except the main SAS window be minimized.

ON

specifies that the active window be minimized.

OFF

specifies that the active window be restored to its previous state.

Details

If the window bar is active, the ICON command minimizes windows to the window bar. Otherwise, windows are minimized to the application workspace.

The ICON command (no options) works as a toggle.

Note: Do not confuse this command with the ICON system option, which minimizes the main SAS window. △

See Also

- “ICON Command” in the SAS Help and Documentation

INCLUDE Command

Copies the entire content of an external file into the current window.

Windows specifics: valid options

Syntax

```
INCLUDE file-specification <ENCODING='encoding-value'><portable-options>
      <host-options>
```

file-specification

specifies a valid Windows external file specification, such as a fileref, a file shortcut, a Windows filename that is enclosed in quotation marks, an environment variable, or an unquoted filename that resides in the current directory.

ENCODING=*'encoding-value'*

specifies the encoding to use when reading from the external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

portable-options

specifies one or more portable options, which are documented under the INCLUDE command in SAS Help and Documentation.

host-options

BLKSIZE=*block-size*

BLK=*block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=*record-length*

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

NOTABS

is used only in the context of Dynamic Data Exchange. This option enables you to use nontab character delimiters between variables. For more information on this option, see “Using the NOTAB Option with DDE” on page 281.

RECFM=*record-format*

controls the record format. Under Windows, the following values are valid:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
S370V	indicates the variable S370 record format (V).
S370VB	indicates the variable block S370 record format (VB).
S370VBS	indicates the variable block with spanned records S370 record format (VBS).
V D	indicates variable format. This value is the default.

Details

The INCLUDE command copies the entire contents of an external file into the active window.

If you do not specify a *file-specification*, then SAS uses the filename from the previous FILE or INCLUDE command. If you have not issued any FILE or INCLUDE commands, you receive an error message indicating no default file exists.

In the Enhanced Editor, if the filename is eight characters or less, the file extension of .SAS is appended to *file-specification*. No extension is appended for a *file-specification* longer than eight characters.

See Also

- “INCLUDE Command” in the SAS Help and Documentation
- “ENCODING System Option” in *SAS National Language Support (NLS): Reference Guide*
- “Referencing External Files” on page 148
- “Using the INCLUDE Command” on page 161

- For an example of using some of these options, see “Advanced External I/O Techniques” on page 162.

PMENU Command

Toggles the command line in the SAS application windows on and off.

Windows specifics: command behavior

Syntax

PMENU <ON | OFF>

no argument

toggles the command lines on and off.

ON

turns the command lines off.

OFF

turns the command lines on.

Details

Under the Windows operating environment, the menus are always enabled. Use can use either the PMENU command or the COMMAND command to specify whether you want the command line to display in SAS windows.

See Also

- “PMENU Command” in the SAS Help and Documentation
- “COMMAND Command” on page 333
- “WMENUPOP Command” on page 368

SAVE Command

Writes the entire contents of the Enhanced Editor, Program Editor, Log, Output, Notepad, and Keys windows to a catalog entry.

Syntax

SAVE <catalog-entry><ATTR> <TABS> <APPEND | REPLACE>

(no argument)

writes the contents of the window to the catalog entry that was most recently specified in a COPY or SAVE command during the current SAS session.

catalog-entry

specifies the four-level name.

ATTR

stores attributes with the entry.

TABS

compresses spaces as tabs during storage instead of storing the file with the default spacing.

APPEND

appends the contents of the window to the contents of the catalog entry. When it is specified, this catalog entry becomes the default until another catalog entry is specified.

REPLACE

replaces the contents of the catalog entry with the contents of the window. Once specified, this replacement becomes the default until another catalog entry is specified.

STORE Command

Copies selected text or graphics to the Windows clipboard.

Windows specifics: valid options; not supported by the Enhanced Editor

Syntax

STORE <LAST | ALL>

LAST

copies only the most recently marked text and unmarks all other marks when more than one area of text is marked. To store one area of text when more than one mark exists, you must use either the LAST or ALL argument.

ALL

stores all current marks when more than one area of text has been marked.

Details

The STORE command copies marked text or graphics in the active window and stores the copy in the Windows clipboard.

The APPEND and BUFFER= options are not supported under Windows for the STORE command.

See Also

- “STORE Command” in the SAS Help and Documentation
- “Using the Clipboard” on page 55

SUBTOP Command

Submits the first *n* lines of a SAS program for processing.

Windows specifics: valid in the Enhanced Editor and the Program Editor

Syntax

SUBTOP <*n*>

no argument

specifies to submit only the top line of the program for processing.

n

specifies to submit the first *n* lines of the program for processing.

Details

When the **Clear text on submit** check box is selected in the Enhanced Editor Options dialog box, all of the submitted lines are deleted from the window when you issue the SUBTOP command.

See Also

- “Submitting Your Program” on page 97

TOOLCLOSE Command

Closes the application toolbar or toolbox.

Windows specifics: all

Syntax

TOOLCLOSE

Details

Use the TOOLCLOSE command to close the toolbar or toolbox.

TOOLEEDIT Command

Opens the **Customize Tools dialog box**.

Windows specifics: all

Syntax

TOOLEEDIT <*library.catalog.entry*>

no argument

edits the currently loaded set of tools.

library.catalog.entry

specifies the TOOLBOX entry you want to edit.

Details

The TOOLEEDIT command invokes the Customize Tools dialog box with the TOOLBOX entry specified by *library.catalog.entry*. If a TOOLBOX entry is not specified, the currently loaded set of tools is used.

See Also

- “Customizing the Toolbar” on page 68

TOOLLARGE Command

Toggles the size of the toolbar or toolbox buttons.

Windows specifics: all

Syntax

TOOLLARGE <ON | OFF>

no argument

toggles the size of the toolbar or toolbox buttons between large and normal.

ON

sets the size of the toolbar or toolbox buttons too large.

OFF

sets the size of the toolbar or toolbox buttons to normal.

Details

The TOOLLARGE command toggles the size of the toolbar buttons between normal and large. You might find the large buttons easier to use with high-resolution displays.

See Also

- “Resetting the Tools to the Default Settings” on page 72

TOOLLOAD Command

Loads a specific toolbox.

Windows specifics: all

Syntax

TOOLLOAD <WINDOW> <BOX | BAR> <*libref.catalog.member*>

no arguments

loads the toolbar for the active window. The tools are displayed as a toolbar or toolbox, depending on the setting in the Customize tools dialog box.

WINDOW

associates the toolbox entry you specify with the active window, so that the particular set of tools that you load apply only to that window. This association lasts until you close the window. If you reopen the window later, the window will revert to its default toolbar.

If the WINDOW option is not specified on the TOOLLOAD command, the toolbar or toolbox that is loaded applies to all windows that do not have a specific toolset definition stored for them in the Sasuser.Profile catalog. Such specific toolsets must be named to match the window. For example, the Explorer window toolset is named Sasuser.Profile.Explorer. If the WINDOW option is not specified, the toolset definition will persist throughout the current SAS session regardless of how many times a particular window is closed and reopened.

BOX | BAR

controls whether the icons are displayed as a toolbox in a separate window or as a toolbar integrated with the main SAS window.

libref.catalog.member

specifies the catalog entry to load. TOOLBOX is the default catalog entry type.

Details

After the TOOLLOAD command is processed, the specified toolbox is the active toolbox.

See Also

- “Customizing and Saving a Toolbar for Use with a Particular Application or Window” on page 71

TOOLSWITCH Command

Toggles the tool switching feature on and off.

Windows specifics: all

Syntax

TOOLSWITCH ON | OFF

ON

automatically loads the toolbar (if one is defined) for the active window.

OFF

uses the default toolbar (Sasuser.Profile.Toolbox) for all windows unless you explicitly load another one.

Details

The TOOLSWITCH command allows you to switch between a toolbar defined for the active window and the SAS default toolbar.

See Also

- “Setting Session Preferences” on page 59
- “TOOLEEDIT Command” on page 356

TOOLTIPS Command

Toggles the Tooltips feature.

Windows specifics: all

Syntax

TOOLTIPS <ON | OFF>

no argument

toggles the Tooltips feature on and off.

ON

turns the Tooltips feature on.

OFF

turns the Tooltips feature off.

Details

Tooltips are the helpful cues that appear over toolbar or toolbox buttons, (and over some other controls in the main SAS window) as you position the mouse pointer over them.

The **TOOLTIPS** command specifies whether the Tooltips text is displayed when you move the cursor over an icon in the toolbox or some other control. If you do not specify **ON** or **OFF**, the **TOOLTIPS** command toggles the text on and off, depending on the current setting.

Note: Do not confuse Tooltips with ScreenTips. ScreenTips display helpful cues for the status bar, the window bar, and tabs in the main SAS window. △

See Also

- “**WSCREENTIPS** Command” on page 373

WATTACH Command

Toggles whether the contents of the active window are attached to an electronic mail message that you initiate using **SAS**.

Windows specifics: all

Syntax

WATTACH <ON | OFF>

no argument

toggles the attach mode on and off

ON

specifies to attach the active window

OFF

specifies to not attach the active window

Details

If you specify **ON**, the contents of the active window are sent as an attached file. For text windows, the format is either text or RTF (as determined by the **WEMAILFMT** command or the Preferences dialog box settings). Graphic windows are sent as Windows bitmap (BMP) files.

You can also toggle this setting in the Preferences dialog box **General** page.

See Also

- “Sending E-Mail Using SAS” on page 42
- “**WEMAILFMT** Command” on page 365
- “Setting Session Preferences” on page 59

WATTENTION Command

Displays the Tasking Manager window, which allows you to select which SAS process to terminate.

Windows specifics: all

Syntax

WATTENTION

Details

The WATTENTION command allows you to select a SAS process to terminate. This action is the equivalent of pressing CTRL + Break.

WAUTOSAVE Command

Controls how often SAS automatically saves work in the SAS editor windows.

Windows specifics: all

Syntax

WAUTOSAVE <<ON | OFF> INTERVAL=*minutes*>

no arguments

turns the autosave feature on and resets the autosave timer (so that work will automatically be saved after the defined time interval).

ON | OFF

specifies to turn the autosave feature on or off.

INTERVAL=*minutes*

saves work every certain number of minutes. The default interval is 10 minutes. Specify the interval as an integer.

Details

Use the WAUTOSAVE command if you want SAS to automatically save your work more often or less often than the default interval of every 10 minutes. SAS saves the Program Editor contents to 'pgm.asv' in the current working folder or in the folder specified by the AUTOSAVELOC system option. Contents of the Enhanced Editor windows are saved to the operating environment temporary folder with the filename of 'Autosave of *filename*.\$AS'. You can also set the autosave feature in the Preferences dialog box **Edit** page.

See Also

- “Setting Session Preferences” on page 59
- “AUTOSAVELOC System Option” in *SAS Language Reference: Dictionary*

WBROWSE Command

Opens the web browser specified in the preferences dialog box.

Windows specifics: all

Syntax

WBROWSE <“URL”>

no argument

invokes the preferred web browser as defined in the Preferences dialog box **Web** page.

URL

specifies a URL (Uniform Resource Locator) which contains the server and path information needed to find a document on the Internet or on a local intranet.

Details

By default, the WBROWSE command invokes the default web browser, which displays SAS Institute’s home page (Support.sas.com). If you specify a URL then that location is displayed instead. Note that you must enclose the URL in double quotations. The default page the web browser opens can be changed in the Preferences dialog box **Web** page.

See Also

- “Setting Session Preferences” on page 59

WCOPY Command

Copies the marked contents of the active window to the Windows clipboard.

Windows specifics: all

Syntax

WCOPY

Details

WCOPY is intended to be used with the toolbar commands. When you enter the WCOPY command and the active window is a text window, the active window’s menu is

searched for a COPY item. If there is a COPY item, the marked contents is copied to the Windows clipboard. If there is no COPY item, WCOPY will execute the STORE command.

See Also

- “STORE Command” on page 354

WCUT Command

Moves the marked contents of the active window to the Windows clipboard.

Windows specifics: all

Syntax

WCUT

Details

WCUT is intended to be used with the toolbar commands and is valid only when the active window is an editor window, such as the PROGRAM EDITOR window. When you enter the WCUT command, the active window’s menu is searched for a CUT item. If there is a CUT item, the marked contents of the active window are moved to the Windows clipboard. If there is no CUT item, WCUT will execute the CUT command.

See Also

- “CUT Command” on page 334

WDOCKVIEW Command

Toggles the Docking View on and off.

Windows specifics: all

Syntax

WDOCKVIEW <ON | OFF>

no argument

toggles the Docking View on and off.

ON

turns the Docking View on.

OFF

turns the Docking View off

Details

The Docking View allows for easy navigation within the main SAS window. When the Docking View is enabled, windows that can be docked (integrated with the main SAS window) such as the SAS Explorer and Results windows, display on the left side of the main SAS window. When you click on an item in a docked window that opens another window, such as the output from a procedure listed in the Results window, the window opens on the right side of the main SAS window. You navigate between docked windows using tabs.

See Also

- “Using the Docking View” on page 37
- “Setting Session Preferences” on page 59

WDOCKVIEWMINIMIZE Command

Minimizes the Docking View window.

Windows specifics: all

Syntax

WDOCKVIEWMINIMIZE

Details

WDOCKVIEWMINIMIZE minimizes the Docking View window.

See Also

- “WDOCKVIEWRESTORE Command” on page 364
- “Using the Docking View” on page 37

WDOCKVIEWRESIZE Command

Start Resize mode for moving the Docking View split bar.

Windows specifics: all

Syntax

WDOCKVIEWRESIZE

Details

When you type WDOCKVIEWRESIZE in the command bar, SAS starts a resize mode. In Resize mode, you can move the Docking View split bar either by using the mouse or by using the left and right arrow keys on the keyboard. When you press the Ctrl key followed by either the left or right arrow keys, the amount of space that the split bar moves is increased. To end Resize mode, press Enter.

You can also start the Docking View Resize mode by typing Alt + W + S or by selecting **Window ► Size Docking View**

See Also

- “Resizing the Docking View in the Main SAS Window” on page 81

WDOCKVIEWRESTORE Command

Restores the Docking View window from the task bar.

Windows specifics: all

Syntax

WDOCKVIEWRESTORE

Details

WDOCKVIEWRESTORE restores the Docking View window to the left side of the main SAS window.

See Also

- “WDOCKVIEWMINIMIZE Command” on page 363
- “Using the Docking View” on page 37

WEDIT Command

Opens an Enhanced Editor window and also enables or disables the Enhanced Editor.

Windows specifics: all

Syntax

WEDIT <“filename”> <USE|NOUSE>

no argument

opens an Enhanced Editor window.

“filename”

specifies the name of a file to open in the Enhanced Editor. The filename should be in double quotation marks. If specified, *filename* must be the first argument.

USE

specifies to enable the Enhanced Editor and to open an Enhanced Editor window.

NOUSE

specifies to disable the Enhanced Editor. An Enhanced Editor window is not opened.

Details

When you use the WEDIT command to enable the Enhanced Editor, the **Use Enhanced Editor** check box is selected in the **Edit** page of the Preferences dialog box. Similarly, when you use the WEDIT command to disable the Enhanced Editor, the **Use Enhanced Editor** check box is deselected.

See Also

- “Setting Session Preferences” on page 59
- “Using the Enhanced Editor” on page 86

WEMAILFMT Command

Specifies the format to use when attaching the contents of a text window to an electronic mail message.

Windows specifics: all

Syntax

WEMAILFMT TEXT | RTF

TEXT

attaches the contents of the current SAS text window as a plain text file.

RTF

attaches the contents of the current SAS text window as a rich text format (RTF) file.

Details

If the current SAS window contains graphics, the contents of the windows are automatically attached as a Windows bitmap file.

When you use the WEMAILFMT command, the **Mail current window as attachment** check box is updated in the General tabbed page of the Preferences dialog box.

See Also

- “Sending E-Mail Using SAS” on page 42
- “WATTACH Command” on page 359
- “DLGSMAIL Command” on page 346

WEXITSAVE Command

Toggles saving your settings when you exit SAS.

Window specifics: all

Syntax

WEXITSAVE <ON | OFF>

no argument

toggles the saving of your settings when you exit SAS.

ON

saves your settings when you exit SAS.

OFF

does not save your settings when you exit SAS.

Details

You can also toggle this setting in the Preferences dialog box **General** page.

See Also

- “Setting Session Preferences” on page 59

WFILE Command

Saves the contents of the active window.

Windows specifics: all

Syntax

WFILE

Details

The WFILE command saves the contents of the active window to a file.

See Also

- Enhanced Editor section “Saving Files” on page 88
- Program Editor section “Saving Files” on page 117

WHIDECURSOR Command

Suppresses the display of the cursor in SAS windows that do not allow text input.

Windows specifics: all

Syntax

WHIDECURSOR <ON | OFF>

no argument

toggles between hiding and displaying the cursor.

ON

hides the cursor.

OFF

displays the cursor.

Details

The WHIDECURSOR command inhibits the display of the default text cursor in windows that do not allow text input, such as SAS/EIS and SAS/AF software. You can also toggle the WHIDECURSOR setting in the Preferences dialog box **Advanced** page.

See Also

- “Setting Session Preferences” on page 59

WHSBAR Command

Toggles the horizontal scroll bars on and off.

Windows specifics: all

Syntax

WHSBAR <ON | OFF>

no argument

toggles the horizontal scroll bars on and off.

ON
displays the horizontal scroll bars.

OFF
hides the horizontal scroll bars.

Details

You can also toggle this setting in the Preferences dialog box **View** page.

See Also

- “Setting Session Preferences” on page 59

WINSERT Command

Toggles insert mode on and off.

Windows specifics: all

Syntax

WINSERT <ON | OFF>

no argument
toggles the insert mode on and off.

ON
enables the insert mode.

OFF
enables the overstrike mode.

Details

You can also toggle this setting by pressing the INSERT key on your keyboard or by modifying the **Overtyping mode** option in the Preferences dialog box **Edit** tabbed page.

See Also

- “Setting Session Preferences” on page 59

WMENUPOP Command

Toggles the pop-up menus in the SAS application windows on and off.

Windows specifics: all

Syntax

WMENUPOP <ON | OFF>

no argument

toggles the pop-up menus on and off.

ON

turns the pop-up menus on.

OFF

turns the pop-up menus off.

Details

By default, the pop-up menus are on. You can access the pop-up menu for a window by clicking the right mouse button inside the window client area.

When used with the -NOAWSMENU system option, this command makes all menu selections unavailable to the user. This technique can be useful when developing SAS/AF applications in which you want to restrict the actions of the end user.

See Also

- “AWSMENU System Option” on page 499
- “PMENU Command” on page 353
- “WPOPOP Command” on page 372

WMRU Command

Retains the names of the most recently used files in the File menu.

Windows specifics: all

Syntax

WMRU <<ON> <NUM=*number-of-filenames*><CASCADE>> | <OFF>

no arguments

toggles the file list on and off.

ON NUM=*number-of-filenames*

turns the file list on and maintains *number-of-filenames* filenames in the list. The *number-of-filenames* argument can be an integer from 1 to 30. If you omit *number-of-filenames*, the last number specified for the most recently used files is used.

CASCADE

specifies that the most recently used files list can be accessed from the File menu **Recent Files** submenu.

OFF

turns the file list off.

Details

When you open or save a file using the Open or Save As dialog boxes, SAS adds the filename to the recently used file list in the File menu or the **Recent Files** submenu. You can open a recently used file in a SAS editor window by making the editor the active window and selecting its name from the File menu or the **Recent Files** submenu. By default, SAS retains four filenames in the list.

You can also configure these settings in the Preferences dialog box **General** page.

See Also

- “Setting Session Preferences” on page 59

WNAVKEYUNMARK Command

Toggles the setting for enabling unmarking of text using navigational keys.

Windows specifics: all

Syntax

WNAVKEYUNMARK <ON | OFF>

no argument

toggles the **Enable unmarking with navigation keys** setting on and off.

ON

turn the **Enable unmarking with navigation keys** setting on.

OFF

turns the **Enable unmarking with navigation keys** setting off.

Details

You can access the **Enable unmarking with navigation keys** setting by selecting **Tools ► Options ► Preferences ► Edit**.

When the **Enable unmarking with navigation keys** setting is selected, you can unmark text by using the up, down, left, and right navigation keys.

See Also

- “Setting Session Preferences” on page 59

WNEWTITLE Command

Clears the contents of the active window and removes its title.

Windows specifics: all

Syntax

WNEWTITLE

Details

When you save the contents of a SAS window to a file, SAS assigns the filename as the title of the window. You can use the WNEWTITLE command to clear the active window and remove that title (reverting to Untitled).

If used in the LOG or OUTPUT window, this command clears the contents of the window and changes the name to Untitled. If this command is used in the Program Editor window, SAS prompts you to save the contents of the window before clearing it and removing the title. If this command is used in the Enhanced Editor window, SAS opens a new, untitled, Enhanced Editor window.

WNEXTEDIT Command

Toggles between all Enhanced Editor windows that are currently open.

Windows specifics: all

Syntax

WNEXTEDIT

Details

You can use the WNEXTEDIT command to move between Enhanced Editor windows.

See Also

- “WPGM Command” on page 372

WPASTE Command

Pastes the contents of the Windows clipboard into the active window.

Windows specifics: all

Syntax

WPASTE

Details

WPASTE is intended to be used with the toolbar commands. When you enter the WPASTE command, the active window's menu is searched for a PASTE item. If there is a PASTE item and the clipboard contains text, WPASTE will execute as if you selected PASTE from the menu. If there is no PASTE item, WPASTE will execute the PASTE command.

See Also

- "PASTE Command" in the SAS Help and Documentation

WPGM Command

Changes the active window to the editor window that was most recently edited.

Windows specifics: all

Syntax

WPGM

Details

The behavior of the WPGM command depends on the setting of the **Use Enhanced Editor** check box. The check box is available from the **Edit** tab in the Preferences dialog box. If the **Use Enhanced Editor** check box is selected and you issue the WPGM command, the active window becomes the Enhanced Editor window that was most recently edited. If the **Use Enhanced Editor** check box is not selected, the active window becomes the Program Editor.

Issuing the WPGM command repeatedly displays the open Enhanced Editor windows in the order of the most recently edited window to the least recently edited.

See Also

- "WNEXTEDIT Command" on page 371

WPOPUP Command

Causes the pop-up menus for a window to appear.

Windows specifics: all

Syntax

WPOPUP

Details

You can access the pop-up menu for a window by clicking the right mouse button inside the window client area. By default under Windows, this command is associated with the right mouse button.

See Also

- “WMENUPOP Command” on page 368

WRTFSAVE Command

Saves the contents of the current text window to an RTF file.

Windows specifics: all

Syntax

WRTFSAVE “*filename*” <NOPROMPT>

filename

is a required argument and can include a file path. If you specify a filename without a path, the file is saved in the current SAS working folder. The WRTFSAVE command does not automatically append the .RTF file extension. If you want the resulting filename to end in .RTF, be sure to include it as part of the filename that you specify.

NOPROMPT

specifies that if a file with the same filename already exists, that file will be overwritten without prompting you with a confirmation dialog box.

Details

The WRTFSAVE command saves the contents of the active window in .RTF format. The contents of the active window must be text. This command performs the same action as the Save As dialog box when you select **.rtf** from the **Save file as type** list. However, WRTFSAVE saves the file without displaying an intermediate dialog box.

Note: The WRTFSAVE command does not work with the enhanced editor. △

WSCREENTIPS Command

Toggles the ScreenTips on and off.

Windows specifics: all

Syntax

WSCREENTIPS <ON | OFF>

no argument

toggles the ScreenTips on and off.

ON

displays helpful cues for the status bar, window bar and tabs within the main SAS window.

OFF

turns off the ScreenTips.

Details

ScreenTips are the helpful cues that appear over the status bar, window bar and tabs in the main SAS window as you position the mouse pointer over them.

The WSCREENTIPS command specifies whether the ScreenTips text is displayed when you move the cursor over the status bar, window bar, or tabs in the main SAS window.

Note: Do not confuse ScreenTips with ToolTips. ToolTips display helpful cues for tools. You can also toggle the ScreenTips setting in the Preferences dialog box **View** page. Δ

See Also

- “TOOLTIPS Command” on page 358
- “Setting Session Preferences” on page 59

WSTATUSLN Command

Toggles the status bar on and off, and specifies the area proportions.

Windows specifics: all

Syntax

```
WSTATUSLN <ON | OFF> <ALL | MSG<=percent-msg> |
          CDIR<=percent-cdir>><CURPOS>>
```

no arguments

toggles the status bar on and off.

The first argument is optional, but if you specify it, you must include it before the second group of options:

ON

displays the status bar in its most recent active state. If the status bar includes a message area, the message lines in the SAS application windows are disabled. ON is the default setting.

OFF

turns off the status bar. This action enables the message lines in the SAS application windows.

The second group of arguments is also optional. Note that specifying these options without specifying the ON option first does not automatically turn the status bar on if it is currently off.

ALL

includes both the message area and the current folder areas on the status bar. If you do not specify the MSG and CDIR options with percentage values, the status bar proportions revert to the most recent settings. ALL is the default setting.

MSG<=*percent-msg*>

includes the message area as part of the status bar. If you specify this option without the CDIR option, the message area occupies the entire status bar. If you specify a percentage with this option and with the CDIR option, the message area occupies the proportion of the line that you specify.

CDIR<=*percent-cdir*>

includes the current folder as part of the status bar. If you specify this option without the MSG option, the current folder area occupies the entire status bar. If you specify a percentage with this option and with the MSG option, the current folder area occupies the proportion of the line that you specify.

CURPOS

includes the Enhanced Editor cursor position (line and column) in the status bar when the Enhanced Editor is the active window.

Details

The WSTATUSLN command specifies whether the status bar of the active window is on or off and specifies the proportions of the status bar that the message area and the current folder area occupy. You can also toggle the status bar in the Preferences dialog box **View** page.

Example

To display a status bar that is evenly divided between the message display and the current folder display, issue the following command:

```
wstatusln on msg=50 cdir=50
```

See Also

- “Setting Session Preferences” on page 59

WUNDO Command

Undoes the last CUT, COPY, or PASTE toolbar action.

Windows specifics: all

Syntax

WUNDO

Details

When you enter the WUNDO command, the active window's menu is searched for an undo item. If there is an undo item, WUNDO will execute as if you selected **UNDO** from the menu. If there is no undo item, WUNDO will execute the UNDO command. Some windows might not have an undo command.

WWSBAR Command

Toggles the vertical scroll bars on and off.

Windows specifics: all

Syntax

WWSBAR <ON | OFF>

no argument

toggles the vertical scroll bars on and off.

ON

displays the vertical scroll bars.

OFF

hides the vertical scroll bars.

Details

You can also toggle this setting in the Preferences dialog box **View** page.

See Also

- “Setting Session Preferences” on page 59

WWINDOWBAR Command

Toggles the window bar on and off.

Windows specifics: all

Syntax

WWINDOWBAR <ON | OFF>

no argument

toggles the window bar on or off.

ON

displays the window bar in the main SAS window.

OFF

does not display the window bar in the main SAS window.

Details

If the window bar is on, it displays at the bottom of the main SAS window just above the status bar. SAS windows minimize to the window bar. You can bring a window to the front by clicking on the window's button in the window bar. To open a file in an open application, such as one of the editors, you drag the file to the application's button in the window bar (which brings the application to the front) and then drag the file to the application's window. When the window bar is off, SAS windows minimize to small title bars.

You can also turn the window bar on and off using the Preferences dialog box **View** page.

See Also

- “Customizing Your Windowing Environment with Commands” on page 63
- “Setting Session Preferences” on page 59

X Command

Enters operating environment mode or allows you to submit a Windows command without ending your SAS session.

Windows specifics: valid values for *command* syntax

Syntax

X <*command* >;

no argument

open a DOS command window.

command

specifies the command that you want to execute.

Details

This form of the X command issues one command. The command is passed to the operating environment and executed. If errors occur, the appropriate error messages are displayed.

See Also

- “X Command” in the SAS Help and Documentation
- “Running Windows or MS-DOS Commands from within SAS” on page 26
- “XCMD System Option” on page 586
- “XSYNC System Option” on page 588
- “XWAIT System Option” on page 589

ZOOM Command

Maximizes the active window.

Windows specifics: all

Syntax

ZOOM <ON | OFF>

ON

maximizes the active window.

OFF

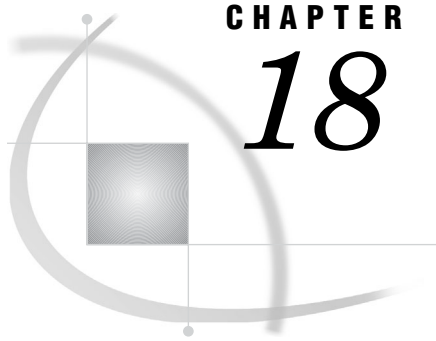
returns the active window to the default size.

Details

When you maximize one application window, the SAS windowing environment enters a maximized mode. As you switch between active windows, each window you select will be maximized. When you restore one of the application windows to its original size, all windows are restored.

See Also

- “ZOOM Command” in the SAS Help and Documentation



CHAPTER

18

SAS Formats under Windows

<i>SAS Formats under Windows</i>	379
<i>Writing Binary Data</i>	379
<i>Accessing User-Written Formats from Earlier Releases to SAS 9.2</i>	380
<i>HEXw. Format</i>	380
<i>\$HEXw. Format</i>	381
<i>IBw.d Format</i>	381
<i>PDw.d Format</i>	383
<i>PIBw.d Format</i>	384
<i>RBw.d Format</i>	385
<i>ZDw.d Format</i>	386

SAS Formats under Windows

A SAS format is an instruction or template that SAS uses to write data values. Most SAS formats are described completely in *SAS Language Reference: Dictionary*. The formats that are described here have behavior that is specific to Windows.

Many of the SAS formats that have details specific to the Windows operating environment are used to write binary data. In using these formats, it is important that you understand the concepts that are presented in “Writing Binary Data” on page 379.

If you have formats that you created for use in earlier releases of SAS, see “Accessing User-Written Formats from Earlier Releases to SAS 9.2” on page 380 for information about how to convert those formats for use with SAS 9.2.

Writing Binary Data

IBM mainframes, Hewlett Packard 9000, and most other UNIX systems store bytes in one order, called big-endian. Intel-based, or IBM compatible microcomputers and the VAX and Alpha computers manufactured by Compaq store bytes in a different order called byte-reversed, or little-endian.

Binary data stored in one order cannot be read by a computer that stores binary data in the other order without additional processing taking place. When you are designing SAS applications, try to anticipate how your data will be read and choose your formats and informats accordingly.

SAS provides two sets of informats for reading binary data and corresponding formats for writing binary data.

- The *IBw.d*, *PDw.d*, *PIBw.d*, and *RBw.d* informats and formats read and write in native mode, that is, using the byte-ordering system that is standard for the machine.

- The S370FIB*w.d*, S370FPD*w.d*, S370FRB*w.d*, and S370FPIB*w.d* informats and formats read and write according to the IBM 370 standard, regardless of the native mode of the machine. These informats and formats allow you to write SAS programs that can be run in any SAS environment, regardless of how numeric data are stored.

If a SAS program that reads and writes binary data runs on only one type of machine, you can use the native mode informats and formats. However, if you want to write SAS programs that can be run on multiple machines using different byte-storage systems, use the IBM 370 formats and informats. The purpose of the IBM 370 informats and formats is to enable you to write SAS programs that can be run in any SAS environment, no matter what standard you use for storing numeric data.

For example, suppose you have a program that writes data with the PIB*w.d* format. You execute the program on a microcomputer so that the data are stored in byte-reversed mode. Then on the microcomputer you run another SAS program that uses the PIB*w.d* informat to read the data. The data are read correctly because both of the programs are run on the microcomputer using byte-reversed mode. However, you cannot upload the data to a Hewlett Packard 9000-series machine and read the data correctly because they are stored in a form native to the microcomputer but foreign to the Hewlett Packard 9000. To avoid this problem, use the S370FPIB*w.d* format to write the data; even on the microcomputer, this causes the data to be stored in IBM 370 mode. Then read the data using the S370FPIB*w.d* informat. Regardless of what type of machine you use when reading the data, they are read correctly.

Accessing User-Written Formats from Earlier Releases to SAS 9.2

Version 6.12, 7, and 8 formats (catalogs) are readable in SAS 9 on 32-bit SAS for Windows. If you are on 64-bit SAS for Windows, you must use PROC CPORT and CIMPORT to convert. For more information on PROC CPORT and CIMPORT see *Base SAS Procedures Guide*.

If you are on 32-bit SAS for Windows, and you want to migrate a SAS library, PROC MIGRATE is the recommended method.

Note: User-defined formats are stored as catalog entries. Δ

HEX*w*. Format

Converts real binary (floating-point) values to hexadecimal values.

Category numeric

Width range: 1–16

Default width: 8

Alignment: left

Windows specifics: native floating-point representation

See: HEX*w*. in *SAS Language Reference: Dictionary*

Syntax

HEX*w*.

w

specifies the width of the output field. When you specify a *w* value of 1 through 15, the real binary number is truncated to a fixed-point integer before being converted to hexadecimal notation. When you specify 16 for the *w* value, the floating-point value of the number is used; in other words, the number is not truncated.

See Also

- “\$HEX*w*. Format” on page 381
- “HEX*w*. Informat” on page 421

\$HEX*w*. Format

Converts character values to hexadecimal values.

Category character

Width range: 1–32767

Default width: 4

Alignment: left

Windows specifics: ASCII character–encoding system

See: \$HEX*w*. in *SAS Language Reference: Dictionary*

Syntax

\$HEX*w*.

w

specifies the width of the output field.

Details

The \$HEX*w*. format is like the HEX*w*. format in that it converts a character value to hexadecimal notation, with each byte requiring two columns. Under Windows, the \$HEX*w*. format produces hexadecimal representations of ASCII codes for characters.

See Also

- “HEX*w*. Format” on page 380
- “\$HEX*w*. Informat” on page 422

IBw.d Format

Writes values in integer binary (fixed-point) format.

Category numeric

Width range: 1–8

Default width: 4

Decimal range: 0–10

Alignment: left

Windows specifics: native floating-point representation

See: IBw.d in *SAS Language Reference: Dictionary*

Syntax

IBw.d

w

specifies the width of the output field in bytes (not digits).

d

specifies a scaling factor. When you specify a *d* value, the IBw.d format multiplies the number by 10^d , and then applies the integer binary format to that value.

Details

The IBw.d format converts a double-precision number and writes it as an integer binary (fixed-point) value. Integers are stored in integer-binary (fixed-point) form.

For more information about microcomputer fixed-point values, see the Intel developer Web site.

Examples

Example 1: Processing a Positive Number If you format 1.0 as the double-precision number, it is stored as an integer:

```
01 00 00 00 00 00 00 00
```

(Remember, Windows stores binary data in byte-reversed order.) The value written depends on the *w* value you specify.

If you specify the IB4. format, you receive the following value:

```
01 00 00 00
```

If you specify the IB2. format, you receive the following value:

```
01 00
```

Example 2: Processing a Negative Number If you try to format –1 with the IB4. format, you receive the following value:

```
FF FF FF FF
```

If you specify the IB2. format, you receive the following value:

```
FF FF
```

Example 3: Processing a Number That Is Too Large to Format When a numeric value is too large to format, the result is largest integer value that can be stored in four bytes, which is 2,147,483,647.

In the following code

```
data a;
  x = 99999999999999999999;
  y = put(x, IB8.);
  put y = hex16.;
run;
```

SAS returns the hexadecimal representation of 2147483647

```
y=FFFFFFFFFFFFFF7F
```

See Also

- “IBw.d Informat” on page 422
- “Writing Binary Data” on page 379

PDw.d Format

Writes values in packed decimal data.

Category numeric

Width range: 1–16

Default width: 1

Decimal range: 1–31

Alignment: left

Windows specifics: How the values are interpreted as negative or positive

See: PDw.d in *SAS Language Reference: Dictionary*

Syntax

PDw.d

w

specifies the width of the output field in bytes (not digits).

d

specifies a scaling factor. When you specify a *d* value, the PDw.d format multiplies the number by 10^d , and then applies the packed decimal format to that value.

Details

The PDw.d format writes double-precision numbers in packed decimal format. In packed decimal data, each byte contains two digits. The *w* value represents the number of bytes, not the number of digits. The value’s sign is in the uppermost bit of the first byte (although the entire first byte is used for the sign).

Examples

Example 1: Processing a Positive Number If you format 1143.0 using the PD2. format, you receive the following value:

```
00 43
```

If you specify PD4., you receive the following value:

```
00 00 11 43
```

Example 2: Processing a Negative Number If you format -1143.0 using the PD2. format, you receive the following value:

```
80 43
```

If you specify the PD4. format, you receive the following value:

```
80 00 11 43
```

Example 3: Processing a Number That Is Too Large To Format When a numeric value is too large to format, as in this example

```
data a;
  x = 1e308;
  y = put(x, PD16.2);
  put y = hex16.;
run;
```

the result is

```
y=0099999999999999
```

See Also

- “PDw.d Informat” on page 423
- “Writing Binary Data” on page 379

PIBw.d Format

Writes values in positive integer-binary (fixed-point) format.

Category: numeric

Width range: 1–8

Default width: 1

Decimal range: 0–10

Alignment: left

Windows specifics: native byte-swapped integers

See: PIBw.d in *SAS Language Reference: Dictionary*

Syntax

PIBw.d

w
specifies the width of the output field in bytes (not digits).

d
specifies a scaling factor. When you specify a *d* value, the PIBw.d format multiplies the number by 10^d , and then applies the positive integer binary format to that value.

Details

The PIBw.d format converts a fixed-point value to an integer binary value. If the fixed-point value is negative, the PIBw.d format writes the integer representation for -1 .

For more information about microcomputer fixed-point values, see the Intel developer Web site.

Examples

Example 1: Processing a Number That Is Too Large To Format When a numeric value is too large to format, the result is the largest integer value that can be stored in four bytes, which is 2,147,483,647.

In the following code

```
data a;
  x = 9999999999999999999;
  y = put(x, PIB8.);
  put y = hex16.;
run;
```

SAS returns the hexadecimal representation of 2147483647

```
y=0000E8890423C78A
```

See Also

- “PIBw.d Informat” on page 424
- “Writing Binary Data” on page 379

RBw.d Format

Writes values real-binary (floating-point) format.

Category numeric

Width range: 2–8

Default width: 4

Decimal range: 0–10

Alignment: left

Windows specifics: native floating-point representation

See: RBw.d in *SAS Language Reference: Dictionary*

Syntax

RBw.d

w
specifies the width of the output field.

d
specifies a scaling factor. When you specify a *d* value, the RB*w.d* format multiplies the number by 10^d , and then applies the real binary format to that value.

Details

The RB*w.d* format writes numeric data in real binary (floating-point) notation. Numeric data for scientific calculations are commonly represented in floating-point notation. (SAS stores all numeric values in floating-point notation.) A floating-point value consists of two parts: a mantissa that gives the value and an exponent that gives the value's magnitude.

Real binary is the most efficient format for representing numeric values because SAS already represents numbers this way and no conversion is needed.

For more information about Windows floating-point notation, see the Intel developer Web site.

Examples

Example 1: Processing a Number That Is Too Large To Format When a numeric value is too large to format, as in this example

```
data a;
  x = 1e308;
  y = put(x, RB8.2);
  put y = hex16.;
run;
```

the result is

```
y=0000000000D1FFFF
```

See Also

- “RB*w.d* Informat” on page 425
- “Writing Binary Data” on page 379

ZDw.d Format

Writes zoned decimal data.

Category numeric

Width range: 1–32

Default width: 1

Decimal range: 1–10

Alignment: left

Windows specifics: Last byte includes the sign.

See: ZDw.d in *SAS Language Reference: Dictionary*

Syntax

ZDw.d

w

specifies the number of bytes (not the number of digits).

d

specifies the number of digits to the right of the decimal point in the numeric value.

Details

The ZDw.d format writes zoned decimal data. This method is also known as an overprint trailing numeric format. In the Windows operating environment, the last byte of the field contains the sign information of the number. The following table gives the conversion for the last byte.

Digit	ASCII Character	Digit	ASCII Character
0	{	-0	}
1	A	-1	J
2	B	-2	K
3	C	-3	L
4	D	-4	M
5	E	-5	N
6	F	-6	O
7	G	-7	P
8	H	-8	Q
9	I	-9	R

Examples

Example 1: Processing a Number That Is Too Large To Format When a numeric value is too large to format, as in this example

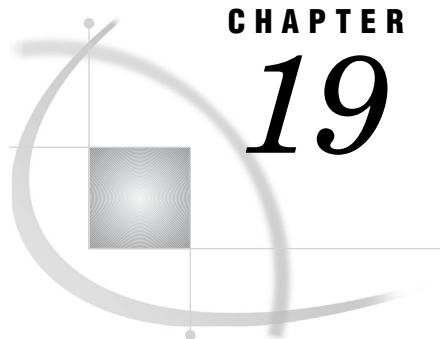
```
data a;
  x = 1e308;
  y = put(x, ZD32.2);
  put y = hex16.;
run;
```

the result is a sequence of 39s:

```
y=3939393939393939
```

See Also

- “ZDw.d Informat” on page 426



CHAPTER

19

SAS Functions and CALL Routines under Windows

SAS Functions and Call Routines under Windows 389

<i>BYTE Function</i>	390
<i>CALL SOUND Routine</i>	390
<i>CALL SYSTEM Routine</i>	391
<i>COLLATE Function</i>	393
<i>DINFO Function</i>	394
<i>DOPEN Function</i>	395
<i>DOPTNAME Function</i>	396
<i>DOPTNUM Function</i>	397
<i>FDELETE Function</i>	397
<i>FEXIST Function</i>	398
<i>FILEEXIST Function</i>	398
<i>FILENAME Function</i>	399
<i>FILEREF Function</i>	400
<i>FINFO Function</i>	400
<i>FOPTNAME Function</i>	404
<i>FOPTNUM Function</i>	406
<i>LIBNAME Function</i>	407
<i>MCIPISLP Function</i>	408
<i>MCIPISTR Function</i>	409
<i>MODULE Function</i>	410
<i>PEEKLONG Function</i>	412
<i>RANK Function</i>	413
<i>SLEEP Function</i>	413
<i>TRANSLATE Function</i>	414
<i>WAKEUP Function</i>	415

SAS Functions and Call Routines under Windows

A SAS function returns a value from a computation or system operation. SAS CALL routines are used to alter variable values or perform other system functions. Most SAS functions and CALL routines are completely described in the SAS functions and CALL routines portion of *SAS Language Reference: Dictionary*. The functions and CALL routines that are described here have syntax or behavior specific to the Windows operating environment.

BYTE Function

Returns one character in the ASCII collating sequence.

Category: Character

Windows specifics: Uses the ASCII code sequence

See: BYTE Function in *SAS Language Reference: Dictionary*

Syntax

BYTE(*n*)

n

specifies an integer that represents a specific ASCII character. The value of *n* can range from 0 to 255.

Details

If the BYTE function returns a value to a variable that has not yet been assigned a length, by default the variable is assigned a length of 1.

Because Windows is an ASCII system, the BYTE function returns the *n*th character in the ASCII collating sequence. The value of *n* can range from 0 to 255.

Any programs using the BYTE function with characters above ASCII 127 (the hexadecimal notation is '7F'x) can return a different value when used on a PC from another country as characters above ASCII 127 are national characters and they vary from country to country.

CALL SOUND Routine

Generates a sound with a specific frequency and duration.

Category: Special

Windows specifics: all

Syntax

CALL SOUND(*frequency,duration*);

frequency

specifies the sound frequency in terms of cycles per second. The frequency must be at least 20 and no greater than 20,000.

duration

specifies the sound duration in milliseconds. The default is -1.

Example

Example 1: Producing a Tone The following statement produces a tone of frequency 523 cycles per second (middle C) lasting 2 seconds:

```
data _null_;
  call sound(523,2000);
run;
```

CALL SYSTEM Routine

Submits an operating system command or a Windows application for execution.

Category: Special

Windows specifics: *command* must be a valid Windows command

See: CALL SYSTEM Routine in *SAS Language Reference: Dictionary*

Syntax

CALL SYSTEM(*command*);

command

can be any of the following:

- an operating system command enclosed in quotes or the name of a Windows application that is enclosed in quotes.
- an expression whose value is an operating system command or the name of a Windows application.
- the name of a character variable whose value is an operating system command or the name of a Windows application.

Details

If you are running SAS interactively, the command executes in a command prompt window. By default, you must type **exit** to return to your SAS session.

Note: The CALL SYSTEM function is not available if SAS is started with NOXCMD. △

Comparison

The CALL SYSTEM routine is similar to the X command. However, the CALL SYSTEM routine is callable and can therefore be executed conditionally.

The values of the XSYNC and XWAIT system options affect how the CALL SYSTEM routine works.

Examples

Example 1: Executing Operating System Commands Conditionally If you want to execute operating system commands conditionally, use the CALL SYSTEM routine:

```
options noxwait;
data _null_;
  input flag $ name $8.;
  if upcase(flag)='Y' then
    do;
      command='md c:\'||name;
      call system(command);
    end;
  datalines;
Y mydir
Y junk2
N mydir2
Y xyz
;
```

This example uses the value of the variable FLAG to conditionally create directories. After the DATA step executes, three directories have been created: C:\MYDIR, C:\JUNK2, and C:\XYZ. The directory C:\MYDIR2 is not created because the value of FLAG for that observation is not Y.

The X command is a global SAS statement. Therefore, it is important to realize that you cannot conditionally execute the X command. For example, if you submit the following code, the X statement is executed:

```
data _null_;
  answer='n';
  if upcase(answer)='y' then
    do;
      x 'md c:\extra';
    end;
run;
```

In this case, the directory C:\EXTRA is created regardless of whether the value of ANSWER is equal to 'n' or 'y'.

Example 2: Obtaining a Directory Listing You can use the CALL SYSTEM routine to obtain a directory listing:

```
data _null_;
  call system('dir /w');
run;
```

In this example, the /W option for the DIR command instructs Windows to print the directory in the wide format instead of a vertical list format.

See Also

- “X Command” on page 377
- “XSYNC System Option” on page 588
- “XWAIT System Option” on page 589

COLLATE Function

Returns an ASCII collating sequence character string.

Category: Character

Windows specifics: Uses the ASCII code sequence

See: COLLATE Function in *SAS Language Reference: Dictionary*

Syntax

COLLATE (*start-position*<,*end-position*>)|(*start-position*<,*length*>)

start-position

specifies the numeric position in the collating sequence of the first character to be returned.

end-position

specifies the numeric position in the collating sequence of the last character to be returned.

length

specifies the number of characters in the returned collating sequence.

Details

The COLLATE function returns a string of ASCII characters that range in value from 0 to 255. The string that is returned by the COLLATE function begins with the ASCII character that is specified by the *start-position* argument. If the *end-position* argument is specified, the string returned by the COLLATE function contains all the ASCII characters between the *start-position* and *end-position* arguments. If the *length* argument is specified instead of the *end-position* argument, then the COLLATE function returns a string that contains a value for *length*. The returned string ends, or truncates, with the character having the value 255 if you request a string length that contains characters exceeding this value.

The default length of the return string value is 200 characters. To return a length of 201 to 256 ASCII characters, use a format such as \$256 for the return string variable or explicitly define the variable's length, such as **length y \$260**.

Any programs using the COLLATE function with characters above ASCII 127 (the hexadecimal notation is '7F'x) can return a different value when used on a PC from another country. Characters above ASCII 127 are national characters and they vary from country to country.

Examples

Example 1: Returning an ASCII String Using the Return Variable Default String

Length In this example, the return code variable **y** uses the default return string length of 200. Therefore, the COLLATE function returns 200 characters of the collating sequence.

```
data _null_;  
  y = collate(1,256);
```

```

    put y;
run;

```

Example 2: Returning an ASCII String Larger Than the Default Return Variable String Length By formatting the return code variable to a length greater than 256, the COLLATE function returns 256 characters of the collating sequence.

```

data _null_;
    format y $260.;
    y = collate(1,256);
    put y;
run;

```

Example 3: Returning an ASCII String of a Specific Length In this example, the return code variable **y** uses a return string length of 56, and the COLLATE function returns the first 56 characters of the collating sequence.

```

data _null_;
    y = collate(,,56);
    put y;
run;

```

DINFO Function

Returns information about a directory.

Category: External Files

Windows specifics: directory pathname is the only information available

See: DINFO Function in *SAS Language Reference: Dictionary*

Syntax

DINFO(*directory-id*, *info-item*)

directory-id

specifies the identifier that was assigned when the directory was opened, generally by the DOPEN function.

info-item

specifies the information item to be retrieved. DINFO returns a blank if the value of *info-item* is invalid.

Details

Directories that are opened with the DOPEN function are identified by a *directory-id*. Use DOPTNAME to determine the names of the available system-dependent directory information items. Use DOPTNUM to determine the number of directory information items available.

Under Windows, the only *info-item* that is available is Directory, which is the pathname of *directory-id*. If *directory-id* points to a list of concatenated directories, then Directory is the list of concatenated directory names.

Example of Obtaining Directory Information

```

data a;
  rc=filename("tmpdir", "c:");
  put "rc = 0 if the directory exists: " rc=;
  did=dopen("tmpdir");
  put did=;
  numopts=doptnum(did);
  put numopts=;
  do i = 1 to numopts;
    optname = doptname(did,i);
    put i= optname=;
    optval=dinfo(did,optname);
    put optval=;
  end;
run;

```

Output 19.1 The SAS Log Displays the Directory Information

```

NOTE: PROCEDURE PRINTTO used (Total process time):
      real time          0.03 seconds
      cpu time           0.00 seconds

446 data a;
447   rc=filename("tmpdir", "c:");
448   put "rc = 0 if the directory exists: " rc=;
449   did=dopen("tmpdir");
450   put did=;
451   numopts=doptnum(did);
452   put numopts=;
453   do i = 1 to numopts;
454     optname = doptname(did,i);
455     put i= optname=;
456     optval=dinfo(did,optname);
457     put optval=;
458   end;
459 run;
rc = 0 if the directory exists: rc=0
did=1
numopts=1
i=1 optname=Directory
optval=C:\TEMP\elimal
NOTE: The data set WORK.A has 1 observations and 6 variables.
NOTE: DATA statement used (Total process time):
      real time          0.08 seconds
      cpu time           0.04 seconds

460 proc printto; run;

```

See Also

- “DOPEN Function” on page 395

DOPEN Function

Opens a directory and returns a directory identifier value.

Category: External Files

Windows specifics: *fileref* can be assigned by using an environment variable

See: DOPEN Function in *SAS Language Reference: Dictionary*

Syntax

DOPEN(*fileref*)

fileref

specifies the fileref that is assigned to the directory.

Details

DOPEN opens a directory and returns a directory identifier value (a number greater than 0) that is used to identify the open directory in other SAS external file access functions. If the directory could not be opened, DOPEN returns 0. The directory to be opened must be identified by a fileref.

DOPTNAME Function

Returns the name of a directory information item.

Category: External Files

Windows specifics: directory is the only item available

See: DOPTNAME Function in *SAS Language Reference: Dictionary*

Syntax

DOPTNAME(*directory-id*, *nval*)

directory-id

specifies the identifier that was assigned when the directory was opened, generally by the DOPEN function.

nval

specifies the sequence number of the option.

Details

Under Windows, the only directory information item that is available is Directory, which is the pathname of *directory-id*. The *nval*, or sequence number, of Directory is 1. If *directory-id* points to a list of concatenated directories, then Directory is the list of concatenated directory names.

Example

For an example of using DOPTNAME, see “Example of Obtaining Directory Information” on page 395.

DOPTNUM Function

Returns the number of information items that are available for a directory.

Category: External Files

Windows specifics: directory is the only item available

See: DOPTNUM Function in *SAS Language Reference: Dictionary*

Syntax

DOPTNUM(*directory-id*)

directory-id

specifies the identifier that was assigned when the directory was opened, generally by the DOPEN function.

Details

Under Windows, only one information item is available for a directory. The name of the item is Directory; its value is the pathname or list of pathnames for *directory-id*, and its sequence number is 1. Since only one information item is available for a directory, this function will return a value of 1.

Example

For an example of the DOPTNUM function, see “Example of Obtaining Directory Information” on page 395.

FDELETE Function

Deletes an external file or an empty directory.

Category: External Files

Windows specifics: *fileref* can be assigned by using an environment variable

See: FDELETE Function in *SAS Language Reference: Dictionary*

Syntax

FDELETE(“*fileref*”)

fileref

specifies the fileref that is assigned to the external file or directory. The fileref cannot be associated with a list of concatenated filenames or directories. If the fileref is associated with a directory, the directory must be empty. You must have permission

to delete the file. Under Windows, *fileref* can be an environment variable. The *fileref* or the environment variable that you specify must be enclosed in quotation marks.

Details

FDELETE returns 0 if the operation was successful, and a non-zero number if it was not successful.

FEXIST Function

Verifies the existence of an external file by its fileref.

Category: External Files

Windows specifics: *fileref* can be assigned with an environment variable

See: FEXIST Function in *SAS Language Reference: Dictionary*

Syntax

FEXIST("fileref")

fileref

specifies the *fileref* that is assigned to an external file. Under Windows, *fileref* can also be an environment variable. The *fileref* or the environment variable that you specify must be enclosed in quotation marks.

Details

FEXIST returns 1 if the external file that is associated with *fileref* exists, and 0 if the file does not exist.

Example

For an example of using the FINFO function, see “Example of Obtaining File Information” on page 401.

FILEEXIST Function

Verifies the existence of an external file by its physical name.

Category: External Files

Windows specifics: *filename* can be assigned with an environment variable

See: FILEEXIST Function in *SAS Language Reference: Dictionary*

Syntax

FILEEXIST("filename")

filename

specifies a fully qualified physical filename of the external file. In a DATA step, *filename* can be a character expression, a string in quotation marks, or a DATA step variable. In a macro, *filename* can be any expression.

Under Windows, *filename* can also be an environment variable. The filename or environment variable that you specify must be enclosed in quotation marks.

Note: The FILEEXIST function can also verify a directories existence. Δ

Details

FILEEXIST returns 1 if the external file exists and 0 if the external file does not exist.

FILENAME Function

Assigns or deassigns a fileref for an external file, directory, or output device.

Category: External Files

Windows specifics: device types and host options

See: FILENAME Function in *SAS Language Reference: Dictionary*

Syntax

FILENAME (“*fileref*”, “*filename*” <,*device-type*<,*host-options*<,*dir-ref*>>>)

fileref

in a DATA step, specifies the fileref to assign to the external file. In a macro (for example, in the %SYSFUNC function), fileref is the name of a macro variable (without an ampersand) whose value contains the fileref to assign to the external file. (See *SAS Language Reference: Dictionary* for details.)

Under Windows, *fileref* can also be a Windows environment variable. The fileref or the environment variable that you specify must be enclosed in quotation marks.

filename

specifies the external file. Specifying a blank filename clears the fileref that was previously assigned.

Under Windows, the *filename* differs according to the device type. Table 5.2 on page 157 shows the information that is appropriate to each device. The filename that you specify must be enclosed in quotation marks.

device-type

specifies type of device or the access method that is used if the fileref points to an input or output device or location that is not a physical file. It can be any one of the devices that are listed in FILENAME statement device-type argument on page 454. DISK is the default device type.

host-options

are options that are specific to Windows. You can use any of the options that are available in the FILENAME statement. See the FILENAME statement host-option-list on page 455.

dir-ref

specifies the fileref that is assigned to the directory in which the external file resides.

Details

FILENAME returns a value of 0 if the operation was successful, and a non-zero number if the operation was not successful.

Example

For an example of using the FILENAME function, see “Example of Obtaining File Information” on page 401.

FILEREF Function

Verifies that a fileref has been assigned for the current SAS session.

Category: External Files

Windows specifics: the fileref argument can specify a Windows environment variable

See: FILEREF Function in *SAS Language Reference: Dictionary*

Syntax

FILEREF(“*fileref*”)

fileref

specifies the fileref to be validated. Under Windows, *fileref* can also be a Windows environment variable. The fileref or the environment variable that you specify must be enclosed in quotation marks.

Details

A negative return code indicates that the fileref exists but the physical file associated with the fileref does not exist. A positive value indicates that the fileref is not assigned. A value of zero indicates that the fileref and external file both exist.

Example

For an example of using the FILEREF function, see “Example of Obtaining File Information” on page 401.

FINFO Function

Returns the value of an information item for an external file.

Category: External Files

Windows specifics: available *info-items*

See: FINFO Function in *SAS Language Reference: Dictionary*

Syntax

FINFO(*file-id*, *info-item*)

file-id

specifies the identifier that was assigned when the file was opened, generally by the FOPEN function.

info-item

specifies the name of the file information item to be retrieved. This item is a character value. *Info-item* is either a variable that contains a file information name or the file information name that has been enclosed in quotation marks.

info-item for disk files can be one of these file information items:

- Create Time: *ddmmyyyy:hh:mm:ss*

Note: The Create Time date/time information item will be localized to the site's locale. The date/time format might appear slightly different in the locale. Δ

- Last Modified: *ddmmyyyy:hh:mm:ss*
- Filename
- File size (bytes)
- RECFM
- LRECL

info-item for pipe files can be one of these file information items:

- Unnamed pipe access device
- PROCESS
- RECFM
- LRECL

Details

The FINFO function returns the value of a system-dependent information item for an external file that was previously opened and assigned a file-id by the FOPEN function. FINFO returns a blank if the value given for *info-item* is invalid.

Example of Obtaining File Information

```
data a;

/* Does fileref "curdirfl" exist? No = 0 */

rc=fexist ("curdirfl");
put;
put "Fileref curdirfl exist? rc should be 0 (no); " rc=;

/* assign fileref */

rc=filename("curdirfl", "c:\tmp333");
```

```

/* RC=0 indicates success in assigning fileref */

put "Fileref assigned - rc should be 0; " rc=;
rc=fexist ("curdirfl");

/* Does file which "curdirfl" points to exist? No = 0 */
/* Assigning a fileref doesn't create the file. */

put "File still doesn't exist - rc should be 0; " rc=;
rc=fileref ("curdirfl");

/* Does fileref "curdirfl" exist? */
/* Negative means fileref exists, but file does not */
/* Positive means fileref does not exist */
/* Zero means both fileref and file exist */

put "Fileref now exists - rc should be negative; " rc=;
put;

/* Does the file that the fileref points to exist? Should be no. */

if ( fileexist (".tmp333") ) then
  /* if it does, open it for input */
  do;
    put "Open file for input";
    fid=fopen ("curdirfl", "i" );
  end;
else /* most likely scenario */
  do;
    put "Open file for output";
    fid=fopen ("curdirfl", "o");
  end;

/* fid should be non-zero. 0 indicates failure. */
put "File id is: " fid=;
numopts = foptnum(fid);
put "Number of information items should be 6; " numopts=;
do i = 1 to numopts;
  optname = foptname (fid,i);
  put i= optname=;
  optval = finfo (fid, optname);
  put optval= ;
end;
rc=fclose (fid);
rc=fdelete ("curdirfl");
put "Closing the file, rc should be 0; "
rc=; run;

```

Output 19.2 The Resulting SAS Log

```

NOTE: PROCEDURE PRINTTO used (Total process time):
      real time          0.36 seconds
      cpu time           0.00 seconds

291 data a;
292
293 /* Does fileref "curdirfl" exist? No = 0 */
294
295 rc=fexist ("curdirfl");
296 put;
t297 put "Fileref curdirfl exist? rc should be 0 (no); " rc=;
298
299 /* assign fileref */
300
301 rc=filename("curdirfl", "c:\tmp333");
302
303 /* RC=0 indicates success in assigning fileref */
304
305 put "Fileref assigned - rc should be 0; " rc=;
306 rc=fexist ("curdirfl");
307
308 /* Does file which "curdirfl" points to exist? No = 0 */
309 /* Assigning a fileref doesn't create the file. */
310
311 put "File still doesn't exist - rc should be 0; " rc=;
312 rc=fileref ("curdirfl");
313
314 /* Does fileref "curdirfl" exist? */
315 /* Negative means fileref exists, but file does not */
316 /* Positive means fileref does not exist */
317 /* Zero means both fileref and file exist */
318
319 put "Fileref now exists - rc should be negative; " rc=;
320 put;
321
322 /* Does the file that the fileref points to exist? Should be no. */
323
324 if ( fileexist ("./tmp333") ) then
325     /* if it does, open it for input */
326     do;
327         put "Open file for input";
328         fid=fopen ("curdirfl", "i") ;
329     end;
330 else /* most likely scenario */
331     do;
332         put "Open file for output";
333         fid=fopen ("curdirfl", "o");
334     end;

```

```

335
336 /* fid should be non-zero. 0 indicates failure. */
337 put "File id is: " fid=;
338 numopts = foptnum(fid);
339 put "Number of information items should be 6; " numopts=;
340 do i = 1 to numopts;
341   optname = foptname (fid,i);
342   put i= optname=;
343   optval = finfo (fid, optname);
344   put optval= ;
345 end;
346 rc=fclose (fid);
347 rc=fdelete ("curdirfl");
348 put "Closing the file, rc should be 0; "
349 rc=; run;

Fileref curdirfl exist? rc should be 0 (no); rc=0
Fileref assigned - rc should be 0; rc=0
File still doesn't exist - rc should be 0; rc=0
Fileref now exists - rc should be negative; rc=-20006

Open file for output
File id is: fid=1
Number of information items should be 6; numopts=6
i=1 optname=Filename
optval=c:\tmp333
i=2 optname=RECFM
optval=V
i=3 optname=LRECL
optval=256
i=4 optname=File Size (bytes)
optval=0
i=5 optname=Last Modified
optval=13Mar2007:13:12:23
i=6 optname=Create Time
optval=13Mar2007:13:12:23
Closing the file, rc should be 0; rc=0
NOTE: The data set WORK.A has 1 observations and 6 variables.
NOTE: DATA statement used (Total process time):
      real time           0.12 seconds
      cpu time            0.09 seconds

350 proc printto; run;

```

See Also

- “FOPEN Function” in *SAS Language Reference: Dictionary*

FOPTNAME Function

Returns the name of an information item for an external file.

Category: External Files

Windows specifics: available information items

See: FOPTNAME Function in *SAS Language Reference: Dictionary*

Syntax

FOPTNAME(file-id, nval)

file-id

specifies the identifier that was assigned when the file was opened, generally by the FOPEN function.

nval

specifies the number of the file information item to be retrieved. The following table shows the values that *nval* can have for single and concatenated files under Windows operating environments.

<i>nval</i>	Single File	Pipe Files	Concatenated Files
1	Filename	Unnamed pipe access device	Filename
2	RECFM	PROCESS	RECFM
3	LRECL	RECFM	LRECL
4		LRECL	

Details

FOPTNAME returns a blank if an error occurred.

Example: File Attributes When Using the Pipe Device Type

The following example creates a data set that contains the name and value attributes that are returned by the FOPTNAME function when you are using pipes:

```
data fileatt;
  filename mypipe pipe 'dir';
  fid=fopen("mypipe","s");
  /* fid should be non---zero. 0 indicates failure */
  put "File id is: " fid=;
  numopts=foptnum(fid);
  put "Number of information items should be 4; " numopts=;
  do i=1 to numopts;
    optname=foptname(fid,i);
    put i= optname=;
    optval=finfo(fid,optname);
    put optval=;
  end;

rc=fclose(fid);
run;
```

Output 19.3 The SAS LOG Displays Pipe File Information

```

NOTE: PROCEDURE PRINTTO used (Total process time):
      real time          0.03 seconds
      cpu time           0.01 seconds

6   data fileatt;
7     filename mypipe pipe 'dir';
8     fid=fopen("mypipe","s");
9     /* fid should be non-zero. 0 indicates failure */
10    put "File id is: " fid=;
11    numopts=foptnum(fid);
12    put "Number of information items should be 4; " numopts=;
13    do i=1 to numopts;
14      optname=foptname(fid,i);
15      put i= optname=;
16      optval=finfo(fid,optname);
17      put optval=;
18    end;
19
20    rc=fclose(fid);
21    run;
File id is: fid=1
Number of information items should be 4; numopts=4
i=1 optname=Unnamed Pipe Access Device
optval=
i=2 optname=PROCESS
optval=dir
i=3 optname=RECFM
optval=V
i=4 optname=LRECL
optval=256
NOTE: The data set WORK.FILEATT has 1 observations and 6 variables.
NOTE: DATA statement used (Total process time):
      real time          9.64 seconds
      cpu time           1.16 seconds

22  proc printto; run;

```

FOPTNUM Function

Returns the number of information items that are available for a file.

Category: External Files

Windows specifics: information items available

See: FOPTNUM Function in *SAS Language Reference: Dictionary*

Syntax

FOPTNUM(*file-id*)

file-id

specifies the identifier that was assigned when the file was opened, generally, by the FOPEN function.

Details

Six information items are available for files:

- Filename
- RECFM
- LRECL
- File Size (bytes)
- Last Modified
- Create Time

These information items are available for pipes:

- Unnamed pipe access device
- PROCESS
- RECFM
- LRECL

FOPTNUM returns the following values:

For files: 6
For pipes: 4

Example

For an example of the FOPTNUM functions, see “Example of Obtaining File Information” on page 401.

LIBNAME Function

Assigns or clears a libref for a SAS library.

Category: SAS File I/O

Windows specifics: behavior of the ' libref (a space between single quotation marks)

See: LIBNAME Function in *SAS Language Reference: Dictionary*

Syntax

LIBNAME(*libref*<,>*SAS-data-library*<,>*engine*<,>*options*>>>)

libref

specifies the libref that is assigned to a SAS library. Under Windows, the value of *libref* can be an environment variable.

SAS-data-library

specifies the physical name of the SAS library that is associated with the libref.

engine

specifies the engine that is used to access SAS files opened in the data library.

options

names one or more options honored by the specified engine, delimited with blanks.

Details

If the LIBNAME function returns a 0, then the function was successful. However, you could receive a non-zero value, even if the function was successful. A non-zero value is returned if an error, warning, or note is produced. To determine whether the function was successful, look through the SAS Log and use the following guidelines:

- If a warning or note was generated, then the function was successful.
- If an error was generated, then the function was not successful.

Under Windows, if you do not specify a *SAS-data-library* or if you specify a *SAS-data-library* as ' '(a space between single quotation marks) or "(no space between single quotation marks), SAS deassigns the libref.

MCIPLP Function

Causes SAS to wait for a piece of multimedia equipment to become active.

Category: Special

Windows specifics: all

Syntax

MCIPLP(*number-of-seconds*)

number-of-seconds

specifies the number of seconds you want SAS to wait. This number must be an integer.

Details

The MCIPLP function is especially useful when you have used the MCIPISTR function to open a piece of equipment, but you know it is going to take a few seconds for the equipment to be ready.

The *number-of-seconds* argument must be an integer and represents how many seconds you want to wait. The return value is the number of seconds slept.

The MCIPLP function can be used in the DATA step and in SCL code.

Example

This example uses both the MCIPISTR and MCIPLP functions to play a CD and a video. The PUT statements display the return values of these functions. This display allows you to see in the SAS log whether there was a problem with any of your equipment.

```
data _null_;
  /* Open a CD player. */
  msg=mcipistr("open cdaudio alias mytunes");
  put msg=;
  /* Wait one second for the CD player    */
```

```

/* to become active. */
slept=mcipislp(1);
/* Begin playing your favorite tunes */
/* from the beginning of the CD. */
msg=mcipistr("play mytunes");
put msg=;
/* Now open a video file. */
msg=mcipistr("open c:\movies\amovie.avx
             alias myshow");
put msg=;
/* Begin the show and wait for it to */
/* complete. */
msg=mcipistr("play myshow wait");
put msg=;
/* When the show is complete, */
/* close the instance. */
msg=mcipistr("close myshow");
put msg=;
/* Stop and close the instance of the CD */
/* player. */
msg=mcipistr("stop mytunes");
put msg=;
msg=mcipistr("close mytunes");
put msg=;
run;

```

See Also

- “MCIPISTR Function” on page 409

MCIPISTR Function

Submits an MCI string command to a piece of multimedia equipment.

Category: Special

Windows specifics: all

Syntax

MCIPISTR(*MCI-string-command*)

MCI-string-command

is any valid SAS string; a character variable, a character literal enclosed in quotes, or other character expression.

Details

The MCIPISTR function submits an MCI (Media Control Interface) string command.

You can use MCI to control many types of multimedia equipment, such as CD players, mixers, videodisc players, and so on. Windows provides MCI support. For more

information about valid MCI string commands, refer to the Windows multimedia SDK documentation in the MSDN Library and your MCI-compliant device documentation.

The return value is a string that contains return information from the MCI string command. Examples of return information include "invalid instance" and "1".

Note: Not all MCI commands supply return codes that are usable from SAS. Δ

The MCIPISTR function can be used in the DATA step and in SCL code.

Example

To use a CD player, you could submit the following statements in your DATA step:

```
msg=mcipistr("open cdaudio alias cd");
msg=mcipistr("play cd");
msg=mcipistr("stop cd");
msg=mcipistr("close cd");
```

See Also

- "MCIPISLP Function" on page 408

MODULE Function

Calls a specific routine or module that resides in an external dynamic link library (DLL).

Category: External Routines

Windows specifics: all

Syntax

CALL MODULE(<cntl>,module,arg-1,arg-2. . . ,arg-n);

num=**MODULEN**(<cntl>,module,arg-1,arg-2...arg-n);

char=**MODULEC**(<cntl>,module,arg-1...arg-2,arg-n);

Note: The following functions permit vector and matrix arguments; you can use them within the IML procedure. Δ

CALL MODULEI <cntl>,modulearg-1,arg-2. . . ,arg-n);

num=**MODULEIN**(<cntl>,module,arg-1,arg-2. . . ,arg-n)

char=**MODULEIC**(<cntl>,module,arg-1,arg-2. . . ,arg-n);

cntl

is an optional control string whose first character must be an asterisk (*), followed by any combination of the following characters:

- I prints the hexadecimal representations of all arguments to the MODULE function and to the requested DLL routine before and after the DLL routine is called. You can use this option to help diagnose problems that are caused by incorrect arguments or

attribute tables. If you specify the **I** option, the **E** option is implied.

- E** prints detailed error messages. Without the **E** option (or the **I** option, which supersedes it), the only error message that the MODULE function generates is "Invalid argument to function," which is usually not enough information to determine the cause of the error.
- Sx** uses *x* as a separator character to separate field definitions. You can then specify *x* in the argument list as its own character argument to serve as a delimiter for a list of arguments that you want to group together as a single structure. Use this option only if you do not supply an entry in the SASCBTBL attribute table. If you do supply an entry for this module in the SASCBTBL attribute table, you should use the FDSTART option in the ARG statement in the table to separate structures.
- H** provides brief help information about the syntax of the MODULE routines, the attribute file format, and the suggested SAS formats and informats.

For example, the control string '***IS/**' specifies that parameter lists be printed and that the string '/' is to be treated as a separator character in the argument list.

module

is the name of the external module to use, specified as a DLL name and the routine name or ordinal value, separated by a comma. The module must reside in a dynamic link library (DLL) and it must be externally callable. For example, the value '**KERNEL32,GetProfileString**' specifies to load KERNEL32.DLL and to invoke the GetProfileString routine. Note that while the DLL name is not case sensitive, the routine name is based on the restraints of the routine's implementation language, so the routine name is case sensitive.

If the DLL supports ordinal-value naming, you can provide the DLL name followed by a decimal number, such as '**XYZ,30**'.

You do not need to specify the DLL name if you specified the MODULE attribute for the routine in the SASCBTBL attribute table, as long as the routine name is unique (that is, no other routines have the same name in the attribute file).

You can specify *module* as a SAS character expression instead of as a constant; most often, though, you will pass it as a constant.

arg-1, arg-2, ...arg-n

are the arguments to pass to the requested routine. Use the proper attributes for the arguments (numeric arguments for numeric attributes and character arguments for character attributes).

CAUTION:

Be sure to use the correct arguments and attributes. Using incorrect arguments or attributes for a DLL function can cause SAS, and possibly your operating system, to fail. Δ

Details

The MODULE functions execute a routine *module* that resides in an external (outside SAS) dynamic link library with the specified arguments *arg-1* through *arg-n*.

The MODULE call routine does not return a value, while the MODULEN and MODULEC functions return a number *num* or a character *char*, respectively. Which routine you use depends on the expected return value of the DLL function that you want to execute.

MODULEI, MODULEIC, and MODULEIN are special versions of the MODULE functions that permit vector and matrix arguments. Their return values are still scalar. You can invoke these functions only from PROC IML.

Other than this name difference, the syntax for all six routines is the same.

The MODULE function builds a parameter list by using the information in *arg-1* to *arg-n* and by using a routine description and argument attribute table that you define in a separate file. Before you invoke the MODULE routine, you must define the fileref of SASCBTBL to point to this external file. You can name the file whatever you want when you create it.

This way, you can use SAS variables and formats as arguments to the MODULE function and ensure that these arguments are properly converted before being passed to the DLL routine.

See Also

- “The SASCBTBL Attribute Table” on page 298

PEEKLONG Function

Stores the contents of a memory address in a numeric variable on 32-bit and 64-bit platforms.

Category Special

Windows specifics: all

See: PEEKLONG Function and PEEKCLONG Function in *SAS Language Reference: Dictionary*

Syntax

PEEKLONG(*address*<,*length*>)

address

specifies a character expression that is the memory address.

length

specifies the length of the character data.

Details

CAUTION:

The PEEKLONG functions can directly access memory addresses. Improper use of the PEEKLONG functions can cause SAS, and your operating system, to fail. Use the PEEKLONG functions only to access information that is returned by one of the MODULE functions. Δ

The PEEKLONG function returns a value of length *length* that contains the data that start at memory address *address*.

The variations of the PEEKLONG functions are

PEEKCLONG accesses character strings.

PEEKLONG accesses numeric values.

Usually, when you need to use one of the PEEKLONG functions, you will use PEEKCLONG to access a character string.

RANK Function

Returns the position of a character in the ASCII collating sequence.

Category: Character

Windows specifics: Uses the ASCII sequence

See: RANK Function in *SAS Language Reference: Dictionary*

Syntax

RANK(*x*)

x

is a character expression that contains a character in the ASCII collating sequence. If the length of *x* is greater than 1, you receive the rank of the first character in the expression.

Details

Because Windows uses the ASCII character set, the RANK function returns an integer that represents the position of a character in the ASCII collating sequence.

Note: Any program that uses the RANK function with characters above ASCII 127 (the hexadecimal notation is '7F'x) is not portable because these characters are national characters and they vary from country to country. Δ

SLEEP Function

Suspends execution of a SAS DATA step for a specified period of time.

Category: Special

Windows specifics: all

See: SLEEP Function in *SAS Language Reference: Dictionary*

Syntax

SLEEP(*n*<,unit>)

n

specifies the number of seconds that you want to suspend execution of a DATA step. The *n* argument is a numeric constant that must be greater than or equal to 0. Negative or missing values for *n* are invalid.

unit

specifies the unit of seconds, as a power of 10, which is applied to *n*. For example, 1 corresponds to a second, and .001 to a millisecond. The default value is 1.

Details

The SLEEP function suspends execution of a DATA step for a specified number of seconds. When the SLEEP function uses the default *unit* value, a pop-up window appears that indicates how long SAS is going to sleep.

The return value of the *n* argument is the number of seconds slept. The maximum sleep period for the SLEEP function is 46 days.

When you submit a program that calls the SLEEP function, the SLEEP window appears telling you when SAS is going to wake up. You can inhibit the SLEEP window by starting SAS with the NOSLEEPWINDOW system option. Your SAS session remains inactive until the sleep period is over. To cancel the call to the SLEEP function, use the CTRL+BREAK attention sequence.

You should use a null DATA step to call the SLEEP function; follow this DATA step with the rest of the SAS program. Using the SLEEP function in this manner enables you to use the CTRL+BREAK attention sequence to interrupt the SLEEP function and to continue with the execution of the rest of your SAS program.

Example

The following example tells SAS to delay the execution of the program for 12 hours and 15 minutes:

```
data _null_;
  /* argument to sleep must be expressed in seconds */
  slept= sleep((60*60*12)+(60*15));
run;
data monthly;
  /*... more data lines */
run;
```

See Also

- “SLEEPWINDOW System Option” on page 563

TRANSLATE Function

Replaces specific characters in a character expression.

Category: Character

Windows specifics: Required syntax; pairs of *to* and *from* arguments are optional

See: TRANSLATE Function in *SAS Language Reference: Dictionary*

Syntax

TRANSLATE(*source,to-1,from-1 <,...to-n,from-n>*)

source

specifies the SAS expression that contains the original character value.

to

specifies the characters that you want TRANSLATE to use as substitutes.

from

specifies the characters that you want TRANSLATE to replace.

Details

Under Windows, you do not have to provide pairs of *to* and *from* arguments. However, if you do not use pairs, you must supply a comma as a place holder.

WAKEUP Function

Specifies the time a SAS DATA step continues execution.

Category: Special

Windows specifics: all

Syntax

WAKEUP(*until-when*)

until-when

specifies the time when the WAKEUP function allow execution to continue.

Details

Use the WAKEUP function to specify the time a DATA step continues to execute. The return value is the number of seconds slept.

The *until-when* argument can be a SAS datetime value, a SAS time value, or a numeric constant, as explained in the following list:

- If *until-when* is a datetime value, the WAKEUP function sleeps until the specified date and time. If the specified date and time have already passed, the WAKEUP function does not sleep, and the return value is 0.
- If *until-when* is a time value, the WAKEUP function sleeps until the specified time. If the specified time has already passed in that 24-hour period, the WAKEUP function sleeps until the specified time occurs again.
- If the value of *until-when* is a numeric constant, the WAKEUP function sleeps for that many seconds before or after the next occurring midnight. If the value of *until-when* is a positive numeric constant, the WAKEUP function sleeps for *until-when* seconds past midnight. If the value of *until-when* is a negative numeric constant, the WAKEUP function sleeps until *until-when* seconds before midnight.

Negative values for the *until-when* argument are allowed, but missing values are not. The maximum sleep period for the WAKEUP function is approximately 46 days.

When you submit a program that calls the WAKEUP function, the SLEEP window appears telling you when SAS is going to wake up. You can inhibit the SLEEP window by starting SAS with the NOSLEEPWINDOW system option. Your SAS session remains inactive until the waiting period is over. If you want to cancel the call to the WAKEUP function, use the CTRL + BREAK attention sequence.

You should use a null DATA step to call the WAKEUP function; follow this DATA step with the rest of the SAS program. Using the WAKEUP function in this manner enables you to use the CTRL+BREAK attention sequence to interrupt the waiting period and continue with the execution of the rest of your SAS program.

Examples

Example 1: Delaying Program Execution until a Specified Date or Time The code in this example tells SAS to delay execution of the program until 1:00 p.m. on January 1, 2004:

```
data _null_;
  slept=wakeup('01JAN2004:13:00:00'dt);
run;
data compare;
  /* ...more data lines */
run;
```

The following example tells SAS to delay execution of the program until 10:00 p.m.:

```
data _null_;
  slept=wakeup("22:00:00"t);
run;
data compare;
  /* ...more data lines */
run;
```

Example 2: Delaying Program Execution until a Specified Time Period after Midnight The following example tells SAS to delay execution of the program until 35 seconds after the next occurring midnight:

```
data _null_;
  slept=wakeup(35);
run;
data compare;
  /* ...more data lines */
run;
```

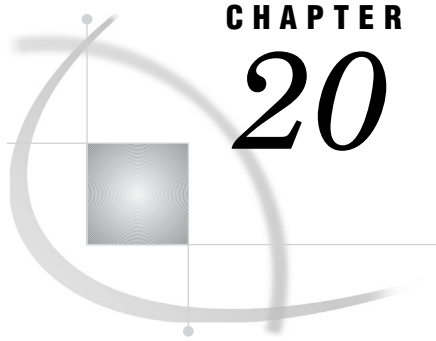
Example 3: Using a Variable as an Argument to the WAKEUP Function This example illustrates using a variable as the argument of the WAKEUP function:

```
data _null_;
  input x;
  slept=wakeup(x);
  datalines;
1000
;
data compare;
  input article1 $ article2 $ rating;
  /* ...more data lines */
run;
```

Because the instream data indicate that the value of X is 1000, the WAKEUP function sleeps for 1,000 seconds past midnight.

See Also

- “SLEEPWINDOW System Option” on page 563



CHAPTER

20

SAS Informats under Windows

SAS Informats under Windows 419

Reading Binary Data 419

Converting User-Written Informats from Earlier Releases to SAS 9.2 420

Converting Version 6 User-Written Informats 420

Converting Version 5 User-Written Informats 421

SAS Informats under Windows

A SAS informat is an instruction or template that SAS uses to read data values into a variable. Most SAS informats are described completely in *SAS Language Reference: Dictionary*. The informats that are described here have behavior that is specific to SAS under Windows.

Many of the SAS informats that have details specific to the Windows operating environment are used to read binary data. In using these informats, it is important that you understand the concepts that are presented in “Reading Binary Data” on page 419.

If you have informats that you created for use in earlier releases of SAS, see “Converting User-Written Informats from Earlier Releases to SAS 9.2” on page 420 for information about how to convert those informats for use with SAS 9.2.

Reading Binary Data

IBM mainframes, Hewlett Packard 9000, and most other UNIX systems store bytes in one order, called big-endian. Intel-based, or IBM compatible microcomputers and the VAX and Alpha computers manufactured by Compaq store bytes in a different order called byte-reversed, or little-endian.

Binary data stored in one order cannot be read by a computer that stores binary data in the other order without additional processing taking place. When you are designing SAS applications, try to anticipate how your data will be read and choose your formats and informats accordingly.

SAS provides two sets of informats for reading binary data and corresponding formats for writing binary data.

- The *IBw.d*, *PDw.d*, *PIBw.d*, and *RBw.d* informats and formats read and write in native mode, that is, using the byte-ordering system that is standard for the machine.
- The *S370FIBw.d*, *S370FPDw.d*, *S370FRBw.d*, and *S370FPIBw.d* informats and formats read and write according to the IBM 370 standard, regardless of the native mode of the machine. These informats and formats allow you to write SAS

programs that can be run in any SAS environment, regardless of how numeric data are stored.

If a SAS program that reads and writes binary data runs on only one type of machine, you can use the native mode informats and formats. However, if you want to write SAS programs that can be run on multiple machines using different byte-storage systems, use the IBM 370 formats and informats. The purpose of the IBM 370 informats and formats is to enable you to write SAS programs that can be run in any SAS environment, no matter what standard you use for storing numeric data.

For example, suppose you have a program that writes data with the `PIBw.d` format. You execute the program on a microcomputer so that the data are stored in byte-reversed mode. Then on the microcomputer you run another SAS program that uses the `PIBw.d` informat to read the data. The data are read correctly because both the programs are run on the microcomputer using byte-reversed mode. However, you cannot upload the data to a Hewlett Packard 9000-series machine and read the data correctly because they are stored in a form native to the microcomputer but foreign to the Hewlett Packard 9000. To avoid this problem, use the `S370FPIBw.d` format to write the data; even on the microcomputer, this causes the data to be stored in IBM 370 mode. Then read the data using the `S370FPIBw.d` informat. Regardless of what type of machine you use when reading the data, they are read correctly.

Converting User-Written Informats from Earlier Releases to SAS 9.2

You must convert Release 6.04, Release 6.06, and Release 6.08 user-written informats and formats to their SAS 9.2 counterparts before you can use them in a SAS 9.2 program. The only exception to this rule is user-written informats and formats created by Release 6.08 or later under Windows; these informats and formats can be read directly from your Windows SAS session. *

Converting Version 6 User-Written Informats

You can convert Release 6.04, 6.06, and 6.08 SAS catalogs that contain user-written informats and formats by using one of the following methods:

Converting Release 6.04 catalogs

use the `CNTLOUT=` option in the `PROC FORMAT` statement in Release 6.04 to create an output data set, and then use the `CNTLIN=` option in the `PROC FORMAT` statement in SAS 9.2 to create the SAS 9.2 informats or formats. You must use the V604 engine in your SAS 9.2 session to read the data set. This method also works for converting from Release 6.06 or Release 6.08.

Converting Release 6.06 or Release 6.08 catalogs

use the `CPORT` and `CIMPORT` procedures to convert the informats and formats. For more information about the `CPORT` and `CIMPORT` procedures, see *Base SAS Procedures Guide*. This method works for converting from Release 6.06 or Release 6.08 only; it does not work for converting from Release 6.04.

* However, it is recommended that you use `PROC CPORT` and `PROC CIMPORT` to convert older Windows catalogs that contain user-written informats and formats to SAS 9.2 if you no longer need to use them in previous releases.

Converting Version 5 User-Written Informats

You must also convert Version 5 user-written informats and formats to their SAS 9.2 counterparts before you can use them in a SAS 9.2 program. (This implies that you are not only converting these files, but are also transferring them from a remote operating system to your PC). You can convert them using one of the following methods:

- Use the V5TOV6 procedure on the remote operating environment to convert the informats and formats to Version 6 format. This implies that the remote operating environment has access to Version 6 SAS software. Then, transport the converted informats and formats (as binary files) to your Windows operating environment and use the CIMPORT procedure to complete the conversion.

Note: The V5TOV6 procedure is not available in SAS 9.2. You must use this procedure in Release 6 of SAS. △

- Use the SAS Global Forum supplemental procedure FMTLIB under Version 5 on the remote operating environment to create an output data set, transport that data set to your PC, and then use the CNTLIN= option in the PROC FORMAT statement in SAS 9.2 to create the SAS 9.2 informats or formats.

HEXw. Informat

Converts hexadecimal positive binary values to fixed-point or floating-point binary values.

Category numeric

Width range: 1–16

Default width: 8

Alignment: left

Windows specifics: native floating-point representation

See: HEXw. Informat in *SAS Language Reference: Dictionary*

Syntax

HEXw.

w

specifies whether the input represents an integer (fixed-point) or a real (floating-point) binary number. When you specify a *w* value of 1 through 15, the input hexadecimal value represents an integer binary number. When you specify 16 for the *w* value, the input hexadecimal value represents a floating-point value.

Details

The HEXw. informat expects input that is not byte-reversed, not in Windows form. (The IB, PIB, and RB informats for binary numbers expect the bytes to be reversed.) You can use the HEXw. informat to read hexadecimal literals from SAS programs that were created in another environment.

See Also

- “\$HEXw. Informat” on page 422
- “HEXw. Format” on page 380

\$HEXw. Informat

Converts hexadecimal data to character data.

Category character

Width range: 1–32767

Default width: 2

Alignment: left

Windows specifics: ASCII character-encoding system

See: \$HEXw. Informat in *SAS Language Reference: Dictionary*

Syntax

\$HEXw.

w

specifies width of the input value.

Details

The \$HEXw. informat is like the HEXw. informat in that it reads values in which each hexadecimal character occupies 1 byte. Use the \$HEXw. informat to encode hexadecimal information into a character variable when your input data are limited to printable characters. The conversion is based on the ASCII character set.

See Also

- “HEXw. Informat” on page 421
- “\$HEXw. Format” on page 381

IBw.d Informat

Reads integer binary (fixed-point) values.

Category numeric

Width range: 1–8

Default width: 4

Decimal range: 0–10

Windows specifics: native floating-point representation

See: IBw.d Informat in *SAS Language Reference: Dictionary*

Syntax

IBw.d

w

specifies the width of the input field.

d

specifies the power of 10 by which to divide the input value. SAS uses the *d* value even if the input data contain decimal points.

Details

For integer binary data, the high-order bit is the value's sign: 0 for positive values, 1 for negative. Negative values are represented in twos-complement notation. If the informat includes a *d* value, the data value is divided by 10^d .

Using the IBw.d informat requires you to understand twos complements and byte-swapped data format.

For more information about microcomputer fixed-point values, see Intels developer Web site.

Comparison of IB and PIB

The IBw.d informat and the PIBw.d informat give you different results. The IBw.d informat processes both positive and negative numbers and it uses the high-order bit as the sign bit. In contrast, the PIBw.d informat is used only for positive numbers and it does not look for a sign bit. As an example, suppose your data contain the following two-byte (byte-swapped) value:

```
01 80
```

When you read this value using the IB2. informat, the informat looks for the sign bit, sees that it is on, and reads the value as $-32,767$. However, if you read this value with the PIB2. informat, no sign bit is used, and the result is $32,769$.

Example

Suppose that your data contain the following 6-byte (byte-swapped) value:

```
64 00 00 00 00 00
```

If you read this value using the IB6. informat, it is read as the fixed-point value 100.0. Now suppose that your data contain the following (byte-swapped) value:

```
01 80
```

Because the sign bit is set, the value is read as $-32,767$.

See Also

- "IBw.d Format" on page 381
- "Reading Binary Data" on page 419

PDw.d Informat

Reads packed decimal data.

Category numeric**Width range:** 1–16**Default width:** 1**Decimal range:** 0–31**Windows specifics:** How values are interpreted as negative or positive**See:** PDw.d Informat in *SAS Language Reference: Dictionary*

Syntax

PDw.d

w

specifies the width of the input field.

dspecifies the power of 10 by which to divide the input value. If the data contain decimal points, then SAS ignores the *d* value.

Details

In packed decimal data, each byte contains two digits. The value's sign is in the first bit of the first byte (although the entire first byte is used for the sign). Although it is usually impossible to key in packed decimal data directly from a terminal, many programs write packed decimal data. The decimal range is 1 through 31.

Example

Suppose your data contain the following packed decimal number:

80 00 11 43

If you use the PD4. informat, this value is read as the double-precision value -1143.0. Similarly, the following value is read as 1500.0:

00 00 15 00

See Also

- “PDw.d Format” on page 383
- “Reading Binary Data” on page 419

PIBw.d Informat

Reads positive integer-binary (fixed-point) values.**Category** numeric**Width range:** 1–8**Default width:** 1**Decimal range:** 0–10

Windows specifics: native byte-swapped integers

See: PIBw.d Informat in *SAS Language Reference: Dictionary*

Syntax

PIBw.d

w

specifies the width of the input field.

d

specifies the power of 10 by which to divide the input value. SAS uses the *d* value even if the input data contain decimal points.

Details

Positive integer binary values are the same as integer binary (see the informat “IBw.d Informat” on page 422), except that all values are treated as positive. Thus, the high-order bit is part of the value rather than the value’s sign.

Comparison of PIB and IB

The PIBw.d informat and the IBw.d informat give you different results, and you should differentiate carefully between these two informats. The IBw.d informat processes both positive and negative numbers and uses the high-order bit as the sign bit. In contrast, the PIBw.d informat is used only for positive numbers and it does not look for a sign bit. As an example, suppose your data contain the following two-byte (byte-swapped) value:

```
01 80
```

When you read this value using the IB2. informat, the informat looks for the sign bit, sees that it is on, and reads the value as $-32,767$. However, if you read this value with the PIB2. informat, no sign bit is used, and the result is $32,769$.

Example

Suppose your data contain the following one-byte value:

```
FF
```

If you read this value using the PIB1. informat, it is read as the double-precision value 255.0. Using this informat requires you to understand twos complements and byte-swapped data format.

See Also

- “PIBw.d Format” on page 384
- “Reading Binary Data” on page 419

RBw.d Informat

Reads real-binary (floating-point) data.

Category numeric

Width range: 2–8

Default width: 4

Decimal range: 0–10

Windows specifics: native floating-point representation

See: RBw.d Informat in *SAS Language Reference: Dictionary*

Syntax

RBw.d

w

specifies the width of the input field.

d

specifies the power of 10 by which to divide the input value. SAS uses the *d* value even if the input data contain decimal points.

Details

The RBw.d informat reads numeric data that are stored in microcomputer real binary (floating-point) notation. Numeric data for scientific calculations are often stored in floating-point notation. (SAS stores all numeric values in floating-point notation.) A floating-point value consists of two parts: a mantissa that gives the value and an exponent that gives the value's magnitude. It is usually impossible to key in floating-point binary data directly from a terminal, but many programs write floating-point binary data.

See Also

- "RBw.d Format" on page 385
- "Reading Binary Data" on page 419

ZDw.d Informat

Reads zoned decimal data.

Category numeric

Width range: 1–32

Default width: 1

Decimal range: 1–10

Windows specifics: Last byte includes the sign

See: ZDw.d Informat in *SAS Language Reference: Dictionary*

Syntax

ZDw.d

w
specifies the width of the input field.

d
specifies the power of 10 by which to divide the input value. If the data contain decimal points, then SAS ignores the *d* value.

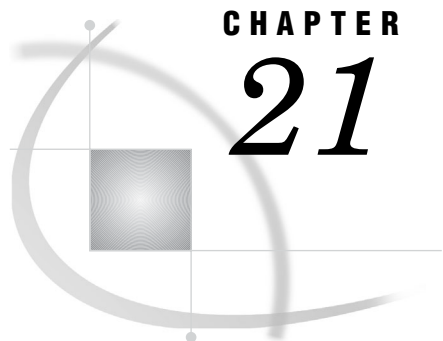
Details

This method is also known as an overprint trailing numeric format. Under Windows, the last byte of the field contains the sign information of the number. The following table gives the conversion for the last byte:

Digit	ASCII Character	Digit	ASCII Character
0	{	-0	}
1	A	-1	J
2	B	-2	K
3	C	-3	L
4	D	-4	M
5	E	-5	N
6	F	-6	O
7	G	-7	P
8	H	-8	Q
9	I	-9	R

See Also

- “ZDw.d Format” on page 386



CHAPTER

21

SAS Procedures under Windows

<i>SAS Procedures under Windows</i>	429
<i>CATALOG Procedure</i>	429
<i>CIMPORT Procedure</i>	430
<i>CONTENTS Procedure</i>	431
<i>CONVERT Procedure</i>	433
<i>CPORT Procedure</i>	435
<i>DATASETS Procedure</i>	436
<i>OPTIONS Procedure</i>	437
<i>PMENU Procedure</i>	439
<i>PRINTTO Procedure</i>	440
<i>SORT Procedure</i>	441

SAS Procedures under Windows

Base SAS procedures enable you to perform statistical computations, create reports, and manage your data. Most of the Base SAS procedures are described in *Base SAS Procedures Guide*. The procedures described here have syntax or behavior that is specific to Windows.

CATALOG Procedure

Manages entries in SAS catalogs.

Windows specifics: FILE= option in the CONTENTS statement

See: CATALOG Procedure in *Base SAS Procedures Guide*

Syntax

```
PROC CATALOG CATALOG=<libref.>catalog <ENTRYTYPE=etype> <KILL>;
  CONTENTS <OUT=SAS-data-set> <FILE=fileref>;
```

Note: This is a simplified version of the CATALOG procedure syntax. For the complete syntax and its explanation, see the CATALOG procedure in *Base SAS Procedures Guide*. △

fileref

names a file specification that is specific to the Windows operating environment.

Details

The CATALOG procedure manages entries in SAS catalogs.

The FILE= option in the CONTENTS statement of the CATALOG procedure accepts a file specification that is specific to the Windows operating environment. If an unquoted file specification is given in the FILE= option, but no FILENAME statement, SET system option, or Windows environment variable is used to define the file specification, the file is named *file-specification.LST* and is stored in the working directory. For example, if MYFILE is not a fileref defined by the FILENAME statement, the SET system option, or a Windows environment variable, and you submit the following statements, the file MYFILE.LST, containing the list of contents for Sasuser.Profile, is created in your working directory:

```
proc catalog catalog=sasuser.profile;
    contents file=myfile;
run;
```

CIMPORT Procedure

Restores a transport file created by the CPORT procedure.

Windows specifics: Name and location of transport file

See: CIMPORT Procedure in *Base SAS Procedures Guide*

Syntax

PROC CIMPORT *destination=libref* | *<libref.>member-name* *<option(s)>*;

Note: This is a simplified version of the CIMPORT procedure syntax. For the complete syntax and its explanation, see the CIMPORT procedure in *Base SAS Procedures Guide*. △

destination

identifies the file(s) in the transport file as a single SAS data set, single SAS catalog, or multiple members of a SAS library.

libref* | *<libref.>member-name

specifies the name of the SAS data set, catalog, or library to be created from the transport file.

Details

The CIMPORT procedure *imports* a transport file that was created (*exported*) by the CPORT procedure.

Coupled with the CPORT procedure, the CIMPORT procedure enables you to move catalogs and data sets from one operating environment to another.

Note: PROC CIMPORT processes a file generated by PROC CPORT, not a transport file generated by the XPORT engine. △

Note: You can use the MIGRATE procedure, beginning with SAS 9.1, to migrate a SAS library from a previous release. △

When you use the CIMPORT procedure under Windows, remember the following:

- The value of the INFILE= option can be a fileref defined in a FILENAME statement, a quoted Windows pathname, or an environment variable.
- If you omit the INFILE= option and have not defined the reserved fileref SASCAT, SAS tries to read from a file named SASCAT.DAT in your working directory. If no file by that name exists, the following error message is issued and the procedure terminates, assuming that C:\SAS has been defined as the working directory:

```
ERROR: Physical file does not exist, C:\SAS\SASCAT.DAT
```

- If you have not transferred the file created by PROC CPORT in binary format, PROC CIMPORT cannot read the file, and you receive the following message:

```
ERROR: Given transport file is bad.
```

See Also

- “CPORT Procedure” on page 435
- The MIGRATE procedure and cross-release compatibility at <http://support/sas.com/migration> and the *Base SAS Procedures Guide*.

CONTENTS Procedure

Prints descriptions of the contents of one or more SAS library files.

Windows specifics: Engine/Host Dependent Information output

See: CONTENTS Procedure in *Base SAS Procedures Guide*

Syntax

PROC CONTENTS <option(s)>;

option(s)

For an explanation of the available options, see the CONTENTS procedure in *Base SAS Procedures Guide*.

Details

The CONTENTS procedure shows the contents of a SAS set and prints the directory of the SAS library.

While most of the printed output generated by the CONTENTS procedure is the same across all operating environments, the Engine/Host Dependent Information output depends on both the operating environment and the engine. The following example output shows the Engine/Host Dependent Information that is generated for the V9 engine from these statements:

```
DATA SCHOOL;
  INPUT NAME $ Y GRADE CLASS $ ID;
```

```

DATALINES;
PHIL 1 85 MATH 234107589
ROBERTO 1 90 ENGLISH 190873452
CAROL 2 70 MATH 257902348
THOMAS 2 71 ENGLISH 234567823
JUANITA 3 98 FRENCH 876345290
CEDRIC 3 75 HISTORY 231987222
MARIA 4 89 PE 87654321
;
PROC CONTENTS DATA=SCHOOL OUT=SCHOUT(DROP=CRDATE MODATE);
  TITLE 'SCHOOL DATASET';
  RUN;

```

Output 21.1 Engine/Host Dependent Information from PROC CONTENTS Using the V9 Engine

SCHOOL DATASET		07:52 Wednesday, October 17, 2007		1
The CONTENTS Procedure				
Data Set Name	WORK.SCHOOL	Observations	7	
Member Type	DATA	Variables	5	
Engine	V9	Indexes	0	
Created	Wednesday, October 17, 2007 00:39:17	Observation Length	40	
Last Modified	Wednesday, October 17, 2007 00:39:17	Deleted Observations	0	
Protection		Compressed	NO	
Data Set Type		Sorted	NO	
Label				
Data Representation	WINDOWS_32			
Encoding	wlatin1 Western (Windows)			
Engine/Host Dependent Information				
Data Set Page Size	4096			
Number of Data Set Pages	1			
First Data Page	1			
Max Obs per Page	101			
Obs in First Data Page	7			
Number of Data Set Repairs	0			
File Name	C:\DOCUME~1\sasusr1\LOCALS~1\Temp\SAS Temporary Files_TD1904\school.sas7bdat			
Release Created	9.9901B0			
Host Created	XP_PRO			
Alphabetic List of Variables and Attributes				
#	Variable	Type	Len	
4	CLASS	Char	8	
3	GRADE	Num	8	
5	ID	Num	8	
1	NAME	Char	8	
2	Y	Num	8	

The engine name (V9) is listed in the header information. The Engine/Host Dependent Information describes attributes of the data set, such as the data set page size and the maximum number of observations per page. For more information about how to interpret the data set size information, see “Calculating Data Set Size” on page 209.

See Also

- the section on starting with SAS data sets in *Step-by-Step Programming with Base SAS Software*

CONVERT Procedure

Converts BMDP, OSIRIS system files and SPSS export files to SAS data sets.

Windows specifics: All

Syntax

PROC CONVERT *product-specification* <*option(s)*>

product-specification

is required and can be one of the following:

BMDP=*fileref* <(CODE=*code* CONTENT=*content-type*)>

converts into a SAS data set the first member a BMDP save file created under DOS. Here is an example:

```
filename save 'c:\myidr\bmdp.dat';
proc convert bmdp=save;
run;
```

If you have more than one save file in the BMDP file referenced by the *fileref* argument, you can use two options in parentheses after *fileref*. The CODE= option lets you specify the code of the save file you want, and the CONTENT= option lets you give the content of the save file. For example, if a file with CODE=JUDGES has a content of DATA, you can use the following statement:

```
filename save 'c:\mydir\bmdpl.dat';
proc convert bmdp=save(code=judges
                        content=data);
run;
```

OSIRIS=*fileref*

specifies a fileref for the OSIRIS file to be converted into a SAS data set. If you use this product specification, you must also use the DICT= option, which specifies the OSIRIS dictionary to use.

SPSS=*fileref*

specifies a fileref for the SPSS export file to be converted into a SAS data set. The SPSS export file must be created by using the SPSS EXPORT command from any operating environment.

option-list

DICT=*fileref*

specifies a fileref of the dictionary file for the OSIRIS file. The DICT= option is valid only when used with the OSIRIS product specification.

FIRSTOBS=*n*

gives the number of the observation where the conversion is to begin. This option enables you to skip over observations at the beginning of the OSIRIS or SPSS/PC system file.

OBS=*n*

specifies the number of the last observation to convert. This option enables you to exclude observations at the end of the file.

OUT= *SAS-data-set*

names the SAS data set created to hold the converted data. If the OUT= option is omitted, SAS still creates a Work data set and automatically names it DATA*n*, just as if you omitted a data set name in a DATA statement. If it is the first such data set in a job or session, SAS names it DATA1, the second is DATA2, and so on. If the OUT= option is omitted or if you do not specify a two-level name (including a libref) in the OUT= option, the converted data set is stored in your Work data library and by default it is not permanent.

Details

The CONVERT procedure converts a BMDP or OSIRIS system file or an SPSS export file to a SAS data set. It produces one output data set, but no printed output. The new data set contains the same information as the input system file; exceptions are noted in “Output Data Sets” on page 434. The BMDP, OSIRIS and SPSS engines provide more extensive capabilities.

Because the BMDP, OSIRIS and SPSS products are maintained by other companies or organizations, changes can be made that make the system files incompatible with the current version of PROC CONVERT. SAS upgrades PROC CONVERT only to support changes that are made to these products when a new version of SAS is available.

Missing Values If a numeric variable in the input data set has either no value or a system missing value, PROC CONVERT assigns it a missing value.

Output Data Sets This section describes the attributes of the output SAS data set for each *product-specification* value.

CAUTION:

Ensure that the translated names are unique. Variable names can sometimes be translated by SAS. To ensure the procedure works correctly, be sure your variables are named in such a way that translation results in unique names. Δ

BMDP output Variable names from the BMDP save file are used in the SAS data set, but nontrailing blanks and all special characters are converted to underscores in the SAS variable names. The subscript in BMDP variable names, such as x(1), becomes part of the SAS variable name, with the parentheses omitted: X1. Alphabetic BMDP variables become SAS character variables of corresponding length. Category records from BMDP are not accepted.

OSIRIS Output For single-response variables, the V1-V9999 name becomes the SAS variable name. For multiple-response variables, the suffix R*n* is added to the variable name, where *n* is the response. For example, V25R1 is the first response of the multiple-response variable V25. If the variable after V1000 has 100 or more responses, responses above 99 are eliminated. Numeric variables that OSIRIS stores in character, fixed-point binary, or floating-point binary mode become SAS numeric variables. Alphabetic variables become SAS character variables; any alphabetic variable of length greater than 200 is truncated to 200. The OSIRIS variable description becomes a SAS variable label, and OSIRIS print formats become SAS formats.

SPSS Output SPSS variable names and variable labels become variable names and labels without change. SPSS alphabetic variables become SAS character variables. SPSS blank values are converted to SAS missing values. SPSS print formats become SAS formats, and the SPSS default precision of no decimal places becomes part of the variables' formats. SPSS value labels are not copied. DOCUMENT data are copied so that PROC CONTENTS can display them.

Comparison

The CONVERT procedure is closely related to the BMDP, OSIRIS and SPSS interface library engines. (In fact, the CONVERT procedure uses these engines.) For example, the following two sections of code provide identical results:

```
□ filename myfile 'myspss.por';
  proc convert spss=myfile out=temp;
    run;

□ libname myfile spss 'myspss.por';
  data temp;
    set myfile._first_;
  run;
```

However, the BMDP, OSIRIS and SPSS engines have more extensive capabilities than PROC CONVERT.

See Also

- “Reading BMDP, OSIRIS, and SPSS Files” on page 142

CPORT Procedure

Writes SAS data sets and catalogs into a special format in a transport file.

Windows specifics: Name and location of transport file

See: CPORT Procedure in *Base SAS Procedures Guide*

Syntax

PROC CPORT *source-type=libref* | *<libref.>member-name<option(s)>*;

Note: This version is a simplified version of the CPORT procedure syntax. For the complete syntax and its explanation, see the CPORT procedure in *Base SAS Procedures Guide*. △

libref

specifies the name and location of the file to be transported.

Details

The CPORT procedure writes SAS data sets, SAS catalogs, or SAS libraries to sequential file formats (transport files). Use PROC CPORT with the CIMPORT procedure to move files from one environment to another.

The value of the FILE= option can be a fileref defined in a FILENAME statement, a quoted Windows pathname, or an environment variable.

If you do not use the FILE= option and have not defined the reserved fileref SASCAT, a file named SASCAT.DAT is created in your working directory.

Note: You can use the MIGRATE procedure, beginning with SAS 9.1, to migrate a SAS library from a previous release. Δ

See Also

- “CIMPORT Procedure” on page 430
- “Transferring SAS Files between Operating Environments” on page 145
- The MIGRATE procedure and cross-release compatibility at <http://support/sas.com/migration>

DATASETS Procedure

Lists, copies, renames, and deletes SAS files and also manages indexes for and appends SAS data sets in a SAS library.

Windows specifics: Directory information; CONTENTS statement output

See: DATASETS Procedure in *Base SAS Procedures Guide*

Syntax

```
PROC DATASETS <options(s)>;
  CONTENTS<options(s)>;
```

option(s)

This version is a simplified version of the DATASETS procedure syntax. For the complete syntax, see the DATASETS procedure in *Base SAS Procedures Guide*.

Details

The DATASETS procedure is a utility procedure that manages your SAS files.

The SAS library information that is displayed in the SAS log by the DATASETS procedure depends on the operating environment and the engine. The following example SAS log shows the information (for the V9 engine) that the DATASETS procedure generates under Windows.

Output 21.2 SAS Library Information from PROC DATASETS

```

PROC DATASETS library=work;
                Directory

      Libref      WORK
      Engine      V9
      Physical Name C:\DOCUME-1\sasusr\LOCALS-1\Temp\SAS Temporary Files\_TD2663
      File Name    C:\DOCUME-1\sasusr\LOCALS-1\Temp\SAS Temporary Files\_TD2663

#   Name      Member      File
      Type      Size  Last Modified

1  GSEG      CATALOG  54272  17MAR2003:13:20:23
2  HAT       DATA    46080  17MAR2003:13:20:20
3  SASGOPT  CATALOG  5120   17MAR2003:13:20:21

```

The output shows you the libref, engine, and physical name that are associated with the library, as well as the names and other properties of the SAS files that are contained in the library.

The CONTENTS statement in the DATASETS procedure generates the same Engine/Host Dependent Information as the CONTENTS procedure.

See Also

- “CONTENTS Procedure” on page 431
- the section about modifying data set names and variable attributes in *Step-by-Step Programming with Base SAS Software*

OPTIONS Procedure

Lists the current values of all SAS system options.

Windows specifics: Host options

See: OPTIONS Procedure in *Base SAS Procedures Guide*

Syntax

PROC OPTIONS <options(s)>;

option(s)

This version is a simplified version of the OPTIONS procedure syntax. For the complete syntax and its explanation, see the OPTIONS procedure in *Base SAS Procedures Guide*.

Details

The OPTIONS procedure lists the current settings of the SAS system options.

The options displayed by the OPTIONS procedure that are not operating environment specific (session and configuration) are the same for every operating

environment, although the default values can differ slightly. However, the environment-specific options displayed by this procedure are different for each operating environment. The following display shows some sample operating environment options for the Windows environment, as generated by this code:

```
proc options host;
run;
```

Output 21.3 Windows Operating Environment Options Displayed by PROC OPTIONS

```
Host Options:

ACCESSIBILITY=STANDARD
                Enable Extended Accessibility
ALTLOG=         Specifies the destination for a copy of the SAS log
ALTPRINT=      Specifies the destination for a copy of the SAS procedure output file
AUTHPROVICERDOMAIN=
                Authentication providers associated with domain suffixes
AUTHSERVER=    Specify the authentication server or domain.
AUTOEXEC=      Specifies the autoexec file to be used
AWSCONTROL=(SYSTEMMENU MINMAX TITLE)
                Used to customize the appearance for the SAS AWS. Valid parameters are:
                TITLE/NOTITLE SYSTEMMENU/NOSYSTEMMENU MINMAX/NOMINMAX
AWSDEF=( 0 0 79 79)
                Specify the initial size and position of the SAS AWS. This should be
                specified as follows: 0 0 100 100
AWSMENU        Show the main window's (AWS) menu.
AWSMENUMERGE   Add host specific menu items to the main window's (AWS) menu.

...
NOTE: PROCEDURE OPTIONS used:( Total process time)
      real time          0.01 seconds
      cpu time           0.01 seconds
```

The option values listed are examples. The output of PROC OPTIONS depends on many things. Some option values depend on what method you use to run SAS. For example, the default line size under the SAS windowing environment is 75 lines on a VGA display, while it is 132 lines in batch mode. Also, the way you have set up your process affects the default values of system options. For example, the default value of the SASAUTOS= option depends on where you store your autocall macros.

Using PROC OPTIONS, you can check the values of all system options. If you want more information about a particular operating environment option, refer to “SAS System Options under Windows” on page 475 or *Using SAS Software in Your Operating Environment* in the SAS Help and Documentation.

See Also

- “SAS System Options under Windows” on page 475

PMENU Procedure

Defines menu facilities for windows created with SAS software.

Windows specifics: ACCELERATE= option accepted for several key combinations

See: PMENU Procedure in *Base SAS Procedures Guide*

Syntax

```
PROC PMENU <CATALOG=<libref.>catalog> <DESC 'entry-description'>;
```

```
  ITEM command <option(s)>;
```

```
  ITEM 'menu-item' <option(s)>;
```

```
    ACCELERATE=name-of-key;
```

This version is a simplified version of the PMENU procedure syntax. For the complete syntax, see the PMENU procedure in *Base SAS Procedures Guide*.

ACCELERATE=name-of-key

defines a key sequence that can be used instead of selecting an item. When you press the key sequence, it has the same effect as selecting the item from the menu bar or menu.

Under Windows, the ACCELERATE= option in the ITEM statement is accepted only for the following key combinations:

- Ctrl + A (Select All)
- Ctrl + C (Copy)
- Ctrl + F (Find)
- Ctrl + N (New)
- Ctrl + O (Include)
- Ctrl + P (Print)
- Ctrl + S (File)
- Ctrl +V (Paste)
- Ctrl +X (Cut).
- Ctrl + Z (Undo)
- Del (Clear)

Details

The PMENU procedure defines menus that can be used in DATA step windows, macro windows, SAS/AF and SAS/FSP windows, or in any SAS application that enables you to specify customized menus.

If you want your program to be portable between Windows and OS/2, you can use the following alternate key combinations:

- Ctrl+Insert
- Shift+Insert
- Alt+Backspace
- Shift+Delete.

If you use these alternate key combinations in your SAS program, the Edit menu shows the standard key combination; however, you can use either the standard or alternate key combination to activate the menu item.

PRINTTO Procedure

Defines destinations for SAS procedure output and the SAS log.

Windows specifics: Valid values for *file-specification*; UNIT= option

See: PRINTTO Procedure in *Base SAS Procedures Guide*

Syntax

PROC PRINTTO <*option(s)*>;

Note: This version is a simplified version of the PRINTTO procedure syntax. For the complete syntax and its explanation, see the PRINTTO procedure in *Base SAS Procedures Guide*. Δ

option(s)

LOG=*file-specification*
 PRINT=*file-specification*
 can be

- a fileref defined in a FILENAME statement or function. To send SAS output or log directly to the printer, use a FILENAME statement or function with the PRINTER device-type keyword.
- a quoted Windows pathname
- an alphanumeric text string. The destination filename is *file-specification.LOG* or *file-specification.LST* and it is stored in the current directory.
- a SAS or Windows environment variable

UNIT=*nn*

sends your SAS procedure output to the file FT*nn*F001.LST, where *nn* represents the UNIT= value, which can range from 1 to 99. The file is located in the SAS working directory.

Details

The PRINTTO procedure defines destinations for SAS procedure output and for the SAS log.

Examples

Example 1: Redirecting SAS Log Output The following statements redirect any SAS log entries that are generated after the RUN statement to an output file with a fileref of TEST, which is associated with the LPT1: device:

```
filename test printer 'lpt1:';
proc printto log=test;
run;
```

When these statements are issued, a dialog box is opened that informs you PROC PRINTTO is running. All SAS log entries are redirected to the TEST output file as

specified; however, they are not printed on the LPT1: device until the output file is closed, either by redirecting the SAS log entries back to the default destination or to another file.

The following statements send any SAS log entries that are generated after the RUN statement to the external file associated with the fileref MYFILE:

```
filename myfile 'c:\mydir\mylog.log';
proc printto log=myfile;
run;
```

Example 2: Redirecting SAS Procedure Output The following statements send any SAS procedure output to a file named MYPRINT.LST in your working directory (assuming that MYPRINT is not a previously defined fileref or environment variable):

```
proc printto print=myprint;
run;
```

The following statements send any SAS procedure output to the printer port, which is usually defined by the system as LPT1:

```
proc printto print='lpt1:';
run;
```

Example 3: Restoring the Output Destinations to the Default The following statements (including a PROC PRINTTO statement with no options) redirect the SAS log and procedure output to the original default destinations:

```
proc printto;
run;
```

SORT Procedure

Sorts observations in a SAS data set by one or more variables, then stores the resulting sorted observations in a new SAS data set or replaces the original data set.

Windows specifics: Sort utilities available; SORTSIZE= and TAGSORT statement options

See: SORT Procedure in *Base SAS Procedures Guide*

Syntax

PROC SORT <option(s)> <collating-sequence-option>;

Note: This version is a simplified version of the SORT procedure syntax. For the complete syntax and its explanation, see the SORT procedure in *Base SAS Procedures Guide* Δ

SORTSIZE=memory-specification

specifies the maximum amount of memory available to the SORT procedure. For further explanation of the SORTSIZE= option, see the following Details section.

TAGSORT

stores only the BY variables and the observation number in temporary files. When you specify TAGSORT, the sort is a single-threaded sort. Do not specify TAGSORT if

you want SAS to use multiple threads to sort. For details about TAGSORT option, see the following Details section.

Details

The SORT procedure sorts observations in a SAS data set by one or more character or numeric variables, either replacing the original data set or creating a new, sorted data set. By default under Windows, the SORT procedure uses the ASCII collating sequence.

The SORT procedure uses the sort utility specified by the SORTPGM system option. Sorting can be done by SAS, your database, or the Windows SyncSort utility. You can use all the options available to the SAS sort utility, such as the SORTSEQ and NODUPKEY options. For a complete list of all options available, see the list of sort options in the See Also section.

SORTSIZE= Option

Under Windows, you can use the SORTSIZE= option in the PROC SORT statement to limit the amount of memory that is available to the SORT procedure. This option might reduce the amount of swapping SAS must do to sort the data set. If PROC SORT needs more memory than you specify, it creates a temporary utility file to store the data in. The SORT procedure's algorithm can swap data more efficiently than Windows can.

The syntax of the SORTSIZE= option is as follows:

`SORTSIZE=memory-specification`

where *memory-specification* can be one of the following:

- `n` specifies the amount of memory in bytes.
- `nK` specifies the amount of memory in 1-kilobyte multiples.
- `nM` specifies the amount of memory in 1-megabyte multiples.

The default SAS configuration file sets this option to 64MB using the SORTSIZE= system option.

You can override the default value of the SORTSIZE= system option by specifying a different SORTSIZE= value in the PROC SORT statement, or by submitting an OPTIONS statement that sets the SORTSIZE= system option to a new value.

The SORTSIZE= option is also discussed in “Improving Performance of the SORT Procedure” on page 208.

TAGSORT Option

The TAGSORT option in the PROC SORT statement is useful in sorts when there might not be enough disk space to sort a large SAS data set. When you specify TAGSORT, the sort is a single-threaded sort. Do not specify TAGSORT if you want the SAS to use multiple threads to sort.

When you specify the TAGSORT option, only sort keys (that is, the variables specified in the BY statement) and the observation number for each observation are stored in the temporary files. The sort keys, together with the observation number, are referred to as *tags*. At the completion of the sorting process, the tags are used to retrieve the records from the input data set in sorted order. Thus, in cases where the total number of bytes of the sort keys is small compared with the length of the record, temporary disk use is reduced considerably. You should have enough disk space to hold another copy of the data (the output data set) or two copies of the tags, whichever is greater. Note that while using the TAGSORT option can reduce temporary disk use, the processing time can be much higher. However, on PCs with limited available disk

space, the TAGSORT option can allow sorts to be performed in situations where they would otherwise not be possible.

Creating Your Own Collating Sequences

If you want to provide your own collating sequences or change a collating sequence that has been provided for you, use the TRANTAB procedure to create or modify translate tables. For more information about the TRANTAB procedure, see *SAS National Language Support (NLS): Reference Guide*. When you create your own translate tables, they are stored in your Sasuser.Profile catalog and they override any translate tables by the same name that are stored in the HOST catalog.

Note: System managers can modify the HOST catalog by copying newly created tables from the Sasuser.Profile catalog to the HOST catalog. Then all users can access the new or modified translate table. Δ

If you want to see the names of the collating sequences stored in the HOST catalog (using the SAS Explorer), submit the following statement:

```
dm 'catalog sashelp.host' catalog;
```

Alternatively, you can select the View menu, select the **Libraries** item, then double-click on the Sashelp library, and then double-click on the HOST catalog. In batch mode, you can use the following statements to generate a list of the contents of the HOST catalog:

```
proc catalog catalog=sashelp.host;
  contents;
run;
```

Entries of type TRANTAB are the collating sequences.

If you want to see the contents of a particular translate table, use the following statements:

```
proc trantab table=table-name;
  list;
run;
```

The contents of the collating sequence are displayed in the SAS log.

Using Syncsort for Windows

Introduction to Using SyncSort with SAS If you have SyncSort installed at your site, you can use Syncsort as an alternative sorting algorithm to the database sort or the SAS sort. SAS determines which sort to use by the values that are set for the SORTPGM, SORTCUT, and SORTCUTP system options.

The SyncSort installation process adds the SyncSort directory to the Windows PATH statement. As long as the SyncSort directory is included in the Windows PATH statement, SAS is able to launch SyncSort. SyncSort is developed by Syncsort, Inc.

Setting SyncSort as the Sort Algorithm To always sort using the SyncSort sort routine, the value of the SORTPGM system option must be HOST. To set this option, submit the following OPTIONS statement:

```
options sortpgm=host;
```

Note: The SORTPGM option can also be set from the SAS System Options window, in the SAS configuration file, or during SAS invocation. This example shows how to specify the SORTPGM system option at invocation or in the SAS configuration file:

```
-sortpgm host
```

Δ

Sorting Based on Size or Observations The sort routine that SAS uses can be based on either the number of observations in a data set or on the size of the data set. When the SORTPGM option is set to BEST, SAS uses the first available and pertinent sorting algorithm based on this order of precedence:

- database sort utility
- host sort utility
- SAS sort utility

If sorting is not to be done by the database, SAS looks at the values for the SORTCUT and SORTCUTP options to determine which sort to use.

The SORTCUT option specifies the number of observations above which SyncSort is used instead of the SAS sort. The SORTCUTP option specifies the number of bytes in the data set above which SyncSort is used.

If SORTCUT and SORTCUTP are set to zero, SAS uses the SAS sort routine. If you specify both options and either condition is met, SAS uses SyncSort.

When the following OPTIONS statement is in effect, the SyncSort routine is used when the number of observations is 501 or greater:

```
options sortpgm=best sortcut=500;
```

Here, the SyncSort routine is used when the size of the data set is greater than 40M:

```
options sortpgm=best sortcutp=40M;
```

For more information about these sort options, see “SORTPGM System Option” on page 569, “SORTCUT System Option” on page 565 and “SORTCUTP System Option” on page 566.

Changing the Location of SyncSort Temporary Files By default, SyncSort uses the location that is specified in the -WORK option for temporary files. To change the location of SyncSort temporary files, specify a new location by using the SORTDEV option. Here is an example:

```
options sortdev="c:\temp\sortsync";
```

For more information about the SORTDEV options, see “SORTDEV System Option” on page 567.

Passing Options to SyncSort Use the SORTANOM option to specify the options that you want to use for SyncSort:

Table 21.1 SORTANOM Options for SyncSort

Task	SORTANOM Option
Run in multi-call mode instead of single-call mode	SORTANOM=b
Print statistics in the SAS log about the sorting process	SORTANOM=t
Print in the SAS log the commands that have been passed to Syncsort	SORTANOM=v

Multiple options can be specified by concatenating the options:

```
options sortdev=btv;
```

For more information about the SORTANOM option, see “SORTANOM System Option” on page 564.

Passing Parameters to SyncSort Use the SORTPARM option to pass Syncsort options to SyncSort. Enclose the options in quotations marks as in this OPTIONS statement:

```
options sortparm="SyncSort-options";
```

For information about the SORTPARM option, see “SORTPARM System Option” on page 568. See the SyncSort documentation for a description of the SyncSort options.

Specifying the SORTSEQ= Option with a Host Sort Utility

The SORTSEQ= option enables you to specify the collating sequence for your sort. For a list of valid values, see the SORT procedure in *Base SAS Procedures Guide*.

CAUTION:

If you are using a host sort utility to sort your data, then specifying the SORTSEQ= option might corrupt the character BY variables if the sort sequence translation table and its inverse are not one-to-one mappings. The translation table must map each character to a unique weight, and the inverse table must map each weight to a unique character variable. Δ

If your translation tables are not one-to-one mappings, then you can use one of the following methods to perform your sort:

- create a translation table that maps one-to-one. When you create a translation table that maps one-to-one, you can easily create a corresponding inverse table by using the TRANTAB procedure. If your table is not mapped one-to-one, then you will receive the following note in the SAS log when you try to create an inverse table:

```
NOTE: This table cannot be mapped one to one.
```

For more information, see the TRANTAB procedure in *SAS National Language Support (NLS): Reference Guide*.

- use the SAS sort. You can specify the SAS sort by using the SORTPGM system option. For more information, see “SORTPGM System Option” on page 569.
- specify the collation order options of your host sort utility. See the documentation for your host sort utility for more information.

- create a view with a dummy BY variable. For an example, see “Example: Creating a View with a Dummy BY Variable” on page 446.

Note: After using one of these methods, you might need to perform subsequent BY processing using either the NOTSORTED option or the NOBYSORTED system option. For more information about the NOTSORTED option, see the BY statement in *SAS Language Reference: Dictionary*. For more information about the NOBYSORTED system option, see the BYSORTED system option in *SAS Language Reference: Dictionary*. Δ

Example: Creating a View with a Dummy BY Variable The following code is an example of creating a view using a dummy BY variable:

```
options no date nostimer ls=78 ps=60;
options sortpgm=host msglevel=i;

data one;
  input name $ age;
  datalines;
  anne 35
  ALBERT 10
  JUAN 90
  janet 5
  bridget 23
  BRIAN 45
  ;
run;

data oneview / view=oneview;
  set one;
  name1=upcase(name);
run;

proc sort data=oneview out=final(drop=name1);
  by name1;
run;

proc print data=final;
run;
```

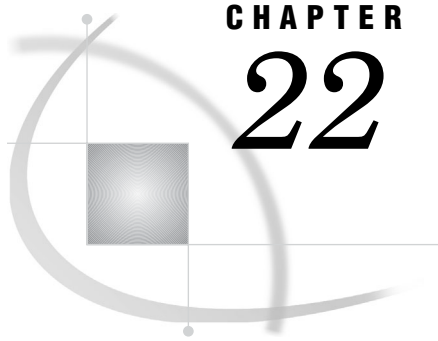
The output is the following:

Output 21.4 Creating a View with a Dummy BY Variable

The SAS System		
Obs	name	age
1	ALBERT	10
2	anne	35
3	BRIAN	45
4	bridget	23
5	janet	5
6	JUAN	90

See Also

- “TRANTAB Procedure” in *SAS National Language Support (NLS): Reference Guide*
- “SORTANOM System Option” on page 564
- “SORTCUT System Option” on page 565
- “SORTCUTP System Option” on page 566
- “SORTDEV System Option” on page 567
- “SORTPARM System Option” on page 568
- “SORTPGM System Option” on page 569
- “SORTSIZE System Option” on page 569
- “Improving Performance of the SORT Procedure” on page 208



CHAPTER 22

SAS Statements under Windows

<i>SAS Statements under Windows</i>	449
<i>ABORT Statement</i>	449
<i>ATTRIB Statement</i>	450
<i>FILE Statement</i>	451
<i>FILENAME Statement</i>	453
<i>FOOTNOTE Statement</i>	459
<i>%INCLUDE Statement</i>	459
<i>INFILE Statement</i>	461
<i>LENGTH Statement</i>	463
<i>LIBNAME Statement</i>	464
<i>SYSTASK Statement</i>	467
<i>TITLE Statement</i>	469
<i>WAITFOR Statement</i>	470
<i>X Statement</i>	471

SAS Statements under Windows

A SAS statement is a directive to SAS that either requests that SAS perform a certain operation or provides information to the system that might be necessary for later operations.

All SAS statements are described in *SAS Language Reference: Dictionary*. Statements that are described here have syntax and usage that are specific to Windows.

ABORT Statement

Stops executing the current DATA step, SAS job, or SAS session.

Valid in: a DATA step

Windows specifics: Action of the ABEND and RETURN options; maximum value of *condition-code*

See: ABORT Statement in *SAS Language Reference: Dictionary*

Syntax

ABORT <ABEND | RETURN> <n>;

ABEND

causes abnormal termination of the current SAS job or session for the current process. Further action is based on how your operating environment and site treat jobs that end abnormally.

RETURN

causes the immediate normal termination of the current SAS job or session. A condition code is returned indicating an error if a job ends abnormally.

n

allows you to specify a condition code that SAS returns to its calling program. The value of *n* must be an integer. Return codes 0 - 6 and those values greater than 997 are used by SAS.

Details

The ABORT statement causes SAS to stop processing the current DATA step.

The ABEND and RETURN options both terminate the SAS process, job, or session.

See Also

- “Return Codes and Completion Status” on page 613

ATTRIB Statement

Associates a format, informat, label, and length with one or more variables.

Valid in: a DATA step

Windows specifics: length specification

See: ATTRIB Statement in *SAS Language Reference: Dictionary*

Syntax

ATTRIB *variable-list-1 attribute-list-1...<variable-list-n attribute-list-n>;*

Note: Here is a simplified explanation of the ATTRIB statement syntax. For the complete syntax and its explanation, see the ATTRIB statement in *SAS Language Reference: Dictionary*. \triangle

attribute-list

LENGTH=< \$ >*length*

specifies the length of the variables in *variable-list*. Under Windows, the length you can specify for a numeric variable ranges from 3 to 8 bytes.

Details

Using the ATTRIB statement in the DATA step permanently associates attributes with variables by changing the descriptor information of the SAS data set that contains the variables.

FILE Statement

Specifies the current output file for PUT statements.

Valid in: a DATA step

Windows specifics: Valid values for *file specification*; valid values for *encoding-value*; valid options for *host-option-list*

See: FILE Statement in *SAS Language Reference: Dictionary*

Syntax

FILE *file-specification*<ENCODING='encoding-value'><*option-list*> <*host-option-list*>;

file-specification

can be any of the file specification forms discussed in “Referencing External Files” on page 148.

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use them as filenames. △

ENCODING='encoding-value'

specifies the encoding to use when writing to the output file. The value for ENCODING= indicates that the output file has a different encoding from the current session encoding.

When you write data to the output file, SAS transcodes the data from the session encoding to the specified encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

host-option-list

names external I/O statement options that are specific to the Windows operating environment. They can be any of the following:

BLKSIZE=*block-size*

BLK=*block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

BLOCK | NOBLOCK

is used only in the context of named pipes. This option indicates whether the client is to wait if no data is currently available. BLOCK is the default value.

BYTE | MESSAGE

is used only in the context of named pipes. This option indicates the type of pipe. BYTE is the default value.

COMMAND

is used only in the context of Dynamic Data Exchange (DDE). This option enables you to issue a remote command for applications that do not use the SYSTEM topic name. For more information, see “Referencing the DDE External File” on page 276 and “Controlling Another Application Using DDE” on page 278.

EOFCONNECT

is used only in the context of named pipes and is valid only when defining the server. This option indicates that if an end-of-file (EOF) character is received from a client, the server should try to connect to the next client.

HOTLINK

is used only in the context of Dynamic Data Exchange (DDE). For a complete description and an example of using this option, see “Using the DDE HOTLINK” on page 282.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=record-length

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

Alternatively, you can specify a logical record length value by using the LRECL= system option.

MOD

specifies that output should be appended to an existing file.

NOTAB

is used only in the context of Dynamic Data Exchange (DDE). This option enables you to use non-tab character delimiters between variables. For more information about this option, see “Using the NOTAB Option with DDE” on page 281.

RECFM=record-format

controls the record format. The following values are valid under Windows:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
S370V	indicates the variable S370 record format (V).
S370VB	indicates the variable block S370 record format (VB).
S370VBS	indicates the variable block with spanned records S370 record format (VBS).
V D	indicates variable format. This format is the default.

The S370 values are valid with z/OS types of files only. That is, files that are binary, have variable-length records, and are in EBCDIC format. If you want to use a fixed-format z/OS, first copy it to a variable-length, binary z/OS file.

RETRY=seconds

is used only in the context of named pipes. This option specifies how long a named pipe client should wait for a busy pipe. The minimum (and default) value for *seconds* is 10.

SERVER | CLIENT

is used only in the context of named pipes. This option specifies the mode of a named pipe. The default value is SERVER.

TERMSTR=

specifies the end-of-line character for the file. Use this option to share files between the UNIX and Windows operating environments. Valid values are:

CRLF

Carriage return line feed. Use TERMSTR=CRLF to write Windows formatted files. CRLF is the default.

LF

Line feed. Use TERMSTR=LF to write UNIX formatted files.

NL

New line. Use TERMSTR=NL to write UNIX formatted files.

Details

The FILE statement routes the output from the PUT statement to either the same external file to which procedure output is written or to a different external file.

If the FILE statement includes the ENCODING argument and the reserved filerefs LOG or PRINT as the file-specification, SAS issues an error message. The ENCODING value in the FILE statement overrides the value of the ENCODING system option.

See Also

- “Named Pipe Examples” on page 290 for examples of using some of these options
- “DDE Examples” on page 278 for examples of using some of these options

FILENAME Statement

Associates a SAS fileref with an external file or a logical file device.

Valid in: anywhere in a SAS program

Windows specifics: Valid values for *access-method*; valid values for *device-type*; valid filenames for *external-file*; valid values for *encoding*; valid options in *host-option-list*

See: FILENAME Statement in *SAS Language Reference: Dictionary*

Syntax

```
FILENAME fileref <device-type> 'external-file'  
      <ENCODING='encoding-value'><host-option-list>;
```

```
FILENAME fileref device-type <'external-file'>  
      <ENCODING=encoding-value><host-option-list>;
```

```
FILENAME fileref <device-type> ('directory-1'<,...directory-n'>)  
      <ENCODING=encoding-value><host-option-list>;
```

Note: This version is a simplified version of the FILENAME statement syntax. For the complete syntax and its explanation, see the FILENAME statement in *SAS Language Reference: Dictionary*. △

fileref

is any valid fileref, as discussed in “Using a Fileref” on page 149.

For examples of using filerefs in member-name syntax (also called aggregate syntax), see “Assigning a Fileref to a Directory” on page 151. For a discussion of the rules SAS uses when accessing files through filerefs, see “Understanding How Concatenated Directories Are Accessed” on page 155.

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use them as filerefs. △

device-type

enables you to read and write data from devices rather than files. The following values are valid:

CATALOG

reads a SAS catalog as an external flat file.

COMMPORT

reads data from and writes data to a communications port.

DDE

reads data from and writes data to another application using Dynamic Data Exchange. For more information, see “DDE Syntax within SAS” on page 276.

DISK

reads data from and writes data to a disk file. Under Windows, DISK is the default for *device-type*.

DRIVEMAP

displays information about the available hard drives (local and networked).

DUMMY

specifies a null output device. This value is especially useful in testing situations.

EMAIL

lets you send electronic mail programmatically from SAS. For more information, see “Sending E-Mail Using SAS” on page 42.

FTP

lets you access information on other machines using TCP/IP. You must have TCP/IP software and a WINSOCK.DLL installed on your local machine. You must also be able to connect to a machine that can function as an FTP server. For more information about using the FTP access method, see the FILENAME statement in *SAS Language Reference: Dictionary*.

NAMEPIPE

writes data to a named pipe. For more information, see “Using Named Pipes” on page 288.

NOTESDB

writes data to a Lotus Notes database. For more information, see “Populating a Lotus Notes Database Using the DATA Step and SCL Code” on page 216.

PIPE

writes data to an unnamed pipe. For more information, see “Using Unnamed Pipes” on page 286.

PLOTTER

indicates that you are accessing a plotter. Windows printing is not used. This device-type keyword is used solely in conjunction with SAS/GRAPH software.

PRINTER

indicates that you are accessing a printer file or device. By default, output is routed through Windows printing when you use this device-type keyword. For more information about altering your default printer, see the system option “SYSPRINT System Option” on page 576.

SOCKET

lets you read and write information over a TCP/IP socket. You must have TCP/IP software and a WINSOCK.DLL installed on your local machine. The SOCKET access method uses the nonblocking method of issuing socket requests. For more

information about using the SOCKET access method, see the FILENAME statement and FILENAME function in *SAS Language Reference: Dictionary*.

TEMP

creates a temporary file that exists only as long as the filename is assigned. The temporary file can be accessed only through the logical name and is available only while the logical name exists. A physical pathname is never shown to the user. If a physical pathname is specified, an error is returned. Files that are manipulated by the TEMP device can have the same attributes and behave identically to DISK files.

TERMINAL

only useful with output, causes output to be sent to the SAS Message Log window. For an example of specifying a device type in the FILENAME statement, see “Advanced External I/O Techniques” on page 162.

Note: The TAPE device-type keyword (documented in *SAS Language Reference: Dictionary*) is not applicable to the Windows operating environment. If you use the TAPE device-type keyword in your SAS program under Windows, you will receive an error message. Also, while the DISK device-type keyword is accepted under Windows, it is ignored because disk files are the default under Windows. △

external-file

can be any valid Windows file specification that is enclosed in quotes. (for more information, see “Referencing External Files” on page 148).

ENCODING=*'encoding-value'*

specifies the encoding to use when reading from or writing to the external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding. When you write data to an external file, SAS transcodes the data from the session encoding to the specified encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

host-option-list

names external I/O statement options that are specific to Windows. They can be any of the following:

ALTDEST=*filename*

is for use only with the PRINTER device type. *Filename* specifies a file destination to write to when you direct output to the fileref. Although the output is written to disk and not to the printer, the output is still formatted by using the printer driver that is associated with the printer that you specified with the *external-file* argument. For example,

```
filename groupHP printer
  "HP LaserJet 4si, 1st floor"
altdest=
  "C:\My SAS Files\Printer output\out.prn";
```

uses the printer driver that is associated with the named printer (an HP LaserJet 4si) to create the output in **out.prn**. No output is actually sent to the printer when you use this fileref.

BAUD=

sets the baud rate. The value for baud-rate depends on your communications hardware. It must be an integer. This host option is valid only if you specify the COMMPORT device-type keyword.

BITS=

sets the transmission bits. Values are 5 through 8. This host option is valid only when you specify the COMMPORT device-type keyword.

Note: For the 8250 serial port, invalid combinations are 5 data bits with 2 stop bits and 6, 7, or 8 data bits with 1.5 stop bits. △

BLKSIZE=*block-size***BLK=***block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

BLOCK | NOBLOCK

is used only in the context of named pipes. This option indicates whether the client is to wait if no data is currently available. BLOCK is the default value.

BYTE | MESSAGE

is used only in the context of named pipes. This option indicates the type of pipe. BYTE is the default value.

COMMAND

is used only in the context of Dynamic Data Exchange (DDE). This option enables you to issue a remote command for applications that do not use the SYSTEM topic name. For more information, see “Referencing the DDE External File” on page 276 and “Controlling Another Application Using DDE” on page 278.

COMTIMEOUT=*value*

controls how a communications port timeout is handled. A timeout occurs when no data is available at the communications port for a period of time, usually 60 seconds. The COMTIMEOUT= option can have the following values:

EOF	returns an end-of-file (EOF) character when a timeout occurs. This behavior is the default. The EOF character causes the current DATA step to terminate.
WAIT	instructs the communications port to wait forever for data. This value overrides the timeout. In this case, no record is returned to the DATA step until data are available. This action can cause your program to go into an infinite loop, so use this value with caution.
ZERO	returns a record length of 0 bytes when a timeout occurs. However, the DATA step does not terminate; it simply tries to read data again.

This host-option is valid only if you specify the COMMPORT device-type keyword.

CONSOLE=*state*

specifies the state of the DOS window when an application is opened using pipes. Valid states are:

MAX	opens the DOS window maximized
MIN	opens the DOS window minimized
NORMAL	opens the DOS window using the default for the machine.

This host-option is valid only if you specify the PIPE keyword.

DROPNULL=

is used to discard null bytes when they are received. The valid values are

ON	specifies to discard null bytes when they are received.
-----------	---

OFF specifies not to discard null bytes when they are received. OFF is the default value.

This host option is valid only if you specify the COMMPORT device-type keyword. For example:

```
filename portin commport 'com1:' dropnull=off;
```

EOFCONNECT

is used only in the context of named pipes and is valid only when you are defining the server. This option indicates that if an end-of-file (EOF) character is received from a client, the server should try to connect to the next client.

FLOW=

controls the transmission control flow. Values are: XONXOFF, DTRDSR, or RTSCTS. This host option is valid only if you specify the COMMPORT device-type keyword.

HOTLINK

is used only in the context of Dynamic Data Exchange (DDE). For a complete description and an example of how to use this option, see “Using the DDE HOTLINK” on page 282.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=*record-length*

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

Alternatively, you can specify a logical record length value by using the LRECL= system option.

MOD

specifies that output should be appended to an existing file.

NOTAB

is used only in the context of Dynamic Data Exchange (DDE). This option enables you to use nontab character delimiters between variables. For more information about this option, see “Using the NOTAB Option with DDE” on page 281.

PARITY=

sets the parity check bit. Values are NONE, ODD, EVEN, MARK, or SPACE. This host option is valid only if you specify the COMMPORT device-type keyword.

RECFM=*record-format*

controls the record format. The following values are valid under Windows:

- | | |
|---------|--|
| F | indicates fixed format. |
| N | indicates binary format and causes the file to be treated as a byte stream. N is not valid for the PIPE or the NAMEPIPE device types. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file. |
| P | indicates print format. |
| S370V | indicates the variable S370 record format (V). |
| S370VB | indicates the variable block S370 record format (VB). |
| S370VBS | indicates the variable block with spanned records S370 record format (VBS). |

V | D indicates variable format. This format is the default.

The S370 values are valid with z/OS types of files only. That is, files that are binary, have variable-length records, and are in EBCDIC format. If you want to use a fixed-format z/OS file, first copy it to a variable-length, binary z/OS file.

RETRY=*seconds*

is used only in the context of named pipes. This option specifies how long a named pipe client should wait for a busy pipe. The minimum (and default) value for *seconds* is 10.

RCONST=*seconds*

specifies the initial read time-out value in 0.001 of a second (1000 = 1 second). The default is 8 seconds. This host-option is valid only if you specify the COMMPORT device-type keyword.

RMULTI= *seconds*

specifies the subsequent read time-out value in 0.001 of a second (1000 = 1 second). This host-option is valid only if you specify the COMMPORT device-type keyword.

SERVER | CLIENT

is used only in the context of named pipes. This option specifies the mode of a named pipe. The default value is SERVER.

STOP=

sets the stop bit. Values are ONE, TWO, ONEHALF. This host option is valid only if you specify the COMMPORT device-type keyword.

Note: For the 8250 serial port, invalid combinations are 5 data bits with 2 stop bits and 6, 7, or 8 data bits with 1.5 stop bits. Δ

WCONST=*seconds*

specifies the initial time-out value in 0.001 of a second (1000 = 1 second). This host option is valid only if you specify the COMMPORT device-type keyword.

WMULTI=*seconds*

specifies the subsequent time-out value in 0.001 of a second (1000 = 1 second). This host option is valid only if you specify the COMMPORT device-type keyword.

Details

The FILENAME statement temporarily associates a valid SAS name with an external file or an output device. An external file is a file created and maintained in the Windows operating environment from which you need to read data.

Example

Example 1: Referencing External Files You can reference external files from a concatenated list of files or directories. The wildcard character * can be used in the FILENAME statement:

```
filename read ('c:\myfiles\*.*', 'c:\myotherfiles\abc.dat');
data new;
infile read;
input;
run;
```

See Also

- “Advanced External I/O Techniques” on page 162

FOOTNOTE Statement

Prints up to ten lines of text at the bottom of the procedure output.

Valid in: anywhere in a SAS program

Windows specifics: Maximum length of footnote

See: FOOTNOTE Statement in *SAS Language Reference: Dictionary*

Syntax

```
FOOTNOTE <n> <'text' | "text">;
```

n

specifies the relative line to be occupied by the footnote.

text

specifies the text of the footnote in single or double quotation marks.

Details

The FOOTNOTE statement takes effect when the step or RUN group with which it is associated executes. Once you specify a footnote for a line, SAS repeats the same footnote on all pages until you cancel or redefine the footnote for that line.

The maximum footnote length under Windows is 256 characters. If the specified footnote is greater than the LINESIZE system option, the footnote is truncated to the line size.

%INCLUDE Statement

Includes and executes SAS statements and data lines.

Valid in: anywhere in a SAS program

Windows specifics: *source*, if a file specification is used; valid options for *encoding-value* and *host-options*

See: %INCLUDE Statement in *SAS Language Reference: Dictionary*

Syntax

```
%INCLUDE source </<ENCODING='encoding-value'><host-options>>;
```

Note: This version is a simplified version of the %INCLUDE statement syntax. For the complete syntax and its explanation, see the %INCLUDE statement in *SAS Language Reference: Dictionary*. Δ

source

describes the location of the information you want to access. The two possible sources are a file specification or internal lines. Under Windows, an asterisk (*) cannot be used to specify keyboard entry. The file specification can be any of the file specification forms discussed in “Referencing External Files” on page 148.

Note: When using member-name syntax and the member name contains a leading digit, enclose the member name in quotation marks. If the member name contains a macro variable reference, use double quotation marks. Δ

ENCODING=*encoding-value*

specifies the encoding to use when reading from the specified source. The value for ENCODING= indicates that the specified source has a different encoding from the current session encoding.

When you read data from the specified source, SAS transcodes the data from the specified encoding to the session encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

host-options

consists of statement options that are valid under Windows. Remember to precede the options list with a forward slash (/). The following options are available under Windows:

BLKSIZE=*block-size*

BLK=*block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

BLOCK | NOBLOCK

is used only in the context of named pipes. This option indicates whether the client is to wait if no data is currently available.

BYTE | MESSAGE

is used only in the context of named pipes. This option indicates the type of pipe; BYTE is the default value.

EOFCONNECT

is used only in the context of named pipes and is valid only when defining the server. This option indicates that the server should try to connect to the next client if an end-of-file (EOF) character is received from a client.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=*record-length*

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

NOTAB

is used only in the context of Dynamic Data Exchange. This option enables you to use non-tab character delimiters between variables. For more information about this option, see “Using the NOTAB Option with DDE” on page 281

RECFM=*record-format*

controls the record format. The following values are valid under Windows:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
S370V	indicates the variable S370 record format (V).
S370VB	indicates the variable block S370 record format (VB).
S370VBS	indicates the variable block with spanned records S370 record format (VBS).
V D	indicates variable format. This format is the default.

The S370 values are valid with files laid out as z/OS files only—that is, files that are binary, have variable-length records, and are in EBCDIC format. If you want to use a fixed-format z/OS file, first copy it to a variable-length, binary z/OS file.

Details

When you execute a program that contains the %INCLUDE statement, SAS executes your code, including any statements or data lines that you bring into the program with %INCLUDE.

INFILE Statement

Specifies an external file to read with an INPUT statement.

Valid in: a DATA step

Windows specifics: Valid values for *encoding-value*, *file-specification*, and *host-options*

See: INFILE Statement in *SAS Language Reference: Dictionary*

Syntax

INFILE *file-specification* <ENCODING=*'encoding-value'*><*options*> <*host-options*>;

file-specification

identifies the source of input data records, usually an external file. The *file-specification* argument can be any of the file specification forms that are discussed in “Referencing External Files” on page 148. The reserved fileref CARDS enables the INFILE statement to reference instream data.

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use them as filerefs. △

ENCODING=*'encoding-value'*

specifies the encoding to use when reading from the external file. The value for ENCODING= indicates that the external file has a different encoding from the current session encoding.

When you read data from an external file, SAS transcodes the data from the specified encoding to the session encoding.

For valid encoding values, see “Encoding Values in SAS Language Elements” in *SAS National Language Support (NLS): Reference Guide*.

host-options

names external I/O statement options that are specific to the Windows operating environment. They can be any of the following:

BLKSIZE= *block-size*

BLK=*block-size*

specifies the number of bytes that are physically read or written in an I/O operation. The default is 8K. The maximum is 1M.

BLOCK | NOBLOCK

is used only in the context of named pipes. This option indicates whether the client is to wait if no data is currently available. The default value is BLOCK.

BYTE | MESSAGE

is used only in the context of named pipes. This option indicates the type of pipe. The default value is BYTE.

EOFCONNECT

is used only in the context of named pipes and is valid only when defining the server. This option indicates that if an end-of-file (EOF) character is received from a client, the server should try to connect to the next client.

HOTLINK

is used only in the context of Dynamic Data Exchange (DDE). For a complete description and an example of using this option, see “Using the DDE HOTLINK” on page 282.

IGNOREDOEOF

is used in the context of I/O operations on variable record format files. When this option is specified, any occurrence of ^Z is interpreted as character data and not as an end-of-file marker.

LRECL=*record-length*

specifies the record length (in bytes). Under Windows, the default is 256. The value of *record-length* can range from 1 to 1,073,741,823 (1 gigabyte).

NOTAB

is used only in the context of Dynamic Data Exchange (DDE). This option enables you to use nontab character delimiters between variables. For more information about this option, see “Using the NOTAB Option with DDE” on page 281.

RECFM=*record-format*

controls the record format. The following are valid values under Windows:

F	indicates fixed format.
N	indicates binary format and causes the file to be treated as a byte stream. If LRECL is not specified, by default SAS reads 256 bytes at a time from the file.
P	indicates print format.
S370V	indicates the variable S370 record format (V).
S370VB	indicates the variable block S370 record format (VB).
S370VBS	indicates the variable block with spanned records S370 record format (VBS).

V | D indicates variable format. This format is the default.

The S370 values are valid with z/OS types of files only. That is, they are valid in files that are binary, have variable-length records, and are in EBCDIC format. If you want to use a fixed-format z/OS file, first copy it to a variable-length, binary z/OS file.

RETRY=*seconds*

is used only in the context of named pipes. This option specifies how long a named pipe client should wait for a busy pipe. The minimum (and default) value for *seconds* is 10.

SERVER | CLIENT

is used only in the context of named pipes. This option specifies the mode of a named pipe. The default value is SERVER.

TERMSTR=

specifies the end-of-line character for the file. Use this option to share files between the UNIX and Windows operating environments. The following are valid values under Windows:

CRLF

Carriage return line feed. Use TERMSTR=CRLF to read Windows or DOS formatted files. CRLF is the default.

LF

Line feed. Use TERMSTR=LF to read UNIX formatted files.

CR

Carriage Return. Use TERMSTR=CR to read MAC/APPLE formatted files.

Details

If the INFILE statement includes the ENCODING argument and CARDS, CARDS4, DATALINES, or DATALINES4 as the file-specification, then SAS issues an error message. The ENCODING value in the INFILE statement overrides the value of the ENCODING system option.

Examples

Example 1: Referencing External Files You can reference external files from a concatenated list of files or directories. The wildcard character * can be used in the INFILE statement:

```
data new;
infile ('c:\myfiles\*.*','c:\myotherfiles\abc.dat');
input;
run;
```

See Also

- “Named Pipe Examples” on page 290 for examples of using some of these options
- “DDE Examples” on page 278 for examples of using some of these options.

LENGTH Statement

Specifies the number of bytes SAS uses to store numeric variables.

Valid in: a DATA step

Windows specifics: Valid numeric variable lengths; valid values for *length*; valid values for *n*

See: LENGTH Statement in *SAS Language Reference: Dictionary*

Syntax

LENGTH <variable-1><...variable-n> <\$> <length> <DEFAULT=*n*>;

length

Under Windows, can range from 3 to 8 bytes for numeric variables.

DEFAULT=*n*

changes the default number of bytes used for storing the values of newly created numeric variables from 8 to the value of *n*. Under Windows, the value of *n* can range from 3 to 8 bytes.

Details

The LENGTH statement specifies the number of bytes SAS is to use for storing values of variables in each data set being created.

CAUTION:

Any length less than 8 bytes can result in a loss of precision for the value of the variable.

Δ

See Also

- “Length and Precision of Variables under Windows” on page 591

LIBNAME Statement

Associates a libref with a SAS library and lists file attributes for a SAS library.

Valid in: anywhere in a SAS program

Windows specifics: Valid values for *engine*; specifications for *SAS-data-library*

See: LIBNAME Statement in *SAS Language Reference: Dictionary*

Syntax

LIBNAME *libref* <engine>('SAS-data-library-1' <,...'SAS-data-library-n'>)
<MEMLIB>, <FILELOCKWAIT>;

LIBNAME *libref* _ALL_ LIST;

LIBNAME *libref* _ALL_ CLEAR;

Note: This version is a simplified version of the LIBNAME statement syntax. For the complete syntax and its explanation, see the LIBNAME statement in *SAS Language Reference: Dictionary*. Δ

libref

is any valid libref, as documented in *SAS Language Reference: Dictionary*.

engine-name

is one of the following library engines supported under Windows:

V9	accesses SAS System 9, SAS 9.1, and SAS 9.2 data sets. You can use the nickname BASE for this engine.
V8	accesses Version 8, Release 8.1, and Release 8.2 data sets.
V7	accesses Version 7 data sets.
V6	accesses Release 6.08 through Release 6.12 data sets.
V604	accesses Release 6.03 and Release 6.04 data sets.

Note: The V604 engine enables you to read from Release 6.03 and Release 6.04 SAS data sets directly from your 32-bit Windows SAS 9.2 session. Release 6.03 and Release 6.04 SAS data sets are not compatible with the x64 64-bit environment and the Itanium 64-bit environment. Δ

XML	generates an XML document from a SAS data set.
XPORT	accesses transport format files.
BMDP	accesses BMDP data files in a 32-bit operating environment.
OSIRIS	accesses OSIRIS data files.
SPSS	accesses SPSS export files.

For more information about these engines, see “Multi Engine Architecture” on page 124 and the discussion of engines in *SAS Language Reference: Dictionary*.

SAS-data-library

is the physical name of a SAS library under Windows. It must be a valid Windows pathname or an environment variable that is set to a valid Windows pathname. You can concatenate several Windows directories to serve as a single SAS library. When you specify multiple libraries, use parentheses around the first and last library pathnames. For more information about concatenated SAS libraries, see “Understanding How Multi-Folder SAS Libraries Are Accessed” on page 133.

MEMLIB

specifies to use extended server memory for this library. For more information about using extended memory, see “Memory-Based Libraries” on page 201.

FILELOCKWAIT=*n*

specifies the number of seconds SAS will wait for a locked file to become available to another process. If the locked file is released before the number of seconds specified by *n*, then SAS locks the file for the current process and continues. If the file is still locked when the number of seconds has been reached, then SAS writes a “Locked File” error to the log and the DATA step fails.

Interaction: Specifying the FILELOCKWAIT= option can have an adverse effect on one or more SAS/SHARE server and client sessions that are waiting for the release of a SAS file that is locked by another process. One or more wait conditions could lead to failed processes for a SAS/SHARE server and clients.

To prevent the possibility of a failed SAS/SHARE process, you can set FILELOCKWAIT=0, which cancels the amount of time that a SAS/SHARE server and clients would wait for the release of a locked file. Canceling the wait time would prevent a failed process. For more information, see the “FILELOCKWAITMAX= System Option” on page 511, and see the section about

predefining a server library by using the LIBNAME statement in the *SAS/SHARE User's Guide*.

Range: 0 – 600

Default: 0

Details

The LIBNAME statement associates a libref with a permanent SAS library. It can also be used to list the file attributes of a SAS library. (The LIBNAME statement is also used to clear a libref. For more information, see “Clearing Librefs” on page 132.)

Note: The words AUX, CON, NUL, PRN, LPT1 - LPT9, and COM1 - COM9 are reserved words under Windows. Do not use them as librefs. Δ

Associating Librefs Use one of the following forms of the LIBNAME statement to associate a libref or an engine with a SAS library:

```
LIBNAME libref <engine> 'SAS-data-library'
```

```
LIBNAME libref <engine> ('SAS-data-library-1' <,...'SAS-data-library-n')>;
```

Use quotation marks when *SAS-data-library* is a physical path. Quotation marks are not needed when you concatenate librefs.

You can use the same arguments with these forms of the LIBNAME statement as shown in the LIBNAME statement syntax.

Listing Data Library Attributes With the LIST option, you can use the LIBNAME statement to list attributes of SAS libraries. Output 22.1 shows the results of the following LIBNAME statement:

```
libname sashelp list;
```

Output 22.1 Data Library Attributes Listed by the LIBNAME Statement

```
5 libname sashelp list;
1 libname sashelp list;
NOTE: Libref= SASHELP
      Scope= Kernel
      Levels= 27
      -Level 1-
      Engine= V9
      Physical Name= C:\Program Files\SAS\SASFoundation\9.2\nls\en\SASCFG
      File Name= C:\Program Files\SAS\SASFoundation\9.2\nls\en\SASCFG
      -Level 2-
      Engine= V9
      Physical Name= C:\Program Files\SAS\SASFoundation\9.2\core\sashelp
      File Name= C:\Program Files\SAS\SASFoundation\9.2\core\sashelp
      . . .
      -Level 27-
      Engine= V9
      Physical Name= C:\Program Files\SAS\SASFoundation\9.2\webhound\sashelp
      File Name= C:\Program Files\SAS\SASFoundation\9.2\webhound\sashelp
2 run;
```

See Also

- “LIBNAME Statement” in *SAS Output Delivery System: User’s Guide*
- “LIBNAME Statement” in *SAS Language Interfaces to Metadata*
- “LIBNAME Statement” in *SAS XML LIBNAME Engine: User’s Guide*
- “LIBNAME Statement” in *SAS/ACCESS for Relational Databases: Reference*
- “Using Data Libraries” on page 127

SYSTASK Statement

Executes, lists, or terminates asynchronous tasks.

Valid in: anywhere in a SAS program

Windows specifics: all

Syntax

SYSTASK COMMAND “*operating system command*”

```

    <WAIT | NOWAIT>
    <TASKNAME=taskname>
    <MNAME=name-var>
    <STATUS=stat-var>
    <SHELL<="shell-command">>;

```

SYSTASK LIST <_ALL_ | *taskname*> <STATE> <STATVAR>;

SYSTASK KILL *taskname* <*taskname*...>;

COMMAND

executes the *operating system command*

LIST

lists either a specific active task or all of the active tasks in the system.

KILL

forces the termination of the specified task(s).

operating system command

specifies the name of a Windows command (including any command-specific options). Enclose the command in either single or double quotation marks. If the command options require quotes, repeat the quotes. For example:

```

    systask command "find "my text" c:\mydir\myfile.sas"

```

Note: The operating system command that you specify cannot require input from the keyboard. △

WAIT | NOWAIT

determines whether SYSTASK COMMAND suspends execution of the current SAS session until the task has completed. NOWAIT is the default. For tasks that are started with the NOWAIT argument, you can use the WAITFOR statement when necessary to suspend execution of the SAS session until the task has finished.

TASKNAME=taskname

specifies a name that identifies the task. Task names must be unique among all active tasks. A task is active if it is running, or if it has completed and has not been waited for using the WAITFOR statement. Duplicate task names generate an error in the SAS log. If you do not specify a task name, SYSTASK will automatically generate a name. If the task name contains a blank character, enclose the task name in quotes.

MNAME=name-var

specifies a macro variable in which you want SYSTASK to store the task name that it automatically generated for the task. If you specify both the TASKNAME option and the MNAME option, SYSTASK copies the name you specified with TASKNAME into the variable that you specified with MNAME.

STATUS=stat-var

specifies a macro variable in which you want SYSTASK to store the status of the task. Status variable names must be unique among all active tasks.

SHELL<="shell-command">

specifies that the *operating system command* should be executed with the operating system shell command. If you specify a shell-command, SYSTASK uses the shell command that you specify to invoke the shell; otherwise, SYSTASK uses the default shell. Enclose the shell command in quotes.

ALL

specifies all active tasks in the system.

STATE

specifies to display the status of the task, which can be Start Failed, Running, or Complete.

STATVAR

specifies to display the status variable associated with the task. The status variable is the variable that you assigned with the STATUS option in the SYSTASK COMMAND statement.

Details

SYSTASK allows you to execute operating system-specific commands from within your SAS session or application. Unlike the X statement, SYSTASK runs these commands as asynchronous tasks, which means that these tasks execute independently of all other tasks that are currently running. Asynchronous tasks run in the background, so you can perform additional tasks while the asynchronous task is still running.

For example, to copy a SAS program, you might use this statement:

```
systask command "copy myprog.sas myprogl.sas"
             taskname="copyfile" status=copystat;
```

The return code from the **copy** command is saved in the macro variable COPYSTAT.

Note: Windows command output is not written to the SAS log. Δ

Program steps that follow the SYSTASK statements in SAS applications usually depend on the successful execution of the SYSTASK statements. Therefore, syntax errors in some SYSTASK statements will cause your SAS application to end.

There are two types of tasks that can be run with SYSTASK:

Task

All tasks started with SYSTASK COMMAND are of type Task. For these tasks, if you do not specify STATVAR or STATE, then SYSTASK LIST displays the task name, type, and state, and the name of the status macro variable. To terminate tasks of type Task, use SYSTASK KILL.

SAS/CONNECT Process

Tasks started from SAS/CONNECT with the SIGNON statement or command, and RSUBMIT statement are of type SAS/CONNECT Process. To display SAS/CONNECT processes, use the LISTTASK statement to display the task name, type, and state. To terminate a SAS/CONNECT process, use the KILLTASK statement. For information on SAS/CONNECT processes, see *SAS/CONNECT User's Guide*.

Note: The preferred method for displaying any task (not just SAS/CONNECT processes) is to use the LISTTASK statement instead of SYSTASK LIST.

The preferred method for ending a task is using the KILLTASK statement in place of SYSTASK KILL. △

The SYSRC macro variable contains the return code for the SYSTASK statement. The status variable that you specify with the STATUS option contains the return code of the process started with SYSTASK COMMAND. To ensure that a task executes successfully, you should monitor both the status of the SYSTASK statement and the status of the process that is started by the SYSTASK statement.

If a SYSTASK statement cannot execute successfully, the SYSRC macro variable will contain a non-zero value. For example, there might be insufficient resources to complete a task, or the SYSTASK statement can contain syntax errors. With the SYSTASK KILL statement, if one or more of the processes cannot be terminated, SYSRC is set to a non-zero value.

When a task is started, its status variable is set to NULL. You can use the status variables for each task to determine which tasks failed to complete. Any task whose status variable is NULL did not complete execution. See WAITFOR for more information about the status variables.

Unlike the X statement, you cannot use the SYSTASK statement to start a new interactive session.

See Also

- “WAITFOR Statement” on page 470
- “X Statement” on page 471

TITLE Statement

Specifies title lines for SAS output.

Valid in: anywhere in a SAS program

Windows specifics: Maximum length of the title

See: TITLE Statement in *SAS Language Reference: Dictionary*

Syntax

TITLE <*n*> <'text' | “text”>;

n

specifies the relative line that contains the title line.

'text' | “text”

specifies text that is enclosed in single or double quotation marks.

Details

The TITLE statement specifies title lines to be printed on procedure output files and other SAS output. A TITLE statement takes effect when the DATA or PROC step or RUN group with which it is associated executes. Once you specify a title for a line, it is used for all subsequent output until you cancel the title or define another title for that line.

Under Windows, the maximum title length is 256 characters. If the specified title is greater than the LINESIZE system option, the title is truncated to the line size.

WAITFOR Statement

Suspends execution of the current SAS session until the specified tasks finish executing.

Valid in: anywhere in a SAS program

Windows specifics: all

Syntax

```
WAITFOR<_ANY_ | _ALL_> taskname <taskname...><TIMEOUT=seconds>;
```

taskname

specifies the name of the task(s) that you want to wait for. See “SYSTASK Statement” on page 467 for information about task names. The task name(s) that you specify must match exactly the task names assigned through the SYSTASK COMMAND statement. You cannot use wildcards to specify task names.

ANY_ | ALL_

suspends execution of the current SAS session until either one or all of the specified tasks finishes executing. The default setting is ANY_, which means that as soon as one of the specified task(s) completes executing, the WAITFOR statement will finish executing.

TIMEOUT=*seconds*

specifies the maximum number of seconds that WAITFOR should suspend the current SAS session. If you do not specify the TIMEOUT option, WAITFOR will suspend execution of the SAS session indefinitely.

Details

The WAITFOR statement suspends execution of the current SAS session until the specified task(s) finish executing or until the TIMEOUT interval (if specified) has elapsed. If the specified task was started with the XWAIT option, then the WAITFOR statement ignores that task.

For example, the following statements start three different SAS jobs and suspend the execution of the current SAS session until those three jobs have finished executing:

```
systask command "sas myprog1.sas" taskname=sas1;
systask command "sas myprog2.sas" taskname=sas2;
```

```
systask command "sas myprog3.sas" taskname=sas3;
waitfor _all_ sas1 sas2 sas3;
```

The SYSRC macro variable contains the return code for the WAITFOR statement. If a WAITFOR statement cannot execute successfully, the SYSRC macro variable will contain a non-zero value. For example, the WAITFOR statement can contain syntax errors. If the number of seconds specified with the TIMEOUT option elapses, then the WAITFOR statement finishes executing, and SYSRC is set to a non-zero value if

- you specify a single task that does not finish executing
- you specify more than one task and the `_ANY_` option (which is the default setting), but none of the tasks finishes executing
- you specify more than one task and the `_ALL_` option, and any one of the tasks does not finish executing.

Any task whose status variable is still NULL after the WAITFOR statement has executed did not complete execution.

See Also

- “SYSTASK Statement” on page 467
- “X Statement” on page 471
- “XWAIT System Option” on page 589

X Statement

Runs an operating system command or a Windows application from within a SAS session.

Valid in: anywhere in a SAS program

Windows specifics: Valid values for *command*

See: X Statement in *SAS Language Reference: Dictionary*

Syntax

X <'command'>;

no argument

places you in a Command prompt session, with an operating system prompt. Here you can execute Windows commands in the context of SAS working directory. There are some things that you cannot do from the Command prompt in this situation, such as define environment variables for use by your SAS session. (Environment variables must be defined before you invoke SAS). Type EXIT at the Command prompt and press ENTER to return to your SAS session.

command

specifies a Windows command or a Windows application. This argument can be anything you can specify at a DOS prompt (including the SAS command). Therefore, you can use the X statement to execute Windows applications. The command can be enclosed in quotes, but this syntax is not required.

The command is passed to Windows and executed in the context of the working directory. If errors occur, the appropriate error messages are displayed.

By default, you must type EXIT to return to your SAS session after the command has completed execution. Also by default, if you execute a Windows application such as Notepad, you must close the application before you can return to your SAS session. Specify NOXWAIT in an OPTIONS statement if you do not want to have to type EXIT. With NOXWAIT in effect, as soon as the command finishes execution, control is returned to your SAS session. Note, however, that if you execute a Windows application with the X statement, specifying NOXWAIT does not let you return to your SAS session until you close the application.

Another system option, XSYNC, controls whether you have to wait for the command to finish executing before you can return to your SAS session. If you specify NOXSYNC, you can start a Windows application with the X statement and return to your SAS session without closing the application. For additional details about these two system options, see “XWAIT System Option” on page 589 and “XSYNC System Option” on page 588.

Details

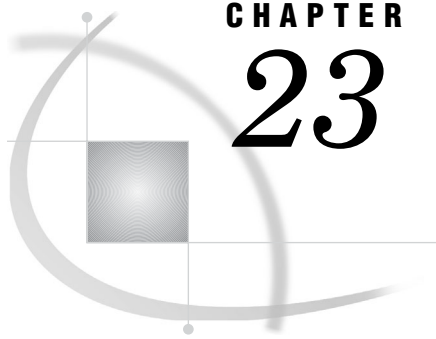
The X statement issues a host command from within a SAS session when you run SAS in windowing mode. SAS executes the X statement immediately.

Under Windows, you can issue the X statement without the *command* argument.

There are other ways of running operating environment commands besides the X statement (and the X command) under Windows.

See Also

- “X Command” on page 377
- “XSYNC System Option” on page 588
- “XWAIT System Option” on page 589
- “CALL SYSTEM Routine” on page 391
- The %SYSEXEC statement in “Macro Statements” on page 597
- “Running Windows or MS-DOS Commands from within SAS” on page 26
- “Adding Applications to the Tools Menu” on page 66



CHAPTER 23

SAS System Options under Windows

<i>SAS System Options under Windows</i>	475
<i>Restricted Options</i>	476
<i>Displaying SAS System Option Settings</i>	476
<i>Changing SAS System Option Settings</i>	476
<i>Syntax for System Options in the SAS Invocation or SAS Configuration File</i>	477
<i>Syntax for Concatenating Libraries in SAS System Options</i>	478
<i>Syntax for System Options in the OPTIONS Statement</i>	478
<i>Processing System Options That Are Set in Several Places</i>	478
<i>Summary of System Options for Windows</i>	479
<i>ACCESSIBILITY System Option</i>	492
<i>ALTLOG System Option</i>	493
<i>ALTPRINT System Option</i>	493
<i>APPEND System Option</i>	494
<i>AUTHPROVIDERDOMAIN System Option</i>	495
<i>AUTHSERVER System Option</i>	496
<i>AUTOEXEC System Option</i>	496
<i>AWSCONTROL System Option</i>	497
<i>AWSDEF System Option</i>	498
<i>AWSMENU System Option</i>	499
<i>AWSMENUMERGE System Option</i>	500
<i>AWSTITLE System Option</i>	500
<i>BUFNO System Option</i>	501
<i>BUFSIZE System Option</i>	502
<i>CATCACHE System Option</i>	503
<i>CLEANUP System Option</i>	504
<i>COMDEF System Option</i>	505
<i>CONFIG System Option</i>	506
<i>DEVICE System Option</i>	506
<i>ECHO System Option</i>	507
<i>EMAILDLG System Option</i>	508
<i>EMAILSYS System Option</i>	509
<i>ENGINE System Option</i>	509
<i>ENHANCEDEDITOR System Option</i>	511
<i>FILELOCKWAITMAX= System Option</i>	511
<i>FILTERLIST System Option</i>	512
<i>FONT System Option</i>	513
<i>FONTALIAS System Option</i>	514
<i>FONTSLC System Option</i>	515
<i>FORMCHAR System Option</i>	515
<i>FULLSTIMER System Option</i>	516
<i>HELPHOST System Option</i>	518

<i>HELPINDEX System Option</i>	518
<i>HELPLLOC System Option</i>	520
<i>HELPPREGISTER System Option</i>	521
<i>HELPTOC System Option</i>	522
<i>HOSTPRINT System Option</i>	524
<i>ICON System Option</i>	524
<i>INITSTMT System Option</i>	525
<i>INSERT System Option</i>	525
<i>JREOPTIONS System Option</i>	526
<i>LINESIZE System Option</i>	527
<i>LOADMEMSIZE System Option</i>	528
<i>LOG System Option</i>	529
<i>MAPS System Option</i>	530
<i>MAXMEMQUERY System Option</i>	531
<i>MEMBLKSZ System Option</i>	532
<i>MEMCACHE System Option</i>	533
<i>MEMLIB System Option</i>	534
<i>MEMMAXSZ System Option</i>	534
<i>MEMSIZE System Option</i>	535
<i>MSG System Option</i>	536
<i>MSGCASE System Option</i>	537
<i>MSYMTABMAX System Option</i>	538
<i>MVARSIZE System Option</i>	539
<i>NEWS System Option</i>	540
<i>NUMKEYS System Option</i>	540
<i>NUMMOUSEKEYS System Option</i>	541
<i>OBS System Option</i>	542
<i>PAGENO System Option</i>	542
<i>PAGESIZE System Option</i>	543
<i>PAPERTYPE System Option</i>	544
<i>PATH System Option</i>	545
<i>PFKEY System Option</i>	546
<i>PRIMARYPROVIDERDOMAIN=</i>	548
<i>PRINT System Option</i>	548
<i>PRNGETLIST System Option</i>	549
<i>PRTABORTDLGS System Option</i>	550
<i>P RTPERSISTDEFAULT System Option</i>	551
<i>PRTSETFORMS System Option</i>	552
<i>REALMEMSIZE System Option</i>	552
<i>REGISTER System Option</i>	553
<i>RESOURCESLOC System Option</i>	554
<i>RSASUSER System Option</i>	555
<i>RTRACE System Option</i>	556
<i>RTRACELOC System Option</i>	556
<i>SASAUTOS System Option</i>	557
<i>SASCONTROL System Option</i>	558
<i>SASHELP System Option</i>	559
<i>SASINITIALFOLDER System Option</i>	559
<i>SASUSER System Option</i>	560
<i>SCROLLBARFLASH System Option</i>	561
<i>SET System Option</i>	561
<i>SGIO System Option</i>	563
<i>SLEEPWINDOW System Option</i>	563
<i>SORTANOM System Option</i>	564

<i>SORTCUT System Option</i>	565
<i>SORTCUTP System Option</i>	566
<i>SORTDEV System Option</i>	567
<i>SORTNAME System Option</i>	568
<i>SORTPARM System Option</i>	568
<i>SORTPGM System Option</i>	569
<i>SORTSIZE System Option</i>	569
<i>SPLASH System Option</i>	570
<i>SPLASHLOC System Option</i>	571
<i>STIMEFMT System Option</i>	572
<i>STIMER System Option</i>	573
<i>SYSGUIFONT System Option</i>	574
<i>SYSIN System Option</i>	575
<i>SYSPARM System Option</i>	576
<i>SYSPRINT System Option</i>	576
<i>SYSPRINTFONT System Option</i>	578
<i>TOOLDEF System Option</i>	580
<i>UPRINTMENUSWITCH System Option</i>	581
<i>USER System Option</i>	581
<i>USERICON System Option</i>	582
<i>VERBOSE System Option</i>	583
<i>WEBUI System Option</i>	584
<i>WINDOWSMENU System Option</i>	584
<i>WORK System Option</i>	585
<i>XCMD System Option</i>	586
<i>XMIN System Option</i>	587
<i>XSYNC System Option</i>	588
<i>XWAIT System Option</i>	589

SAS System Options under Windows

SAS system options control many aspects of your SAS session, including output destinations, the efficiency of program execution, and the attributes of SAS files and data libraries. System options can be specified various ways: in the SAS command, in a SAS configuration file, using PROC OPTLOAD or the DMOPTLOAD command (PROC OPTLOAD and the DMOPTLOAD command load options settings that were previously saved in a SAS data set), in an OPTIONS statement (either in a SAS program or in a SAS autoexec file), in the SAS System Options window, or in SCL programs. “Summary of System Options for Windows” on page 479 gives specific information about where each SAS system option can be specified.

Once a system option is set, it affects all subsequent DATA and PROC steps in a program or SAS session until it is respecified. For example, the CENTER system option affects all subsequent output from a program, regardless of the number of steps in the program.

Some SAS system options have the same effect (and usually the same name) as data set or statement options. For example, the BUFSIZE system option is analogous to the BUFSIZE= data set option. In the case of overlapping options, SAS uses the following rules of precedence:

- data set option values (highest precedence)
- statement option values (precedence over system options)
- system option values (lowest precedence).

Restricted Options

Restricted options are system options whose values are determined by the site administrator. You cannot override restricted options. The following system options in the Windows environment are restricted. For more information about restricted options, see “Restricted Options” in the *SAS Language Reference: Dictionary*.

COMDEF

FILELOCKWAITMAX

MEMCACHE

MEMLIB

PATH

RESOURCESLOC

SASCONTROL

SGIO

TOOLDEF

Displaying SAS System Option Settings

SAS system options are set to the default values. To display the settings of the SAS system options in the SAS log, use the OPTIONS procedure. For example, the following statement produces a list of options, one option per line, with a brief explanation of what each option does:

```
proc options; run;
```

You can specify the SHORT option in the PROC OPTIONS statement to produce a list of option settings with no explanation of the options. For more information, see the OPTIONS procedure in *Base SAS Procedures Guide*.

In an interactive SAS session, the SAS System Options window displays the settings of many SAS system options, including the invocation and configuration options. You cannot edit these options from the Options window. To open the SAS System Options window, enter **Tools ► Options ► System**, or type **options** in the command area and submit the command.

Changing SAS System Option Settings

There are several ways to specify values for SAS system options:

- as part of the command that invokes SAS
- as part of a SAS configuration file that is processed when SAS initializes
- in a Windows environment variable (SAS_OPTIONS) that is processed when SAS initializes
- using PROC OPTLOAD or the DMOPTLOAD command to load a previous set of option values saved to a SAS DATA set.
- as part of the OPTIONS statement from within your SAS session
- using the interactive SAS System Options window
- within SCL or SAS/AF programs, using the OPTSETC and OPTSETN SCL functions.

Some system options can be specified only when a SAS session or process is initialized (starts up), while other options can be changed as needed during your SAS session.

It is important to remember the differences in syntax between specifying a system option in the SAS command when you start SAS or in the SAS configuration file, and specifying a system option in the OPTIONS statement. The syntax for these situations is different, and if you use the wrong syntax, SAS generates an error message. For information on the OPTIONS statement, see *SAS Language Reference: Dictionary*.

Syntax for System Options in the SAS Invocation or SAS Configuration File

When you specify a system option at initialization, it must be preceded by a hyphen (-). For on or off options, just list the keyword corresponding to the appropriate setting. For example, the following command invokes SAS and indicates that SAS output should not be centered:

```
c:\sas\sas.exe -nocenter
```

For options that take a value, do not use an equal sign; follow the option name with a space and then the value. For example, the following SAS command invokes SAS with a line length of 132:

```
c:\sas\sas.exe -linesize 132
```

Physical names (that is, directory names or filenames) should be enclosed in double quotation marks when you use them in the SAS command or in the SAS configuration file. The quotation marks are especially necessary when the file or pathname that you are specifying contains a space or single quotation mark character, which are valid characters in Windows filenames. For example, the following SAS command invokes SAS and indicates that autocall macros are stored in the **C:\SAS\CORE\SASMACRO** directory:

```
c:\sas\sas.exe -sasautos "c:\sas\core\sasmacro"
```

Double quotation marks are also needed when an option value contains '=', as shown in this example:

```
c:\sas\sas.exe -set fruit "navel=orange"
```

To specify more than one option in the SAS command, simply separate each option with a space. For example, the following SAS command combines the three options shown previously in this section:

```
c:\sas\sas.exe -linesize 132 -nocenter
               -sasautos "c:\sas\core\sasmacro"
```

The SAS configuration file must contain only option settings; it cannot contain SAS statements. The file can contain SAS comments. For example, a configuration file named MySASConfig.CFG can contain these option specifications (among others):

```
-nocenter
-noxwait
-pagesize 60
```

All SAS system options can appear in a SAS configuration file. For more information on SAS configuration files, see "SAS Configuration Files" on page 12.

Syntax for Concatenating Libraries in SAS System Options

To provide more flexibility for storing SAS files across different drives, such as multiple logical drives on your hard disk or on a network, SAS lets you concatenate SAS libraries. The concept of concatenation within SAS means that you can specify multiple drives or directories when you specify certain system options in the SAS configuration file or in the SAS command. To specify concatenated directories, specify the directory names inside parentheses, enclose each directory name in double quotation marks, and separate the directory names with spaces.

One practical use of concatenation is the storage of SAS help catalogs. If you want to partition your SAS products among two or more directories, simply specify these multiple directories with the SASHELP option in the SAS configuration file, as in the following example:

```
-sashelp ("c:\sas\core\sashelp"
         "d:\sas\stat\sashelp")
```

Syntax for System Options in the OPTIONS Statement

You can specify many SAS system options in an OPTIONS statement at any point within a SAS session. The options are set for the duration of the SAS session or until you change them with another OPTIONS statement or load a previously saved set of option values using PROC OPTLOAD or the DMOPTLOAD command. For more information about the OPTIONS statement, see *SAS Language Reference: Dictionary*.

When you specify a system option in the OPTIONS statement, do not precede the option name with a hyphen (-). Also, for system options that take a value, use an equal sign (=), not a space. For example, the following statement specifies that output is not to be labeled with a date and that the line size should be 132:

```
options nodate linesize=132;
```

Physical names (that is, directory names or filenames) must be enclosed in quotation marks when used in the OPTIONS statement. For example, the following OPTIONS statement indicates that autocall macros are stored in the C:\SAS\CORE\SASMACRO directory:

```
options sasautos="c:\sas\core\sasmacro";
```

Any file specification that is not enclosed in quotation marks in the OPTIONS statement is assumed to be a logical name, that is, a fileref or an environment variable name. If no logical name is found, SAS issues an error message.

Not all system options can be specified in the OPTIONS statement. To find out whether a system option can be specified in the OPTIONS statement, look up the option name in Table 23.1 on page 480, which summarizes all SAS system option information, including where you can specify the options or use PROC OPTIONS

```
option=optname define;
run;
```

Processing System Options That Are Set in Several Places

When the same system option is set in more than one place, the most recent specification is used. Therefore, the SAS System Options window or OPTIONS

statement takes precedence over the SAS autoexec file; the SAS autoexec file takes precedence over the SAS command; and the SAS command takes precedence over the SAS configuration file and environment variable settings.

Summary of System Options for Windows

Table 23.1 on page 480 lists all the system options available to SAS users under the Windows operating environment. Many of these options have no system-dependent behavior and are described completely in *SAS Language Reference: Dictionary*. Others are available only under Windows and are completely described here. Some system options are described here and in *SAS Language Reference: Dictionary*.

Note: Some system options in *SAS Language Reference: Dictionary* indicate that the system option can have additional operating environment information and to refer to the SAS documentation for your operating environment. If such a system option is not described in *SAS Companion for Windows*, the system option is to be used as described in *SAS Language Reference: Dictionary*. Δ

Use the following legend to determine where to find more information on a system option:

Access	<i>SAS/ACCESS for Relational Databases: Reference.</i>
AppSrv	<i>SAS Intelligence Platform: Application Server Administration Guide</i>
ARM	<i>SAS Interface to Application Response Measurement (ARM): Reference.</i>
CAM	<i>Communications Access Methods for SAS/CONNECT and SAS/SHARE.</i>
Comp	indicates that the option is completely described in this section.
Conn	<i>SAS/CONNECT User's Guide.</i>
DQ	<i>System Options in SAS Data Quality Server: Reference.</i>
DST	<i>Encryption in SAS.</i>
Log	<i>SAS Logging: Configuration and Programming Reference</i>
LR	<i>SAS Language Reference: Dictionary.</i>
Macro	<i>SAS Macro Language: Reference.</i>
Meta	<i>SAS Language Interfaces to Metadata</i>
NLS	<i>SAS National Language Support (NLS): Reference Guide.</i>
Share	<i>SAS/SHARE User's Guide.</i>
SPDE	<i>SAS Scalable Performance Data Engine: Reference.</i>
Web	indicates that the option is described in documentation posted on the SAS Web site (support.sas.com).

Table 23.1 Summary of SAS System Options

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
ACCESSIBILITY	STANDARD	X	X			Comp
ALTLOG arg	NOALTLOG	X	X			Comp
ALTPRINT arg	NOALTPRINT	X	X			Comp
APPEND	none	X	X	X	X	LR
APPLETLOC	none	X	X	X	X	LR
ARMAGENT	none	X	X	X	X	ARM
ARMLOC	ARMLOG.LOG	X	X	X	X	ARM
ARMSUBSYS	ARM_NONE	X	X	X	X	ARM
AUTHPROVIDER-DOMAIN	AUTHPP	X	X			LR, Comp
AUTHSERVER	local and trusted servers	X	X	X	X	Comp
AUTOEXEC arg	AUTOEXEC.SAS if file is available; otherwise none	X	X			Comp
AUTOSAVELOC	none	X	X	X	X	LR
AUTOSIGNON	NOAUTOSIGNON	X	X	X	X	Conn
AWSCONTROL	TITLE SYSTEMMENU MINMAX	X	X	X	X	Comp
AWSDEF arg	80% of display height and width	X	X	X	X	Comp
AWSMENU	AWSMENU	X	X	X	X	Comp
AWSMENUMERGE	AWSMENUMERGE	X	X	X	X	Comp
AWSTITLE arg	none	X	X			Comp
BINDING arg	DEFAULT	X	X	X	X	LR
BOMFILE	BOMFILE	X	X	X	X	NLS
BOTTOMMARGIN	0.000IN	X	X	X	X	LR
BUFNO arg	1	X	X	X	X	LR, Comp
BUFSIZE arg	0	X	X	X	X	LR, Comp
BYERR	BYERR	X	X	X	X	LR
BYLINE	BYLINE	X	X	X	X	LR
BYSORTED	BYSORTED	X	X	X	X	LR
CAPS	NOCAPS	X	X	X	X	LR
CARDIMAGE	NOCARDIMAGE	X	X	X	X	LR
CATCACHE arg	0	X	X			LR, Comp

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
CBUFNO arg	0	X	X	X	X	LR
CENTER	CENTER	X	X	X	X	LR
CGOPTIMIZE	3	X	X	X	X	LR
CHARCODE	NOCHARCODE	X	X	X	X	LR
CLEANUP	CLEANUP	X	X	X	X	LR, Comp
CMDMAC	NOCMDMAC	X	X	X	X	Macro
CMPLIB arg	none	X	X	X	X	LR
CMPMODEL	BOTH	X	X	X	X	LR
CMPOPT arg	NOEXTRAMATH NOMISSCHECK NOPRECISE NOGUARDCHECK NOFUNCDIFFERENCING	X	X	X	X	LR
COLLATE	NOCOLLATE	X	X	X	X	LR
COLORPRINTING	COLORPRINTING	X	X	X	X	LR
COMAMID arg	TCP	X	X		X	Conn, Share, CAM
COMAUX1 arg	none	X	X			CAM
COMAUX2 arg	none	X	X			CAM
COMDEF arg	BOTTOM CENTER	X	X			Comp
COMPRESS arg	NO	X	X	X	X	LR
CONFIG arg	!sasroot\SASV9.CFG	X	X			Comp
CONNECTPERSIST	YES	X	X			Conn
CONNECTREMOTE arg	none	X	X	X	X	Conn
CONNECTSTATUS	CONNECTSTATUS	X	X	X	X	Conn
CONNECTWAIT	CONNECTWAIT	X	X	X	X	Conn
COPIES arg	1	X	X	X	X	LR
CPUCOUNT arg	1	X	X	X	X	LR
CPUID	CPUID	X	X			LR
DATASTMTCHK arg	COREKEYWORDS	X	X	X	X	LR
DATE	DATE	X	X	X	X	LR
DATESTYLE	MDY	X	X	X	X	LR
DBCS	NODBCS	X	X			NLS
DBCSLANG	NODBCSLANG	X	X			NLS

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
DBCSTYPE	WINDOWS	X	X			NLS
DBIDIRECTEXEC	NODBIDIRECTEXEC	X	X	X	X	Access
DBSLICEPARM	THREADED_APPS, 2	X	X	X	X	Access
DBSRVTP	NONE	X	X			Access
DEFLATION	6	X	X	X	X	LR
DMSEXP	NODMSEXP	X	X			LR
DMSPGMLINESIZE	136	X	X			LR
DETAILS	NODETAILS	X	X	X	X	LR
DEVICE arg	none	X	X	X	X	LR, Comp
DFLANG arg	ENGLISH	X	X	X	X	NLS
DKRICOND arg	ERROR	X	X	X	X	LR
DKROCOND arg	WARN	X	X	X	X	LR
DLDMGACTION	FAIL for batch mode; REPAIR for interactive mode	X	X	X	X	LR
DMR	NODMR	X	X			LR, Conn
DMS	DMS	X	X			LR
DMSLOGSIZE arg	99999	X	X			LR
DMSOUTSIZE arg	99999	X	X			LR
DMSSYNCHK	NODMSSYNCHK	X	X	X	X	LR
DQLOCALE arg	none	X	X	X	X	DQ
DQOPTIONS	none	X	X			DQ
DQSETUPLOC arg	none	X	X	X	X	DQ
DSNFERR	DSNFERR	X	X	X	X	LR
DTRESET	NODTRESET	X	X	X	X	LR
DUPLEX arg	NODUPLEX	X	X	X	X	LR
ECHO arg	NOECHO	X	X			Comp
ECHOAUTO	NOECHOAUTO	X	X			LR
EMAILAUTH PROTOCOL arg	NONE	X	X			LR
EMAILDLG arg	NATIVE	X	X			Comp
EMAILFROM	NOEMAILFROM	X	X	X	X	LR
EMAILHOST arg	LOCALHOST	X	X			LR
EMAILID arg	none	X	X			LR

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
EMAILPORT arg	25	X	X			LR
EMAILPW arg	none	X	X			LR
EMAILSYS arg	MAPI	X	X			Comp
ENCODING	WLATIN1	X	X			NLS
ENGINE arg	V9	X	X			LR, Comp
ENHANCEDEDITOR	ENHANCEDEDITOR	X	X			Comp
ERRORABEND	NOERRORABEND	X	X	X	X	LR
ERRORBYABEND	NOERRORBYABEND	X	X	X	X	LR
ERRORCHECK arg	NORMAL	X	X	X	X	LR
ERRORS arg	20	X	X	X	X	LR
EXPLORER	NOEXPLORER	X	X			LR
FILELOCKWAITMAX	600	X	X			Comp
FILESYNC	SAS	X	X			LR
FILTERLIST arg	none	X	X			Comp
FIRSTOBS arg	1	X	X	X	X	LR
FMterr	FMterr	X	X	X	X	LR
FMTSEARCH arg	Work Library	X	X	X	X	LR
FONT arg	Sasfont 8	X	X	X	X	Comp
FONTALIAS arg	varies	X	X			Comp
FONTEMBEDDING	FONTEMBEDDING	X	X	X	X	LR
FONTRENDERING	FREETYPE-POINTS	X	X	X	X	LR
FONTSLoc arg	!sasroot\core\resource	X	X			LR, Comp
FORMCHAR arg	(see SASV9.CFG)	X	X	X	X	LR, Comp
FORMDLIM arg	none	X	X	X	X	LR
FORMS arg	DEFAULT	X	X	X	X	LR
FULLSTIMER	NOFULLSTIMER	X	X	X	X	Comp
GSTYLE	GSTYLE	X	X	X	X	LR
GWINDOW	GWINDOW	X	X	X	X	LR
HELPADDR	none	X	X	X	X	Web
HELPBROWSER	REMOTE	X	X	X	X	LR
HELPENCMD	HELPENCMD	X	X			LR
HELPHOST	NULL	X	X	X	X	LR

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
HELPINDEX arg	/help/common.hlp/index.txt, /help/common.hlp/ keywords.htm, common.hhk	X	X			Comp
HELPLLOC arg	("!sasuser\classdoc" "!sasroot\core\help" "!sasroot\nls\en\help")	X	X			LR, Comp
HELPPORT	0	X	X	X	X	LR
HELPPREGISTER arg	none	X	X			Comp
HELPTOC arg	/help/helpnav.hlp/config.txt /help/common.hlp/toc.htm common.hhc	X	X			Comp
HOSTPRINT	HOSTPRINT	X	X	X	X	Comp
HTTPSERVERPORTMAX	0	X	X			LR
HTTPSERVERPORTMIN	0	X	X			LR
IBUFNO	0	X	X	X	X	LR
IBUFSIZE	0	X	X	X	X	LR
ICON	NOICON	X	X	X	X	Comp
IMPLMAC	NOIMPLMAC	X	X	X	X	Macro
INITCMD arg	none	X	X			LR
INITSTMT arg	none	X	X			LR, Comp
INSERT	none	X	X	X	X	LR
INTERVALDS		X	X	X	X	LR
INVALIDDATA arg	a period (.)	X	X	X	X	LR
IPADDRESS	NOIPADDRESS	X	X			CONN
JPEGQUALITY	75	X	X	X	X	LR
JREOPTIONS	See SASV9.CFG	X	X			Comp
LABEL	LABEL	X	X	X	X	LR
LAST arg	_NULL_	X	X	X	X	LR
LEFTMARGIN arg	0.000IN	X	X	X	X	LR
LINESIZE arg	varies	X	X	X	X	LR, Comp
LOADMEMSIZE	0	X	X			Comp
LOCALE	ENGLISH_UNITEDSTATES	X	X	X	X	NLS
LOCALELANGCHG	NOLOCALELANGCHG	X	X			NLS
LOG arg	filename.LOG in batch mode	X	X			Comp

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
LOGAPPLNAME=	none	X	X			Log
LOGCONFIGLOC=	none	X	X			Log
LOGPARM	WRITE: BUFFERED ROLLOVER	X	X			LR
LRECL	256	X	X	X	X	LR
Macro	Macro	X	X			Macro
MAPS arg	!sasroot\maps	X	X	X	X	LR, Comp
MAUTOLOCDISPLAY	NOMAUTOLOC DISPLAY	X	X	X	X	Macro
MAUTOSOURCE	MAUTOSOURCE	X	X	X	X	Macro
MAXMEMQUERY	0	X	X	X	X	Comp
MAXSEGRATIO	75	X	X	X	X	SPDE
MCOMPILE	MCOMPILE	X	X	X	X	Macro
MCOMPILENOTE	none	X	X	X	X	Macro
MEMBLKSZ	16 MB	X	X			Comp
MEMCACHE	0	X	X	X	X	Comp
MEMLIB	NOMEMLIB	X	X			Comp
MEMMAXSZ	2G	X	X			Comp
MEMSIZE	100663296	X	X			Comp
MERGENOBY	NOWARN	X	X	X	X	LR
MERROR	MERROR	X	X	X	X	Macro
METAAUTORESOURCES	none	X	X			Meta
METACONNECT	none	X	X	X	X	Meta
METAENCRYPTALG arg	SASPROPRIETARY	X	X			Meta
METAENCRYPT LEVEL	CREDENTIALS	X	X			Meta
METAID		X	X			Meta
METAPASS	none	X	X	X	X	Meta
METAPORT	see SASV9.CFG	X	X	X	X	Meta
METAPROFILE	none	X	X			Meta
METAPROTOCOL	BRIDGE	X	X	X	X	Meta
METAREPOSITORY	see SASV9.CFG	X	X	X	X	Meta
METASERVER	see SASV9.CFG	X	X	X	X	Meta
METASPN=	none	X	X	X	X	Meta
METAUSER	none	X	X	X	X	Meta

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
MEXECCNOTE	NOMEXECCNOTE	X	X	X	X	Macro
MEXECSIZE	65536	X	X	X	X	Macro
MFILE	NOMFILE	X	X	X	X	Macro
MINDELIMITER	none	X	X	X	X	Macro
MINOPERATOR	NOMINOPERATOR	X	X	X	X	Macro
MINPARTSIZE	16777216	X	X			SPDE
MISSING arg	a period (.)	X	X	X	X	LR
MLOGIC	NOMLOGIC	X	X	X	X	Macro
MLOGICNEST	NOMLOGICNEST	X	X	X	X	Macro
MPRINT	NOMPRINT	X	X	X	X	Macro
MPRINTNEST	NOMPRINTNEST	X	X	X	X	Macro
MRECALL	NOMRECALL	X	X	X	X	Macro
MREPLACE	MREPLACE	X	X	X	X	Macro
MSG arg	!sasroot\core\sasmsg	X	X			Comp
MSGCASE	NOMSGCASE	X	X			Comp
MSGLEVEL arg	N	X	X	X	X	LR
MSTORED	NOMSTORED	X	X	X	X	Macro
MSYMTABMAX arg	4,194,304 bytes	X	X	X	X	Comp, Macro
MULTENVAPPL	NOMULTENVAPPL	X	X		X	LR
MVARSIZE arg	4,096 bytes	X	X	X	X	Comp, Macro
NETENCRYPT	NONETENCRYPT	X	X	X	X	DST
NETENCRYPT ALGORITHM arg	none	X	X	X	X	DST
NETENCRYPT KEYLEN arg	0	X	X	X	X	DST
NEWS arg	none	X	X			LR, Comp
NLSCOMPATMODE	NONLSCOMPAT-MODE	X	X			NLS
NOTES	NOTES	X	X	X	X	LR
NUMBER	NUMBER	X	X	X	X	LR
NUMKEYS arg	varies	X	X			Comp
NUMMOUSEKEYS arg	3	X	X			Comp
OBJECTSERVER	NOOBJECTSERVER	X	X			LR

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
OBS arg	MAX	X	X	X	X	LR, Comp
ORIENTATION arg	PORTRAIT	X	X	X	X	LR
OVP	NOOVP	X	X	X	X	LR
PAGEBREAKINITIAL	NOPAGEBREAK INITIAL	X	X			LR
PAGENO arg	1	X	X	X	X	LR, Comp
PAGESIZE arg	varies	X	X	X	X	LR, Comp
PAPERDEST arg	none	X	X	X	X	LR
PAPERSIZE arg	LETTER	X	X	X	X	LR
PAPERSOURCE arg	none	X	X	X	X	LR
PAPERTYPE arg	Plain	X	X	X	X	LR, Comp
PARM arg	none	X	X	X	X	LR
PARMCARDS arg	FT15F001	X	X	X	X	LR
PATH arg	!sasroot\core\sasexe	X	X			Comp
PDFACCESS	PDFACCESS	X	X	X	X	LR
PDFASSEMBLY	NOPDFASSEMBLY	X	X	X	X	LR
PDFCOMMENT	NOPDFCOMMENT	X	X	X	X	LR
PDFCONTENT	NOPDFCONTENT	X	X	X	X	LR
PDFCOPY	PDFCOPY	X	X	X	X	LR
PDFFILLIN	PDFFILLIN	X	X	X	X	LR
PFKEY arg	WIN	X	X			Comp
PDFPAGELAYOUT	DEFAULT	X	X	X	X	LR
PDFPAGEVIEW	DEFAULT	X	X	X	X	LR
PDFPASSWORD	xxxxxxx	X	X		X	LR
PDFPRINT	HRES	X	X	X	X	LR
PDFSECURITY	NONE	X	X	X	X	LR
PRINT arg	<i>filename</i> .LST in batch mode	X	X			Comp
PRIMARYPROVIDERDOMAIN	PRIMPD=	X	X			LR
PRINTERPATH arg	none	X	X	X	X	LR
PRINTINIT	NOPRINTINIT	X	X			LR
PRINTMSGLIST	PRINTMSGLIST	X	X	X	X	LR
PRNGETLIST	PRNGETLIST	X	X			Comp

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
PRTABORTDLGS	BOTH	X	X	X	X	Comp
PRTPERSIST DEFAULT	NOPRTPERSIST DEFAULT	X	X			Comp
PRTSETFORMS	PRTSETFORMS	X	X	X	X	Comp
QUOTELENMAX	QUOTELENMAX	X	X	X	X	LR
REALMEMSIZE	0	X	X			Comp
REGISTER arg	none	X	X			Comp
REPLACE	REPLACE	X	X	X	X	LR
RESOURCESLOC arg	see SASV9.CFG	X	X			Comp
REUSE arg	NO	X	X	X	X	LR
RIGHTMARGIN arg	0.000 IN	X	X	X	X	LR
RSASIoTTRANSERROR	RSASIoTTRANSERROR	X	X	X	X	NLS
RSASUSER	NORSASUSER	X	X			LR, Comp
RTRACE	none	X	X			Comp
RTRACELOC arg	none	X	X	X	X	Comp
S arg	0	X	X	X	X	LR
S2 arg	0	X	X	X	X	LR
S2V arg	0	X	X	X	X	LR
SASAUTOS arg	SASAUTOS	X	X	X	X	Comp, Macro
SASCMD	none	X	X	X	X	Conn
SASCONTROL	SYSTEMMENU MINMAX	X	X	X	X	Comp
SASFRSCR	#LN00003					Conn
SASHELP arg	see SASV9.CFG	X	X			LR, Comp
SASINITIALFOLDER	none	X	X			Comp
SASMSTORE arg	none	X	X	X	X	Macro
SASSCRIPT arg	see SASV9.CFG	X	X	X	X	Conn
SASUSER arg	see SASV9.CFG	X	X			LR, Comp
SCROLLBARFLASH	NOSCROLLBAR FLASH	X	X	X	X	Comp
SECPACKAGE	NEGOTIATE	X	X			Comp
SECPACKAGELIST	KERBEROS, NTLM	X	X			Comp
SEQ arg	8	X	X	X	X	LR
SERROR	SERROR	X	X	X	X	Macro

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
SET arg	none	X	X	X	X	Comp
SETINIT	NOSETINIT	X	X			LR
SGIO	NOSGIO	X	X			Comp
SHARESESSIONCNTL=	SERVER	X	X	X	X	Share
SIGNONWAIT	SIGNONWAIT	X	X	X	X	Conn
SKIP arg	0	X	X	X	X	LR
SLEEPWINDOW	SLEEPWINDOW	X	X			Comp
SOLUTIONS	SOLUTIONS	X	X			LR
SORTANOM	none	X	X	X	X	Comp
SORTCUT	0	X	X	X	X	Comp
SORTCUTP	0	X	X	X	X	Comp
SORTDEV	the same location as -WORK	X	X	X	X	Comp
SORTDUP arg	PHYSICAL	X	X	X	X	LR
SORTEQUALS	SORTEQUALS	X	X	X	X	LR
SORTNAME	none	X	X		X	Comp
SORTPARM	none	X	X	X	X	Comp
SORTPGM	BEST	X	X	X	X	Comp
SORTSEQ arg	none	X	X	X	X	NLS
SORTSIZE arg	64M	X	X	X	X	LR, Comp
SORTVALIDATE	NOSORTVALIDATE	X	X	X	X	LR
SOURCE	SOURCE	X	X	X	X	LR
SOURCE2	NOSOURCE2	X	X	X	X	LR
SPDEINDEXSORTSIZE	33554432	X	X	X	X	SPDE
SPDEMAXTHREADS	0	X	X			SPDE
SPDESORTSIZE	33554432	X	X	X	X	SPDE
SPDEUTILLOC	none	X	X			SPDE
SPDEWHEVAL	COST	X	X			SPDE
SPLASH	SPLASH	X	X			Comp
SPLASHLOC	none	X	X			Comp
SPOOL	NOSPOOL	X	X	X	X	LR
SQLCONSTDATETIME	SQLCONSTDATETIME	X	X	X	X	LR
SQLMAPPUTTO	NONE	X	X	X	X	ACCESS
SQLREDUCEPUT	DBMS	X	X	X	X	LR
SQLREDUCEPUTOBS	0	X	X	X	X	LR

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
SQLREDUCEPUTVALUES	0	X	X	X	X	LR
SQLREMERGE	SQLREMERGE	X	X	X	X	LR
SQLLUNDOPOLICY	REQUIRED	X	X		X	LR
SSLCERTISS	none	X	X	X	X	DST
SSLCERTSERIAL	none	X	X	X	X	DST
SSLCERTSUBJ	none	X	X	X	X	DST
SSLCLIENTAUTH	NOSSLCLIENTAUTH	X	X	X	X	DST
SSLCRLCHECK	NOSSLCRLCHECK	X	X	X	X	DST
SSPI	NOSSPI	X	X	X	X	AppSrv
STARTLIB	STARTLIB	X	X			LR
STEPCHKPT	NOSTEPCHKPT	X	X			LR
STEPCHKPTLIB	WORK	X	X			LR
STEPRESTART	NOSTEPRESTART	X	X			LR
STIMEFMT	M	X	X	X	X	Comp
STIMER	STIMER	X	X	X	X	Comp
SUMSIZE arg	0	X	X	X	X	LR
SVGCONTROLBUTTONS	NOSVGCONTROLBUTTONS	X	X	X	X	LR
SVGHEIGHT	INITIAL	X	X	X	X	LR
SVGPRESERVEASPECTRATIO	ELEMENT	X	X	X	X	LR
SVGTITLE	none	X	X	X	X	LR
SVGVIEWBOX	none	X	X	X	X	LR
SVGWIDTH	none	X	X	X	X	LR
SVGX	none	X	X	X	X	LR
SVGY	none	X	X	X	X	LR
SYMBOLGEN	NOSYMBOLGEN	X	X	X	X	Macro
SYNTAXCHECK	SYNTAXCHECK	X	X	X	X	LR
SYSGUIFONT arg	display setting	X	X			Comp
SYSIN arg	none	X	X			Comp
SYSARM arg	none	X	X	X	X	Comp, Macro
SYSRINT arg	default system printer	X	X	X	X	Comp
SYSRINTFONT arg	none	X	X	X	X	LR, Comp
SYSRPUTSYNC	NO	X	X			Conn
TBUFSIZE arg	0	X	X	X	X	Conn, CAM

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
TCPPOORTFIRST arg	0	X	X	X	X	Conn, CAM
TCPPOORTLAST arg	0	X	X	X	X	Conn, CAM
TERMINAL	TERMINAL	X	X			LR
TERMSTMT	none	X	X			LR
TEXTURELOC	none	X	X	X	X	LR
THREADS	THREADS	X	X	X	X	LR
TOOLDEF arg	TOP RIGHT	X	X			Comp
TOOLSMENU	TOOLSMENU	X	X			LR
TOPMARGIN arg	0.000 IN	X	X	X	X	LR
TRAINLOC	none	X	X			LR
TRANTAB arg	none	X	X	X	X	NLS
UNIVERSALPRINT	NOUNIVERSAL PRINT	X	X			LR
UPRINTMENU SWITCH	NOUPRINTMENU SWITCH	X	X			Comp
UPRINTCOMPRESSION	UPRINTCOMPRESSION	X	X	X	X	LR
USER arg	none	X	X	X	X	LR, Comp
USERICON arg	none	X	X			Comp
UTILLOC arg	WORK	X	X			LR
UIDCOUNT arg	100	X	X	X	X	LR
UIDGENDHOST arg	none	X	X			LR
V6CREATEUPDATE arg	ERROR	X	X			LR
VALIDFMTNAME arg	LONG	X	X	X	X	LR
VALIDVARNAME arg	V7	X	X	X	X	LR
VARLENCHK	WARN	X	X	X	X	LR
VERBOSE	NOVERBOSE	X	X			Comp
VIEWMENU	VIEWMENU	X	X			LR
VNFERR	VNFERR	X	X	X	X	LR
WEBUI	NOWEBUI	X	X			Comp
WINDOWSMENU	NOWINDOWSMENU	X	X	X	X	Comp
WORK arg	!TEMP\SAS Temporary Files	X	X			LR, Comp
WORKINIT	WORKINIT	X	X			LR

Options Specification	Default Value	SAS invocation	Config-uration file	SAS System Options window	OPTIONS statement	See
WORKTERM	WORKTERM	X	X	X	X	LR
XCMD	XCMD	X	X			Comp
XMIN	NOXMIN	X	X	X	X	Comp
XSYNC	XSYNC	X	X	X	X	Comp
XWAIT	XWAIT	X	X	X	X	Comp
YEARCUTOFF arg	1920	X	X	X	X	LR

ACCESSIBILITY System Option

Enables the accessibility features on the Customize Tools dialog box.

Default: STANDARD

Valid in: configuration file, SAS invocation

Category: Input control: Data processing

PROC OPTIONS GROUP= INPUTCONTROL

Windows specifics: all

Syntax

-ACCESSIBILITY STANDARD | EXTENDED

STANDARD

specifies that the standard Customize Tools dialog box and Properties dialog boxes are enabled.

EXTENDED

specifies that the accessibility features are enabled in the Customize Tools dialog box and for some Properties dialog boxes.

Details

When the ACCESSIBILITY option is set to EXTENDED, the Customize Tools Custom tabbed page and some SAS Properties dialog boxes are modified for accessibility.

The Customize tab contains two additional buttons, **File Menu** and **Edit Menu**. These menu buttons enable accessibility to the commands that are available using the toolbar buttons.

The tabs in these dialog boxes are buttons in order to enable some of the SAS Properties dialog boxes for accessibility. Using the Ctrl + Page Up and Ctrl + Page Down keys, you can access all parts of these Properties dialog boxes.

When this system option is set to EXTENDED, you can toggle between the overstrike cursor and the insert cursor. The insert cursor is the default since some accessibility utilities expect the insert cursor.

ALTLOG System Option

Specifies a destination for a copy of the SAS log.

Default: NOALTLOG

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES, LOGCONTROL

Windows specifics: *destination* must resolve to a valid Windows path or filename

Syntax

-ALTLOG *destination*

-NOALTLOG

ALTLOG *destination*

specifies a destination for a copy of the SAS log. The *destination* argument can be a valid Windows pathname or filename (including device names) or an environment variable associated with a pathname. If you specify only a pathname, the copy is placed in a file in the specified directory, with a name of *filename*.LOG, where *filename* is the name of your SAS job. If you are running SAS interactively and specify only a pathname, the log is written to a file named SAS.LOG within that path.

NOALTLOG

specifies that the SAS log is not copied.

Details

The ALTLOG system option specifies a destination to which a copy of the SAS log is written. Use the ALTLOG system option to capture log output for printing.

To send the SAS log to a printer other than the default printer, use a valid Windows printer name for the *destination* value.

When SAS is started with the OBJECTSERVER and NOTERMINAL system options and no log is specified, SAS discards all log and alternate log messages.

Note: ALTLOG replaces the following system options from earlier versions of SAS: LDISK, LPRINT, and LTYPE. △

See Also

- “Routing Procedure Output and the SAS Log to a File” on page 184
- in *SAS Language Reference: Concepts*.

ALTPRINT System Option

Specifies the destination for the copies of the output files from SAS procedures.

Default: NOALTPRINT

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: *destination* must resolve to a valid Windows pathname or filename

Syntax

-ALTPRINT *file-specification*

-NOALTPRINT

ALTPRINT *file-specification*

specifies the destination for a copy of the SAS procedure output file. The *file-specification* argument can be a valid Windows pathname or filename (including device names) or an environment variable associated with a pathname. If you specify only a pathname, the copy is placed in a file in the specified directory, with a name of *filename.LST*, where *filename* is the name of your SAS job. If you are running SAS interactively and specify only a pathname, the filename is SAS.

NOALTPRINT

does not create a copy of the SAS procedure output file.

Details

The ALTPRINT system option specifies the destination for the copies of output files from SAS procedures. Use the ALTPRINT system option to capture procedure output for printing.

To send the procedure output to a printer other than the default printer, use a valid Windows printer name for the *destination* value.

Note: ALTPRINT replaces the following system options from earlier versions of SAS: PDISK, PPRINT, and PTYPE. Δ

See Also

- “Routing Procedure Output and the SAS Log to a File” on page 184
- “Printing” on page 168

APPEND System Option

Used when SAS starts, appends the specified value at the end of the specified system option.

Default: none

Valid in: configuration file, SAS invocation

PROC OPTIONS GROUP= ENVFILES

Windows specifics: all

Syntax

-APPEND *system-option argument*

system-option

can be FMTSEARCH, HELPLOC, MAPS, MSG, SAMPLOC, SASAUTOS, SET, SASHELP, or SASSCRIPT.

argument

specifies a new pathname or an environment setting that you want to append to the current value of *system-option*. The following example shows that a library is being appended to the FMTSEARCH option:

```
-set APFMTLIB 'SASEnvironment/SASFormats'
-append fmtsearch APFMTLIB
```

Details

By default, if you specify the FMTSEARCH, HELPLOC, MAPS, MSG, SASAUTOS, SET, SASSCRIPT, or SASHELP system option more than one time, the last value that is specified is the value that SAS uses. If you want to add pathnames to the pathnames that were already specified by one of these options, you must use the APPEND system option to add the new pathname. For example, if you entered the following SAS command, the only location that SAS will look for help files is **c:\app2\help**, and the output of PROC OPTIONS will show only **c:\app2\help**:

```
sas -helploc 'c:\app1\help' -helploc 'c:\app2\help'
```

If you want SAS to look in both locations for help files, you must use the APPEND option:

```
sas -helploc 'c:\app1\help' -append helploc 'c:\app2\help'
```

For the value of the HELPLOC option, PROC OPTIONS will now show

```
('c:\app1\help' 'c:\app2\help')
```

See Also

- See the Append system option in the *SAS Language Reference: Dictionary* to append a value to a system option after SAS starts.

AUTHPROVIDERDOMAIN System Option

Associates a domain suffix with an authentication provider.

Valid in: configuration file, SAS invocation

Alias: AUTHPD

Category: Environment control: Initialization and operation

PROC OPTIONS GROUP= EXECMODES

See: AUTHPROVIDERDOMAIN in *SAS Language Reference: Dictionary*

Syntax

AUTHPROVIDERDOMAIN <provider: domain>

AUTHPROVIDERDOMAIN <(provider-1: domain-1<, ...provider: domain-n)>>

AUTHSERVER System Option

Specifies the authentication domain server to search for secure server logins.

Default: local and trusted servers

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Initialization and operation

PROC OPTIONS GROUP= EXECMODES

Windows specifics: all

Syntax

-AUTHSERVER <" | 'domain-name' | '.'>

AUTHSERVER <" | 'domain-name' | '.'>

" "

specifies to search the local server first, and then search trusted servers for a valid user login.

'domain-name'

specifies a specific domain-name to search for a valid user login. Single quotation-marks are required.

'.'

specifies to search only the local server for a valid user login. Single quotation-marks are required.

Details

The AUTHSERVER system option specifies which servers to search to validate user logins.

Comparisons

You use the AUTHSERVER system option to specify a single authentication domain. You use the AUTHPROVIDERDOMAIN system option to specify multiple authentication providers and the associated domains.

See Also

- "AUTHPROVIDERDOMAIN System Option" on page 495

AUTOEXEC System Option

Specifies the SAS autoexec file.

Default: AUTOEXEC.SAS, if the file is available; otherwise, none

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: *file-specification* must be a valid Windows filename

Syntax

-AUTOEXEC *file-specification*

-NOAUTOEXEC

AUTOEXEC *file-specification*

specifies the SAS autoexec file to be used instead of the default AUTOEXEC.SAS file. The *file-specification* argument can be a valid Windows filename or an environment variable associated with a pathname. For more information on the SAS autoexec file, see “SAS Autoexec File” on page 18.

NOAUTOEXEC

indicates that no SAS autoexec file is processed, even if one exists.

Details

The AUTOEXEC system option specifies the autoexec file. The autoexec file contains SAS statements that are executed automatically when you invoke SAS or when you start another SAS process. The autoexec file can contain any valid SAS statements. For example, you can include LIBNAME statements for SAS libraries you access routinely in SAS sessions.

If no AUTOEXEC.SAS file is found, the default value for this option is NOAUTOEXEC.

See Also

- “SAS Autoexec File” on page 18

AWSCONTROL System Option

Specifies whether the main SAS window includes a title bar, a system/control menu, and minimize/maximize buttons.

Default: TITLE SYSTEMMENU MINMAX

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

```
-AWSCONTROL <TITLE | NOTITLE><SYSTEMMENU | NOSYSTEMMENU
><MINMAX | NOMINMAX>
```

```
AWSCONTROL= <TITLE | NOTITLE><SYSTEMMENU |
NOSYSTEMMENU><MINMAX | NOMINMAX>
```

AWSCONTROL

specifies to display the title bar, the system menu, and the minimize and maximize buttons on the main SAS window.

TITLE | NOTITLE

specifies whether to display the title bar on the main SAS window. If NOTITLE is specified, the system menu and the minimize and maximize buttons are automatically omitted as well.

SYSTEMMENU | NOSYSTEMMENU

specifies whether to display the system menu on the title bar of the main SAS window. If NOSYSTEMMENU is specified, the minimize and maximize buttons are also omitted.

MINMAX | NOMINMAX

specifies whether to display the minimize and maximize buttons on the title bar of the main SAS window.

Details

The AWSCONTROL system option controls only the main SAS window, not the windows that are contained inside the main SAS window. The SASCONTROL system option controls those SAS process windows.

This system option is intended for use by SAS/AF programmers to customize the interface of their applications.

See Also

- “SASCONTROL System Option” on page 558

AWSDEF System Option

Specifies the location and dimensions of the main SAS window when SAS initializes.

Default: 80% of the display height and width

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

```
-AWSDEF row-percent-position column-percent-position height-percent width-percent
```

AWSDEF=row-percent-position column-percent-position height-percent width-percent

row-percent-position and column-percent-position

specify screen percentages that control the position of the upper-left corner of the main SAS window. For example, if you specify 50 for each of these values, the upper-left corner of the SAS window is positioned in the center of your display.

The valid range of values for these parameters is 0 through 95.

height-percent and width-percent

specify screen percentages that control the size of the main SAS window. For example, if you specify 100 for each of these values, the SAS window occupies your entire display. If you specify 50 for each of these values, the SAS window occupies half of your display.

The valid range of values for these parameters is 40 through 100.

Details

The AWSDEF system option specifies the location and dimensions of the main SAS window when SAS initializes. For an example of how to use the AWSDEF system option, see “Changing the Size and Placement of the Main SAS Window” on page 65.

AWSMENU System Option

Specifies whether to display the menu bar in the main SAS window.

Default: AWSMENU

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-AWSMENU | -NOAWSMENU

AWSMENU | NOAWSMENU

AWSMENU

specifies to display the menu bar in the main SAS window.

NOAWSMENU

specifies to omit the menu bar in the main SAS window.

Details

The AWSMENU system option is intended for use by SAS/AF programmers to customize the interface of their applications.

AWSMENUMERGE System Option

Specifies whether to embed menu items that are specific to Windows in the main menus.

Default: AWSMENUMERGE

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-AWSMENUMERGE | -NOAWSMENUMERGE

AWSMENUMERGE | NOAWSMENUMERGE

AWSMENUMERGE

specifies to embed the menu items that are specific to Windows.

NOAWSMENUMERGE

specifies to not embed the menu items that are specific to Windows.

Details

The AWSMENUMERGE system option determines whether the menu items that are specific to the Windows operating environment are included in the main SAS window menus.

This system option is used by SAS/AF programmers to customize the interface of their applications. If SAS is started in batch mode, SAS sets this system option to NOAWSMENUMERGE.

See Also

- “WINDOWSMENU System Option” on page 584

AWSTITLE System Option

Replaces the default text in the main SAS title bar.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-AWSTITLE *“title-text”*

“title-text”

specifies the text that appears in the title bar of the main SAS window. The text must be enclosed in either single or double quotation marks.

Details

The AWSTITLE system option allows you to replace the default text in the title bar of the main SAS window with the title that you specify.

This system option is intended for use by SAS/AF programmers to customize the interface of their applications.

BUFNO System Option

Specifies the number of buffers to be allocated for processing SAS data sets.

Default: 1

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES, PERFORMANCE

Windows specifics: Default value

See: BUFNO System Option in *SAS Language Reference: Dictionary*

Syntax

-BUFNO *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

BUFNO= *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

n | *nK* | *nM* | *nG*

specifies the number of buffers in multiples of 1 (bytes); 1,024 (kilobytes); 1,048,576 (megabytes); or 1,073,741,824 (gigabytes). You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 buffers, a value of **.782k** specifies 801 buffers, and a value of **3m** specifies 3,145,728 buffers.

For values greater than 1G, use the *nM* option or specify MAX.

hexX

specifies the number of buffers as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** specifies 45 buffers.

MIN

sets the number of buffers to 0, and requires SAS to use the default value of 1.

MAX

sets the number of buffers to 2,147,483,647.

Details

The number of buffers is not a permanent attribute of the data set; it is valid only for the current SAS session or job.

BUFNO= applies to SAS data sets that are opened for input, output, or update.

Using BUFNO= can improve execution time by limiting the number of input/output operations that are required for a particular SAS data set. The improvement in execution time, however, comes at the expense of increased memory consumption.

Under Windows, the maximum number of buffers that you can allocate is determined by the amount of memory available. To request that SAS allocate the number of buffers based on the number of pages for the data set, use the SASFILE statement.

See Also

- “BUFSIZE System Option” on page 502
- “SASFILE Statement” in *SAS Language Reference: Dictionary*.
- The chapter on optimizing system performance in *SAS Language Reference: Concepts*.

BUFSIZE System Option

Specifies the permanent buffer page size for output SAS data sets.

Default: 0

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES, PERFORMANCE

Windows specifics: Valid values for *n*

See: BUFSIZE System Option in *SAS Language Reference: Dictionary*

Syntax

-BUFSIZE *n* | *nK* | *nM* | *nG* | *hexX* | MAX

BUFSIZE=*n* | *nK* | *nM* | *nG* | *hexX* | MAX

n* | *nK* | *nM* | *nG

specifies the buffer page size in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes), and 1,073,741,824 (gigabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the buffer page size as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the buffer page size to 45 bytes.

MAX

sets the buffer page size to 2,147,483,647 bytes.

Details

The BUFSIZE system option enables you to specify the permanent buffer page size for output SAS data sets. Under Windows, the value can range from 512 bytes to 2,147,483,647 bytes. Using the default value of 0 optimizes the buffer page size by enabling the engine to pick a value depending on the size of the observation.

Experienced users might want to vary the value of the BUFSIZE system option if you are trying to maximize memory usage or the number of observations per page.

See Also

- “BUFNO System Option” on page 501
- The chapter about optimizing system performance in *SAS Language Reference: Concepts*.

CATCACHE System Option

Specifies the number of SAS catalogs to keep open.

Default: 0

Valid in: configuration file, SAS invocation

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics: Valid values for *n*

See: CATCACHE System Option in *SAS Language Reference: Dictionary*

Syntax

-CATCACHE *n* | *nK* | MIN | MAX

n* | *nK

specifies the number of open-file descriptors to keep in cache memory in multiples of 1 (*n*) or 1,024 (*nK*). You can specify decimal values for the number of kilobytes. For example, a value of **8** specifies 8 open-file descriptors, a value of **.782k** specifies 801 open-file descriptors, and a value of **3k** specifies 3,072 open-file descriptors.

If *n* > 0, SAS places up to that number of open-file descriptors in cache memory instead of closing the catalogs.

MIN

sets the number of open-file descriptors that are kept in cache memory to 0.

MAX

sets the number of open-file descriptors that are kept in cache memory to 32,767.

Details

By using the CATCACHE system option to specify the number of SAS catalogs to keep open, you can avoid the repeated opening and closing of the same catalogs.

If SAS is running on a z/OS server and the MINSTG system option is in effect, SAS sets the value of CATCACHE to 0.

See Also

- The chapter about optimizing system performance in *SAS Language Reference: Concepts*.

CLEANUP System Option

Specifies how to handle an out-of-resource condition.

Default: CLEANUP

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Error handling

PROC OPTIONS GROUP= ERRORHANDLING

Windows specifics: behavior when running in batch mode

See: CLEANUP System Option in *SAS Language Reference: Dictionary*

Syntax

-CLEANUP | -NOCLEANUP

CLEANUP | NOCLEANUP

CLEANUP

specifies that during the entire session, SAS attempts to perform automatic, continuous clean-up of resources that are not essential for execution. Nonessential resources include those resources that are not visible to the user (for example, cache memory) and are visible to the user (for example, the KEYS windows).

CLEANUP does not prompt you for any out-of-resource condition except for out-of-disk-space conditions. If you do not want to be prompted for out-of-disk-space conditions, use the CLEANUP option in conjunction with the NOTERMINAL option.

NOCLEANUP

specifies that SAS allow the user to choose how to handle an out-of-resource condition. When NOCLEANUP is in effect and SAS cannot execute because of a lack of resources, SAS automatically attempts to clean up resources that are not visible to the user (for example, cache memory). However, resources that are visible to the user (for example, the KEYS windows) are not automatically cleaned up. Instead, SAS prompts you before attempting to regain resources.

Details

The CLEANUP system option indicates whether you are prompted with a menu of items to clean up when SAS encounters an out-of-resource condition.

If you specify NOCLEANUP and are prompted for input, you can select **Continuous** on every menu except the out-of-disk-space menu. If you choose **Continuous**, the CLEANUP option is turned on and you are not prompted again in out-of-resource conditions, unless SAS runs out of disk space.

COMDEF System Option

Specifies the location where the SAS Command window is displayed.

Default: BOTTOM CENTER

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-COMDEF TOP | CENTER | BOTTOM
<LEFT | CENTER | RIGHT>

TOP | CENTER | BOTTOM

specifies the vertical position of the SAS Command window. The default value is BOTTOM.

LEFT | CENTER | RIGHT

specifies the horizontal position of the SAS Command window. The default value is CENTER.

Details

You must specify a vertical position first. You do not have to specify a horizontal position, but if you omit it, CENTER is used.

Note: The SAS Command window is positioned with respect to your entire display, not to the main SAS window. Also, the COMDEF system option applies only when the command bar is not docked to the main SAS window. △

See Also

- “Setting Session Preferences” on page 59
- “Using the Command Bar to Issue Commands” on page 41

CONFIG System Option

Specifies the configuration file that is used when initializing or overriding the values of SAS system options.

Default: `!sasroot\SASV9.CFG`

Valid in: configuration file, SAS invocation

Category: System administration: Installation

PROC OPTIONS GROUP= INSTALL

Windows specifics: all

Syntax

`-CONFIG file-specification`

file-specification

specifies the filename of the SAS configuration file that you want to use, or a Windows environment variable that resolves to a valid filename. The *file-specification* must be a valid Windows filename. If *file-specification* contains spaces, it must be enclosed in quotation marks.

Details

The CONFIG system option specifies the complete filename of your configuration file. This file contains SAS options that are executed automatically whenever SAS is invoked. SAS supplies a default configuration file, but you can create your own configuration file and store it in a location you choose.

See Also

- “SAS Configuration Files” on page 12

DEVICE System Option

Specifies a device driver for graphics output for SAS/GRAPH software.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Alias: -DEV

Category: Graphics: Driver settings

PROC OPTIONS GROUP= GRAPHICS

Windows specifics: Valid values for *device-driver-name*; default value

See: DEVICE System Option in *SAS Language Reference: Dictionary*

Syntax

`-DEVICE device-driver-name`

`DEVICE=device-driver-name`

device-driver-name

specifies the name of a device driver for graphics output.

Details

To see the list of device drivers that are available under Windows, you can use the GDEVICE procedure. If you are using the SAS windowing environment, submit the following statements:

```
proc gdevice catalog=sashelp.devices;
run;
quit;
```

If you want to write the device list to the SAS log, submit the following statements:

```
proc gdevice catalog=sashelp.devices nofs;
  list _all_;
run;
quit;
```

Your site might have defined additional device catalogs referenced by the GDEVICE0 libref. See your on-site SAS support personnel for more information.

See Also

- “GDEVICE Procedure” in *SAS/GRAPH: Reference*

ECHO System Option

Specifies a message to be echoed to the SAS log while initializing SAS.

Default: NOECHO

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: all

Syntax

`-ECHO “message” | -NOECHO`

ECHO “*message*”

specifies the text of the message to be echoed to the SAS log. The text must be enclosed in single or double quotation marks if the message is more than one word. Otherwise, quotation marks are not needed.

NOECHO

specifies that no messages are to be echoed to the SAS log.

Details

Messages that result from errors in the autoexec file are printed in the SAS log regardless of how the ECHO system option is set.

Example

For example, you can specify the following:

```
-echo "SAS System under Windows
      is initializing."
```

The message appears in the LOG window as SAS initializes.

See Also

- “ECHOAUTO System Option” in *SAS Language Reference: Dictionary*
- The SAS Log in *SAS Language Reference: Concepts*.

EMAILDLG System Option

Specifies whether to use the native e-mail dialog box provided by your e-mail application or the e-mail dialog box provided by SAS.

Default: NATIVE

Valid in: configuration file, SAS invocation

Category: Environment control: E-mail

PROC OPTIONS GROUP= E-MAIL

Windows specifics: all

Syntax

-EMAILDLG NATIVE | SAS

NATIVE

specifies to use the e-mail dialog box provided by your e-mail system vendor. You can use the native dialog box with SAS only if the e-mail system supports the MAPI interface.

SAS

specifies to use the e-mail dialog box provided by SAS.

Details

The EMAILDLG system option specifies whether to use the native e-mail interactive dialog box provided by your e-mail application or the e-mail interface provided by SAS. SAS uses the native dialog box by default.

See Also

- “Sending E-Mail Using SAS” on page 42

EMAILSYS System Option

Specifies the e-mail protocol to use for sending electronic mail.

Default: MAPI

Valid in: configuration file, SAS invocation

Category: Environment control: Email

PROC OPTIONS GROUP= EMAIL

Windows specifics: all

Syntax

-EMAILSYS MAPI | VIM | SMTP

MAPI

specifies to use the Messaging Application Program Interface (MAPI) electronic mail interface. This value is the default.

VIM

specifies to use the Vendor Independent Mail (VIM) electronic mail interface.

SMTP

specifies to use the Simple Mail Transfer Protocol e-mail interface.

Details

SAS supports three types of protocols: MAPI (such as Microsoft Exchange), Vendor Independent Mail (VIM—such as Lotus Notes) and SMTP. The default value is MAPI. If you specify SMTP, you must also specify and configure the EMAILHOST and EMAILPORT system options. SMTP is available only when you are sending e-mail programmatically. SMTP is not available using either your e-mail program native dialog box or the SAS e-mail dialog box.

See Also

- “Sending E-Mail Using SAS” on page 42
- From *SAS Language Reference: Dictionary*
 - “EMAILID System Option”
 - “EMAILPW System Option”
 - “EMAILAUTHPROTOCOL System Option”
- “The SMTP E-mail Interface” in *SAS Language Reference: Concepts*.

ENGINE System Option

Specifies the default access method to use for SAS libraries.

Default V9

Valid in: configuration file, SAS invocation

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Window specifics: valid values

Syntax

-ENGINE *engine-name*

engine-name

can be one of the following under Windows:

BASE | V9

specifies the default SAS engine for SAS System 9 files.

BMDP

specifies the engine for BMDP data files.

OSIRIS

specifies the engine for OSIRIS data files.

SPSS

specifies the engine for SPSS data files.

V8

specifies the SAS engine all Version 8 files.

V7

specifies the SAS engine for all Version 7 files.

V6

specifies the default engine for Releases 6.08 - 6.12. The V6 engine is supported only in 32-bit operating environments.

V604

specifies the default engine for Release 6.04 and Release 6.03.

XML

specifies the default engine for XML files.

XPORT

specifies the transport engine.

Details

The default engine is used when a SAS library points to an empty directory or a new file. For information about SAS/SHARE and SAS/ACCESS engines, see their respective documentation.

See Also

- “Types of Library Engines” on page 125
- *SAS Language Reference: Concepts*
- *SAS/ACCESS for Relational Databases: Reference*

- *Communications Access Methods for SAS/CONNECT and SAS/SHARE*

ENHANCEDEDITOR System Option

Specifies whether to enable the Enhanced Editor during SAS invocation.

Default: ENHANCEDEDITOR

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-ENHANCEDEDITOR | -NOENHANCEDEDITOR

ENHANCEDEDITOR

specifies to enable the Enhanced Editor during SAS invocation.

NOENHANCEDEDITOR

specifies not to enable the Enhanced Editor during SAS invocation.

Details

By default, the Enhanced Editor is enabled when you start SAS. If you do not want the Enhanced Editor enabled when you start SAS, use the NOENHANCEDEDITOR system option.

See Also

- “WEDIT Command” on page 364

FILELOCKWAITMAX= System Option

Sets an upper limit on the amount of time that SAS will wait for a locked file.

Default: 600

Valid in: configuration file, SAS invocation

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics all

Syntax

FILELOCKWAITMAX =*wait-time*

wait-time

specifies the amount of time, in seconds, that SAS will wait for a locked file to become available.

Interaction: Specifying the FILELOCKWAITMAX= system option can have an adverse effect on one or more SAS/SHARE server and client sessions that are waiting for the release of a SAS file that is locked by another process. One or more wait conditions could lead to failed processes for a SAS/SHARE server and clients.

To prevent the possibility of a failed SAS/SHARE process, you can specify FILELOCKWAITMAX=0, which cancels the amount of time that a SAS/SHARE server and clients would wait for the release of a locked file. Canceling the wait time would prevent a failed process.

Range: 0 - 600

Default: 600

Details

The FILELOCKWAITMAX= system option enables you to limit or turn off the amount of time SAS will wait for a locked file. SAS uses the FILELOCKWAIT= LIBNAME option to wait for the file to become available. Using the FILELOCKWAITMAX= system option, an administrator can limit or turn off this behavior. Normally, SAS returns an error if the file it attempts to access is locked. If you set FILELOCKWAITMAX= to 0, SAS fails immediately after encountering a locked file. This option is used primarily by a system administrator.

See Also

- FILELOCKWAIT= option in the “LIBNAME Statement” on page 464

FILTERLIST System Option

Specifies an alternative set of file filter specifications to use for the Open and Save As dialog boxes.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-FILTERLIST “*filter1* | *filter2* |... | *filter-n*”

filter1...filter n

specifies one or more strings of text separated by a “|” and enclosed in double quotation marks, such as “*.Bob’s work | SAS*.*” Note that you can specify long filename extensions that include spaces and single quotation marks.

Details

All filters in the FILTERLIST are added to the application specified filter list displayed in the **Files of type** box in the Open dialog box and in the **Save as type** box in the Save As dialog box. The first filter in the FILTERLIST becomes the default filter. The FILTERLIST must be enclosed in double quotation marks.

See Also

- “DLGOPEN Command” on page 339
- “DLGSAVE Command” on page 344

FONT System Option

Specifies a font to use for SAS windows.

Default: Sasfont 8

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

```
-FONT "font-name" <BOLD | NORMAL><REGULAR |  
      ITALIC><font-size><character-set>
```

```
FONT="font-name" <BOLD | NORMAL><REGULAR | ITALIC>  
      <font-size><character-set>
```

“font-name”

specifies the name of the font for text in the SAS windowing environment. This name must be a valid font name (for example, “SAS Monospace” or “Courier”). The *font-name* argument must be enclosed in double quotation marks. This argument is required.

BOLD | NORMAL

specifies the weight of the font. The default is NORMAL.

REGULAR | ITALIC

specifies the style of the font. The default is REGULAR.

font-size

specifies the font size to use for printing. This value must be an integer from 1 to 7200, inclusive. If you omit this argument, SAS uses the last selected size unless there is no previous size, in that case 8 is used.

character-set

specifies the character set to use. The default is “Western.” Some possible valid values are Western, Central European, Cyrillic, Greek, Turkish, Arabic, Baltic, and Thai. If the font does not support the specified character set, the default character

set is used. If the default character set is not supported by the font, the font's default character set is used.

Details

Valid font names are shown in the Fonts folder. To open the Font folder, type **font** in the Run dialog box. For example, you can use the following option with the SAS command:

```
-font "sas monospace bold" 12
```

SAS displays output best with a monospace (fixed-pitch) font. If you use a proportional (variable pitch) font, text can display incorrectly. If you specify a *point-size* that is not valid for a font, SAS uses the closest point size for the font you specify.

See Also

- “SYSGUIFONT System Option” on page 574
- “SYSPRINTFONT System Option” on page 578

FONTALIAS System Option

Assigns a Windows font to one of the SAS fonts.

Default: varies (see table in “Details” on page 514)

Valid in: configuration file, SAS invocation

Category: Graphics: Driver settings

PROC OPTIONS GROUP= GRAPHICS

Windows specifics: all

Syntax

-FONTALIAS “*SAS-font*” “*host-specific-font*”

“*SAS-font*”

specifies the SAS font you want to replace. The name of the font must be enclosed in double quotation marks.

“*host-specific-font*”

specifies the Windows font that you want to assign. The name of the font must be enclosed in double quotation marks.

Details

Use the FONTALIAS system option for each font that you want to override.

The default font aliases for Windows are as follows:

SAS font	Windows font
Times	Times New Roman
Helvetica	Arial
Courier	Courier New

SAS font	Windows font
Symbol	Symbol
Script	Script
AvantGarde	Arial
Bookman	Times New Roman
Schoolbook	Times New Roman
Palatino	Times New Roman
Dingbats	Symbol

Example

The system option `-fontalias "Times" "Courier New"` tells SAS to use Courier New wherever the Times SAS font is requested.

FONTSLOC System Option

Specifies the location of the SAS fonts that are loaded during the SAS session.

Default: `!sasroot\core\resource`

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

See: FONTSLOC System Option in *SAS Language Reference: Dictionary*

Syntax

`-FONTSLOC directory-specification`

directory-specification

specifies the directory that contains the SAS fonts that are loaded during the SAS session. If *directory-specification* contains spaces, it must be enclosed in quotation marks.

Details

The directory must be a valid Windows pathname.

FORMCHAR System Option

Specifies the default output formatting characters.

Default: (see the SAS configuration file)

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: Procedure output

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: Valid values for *formatting-characters*

See: FORMCHAR System Option in *SAS Language Reference: Dictionary*

Syntax

-FORMCHAR "*formatting-characters*"

FORMCHAR="*formatting-characters*"

formatting-characters

specifies any string or list of strings of characters up to 64 bytes long. If fewer than 64 bytes are specified, the string is padded with blanks on the right. The character string must be enclosed in double quotation marks.

Details

Formatting characters are used to construct tabular output outlines and dividers for various procedures, such as the CALENDAR, FREQ, and TABULATE procedures. If you omit formatting characters as an option in the procedure, the default specifications given in the FORMCHAR= system option are used. Note that you can also specify a hexadecimal character constant as a formatting character. When you use a hexadecimal constant with this option, SAS interprets the value of the hexadecimal constant as appropriate for the Windows environment.

The configuration file shipped with SAS contains two FORMCHAR system option specifications, with one of them commented out. The default FORMCHAR uses the characters in the SAS Monospace and Sasfont fonts. If you use a code page other than the standard code pages, comment out the FORMCHAR system option that shipped with SAS and use the other FORMCHAR system option.

Note: Note: To ensure that row and column separators and boxed tabular reports will be printed legibly when using the standard forms characters, you must use these resources:

- the SAS Monospace or the SAS Monospace Bold font
- a printer that supports TrueType fonts

Δ

FULLSTIMER System Option

Specifies whether to write all available system performance statistics to the SAS log.

Default: NOFULLSTIMER

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: all

Syntax

-FULLSTIMER | -NOFULLSTIMER

FULLSTIMER | NOFULLSTIMER

FULLSTIMER

specifies that SAS write to the SAS log a complete list of computer resources that were used for each step and for the entire SAS session.

NOFULLSTIMER

specifies that SAS not write a complete list of computer resources to the SAS log. NOFULLSTIMER is the default.

Details

The FULLSTIMER system option specifies whether all the performance statistics of your computer system that are available to SAS are written to the SAS log.

This system option gives you time-elapsed statistics if you have not turned off the STIMER option. If you turn off the STIMER option, the FULLSTIMER option does not generate time statistics.

If you need statistics on tasks such as the SAS windowing environment (statistics for the windowing environment are available only when SAS terminates), you should use the “ALTLOG System Option” on page 493 to specify the destination for a copy of the SAS log. If you specify the FULLSTIMER system option before you end your SAS session, you can view statistics for the SAS windowing environment at the destination that you specified.

The following is an example of the statistics that the SAS log displays when the FULLSTIMER option is on:

```
NOTE: There were 5 observations read from the data set MYSAS.DEPART1.
NOTE: PROCEDURE PRINT used (Total process time):
      real time           0.96 seconds
      user cpu time       0.01 seconds
      system cpu time     0.15 seconds
      Memory              83k
      OS Memory           4648k
```

FULLSTIMER displays the following statistics:

Table 23.2 Description of FULLSTIMER Statistics

Statistic	Description
Real-Time	the amount of time spent to process the SAS job. Real-time is also referred to as elapsed time.
User CPU Time	the CPU time spent to execute SAS code.
System CPU Time	the CPU time spent to perform operating system tasks (system overhead tasks) that support the execution of SAS code

Statistic	Description
Memory	the amount of memory required to run a step.
OS Memory	the maximum amount of memory that a step requested from the System.

Note: Starting in SAS 9, some procedures use multiple threads. On computers with multiple CPUs, the operating system can run more than one thread simultaneously. Consequently, CPU time might exceed real-time in your FULLSTIMER output. \triangle

For example, a SAS procedure could use two threads that run on two separate CPUs simultaneously. The value of CPU time would be calculated as the following:

```

CPU1 time + CPU2 time = total CPU time
1 second + 1 second = 2 seconds

```

Since CPU1 can run a thread at the same time that CPU2 runs a separate thread for the same SAS process, you can theoretically consume 2 CPU seconds in 1 second of real-time.

Comparisons

The FULLSTIMER system option specifies whether all of the available performance statistics are written to the SAS log. The STIMER system option specifies whether time-elapsed statistics for DATA steps or PROC steps are written to the SAS log.

See Also

- \square “STIMER System Option” on page 573
- \square The section optimizing system performance in *SAS Language Reference: Concepts*.
- \square The SAS Log in *SAS Language Reference: Concepts*.

HELPHOST System Option

Specifies the name of the computer where the remote browsing system is to be displayed.

Default: NULL

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window, VMS_SAS_OPTIONS DCL symbol, or SASV9_OPTIONS environment variable

See: HELPHOST in *SAS Language Reference: Dictionary*

Details

The value of HELPHOST is based on the address of the computer running the remote desktop client. If you are logged into a host, then you will receive an error message.

HELPINDEX System Option

Specifies one or more index files for the SAS Help and Documentation.

Default: /help/common.hlp/index.txt, /help/common.hlp/keywords.htm, common.hhk

Valid in: configuration file, SAS invocation

Category: Environment control: Help

PROC OPTIONS GROUP= HELP

Windows specifics: *HTML-HELP-index-pathname*

Syntax

-HELPINDEX <(> “*index-pathname-1*” < “*index-pathname-2*” “*index-pathname-n*”)>

index-pathname

specifies the partial pathname for the index that is to be used by SAS Help and Documentation. *index-pathname* must be a valid Windows pathname. Pathname must be enclosed in quotation marks. When you specify more than one pathname, separate the pathnames with a space and enclose the list of pathnames in parentheses.

The *index-pathname* can be any or all of the following:

/help/applet-index-filename

specifies the partial pathname of the index file that is to be used by the SAS Help and Documentation Java applet under a UNIX environment. *applet-index-filename* must have a file extension of .txt, and it must reside in a path that is specified by the HELPLOC system option. The default is /help/common.hlp/index.txt.

See the default index file for the format that is required for an index file.

/help/accessible-index-filename

specifies the partial pathname of an accessible index file that is to be used by SAS Help and Documentation under UNIX, OpenVMS, or z/OS environments. An accessible index file is an HTML file that can be used by Web browsers.

accessible-index-filename must have a file extension of .htm and it must reside in a path that is specified by the HELPLOC system option. The default pathname is /help/common.hlp/keywords.htm.

See the default index file for the format that is required for an index file.

HTML-Help-index-pathname

specifies the pathname of the Microsoft HTML Help index that is to be used by SAS Help and Documentation under Windows environments. The default pathname is common.hhk. For information about creating an index for Microsoft HTML Help, see your Microsoft HTML Help documentation.

Details

Use the HELPINDEX option if you have a customized index that you want to use instead of the index that SAS supplies. If you use one configuration file to start SAS under more than one operating environment, you can specify all of the partial pathnames in the HELPINDEX option. The order of the pathnames is not important, although only one pathname of each type can be specified.

When the HELPINDEX option specifies a pathname for UNIX, OpenVMS, or z/OS operating environments, SAS determines the complete path by replacing **/help/** in the partial pathname with the pathname that is specified in the HELPLOC option. If the HELPLOC option contains more than one pathname, each path is searched for the specified index.

For example, when the value of HELPINDEX is `/help/common.hlp/myindex.htm` and the value of HELPLOC is `/u/myhome/myhelp`, the complete path to the index is `/u/myhome/myhelp/common.hlp/myindex.htm`.

See Also

- “HELPLOC System Option” on page 520

HELPLOC System Option

Specifies the location of Help files that are used to view SAS Help and Documentation using Microsoft HTML Help.

Default: (“!MYSASFILES\classdoc” “!sasroot\nls\en\help” “!sasroot\core\help”)

Valid in: configuration file, SAS invocation

Category: Environment control: Help

PROC OPTIONS GROUP= HELP

Windows specifics: valid values for *pathname*

Syntax

```
-HELPLOC <(> "pathname-1" <"pathname-2" "pathname-n">
```

pathname

specifies one or more directory pathnames in which SAS Help and Documentation files are located. *Pathname* must be a valid Windows pathname that contains the installed Microsoft HTML Help files. Pathnames must be enclosed in quotation marks. When more than one pathname is specified, use parentheses around the list of pathnames.

Details

Specifying a value for the HELPLOC system option causes SAS to insert that value at the start of a concatenated list of values. This action enables you to access the help for your site without losing access to SAS Help and Documentation.

The default folders !MYSASFILES\classdoc and !sasroot\core\help are used for SAS/AF application Help and SAS Help and Documentation, respectively.

Example The following command contains two specifications of HELPLOC:

```
sas -helploc "c:\app1\help" -helploc "c:\app2\help"
```

The value of the system option is of the following form:

```
("c:\app2\help" "c:\app1\help" "!sasuser\classdoc" "!sasroot\nls\en\help"
"!sasroot\core\help")
```

HELPREGISTER System Option

Registers help files to access from the main SAS window Help menu.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Help

PROC OPTIONS GROUP= HELP

Windows specifics: all

Syntax

```
-HELPREGISTER "menu string" help file location <"help string"> <topic><CHM | HLP
| HTML>
```

"menu string"

is the text string that appears in the Help menu.

help file location

specifies the folder and the filename in which the help file is located. The *help file location* can be omitted if the file resides in a folder that is specified by the HELPLOC system option. The *help file location* can be truncated with *!sasroot*. If *help file location* includes blank spaces, it must be enclosed in quotation marks.

"help string"

is the text that appears in the status bar when a user places the mouse over the *menu string*.

topic

is the topic within the help file that displays when you select *menu string* from SAS help menu. For HTML files, the topic is the anchor (preceded by #) within the document. For CHM files, the topic is the page within the CHM file. For HLP files, topic is the keyword in the file for which WinHelp searches. If *topic* includes blank spaces, it must be enclosed in quotation marks.

CHM

specifies an HtmlHelp CHM file on the local system or network.

HLP

specifies a WinHelp file on the local system or network.

HTML

specifies an HTML file on the local file system or network, or a valid URL.

Details

Use the HELPREGISTER system option to add up to 20 help files that you would like available from the main SAS window Help menu. All strings containing spaces must be enclosed in double quotation marks. Optional arguments can be omitted by replacing them with a single period (.) or empty double quotation marks (""). If no further argument is necessary, no place-holder is required.

To add multiple Help files to the Help menu, use multiple HELPREGISTER system options either in the configuration file or at the command prompt when you start SAS.

Examples

Example 1: HTML Pages and URLs

```
sas -helpregister 'SAS Institute Inc' http://www.sas.com
'SAS's homepage on the web' . html

sas -helpregister 'Local HTML Doc' c:\mypage.htm
'My own help' middle
```

Example 2: HTML Help Files (.CHM)

```
sas -helpregister 'My CHM file' \\server\share\HelpStuff.chm .
'InternalFile.htm'

sas -helpregister 'SAS Windows Companion' host.chm .
'/host.hlp/chostfutil.htm'
```

Example 3: WinHelp Files (.HLP)

```
sas -helpregister 'A WinHelp File' c:\somefile.hlp
'simply an .hlp file'

sas -helpregister 'WinHelp with a Topic' c:\somefile.hlp .
'My Topic'
```

See Also

- “Adding Help to the Help Menu” on page 66

HELPTOC System Option

Specifies the table of contents files for the SAS Help and Documentation.

Default: /help/helpnav.hlp/config.txt /help/common.hlp/toc.htm common.hhc

Valid in: configuration file, SAS invocation

Category: Environment control: Help

PROC OPTIONS GROUP= HELP

Windows specifics: *HTML-Help-TOC-pathname*

Syntax

```
-HELPTOC <(> "TOC-pathname-1" <"TOC-pathname-2" "TOC-pathname-3">
```

TOC-pathname

specifies a partial pathname for the table of contents that is to be used by SAS Help and Documentation. The *TOC-pathname* must be a valid Windows pathname.

Pathnames must be enclosed in quotation marks. When more than one pathname is specified, use parentheses around the list of pathnames.

The *TOC-pathname* can be any or all of the following:

/help/applet-TOC-filename

specifies the partial pathname of the table of contents file that is to be used by the SAS Help and Documentation Java applet under a UNIX environment.

applet-TOC-filename must have a file extension of .txt, and it must reside in a path that is specified by the HELPLOC system option. The default pathname is */help/helpnav.hlp/config.txt*.

See the default table of contents file for the format that is required for an index file.

/help/accessible-TOC-filename

specifies the partial pathname of an accessible table of contents file that is to be used by SAS Help and Documentation under UNIX, OpenVMS, or z/OS environments. An accessible table of contents file is an HTML file that can be used by Web browsers. *accessible-TOC-filename* must have a file extension of .htm and it must reside in a path that is specified by the HELPLOC system option. The default pathname is */help/common.hlp/toc.htm*.

See the default table of contents file for the format that is required for a table of contents.

HTML-Help-TOC-pathname

specifies the complete pathname to the Microsoft HTML Help table of contents that is to be used by SAS Help and Documentation in Windows environments. The default pathname is *common.hhc*. For information about creating an index for Microsoft HTML Help, see your Microsoft HTML Help documentation.

Details

Use the HELPTOC option if you have a customized table of contents that you want to use instead of the table of contents that SAS supplies. If you use one configuration file to start SAS under more than one operating environment, you can specify all of the partial pathnames in the HELPTOC option. The order of the pathnames is not important, although only one pathname of each type can be specified.

When the HELPTOC option specifies the pathname for UNIX, OpenVMS, and z/OS operating environments, SAS determines the complete path by replacing */help/* in the partial pathname with the pathname that is specified in the HELPLOC option. If the HELPLOC option contains more than one pathname, each path is searched for the table of contents.

For example, when HELPTOC is */help/common.hlp/mytoc.htm* and the value of HELPLOC is */u/myhome/myhelp*, the complete path to the table of contents is */u/myhome/myhelp/common.hlp/mytoc.htm*.

See Also

- “HELPLOC System Option” on page 520

HOSTPRINT System Option

Specifies that the Windows Print Manager is to be used for printing.

Default: HOSTPRINT

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: Procedure output

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: all

Syntax

-HOSTPRINT | -NOHOSTPRINT

HOSTPRINT | NOHOSTPRINT

HOSTPRINT

specifies to use Windows printing. HOSTPRINT is the default.

NOHOSTPRINT

specifies to use SAS forms for printing.

Details

Use the NOHOSTPRINT option to use forms for printing in a batch SAS session. When you specify NOHOSTPRINT, the **Use Forms** check box is selected in the Print Setup dialog box, and SAS uses the line size, page size, and font values that are specified in your SAS form.

See Also

- “Setting Print Options to Use Forms” on page 177

ICON System Option

Minimizes the SAS window.

Default: NOICON

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Option window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-ICON | -NOICON

ICON | NOICON

ICON

specifies to minimize the main SAS window immediately.

NOICON

restores the main SAS window immediately.

Details

If you put the ICON system option in the SAS command or the SAS configuration file, SAS is minimized upon initialization. If you submit the ICON system option in an OPTIONS statement, SAS is immediately minimized. This action is equivalent to clicking on the minimize button.

This system option is especially useful for obtaining a minimized SAS session as soon as you start Windows. For example, the ICON system option could be specified in the SAS command as follows:

```
c:\sas\sas.exe -icon
```

INITSTMT System Option

Specifies a SAS statement to be executed after any statements in the autoexec file and before any statements from the SYSIN= file.

Default: none

Valid in: configuration file, SAS invocation

Alias: IS

Category: Environment control: Initialization and operation

PROC OPTIONS GROUP= EXECMODES

Windows specifics: *statement* must end a DATA or PROC step if you use the Enhanced Editor

See: INITSTMT= System Option in *SAS Language Reference: Dictionary*

Syntax

INITSTMT '*statement*'

'*statement*'

specifies any SAS statement or statements. The value of *statement* must end a DATA or PROC step if you use the Enhanced Editor.

INSERT System Option

Used when SAS starts, inserts the specified value at the beginning of the specified system option.

Default: none
Valid in: configuration file, SAS invocation
PROC OPTIONS GROUP= ENVFILES
Windows specifics: all

Syntax

`-INSERT system-option argument`

system-option

can be FMTSEARCH, HELPLOC, MAPS, MSG, SAMPLOC, SET, SASSCRIPT, SASAUTOS, or SASHELP.

argument

specifies a new pathname or an environment setting that you want to insert at the front of the current value of *system-option*. The following example shows that a library is being inserted before the FMTSEARCH option:

```
-set APFMTLIB 'SASEnvironment/SASFormats'
-insert fmtsearch APFMTLI
```

Details

By default, if you specify the FMTSEARCH, HELPLOC, MAPS, MSG, SAMPLOC, SET, SASSCRIPT, SASAUTOS, or SASHELP system option more than one time, the last specification is the one that SAS uses. If you want to insert additional pathnames in front of the search paths that have already been specified by one of these options, you must use the INSERT system option to add the new pathname. For example, if you entered the following SAS command, the only location that SAS will look for help files is `c:\app2\help`, and the output of PROC OPTIONS will only show `c:\app2\help`:

```
sas -helploc 'c:\app2\help'
```

If you want SAS to look in both the current path for help files and in `c:\app2\help` and if you want SAS to search `c:\app2\help` first, then you must use the INSERT option:

```
sas -insert helploc 'c:\app2\help'
```

If your current path for help files is `!sasroot\nls\en\help`, then for the value of the HELPLOC option, PROC OPTIONS will now show

```
('c:\app2\help' '!sasroot\nls\en\help')
```

See Also

- See the Insert system option in the *SAS Language Reference: Dictionary* to insert a value to a system option after SAS starts.

JREOPTIONS System Option

Identifies Java Runtime Environment (JRE) options for SAS.

Default: `-Djava.security.policy=<pathname\filename> -Dsas.jre=(private | public)`
`-Dsas.jre.home=!sasroot\pathname -Djava.ext.dirs=pathname\filename`

Valid in: configuration file, SAS invocation

Category: Environment control: Initialization and operation

PROC OPTIONS GROUP EXECMODES

Windows specifics: all

Syntax

`-JREOPTIONS (-JRE-option-1 <-JRE-option-n>)`

`JREOPTIONS (-JRE-option-1 <-JRE-option-n>)`

-JRE-option

specifies one or more Java Runtime Environment options. JRE options must begin with a hyphen (-). Use a space to separate multiple JRE options. Valid values for *JRE-option* depend on your installation's Java Runtime Environment. For information about JRE options, see your installation's Java documentation.

Details

The set of JRE options must be enclosed in parentheses. If you specify multiple JREOPTIONS system options, SAS appends JRE options to JRE options that are currently defined. Incorrect JRE options are ignored. To define the classpath, use the `Djava.class.path` option.

Examples

- `-jreoptions (-verbose)`
- `-jreoptions (-Djava.class.path= "c:\my java\classes\myclasses.jar";c:\java2\classes2\classes2.jar -oss600k)`

LINESIZE System Option

Specifies the line size of SAS Log and Output windows.

Default: Varies depending on display settings

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: SAS log and procedure output

PROC OPTIONS GROUP= LOG_LISTCONTROL

Windows specifics: Default value

See: LINESIZE System Option in *SAS Language Reference: Dictionary*

Syntax

`-LINESIZE n | MIN | MAX`

`LINESIZE=n | MIN | MAX`

n

specifies the line size in characters. Valid values range between 64 and 256.

MIN

sets the line size to 64 characters.

MAX

sets the line size to 256 characters.

Details

The default values are based on the printer resolution and printer font so that generated reports print correctly.

CAUTION:

Modifying print options by using the Windows printing dialog boxes can change the values of SAS printing system options, which might cause unpredictable output. If you set printing options using SAS system options such as LINESIZE and PAGESIZE, and then use the Windows printing dialog boxes to set printing options. The SAS system options are set to the values that are specified in the Windows print dialog boxes. Δ

See Also

- “PAGESIZE System Option” on page 543
- In the *SAS Language Reference: Dictionary*:
 - “ORIENTATION System Option”
 - “PAGESIZE System Option”.

LOADMEMSIZE System Option

Specifies a suggested amount of memory needed for executable programs loaded by SAS.

Default: 0

Valid in: configuration file, SAS invocation

Category: System administration: Memory

PROC OPTIONS GROUP= MEMORY

Windows specifics: all

Syntax

-LOADMEMSIZE *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

n* | *nK* | *nM* | *nG

specifies the memory size in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes), and 1,073,741,842 (gigabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the amount of memory as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

MIN

specifies 0 bytes, which indicates that there is no limit on the total amount of memory that can be used.

MAX

specifies that the maximum amount of memory for executable programs is limited only by the amount of memory available.

Details

When LOADMEMSIZE is set to 0, the memory that is used for executable programs that are loaded by SAS is limited only by the amount of system memory available. If LOADMEMSIZE is set to 1, executable programs are purged from memory when they are no longer in use.

For values of two or greater, SAS first checks the amount of memory that is available for SAS executable programs. If the total amount of memory that is available is greater than the value of LOADMEMSIZE, SAS purges the SAS loaded executable programs that are not in use until the memory that is used is less than the value of the LOADMEMSIZE option, or until there are no other SAS loaded executable programs that can be purged. If all executable programs have been purged and more memory is needed, additional system memory is used as long as it is available.

LOG System Option

Specifies a destination for a copy of the SAS log when SAS is running in batch mode.

Default: *filename*.LOG in batch mode, where *filename* is the name of your SAS job

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES, LOGCONTROL

Windows specifics: *destination* must be a valid Windows filename

Syntax

-LOG "*destination*" | -NOLOG

LOG "*destination*"

specifies the destination for the SAS log. The *destination* argument can be a valid Windows pathname or filename (including device names such as LPT1) or an environment variable that is associated with a pathname. If you specify only a pathname, the log file is created in the specified directory with the default name of *filename*.LOG, where *filename* is the name of your SAS job.

NOLOG

routes each log message to a message box, where one message is displayed per message box.

Details

The LOG system option specifies a destination for a copy of the SAS log when running in batch mode.

This system option is valid only in batch mode.

When you are running SAS interactively, the log is sent to the LOG window in batch mode. The log is sent to a file named *filename*.LOG that is located in the current SAS directory, where *filename* is the name of your SAS job. You can use the LOG system option to specify an alternate destination.

To disable the display of the SAS log, use the NOTERMINAL system option.

When SAS is started with the OBJECTSERVER and NOTERMINAL system options and no log is specified, SAS discards all log messages.

When SAS is started with the OBJECTSERVER and NOTERMINAL system options active, and no log is specified, SAS discards all log and alternate log messages.

Using directives in the value of the LOG system option enables you to control when logs are open and closed and how they are named, based on real-time events, such as time, month, day of week. For a list of directives see the LOGPARM= system option in the SAS Language Reference; Dictionary.

If you start SAS in batch mode or in server mode and if the LOGCONFIGLOC= option is specified, logging is done by the SAS logging facility. The traditional SAS log option LOGPARM= is ignored. The traditional SAS log option LOG= is applied only when the %S{App.Log} conversion character is specified in the logging configuration file. For more information, see SAS Logging Facility in *SAS Logging: Configuration and Programming Reference*.

See Also

- “TERMINAL System Option” in *SAS Language Reference: Dictionary*
- “LOGPARM System Option” in *SAS Language Reference: Dictionary*.
- “The SAS Log” in *SAS Language Reference: Concepts*.

MAPS System Option

Specifies the name of the SAS library that holds the SAS/GRAPH map data sets.

Default: `!sasroot\maps`

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Graphics: Driver settings

PROC OPTIONS GROUP= GRAPHICS

Windows specifics: default value and *location-of-maps* must resolve to a valid Windows pathname

See: MAPS System Option in *SAS Language Reference: Dictionary*

Syntax

`-MAPS location-of-maps`

`MAPS=location-of-maps`

location-of-maps

specifies a libref, a valid Windows pathname, or an environment variable associated with a pathname. Remember that a pathname is only to the directory or subdirectory level. If the pathname contains spaces, enclose the pathname in quotation marks.

MAXMEMQUERY System Option

Specifies the limit on the maximum amount of memory that is allocated for procedures.

Default: 0

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: System administration: Memory

PROC OPTIONS GROUP= MEMORY

Windows specifics: all

Syntax

`-MAXMEMQUERY n | nK | nM | nG | hexX | MIN | MAX`

`MAXMEMQUERY= n | nK | nM | nG | hexX | MIN | MAX`

n* | *nK* | *nM* | *nG

specifies the limit in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes), and 1,073,741,842 (gigabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the amount of memory as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

MIN

sets the amount of memory to the minimum setting, which is 0 bytes. This value indicates that there is no limit on the total amount of memory that can be used by each procedure.

MAX

sets the amount of memory to the maximum setting, which is 2,147,483,647 bytes.

Details

Some SAS procedures use the MAXMEMQUERY option to specify the largest block of virtual memory that SAS can request at one time. By contrast, the MEMSIZE option places a limit on the total amount of virtual memory that SAS dynamically allocates at any time. This virtual memory is supported by a combination of real memory and paging space. The operating environment begins paging when the amount of virtual memory that is required exceeds the real memory that is available. To prevent paging and the associated performance problems, the MAXMEMQUERY and MEMSIZE system options should be set to a subset of real memory.

MEMBLKSZ System Option

Specifies the memory block size for memory-based libraries for Windows operating environments.

Default: 16 MB

Valid in: configuration file, SAS invocation

Category: System administration: Memory

PROC OPTIONS GROUP MEMORY

Windows specifics: all

Syntax

`-MEMBLKSZ n | nK | nM | nG | nT | hexX`

n* | *nK* | *nM* | *nG* | *nT

specifies the memory block size in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); 1,073,741,824 (gigabytes); and 1,099,511,627,776 (terabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, gigabytes, or terabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the memory block size as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the memory block size to 45 bytes.

Details

Beginning with Windows 2000, multiple processes can be run simultaneously in memory. The value of the MEMBLKSZ system option is the amount of memory that is initially allocated. Additional memory can be allocated in the same memory allocation size that is specified in the MEMBLKSZ option, up to the amount of memory that is specified in the MEMMAXSZ option. For example, if MEMBLKSZ is 2M, additional memory can be allocated in 2M blocks.

When memory-based libraries are using extended memory, this value is also used to determine the amount of the process address space that is used to access the extended memory.

Note: Specifying a value that is too large could adversely affect performance.

- Specifying a value that is too large could adversely affect overall system performance. Try different values for the MEMBLKSZ option to determine the value that gives the best system performance.
- If you are using extended memory in 32-bit environments, then specifying a value that is too large could adversely affect SAS performance. A smaller value might be optimal. A good starting point is 64K; however, try different values for the MEMBLKSZ option to determine the value that gives the best SAS performance.

See Also

- “Memory-Based Libraries” on page 201
- “MEMMAXSZ System Option” on page 534

MEMCACHE System Option

Specifies to use the memory-based libraries as a SAS file cache.

Default: 0

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics: all

Syntax

-MEMCACHE 0 | 1 | 4

MEMCACHE= 0 | 1 | 4

0

specifies memory cache is off.

1

specifies not to add any new files to the cache. Reads and writes to files already in the cache continue as if MEMCACHE is on.

4

specifies memory cache is on. Memory is used as a SAS file cache.

Details

When the MEMCACHE system option is 4 or 1, SAS file cache places data in memory as it is processed. This data is then available for future references by SAS. Files in the cache are kept until SAS is shut down, caching is terminated, or more space is required for new files. Memory is reclaimed on a least recently used basis. Cached data is written to permanent storage. You can control which SAS libraries use the cache by using the MEMCACHE system option in the OPTIONS statement. Memory usage can be monitored using the performance tools.

See Also

- “Memory-Based Libraries” on page 201
- “MEMLIB System Option” on page 534

MEMLIB System Option

Specifies to process the Work library as a memory-based library.

Default: NOMEMLIB

Valid in: configuration file, SAS invocation

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics: all

Syntax

-MEMLIB | -NOMEMLIB

MEMLIB

specifies to use memory for the Work libraries.

NOMEMLIB

specifies not to use memory.

Details

When the MEMLIB system option is specified, the Work library is processed in memory. Files are kept in memory until SAS is terminated or the files are deleted. You can monitor memory usage by using the performance tools.

See Also

- “Memory-Based Libraries” on page 201
- “LIBNAME Statement” on page 464
- “MEMCACHE System Option” on page 533
- “Performance Tools” on page 228

MEMMAXSZ System Option

Specifies the maximum amount of memory to allocate for using memory-based libraries in Windows operating environments.

Default: 2G

Valid in: configuration file, SAS invocation

Category: System administration: Memory

PROC OPTIONS GROUP= MEMORY

Windows specifics: all

Syntax

-MEMMAXSZ *n* | *nK* | *nM* | *nG* | *nT* | *hexX*

n* | *nK* | *nM* | *nG* | *nT

specifies the amount of memory to allocate in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); 1,073,741,824 (gigabytes); and 1,099,511,627,776 (terabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, gigabytes, or terabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the amount of memory to allocate as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

Details

The MEMMAXSZ system option specifies the total amount of memory that SAS can use for memory-based libraries. You can monitor the memory by using the performance tools.

CAUTION:

Specifying a value that is too large can adversely affect overall system performance. Try different values for the MEMMAXSZ option to determine the value that gives the best system performance. △

See Also

- “Memory-Based Libraries” on page 201
- “MEMBLKSZ System Option” on page 532
- “MEMLIB System Option” on page 534
- “MEMCACHE System Option” on page 533

MEMSIZE System Option

Specifies the limit on the amount of virtual memory that can be used during a SAS session.

Default: 0

Valid in: configuration file, SAS invocation

Category: System administration: Memory

PROC OPTIONS GROUP= MEMORY

Windows specifics: valid values

Syntax

-MEMSIZE *n* | *nK* | *nM* | *nG* | *nT* | *hexX* | MAX

n* | *nK* | *nM* | *nG* | *nT

specifies the limit in bytes, kilobytes (1024 bytes), megabytes (1,048,576 bytes), gigabytes (1,073,741,824 bytes), or terabytes (1,099,511,627,776 bytes). For example,

a value of **0.25G** is equivalent to 268,435,456 bytes, and 16.5M is equivalent to 17,301,504 bytes.

hexX

specifies the amount of memory as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by hexadecimal characters (0–9, A-F), and then followed by an X. For example, **0F00000x** sets the value of the MEMSIZE option to 15,728,640 bytes, which is equivalent to a value of **0x**

MAX

specifies the largest reasonable value dependent on the amount of physical memory and paging space available at the time that SAS is started.

Details

The MEMSIZE system option specifies the total amount of memory available to each SAS session. A value that is too low will result in out-of-memory conditions.

A numeric value of 0 (or 0x) is equivalent to the option value MAX.

If an unreasonably small numeric value is specified (for example 6K) the setting of the MEMSIZE option will be silently increased to a minimum reasonable value that will allow SAS to start and have basic functionality.

If a numeric value greater than 4,294,967,295 is specified on a 32-bit version of SAS, the setting of the value will be silently reduced to 4,294,967,295.

Numeric values greater than 9,223,372,036,854,775,807 bytes will be rejected as invalid, and will prevent SAS from starting.

SAS does not automatically reserve or allocate the amount of memory that you specify in the MEMSIZE system option. SAS will use only as much memory as it needs to complete a process. For example, a DATA step might require only 20M of memory, so even though MEMSIZE is set to 500M, SAS will use only 20M of memory.

While your SAS jobs are running, you can monitor the effect of larger memory settings by using system monitoring tools.

Note: Setting MEMSIZE to MAX is reasonable only if consumers of large amounts of memory are not likely to become active after SAS has started. As an example, if multiple instances of SAS are running concurrently, and all of these instances are started with a MEMSIZE value of MAX, one or more of these instances can encounter out of memory conditions, or, the operating system can run out of available paging space. Δ

MSG System Option

Specifies the library that contains the SAS error messages.

Default: `!sasroot\core\sasmsg`

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *library-specification*

Syntax

`-MSG library-specification`

library-specification

can be a Windows logical name (including search strings) or pathname. Do not include a filename. If the pathname contains spaces, you must enclose the pathname in quotation marks.

Details

The MSG system option specifies the name of the library for SAS error messages.

MSGCASE System Option

Specifies whether notes, warnings, and error messages that are generated by SAS are displayed in uppercase characters.

Default: NOMSGCASE

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: all

Syntax

-MSGCASE | -NOMSGCASE

MSGCASE

specifies that messages are displayed in uppercase characters.

NOMSGCASE

specifies that messages can include uppercase and lowercase characters. NOMSGCASE is the default.

Details

Specifies whether notes, warnings, and error messages that are generated by SAS are displayed in uppercase characters. The setting of the MSGCASE option does not affect user-generated messages and source lines.

See Also

- The SAS Log in *SAS Language Reference: Concepts*.

MSYMTABMAX System Option

Specifies the maximum amount of memory available to the macro variable symbol table(s).

Default: 4194304 bytes (4 MB)

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Macro: SAS macro

PROC OPTIONS GROUP= MACRO

Windows specifics: Default value

See: MSYMTABMAX in *SAS Macro Language: Reference*

Syntax

-MSYMTABMAX *n* | *nK* | *nM* | *nG* | *nT* | *hexX* | MIN | MAX

MSYMTABMAX=*n* | *nK* | *nM* | *nG* | *nT* | *hexX* | MIN | MAX

n* | *nK* | *nM* | *nG* | *nT

specifies the amount of memory that is available in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); 1,072,741,824 (gigabytes); and 1,099,511,627,776 (terabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, gigabytes, or terabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the amount of memory that is available as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

MIN

sets the amount of memory that is available to the minimum setting, which is 0. This value causes all macro variables to be written to disk.

MAX

sets the amount of memory that is available to the maximum setting.

Details

After the MSYMTABMAX value is reached, SAS writes any additional macro variables to disk.

MVARSIZE System Option

Specifies the maximum size for in-memory macro variables.

Default: 4096 bytes

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Macro: SAS macro

PROC OPTIONS GROUP= MACRO

Windows specifics: Default value

See: MVARSIZE System Option in *SAS Macro Language: Reference*

Syntax

-MVARSIZE *n* | *nK* | *hexX* | MIN | MAX

MVARSIZE=*n* | *nK* | *hexX* | MIN | MAX

n | *nK*

specifies the maximum macro variable size in multiples of 1 or 1,024 (kilobytes), respectively. You can specify decimal values for the number of kilobytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3k** specifies 3,072 bytes.

hexX

specifies the maximum macro variable size as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the maximum macro variable size to 45 bytes.

MIN

sets the macro variable size to the minimum setting, which is 0 bytes. This value causes all macro variables to be written to disk.

MAX

sets the macro variable size to the maximum setting, which is 65,534 bytes.

Details

The MVARSIZE system option specifies the maximum size for macro variables that are stored in memory. If the size of the macro variable is larger than the maximum value that is specified, variables are written out to disk.

The value of the MVARSIZE system option can affect system performance. Before you specify the value for production jobs, run tests to determine the optimum value.

NEWS System Option

Specifies a file that contains messages to be written to the SAS log.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *file-specification*

See: NEWS System Option in *SAS Language Reference: Dictionary*

Syntax

-NEWS *file-specification*

file-specification

specifies an external file. The value for *file-specification* can be a valid Windows pathname or shortcut name. If the pathname contains spaces, you must enclose the pathname in quotation marks.

Details

The NEWS file can contain information for users, including news items about SAS. The contents of the NEWS file are displayed in the SAS log immediately after the SAS header.

NUMKEYS System Option

Controls the number of available function keys.

Default: number of function keys on the keyboard

Valid in: configuration file, SAS invocation

Category: Input control: Data processing

PROC OPTIONS GROUP= INPUTCONTROL

Windows specifics: all

Syntax

-NUMKEYS *number-of-keys*

number-of-keys

specifies the number of active keyboard function keys.

Details

When SAS initializes, it queries your machine to determine the number of keyboard function keys. You can override this setting by specifying a different value with the NUMKEYS system option.

Example

If you specify the following system option, SAS displays 10 function keys in the KEYS window:

```
-numkeys 10
```

NUMMOUSEKEYS System Option

Specifies the number of mouse buttons SAS displays in the KEYS window.

Default: 3 buttons

Valid in: configuration file, SAS invocation

Category: Input control: Data processing

PROC OPTIONS GROUP= INPUTCONTROL

Windows specifics: all

Syntax

-NUMMOUSEKEYS *number-of-buttons*

number-of-buttons

specifies the number of mouse buttons, ranging from 0 to 3. If *number-of-buttons* is 0 or 1, the KEYS windows lists no mouse buttons (because the left, and in this case the only, mouse button is reserved by SAS). If *number-of-buttons* is 2, the KEYS window lists the right mouse button (RMB), as well as Ctrl + right mouse button and Shift + right mouse button. If *number-of-buttons* is 3, the KEYS window lists both the right mouse button and the middle mouse button.

Details

Unless you specify the NUMMOUSEKEYS system option, SAS assumes that three mouse buttons are available. If you have a one- or two-button mouse and want the KEYS window to reflect this configuration, specify the NUMMOUSEKEYS system option in your SAS configuration file.

OBS System Option

Specifies when to stop processing observations or records.

Default: MAX

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics: Valid range

See: OBS System Option in *SAS Language Reference: Dictionary*

Syntax

-OBS *n* | *n*K | *n*M | *n*G | *n*T | *hexX* | MIN | MAX

OBS=*n* | *n*K | *n*M | *n*G | *n*T | *hexX* | MIN | MAX

***n* | *n*K | *n*M | *n*G | *n*T**

specifies a number to indicate when to stop processing, with *n* being an integer. Using one of the letter notations results in multiplying the integer by a specific value. That is, specifying K (kilo) multiplies the integer by 1,024, M (mega) multiplies by 1,048,576, G (giga) multiplies by 1,073,741,824, T (tera) multiplies by 1,099,511,627,776. You can specify a decimal value for *n* when it is used to specify a K, M, G, or T value. For example, a value of **20** specifies 20 observations or records, a value of **.782k** specifies 801 observations or records, and a value of **3m** specifies 3,145,728 observations or records.

hexX

specifies a number to indicate when to stop processing as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the hexadecimal value F8 must be specified as **0F8X** in order to specify the decimal equivalent of 248. The value **2dX** specifies the decimal equivalent of 45.

MIN

sets the number to indicate when to stop processing to 0.

MAX

sets the number to indicate when to stop processing to 2,147,483,647. On 64-bit systems, MAX is 9,223,372,036,854,775,807. MAX is the default.

PAGENO System Option

Resets the page number.

Default: 1

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: Procedure output

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: Valid values for *n*; syntax

See: PAGENO System Option in *SAS Language Reference: Dictionary*

Syntax

-PAGENO *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

PAGENO=*n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

n* | *nK* | *nM* | *nG

specifies the page number in multiples of 1(*n*); 1,024 (*nK*); 1,048,576 (*nM*); and 1,073,741,824 (*nG*), respectively. You can specify a decimal value for *n* when it is used to specify a K, M, G, or T value. For example, a value of **8** sets the page number to 8, a value of **.782k** sets the page number to 801, and a value of **3k** sets the page number to 3,072.

hexX

specifies the page number as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the page number to 45.

MIN

sets the page number to the minimum number, which is 1.

MAX

sets the page number to the maximum number, which is 2,147,483,647.

Details

The PAGENO system option specifies a beginning page number for the next page of output that SAS produces.

PAGESIZE System Option

Specifies the number of lines that compose a page of SAS output.

Default: Varies depending on your display settings

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: SAS log and procedure output

PROC OPTIONS GROUP= LOG_LISTCONTROL

Windows specifics: Default value

See: PAGESIZE System Option in *SAS Language Reference: Dictionary*

Syntax

-PAGESIZE *n* | MIN | MAX

PAGESIZE=*n* | MIN | MAX

n

specifies the number of lines that compose a page.

MIN

sets the number of lines that compose a page to the minimum setting, which is 15.

MAX

sets the number of lines that compose a page to the maximum setting, which is 32,767.

Details

Under Windows, the default values are based on the printer resolution and printer font so that generated reports print correctly.

CAUTION:

Modifying print options by using the Windows printing dialog boxes might change the values of SAS printing system options, which might cause unpredictable output. If you set printing options using SAS system options such as LINESIZE and PAGESIZE, and then use the Windows printing dialog boxes to set printing options, the SAS system options are set to the values that are specified in the Windows print dialog boxes. Δ

See Also

- “LINESIZE System Option” on page 527

PAPER_{TYPE} System Option

Specifies to a printer the type of paper to use for printing.

Default: PLAIN

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: ODS printing

PROC OPTIONS GROUP= ODSPRINT

Windows specifics: valid values

See: PAPER_{TYPE}= System Option in *SAS Language Reference: Dictionary*

Syntax

-PAPER_{TYPE} PLAIN | STANDARD | GLOSSY | TRANSPARENCY |
printer-defined-value

PAPER_{TYPE}= PLAIN | STANDARD | GLOSSY | TRANSPARENCY |
printer-defined-value

PLAIN

specifies to use plain paper.

STANDARD

specifies to use the standard paper for the printer.

GLOSSY

specifies to use glossy paper.

TRANSPARENCY

specifies to use transparent paper.

printer-defined-value

specifies a paper type that is defined by the printer.

Details

See your printer documentation for the paper types that your printer can use.

PATH System Option

Specifies one or more search paths for SAS executable files.

Default: !sasroot\core\sasexe

Valid in: configuration file, SAS invocation

Category: System administration: Installation

PROC OPTIONS GROUP= INSTALL

Windows specifics: all

Syntax

`-PATH <(<"directory-specification-1" <"directory-specification-n") >`

directory-specification

specifies the path to search. The value *directory-specification* must be a valid Windows pathname or an environment variable associated with a pathname. If the pathname contains spaces, it must be enclosed in quotation marks. If you specify more than one *directory-specification*, enclose the list of *directory-specification* in parentheses.

Details

The PATH option identifies the search paths for SAS executable files. You can specify multiple PATH options to define the search order. The paths are searched in the order in which SAS encounters them; therefore, specify at the front of the list the paths for the products that you run most frequently.

PFKEY System Option

Specifies which set of function keys to designate as the primary set of function keys.

Default: WIN

Valid in: configuration file, SAS invocation

Category: Input control: Data processing

PROC OPTIONS GROUP= INPUTCONTROL

Windows specifics: all

Syntax

-PFKEY PRIMARY | ALTERNATE | SAA | WIN

PRIMARY

maps F1 through F12 to the mainframe primary settings for PF1 through PF12 and Shift + F1 through Shift + F12 to PF13 through PF24. The right mouse button (RMB) is mapped to MB2. If you have only 10 function keys, F11, F12, Shift + F11, and Shift + F12 are not available and are not shown in the KEYS window.

Here are the primary mainframe key definitions:

PC Key	Mainframe Definition	Key	Mainframe Definition
F1	mark	Shift + F1	help
F2	smark	Shift + F2	zoom
F3	unmark	Shift + F3	zoom off; submit
F4	cut	Shift + F4	pgm; recall
F5	paste	Shift + F5	rfind
F6	store	Shift + F6	rchange
F7	prevwind	Shift + F7	backward
F8	next	Shift + FF8	forward
F9	pmenu	Shift + F9	output
F10	command	Shift + F10	left
F11	keys	Shift + F11	right
F12	undo	Shift + F12	home
RMB	zoom off; submit		

ALTERNATE

maps F1 through F12 to the alternate mainframe key settings. That is, F1 through F12 maps to PF13 through PF24. The result is that F1 through F12 are equivalent to Shift + F1 through Shift + F12. The right mouse button (RMB) is mapped to MB2. If you have only 10 function keys, F11 and F12 are unavailable and are not shown in the KEYS window. F13 through F24 are mapped to F1 through F12 if your keyboard has only 12 function keys instead of 24.

Here are the alternate mainframe key definitions:

PC Key	Mainframe Definition	Key	Mainframe Definition
F1	help	F7	backward
F2	zoom	F8	forward
F3	zoom off; submit	F9	output
F4	pgm; recall	F10	left
F5	rfind	F11	right
F6	rchange	F12	home
		RMB	zoom off; submit

SAA

maps F1 through F12 to the IBM SAA values for CUAPF1 through CUAPF12 and Shift + F1 through Shift + F12 to CUAPF13 through CUAPF24. The right mouse button (RMB) is mapped to MB2. If you have only 10 function keys, F11, F12, Shift + F11, and Shift + F12 are unavailable and are not shown in the KEYS window.

Note: SAA stands for System Application Architecture, which is a framework for application development and is used across IBM systems. CUA (Common User Access) is a part of SAA that defines the user interface and components that should be identical across applications. Δ

Here are the IBM SAA key definitions:

PC Key	Mainframe Definition	Key	Mainframe Definition
F1	help	Shift + F1	cut
F2	keys	Shift + F2	paste
F3	zoom off; submit	Shift + F3	store
F4	home	Shift + F4	mark
F5	pgm; recall	Shift + F5	unmark
F6	zoom	Shift + F6	smark
F7	backward	Shift + F7	left
F8	forward	Shift + F8	right
F9	prevcmd	Shift + F9	rfind
F10	pmenu	Shift + F10	rchange
F11	command	Shift + F11	undo

	Mainframe		Mainframe
PC Key	Definition	Key	Definition
F12	cancel	Shift + F12	next
RMB	zoom off; submit		

WIN

specifies to use the default key definitions for SAS under Windows. WIN is the default.

Details

Use the PFKEY system option when you do not want the default key definitions for SAS under Windows but instead want to use other key mappings (for example, the mappings used by SAS under z/OS).

Note that the function key values shown in the previous key map tables are for the Base SAS windows only. Other windowing SAS products, such as SAS/AF software, have other key definitions.

If you do not specify the PFKEY system option, or if you specify an invalid value, SAS loads the default Windows key definitions. For a list of key definitions, open the KEYS window by typing **keys** in the command bar.

PRIMARYPROVIDERDOMAIN=

Specifies the domain name of the primary authentication provider.

Valid in: configuration file, SAS invocation

Alias: PRIMPD=

Category: Environment control: Initialization and operation

PROC OPTIONS GROUP= EXECMODES

See: PRIMARYPROVIDERDOMAIN= System Option

PRINT System Option

Specifies a destination for SAS output when running in batch mode.

Default: *filename*.LST in batch mode, where *filename* is the name of your SAS job

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: all

Syntax

-PRINT *destination* | -NOPRINT

PRINT *destination*

specifies the destination for the SAS procedure output file. The *destination* argument can be a valid Windows pathname or filename (including device names) or an environment variable associated with a pathname. If you specify a pathname and it contains spaces, it must be enclosed in quotation marks. If you specify only a pathname, the procedure output file is created in the specified directory, with the default name of *filename.LST*, where *filename* is the name of your SAS job.

NOPRINT

suppresses the creation of the SAS procedure output file.

Details

The PRINT system option specifies the destination to which SAS output is written when executing SAS programs in modes other than the interactive windowing environment.

The PRINT system option is valid only in batch mode.

When SAS is running interactively, the procedure output file is sent to the OUTPUT window; when SAS is running in batch mode, output is sent to a file named *filename.LST*, where *filename* is the name of your SAS job. You can use the PRINT option to specify an alternate destination.

PRNGETLIST System Option

specifies whether printers that are attached to the system are recognized.

Default: PRNGETLIST

Valid in: configuration file, SAS invocation

Category: LISTCONTROL

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: all

Syntax

PRNGETLIST | NOPRNGETLIST

PRNGETLIST

specifies that SAS recognizes printers that are attached to the system

NOPRNGETLIST

specifies that SAS does not recognize printers that are attached to the system

Details

The PRNGETLIST option specifies that SAS recognizes all printers that are attached to the system. NOPRNGETLIST specifies that SAS does not recognize the printers that

are attached to the system. NOPRNGETLIST can be used by SAS technical support as an alternative to advising users to delete all the printers on their system. NOPRNGETLIST can also be used when SAS is started by the object spawner in order to avoid the performance penalty of discovering printers and their capabilities

PRTABORTDLGS System Option

Specifies when to display the Print Abort dialog box.

Default: BOTH

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-PRTABORTDLGS BOTH | NEITHER | FILE | PRINTER

PRTABORTDLGS = BOTH | NEITHER | FILE | PRINTER

BOTH

specifies to display the Print Abort dialog box when you are printing either to a file or to the printer.

NEITHER

specifies not to display the Print Abort dialog box when you are printing either to a file or to the printer.

FILE

specifies to display the Print Abort dialog box only when you are printing to a file.

PRINTER

specifies to display the Print Abort dialog box only when you are printing to the printer.

Details

The Print Abort dialog box appears only while SAS is spooling a print job to its destination. Use the NEITHER value to suppress the Print Abort dialog box.

See Also

- “Canceling a Print Job” on page 181

P RTPERSISTDEFAULT System Option

Specifies to use the same destination printer from SAS session to SAS session.

Default: NOP RTPERSISTDEFAULT

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: ODS printing

PROC OPTIONS GROUP= ODS PRINT

Windows specifics: all

Syntax

-P RTPERSISTDEFAULT | -NOP RTPERSISTDEFAULT

P RTPERSISTDEFAULT

specifies to use the same destination printer from SAS session to SAS session.

NOP RTPERSISTDEFAULT

specifies to use the default printer.

Details

Typically, when you start SAS, SAS sets the value of the SYSPRINT system option (which specifies the destination printer) to be the Windows default printer. When you start SAS by using the P RTPERSISTDEFAULT system option, SAS sets the value of the SYSPRINT system option to be the destination printer of the last SAS session that was started by using P RTPERSISTDEFAULT.

To use the same destination printer from SAS session to SAS session, you must use the P RTPERSISTDEFAULT system option each time that you start SAS. If you start SAS by using both the SYSPRINT system option and P RTPERSISTDEFAULT system option, the destination printer is the value that is specified by the SYSPRINT system option.

See Also

- “SYSPRINT System Option” on page 576
- “Printing” on page 168

PRTSETFORMS System Option

Specifies whether to include the Use Forms check box in the Print Setup dialog box.

Default: PRTSETFORMS

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-PRTSETFORMS | -NOPRTSETFORMS

PRTSETFORMS | NOPRTSETFORMS

PRTSETFORMS

specifies to include the Use Forms check box in the Print Setup dialog box.

NOPRTSETFORMS

specifies to exclude the Use Forms check box from the Print Setup dialog box.

Details

Use the NOPRTSETFORMS system option to suppress the Use Forms check box in the Print Setup dialog box.

See Also

- “Using SAS Print Forms” on page 177

REALMEMSIZE System Option

Specifies the amount of real memory SAS can expect to allocate.

Default: 0

Valid in: configuration file, SAS invocation

Category: System administration: Memory

PROC OPTIONS GROUP= MEMORY

Windows specifics: valid values

Syntax

-REALMEMSIZE *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

n* | *nK* | *nM* | *nG

specifies the amount of memory to reserve in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); and 1,073,741,824 (gigabytes), respectively. The value of *n* can be a decimal value. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes. Under 32-bit operating environments, the largest value that you can specify is 4294967295 (4G–1).

hexX

specifies the amount of memory as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

MIN

specifies a value of 0 which indicates that the memory usage is determined by SAS when SAS starts.

MAX

specifies to set the memory size to the largest permissible value.

Details

Some SAS procedures use the REALMEMSIZE option to specify how much virtual memory the procedure can allocate and use without inducing excessive page swapping. By contrast, the MEMSIZE option places a limit on the total amount of virtual memory that SAS dynamically allocates at any time. This virtual memory is supported by a combination of real memory and paging space. The operating environment begins paging when the amount of virtual memory that is required exceeds the real memory that is available. To prevent paging and the associated performance problems, the REALMEMSIZE and MEMSIZE options should be set to a subset of real memory.

Comparisons

The REALMEMSIZE option is similar to the SORTSIZE option. The REALMEMSIZE option affects multiple procedures. The SORTSIZE option only affects the SORT procedure.

REGISTER System Option

Adds an application to the Tools menu in the main SAS window.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-REGISTER '*menu-name*' '*command*' <'working-directory'>

'menu-name'

specifies the name you want to appear in the menu. The *menu-name* must be enclosed in quotation marks.

'command'

specifies the command you want to execute. The *command* argument can either be a .EXE, .COM, or .BAT file, or it can be an operating environment command such as the DIR command. The *command* must be enclosed in quotation marks.

'working-directory'

specifies the working directory to use for the application. This argument is optional. Read your application's documentation to see whether the application requires a working directory specification. The *working-directory* must be enclosed in quotation marks.

Details

You can add up to eight commands to the Tools menu in the main SAS window. If your menu name or command does not include blanks or special characters, you can omit the quotation marks. For more information about adding commands to the list, see "Adding Applications to the Tools Menu" on page 66.

RESOURCESLOC System Option

Specifies a directory location of the files that contain SAS resources.

Default: !sasroot\core\resource

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-RESOURCESLOC <(>'directory-specification-1' <'directory-specification-n')> | "."

'directory-specification'

specifies a directory location of the files that contain SAS resources. If *directory-specification* contains spaces, it must be enclosed in quotation marks. If you specify more than one *directory-specification*, enclose the list in parenthesis.

“.”

specifies that the current working folder is to be the default directory for the location of the files that contain SAS resources.

Details

SAS resources are dynamic link libraries that contain icons, strings, and fonts that are used by SAS. The types of files that reside in the RESOURCESLOC directory are font files (.fon, .ttf) and dynamic link libraries (.dll).

You can specify multiple RESOURCESLOC options to define a search order.

RSASUSER System Option

Controls whether members of the Sasuser data library can be opened for update or for read-only access.

Default: NORSASUSER

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Network considerations

See: RSASUSER System Option in *SAS Language Reference: Dictionary*

Syntax

-RSASUSER | -NORSASUSER

RSASUSER

limits access to the Sasuser data library to read-only access in environments where all users share the Sasuser library.

NORSASUSER

enables a user to open a file in the Sasuser library for update access, thus preventing users from sharing members of the Sasuser data library. Update access to the Sasuser library requires exclusive rights to the data library member. NORSASUSER is the default value.

Details

Specifying RSASUSER enables a group of users to share Sasuser data library members by enabling all users to have read-only access to members. For example, if RSASUSER is in effect, each user can open the Sasuser.Profile catalog for read-only access, enabling other users to concurrently read from the Profile catalog. However, no user can write information out to the Profile catalog; you receive an error message if you try to do so.

Specifying RSASUSER in a SAS session affects only that session's access to files. To enable a group of users to share members in the Sasuser data library, the system administrator should set RSASUSER in the network version of the SAS configuration file, which is shared by all users who share the Sasuser data library.

If you specify RSASUSER but no Profile catalog exists in the Sasuser data library, the Profile catalog is created in the Work data library.

Whether the RSASUSER system option is useful depends on how SAS is being used. While the RSASUSER system option is extremely useful when users must share information (such as the Profile catalog) stored in the Sasuser data library, it is not useful if these same users are using SAS/ASSIST software. SAS/ASSIST software requires update access to the Sasuser data library.

RTRACE System Option

Produces a list of resources that are read or loaded during a SAS session.

Default: NONE

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: all

Syntax

-RTRACE ALL | NONE

ALL

specifies to list all the file resources used in a given SAS session.

NONE

specifies not to list the file resources.

Details

Use the RTRACE and the RTRACELOC system options to create a file that lists the resources SAS uses.

See Also

- “RTRACELOC System Option” on page 556
- The SAS Log in *SAS Language Reference: Concepts*.

RTRACELOC System Option

Specifies the pathname of the file to which the list of resources that are read or loaded during a SAS session is written.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: all

Syntax

-RTRACELOC *filename* | *pathname\filename*

filename* | *pathname**filename

specifies a valid Windows filename or a pathname and a filename in which to store the file resource information. If the filename or the pathname contains spaces, enclose the name in quotation marks. If *pathname* is not specified, the file resource information is stored in the current directory.

Details

You can use the RTRACELOC and the RTRACE system options to determine which resources SAS uses.

See Also

- “RTRACE System Option” on page 556

SASAUTOS System Option

Specifies the autocall macro library.

Default: SASAUTOS

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Files

Macro: SAS macro

PROC OPTIONS GROUP= ENVFILES

MACRO

Windows specifics: Valid values for *library-specification*

See: SASAUTOS System Option in *SAS Macro Language: Reference*

Syntax

-SASAUTOS <(>"*library-specification-1*"...<"*library-specification-n*">

SASAUTOS=<(>"*library-specification-1*"...<"*library-specification-n*">

“library-specification-1”... “library-specification-n”

specifies one or more valid Windows pathnames or environment variables that are associated with pathnames. Remember that a pathname is only to the directory or subdirectory level. Windows pathnames must be enclosed in quotation marks if you are using the OPTIONS statement or if the pathname contains spaces. If you specify only one library specification, the parentheses are optional. The value for *library-specification* must resolve to a valid Windows pathname.

Details

The SASAUTOS system option specifies the SAS autocall macro library or libraries.

See Also

- “SASAUTOS System Option” on page 599
- *SAS Macro Language: Reference*.

SASCONTROL System Option

Specifies whether the SAS application windows include system/control menus and minimize/maximize buttons.

Default: SYSTEMMENU MINMAX

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-SASCONTROL SYSTEMMENU | NOSYSTEMMENU <MINMAX | NOMINMAX>

-SASCONTROL <SYSTEMMENU | NOSYSTEMMENU> MINMAX | NOMINMAX

SASCONTROL=SYSTEMMENU | NOSYSTEMMENU <MINMAX | NOMINMAX>

SASCONTROL=<SYSTEMMENU | NOSYSTEMMENU> MINMAX | NOMINMAX

SYSTEMMENU

specifies to display the system/control menu in the windows that are contained in the main SAS window.

NOSYSTEMMENU

specifies to omit the system/control menu and the minimize, maximize, and close buttons from the title bar in the windows that are contained in the main SAS window.

MINMAX

specifies to display the minimize and maximize buttons in the windows that are contained in the main SAS window.

NOMINMAX

specifies to omit the minimize and maximize buttons from the windows that are contained in the main SAS window.

Details

The SASCONTROL system option affects the windows contained inside the main SAS window, but not the main SAS window itself (which is controlled by the AWSCONTROL system option).

The SASCONTROL system option is intended for use by SAS/AF programmers to customize the interface of their applications.

See Also

- “AWSCONTROL System Option” on page 497

SASHELP System Option

Specifies the directory or directories to be searched for SAS default forms, device lists, dictionaries, and other entries in the Sashelp catalog.

Default: `!sasroot\SAS product\sashelp, !sascfg\sascfg`

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *library-specification*

See: SASHELP System Option in *SAS Language Reference: Dictionary*

Syntax

`-SASHELP ("library-specification-1"...<"library-specification-n">`

“library-specification-1”... “library-specification-n”

specifies one or more valid Windows pathnames or environment variables that are associated with pathnames. Remember that a pathname applies only to the directory or subdirectory level. The value for *library-specification* must resolve to a valid Windows pathname. If the pathname contains spaces, it must be enclosed in quotation marks.

Details

The SASHELP system option is set during the installation process and normally is not changed after installation.

Note that products and their corresponding files can be split across multiple drives and directories. The *library-specification* argument can be a Windows pathname or an environment variable associated with a pathname.

SASINITIALFOLDER System Option

Changes the working folder and the default folders for the Open and Save As dialog boxes to the specified folder after SAS initialization is complete.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: all

Syntax

`-SASINITIALFOLDER newfolder`

newfolder

specifies the path to the current working folder and the default folders for the Open and Save As dialog boxes. If *newfolder* contains spaces, it must be enclosed in quotation marks.

Details

SAS determines the locations for AUTOEXEC or INITSTMT files before the SASINITIALFOLDER system option is processed. To ensure that SAS can determine the location of these files, place them in a folder other than the folder that is specified by the SASINITIALFOLDER system option.

If you do not specify the SASINITIALFOLDER system option, SAS determines the current folder by default. SAS uses the Sasuser folder as the default folder for the Open and Save As dialog boxes.

The current working folder is set according to information in “Determining the Current Folder When SAS Starts” on page 9.

SASUSER System Option

Specifies the name of the Sasuser library.

Default: `c:\Users\userid\Documents\My SAS Files\9.2` for Windows Vista, Windows 7, and Windows Server 2008

`c:\Documents and Settings\userid\My Documents\My SAS Files\9.2` for Windows XP, and Windows Server 2003

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *library-specification*; syntax

Syntax

`-SASUSER (“library-specification-1”...<“library-specification-n”>)`

“*library-specification-1*”... “*library-specification-n*”

specifies one or more valid Windows pathnames or environment variables that are associated with pathnames for a SAS library. Remember that a pathname applies only to the directory or subdirectory level. If you list only one library specification, the parentheses are optional. The value for *library-specification* must resolve to a valid Windows pathname.

Details

The SASUSER system option specifies the SAS library that contains a user’s Profile catalog. The default value for SASUSER is defined in the SAS configuration file, which

you can change when you install SAS. If you do not use the SASUSER system option when you invoke SAS (either in the configuration file or as part of the SAS command), the Sasuser library is set to be equal to the Work library, which is temporary.

See Also

- “Profile Catalog” on page 20
- “Using the Sasuser Data Library” on page 134

SCROLLBARFLASH System Option

Specifies whether to allow the mouse or keyboard to focus on a scroll bar.

Default: NOSCROLLBARFLASH

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-SCROLLBARFLASH | -NOSCROLLBARFLASH

SCROLLBARFLASH | NOSCROLLBARFLASH

SCROLLBARFLASH

specifies to enable mouse and keyboard focus on the scroll bars.

NOSCROLLBARFLASH

specifies to disable mouse and keyboard focus on the scroll bars.

Details

Under certain conditions, the cursor can flash if you select a scroll bar using the mouse or the keyboard. You can turn off the flashing cursor using the NOSCROLLBARFLASH system option. You can also use the Preferences dialog box **Advanced** page to disable the flashing cursor by selecting **Disable scroll bar focus**.

See Also

- “Setting Session Preferences” on page 59

SET System Option

Defines a SAS environment variable.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Values intended to represent files or paths must be valid under Windows

Syntax

`-SET SAS-variable "value" | ("value-1"...<"value-n">)`

`SET=SAS-variable "value" | ("value-1"...<"value-n">)`

SAS-variable

specifies the environment variable to define.

value

specifies the value or set of values to assign to the environment variable. If *value* is a pathname that contains spaces, enclose *value* in quotation marks.

Details

This action is analogous to defining a Windows environment variable with the Windows SET command. One way to use the SET system option is to set up environment variables that represent commonly used external files. For example, the following code defines an environment variable for the sample source library:

```
-set sampsrc (!sasroot\base\sample
             !sasroot\stat\sample
             !sasroot\graph\sample)
```

When you refer to SAMPSRC as a library name during your SAS session, SAS automatically assigns the library with the directories listed. Note that *!sasroot* is also a SAS environment variable that represents the root directory of your SAS installation, and is typically assigned in the SAS configuration file.

Environment variables only can be used as a libref if you use the SET system option at SAS invocation and not in an OPTIONS statement.

If you specify SET on the command line when you start SAS, the variable will be set only for that SAS session. To set an environment variable for repeated use, either add the SET system option to your configuration file or create a Windows environment variable.

Note: The words AUX, CON, NUL, LPT1 - LPT9, COM1 - COM9, and PRN are reserved words under Windows. Do not use CON or NUL as environment variable names. Δ

See Also

- \square "Assigning SAS Libraries Using Environment Variables" on page 130
- \square "Using Environment Variables" on page 150

SGIO System Option

Activates the Scatter/Gather I/O feature.

Default: NOSGIO

Valid in: configuration file, SAS invocation

Category: Files: SAS Files

PROC OPTIONS GROUP= SASFILES

Windows specifics: all

Syntax

-SGIO | -NOSGIO

SGIO

specifies to activate the scatter-read / gather-write feature. The scatter-read / gather-write feature remains active until your SAS session ends.

NOSGIO

specifies not to activate the scatter-read/gather-write feature.

Details

The SGIO system option greatly improves I/O performance for SAS I/O files (data sets, catalogs, indexes, utility files, and other I/O files) when the PC has a large amount of RAM. Scatter-read / gather-write bypasses intermediate buffer transfers between memory and disk.

When SGIO is active, SAS uses the number of buffers that are specified by the BUFNO system option to transfer data between disk and RAM. I/O performance usually improves as the value for the BUFNO increases. Try different values of the BUFNO system option to tune each SAS job or DATA step.

The scatter-read / gather-write feature is active only for SAS I/O files that

- contain a 4K-multiple pagesize (for example, 4096 or 8192) on 32-bit systems
- contain a 8K-multiple pagesize (for example, 8192 or 16384) on 64-bit systems
- were not created by using Version 6 of SAS
- are accessed sequentially.

If an I/O file does not meet these criteria, SGIO is inactive for that file even though the SGIO option is specified.

See Also

- “BUFNO System Option” on page 501
- “SAS Features That Optimize Performance” on page 206

SLEEPWINDOW System Option

Enables or disables the SLEEP window.

Default: SLEEPWINDOW

Valid in: configuration file, SAS invocation

Category: Environment control, Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-SLEEPWINDOW | -NOSLEEPWINDOW

SLEEPWINDOW

specifies to display the SLEEP window.

NOSLEEPWINDOW

specifies not to display the SLEEP window.

Details

The SLEEP window appears when the SLEEP function or the WAKEUP function suspends the execution of a DATA step. The SLEEP window displays the time that remains before the DATA step begins running.

See Also

- “SLEEP Function” on page 413
- “WAKEUP Function” on page 415

SORTANOM System Option

Specifies certain options for the SyncSort utility.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

-SORTANOM *option(s)*

SORTANOM=*option(s)*

option(s)

can be one or more of the following:

- b tells SyncSort to run in multi-call mode instead of single-call mode.
- t prints statistics about the sorting process in the SAS log.
- v prints all of the commands that are passed to the SyncSort utility in the SAS log.

See Also

- “Passing Options to SyncSort” on page 445
- The documentation for SyncSort for Windows.

SORTCUT System Option

Specifies the number of observations above which SyncSort is used instead of the SAS sort program.

Default: 0

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

-SORTCUT *n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

SORTCUT=*n* | *nK* | *nM* | *nG* | *hexX* | MIN | MAX

n* | *nK* | *nM* | *nG

specifies the number of observations in multiples of 1 (*n*); 1,024 (*nK*); 1,048,576 (*nM*); and 1,073,741,824 (*nG*), respectively. You can specify decimal values for *n* when it is used to specify a K, M, or G value. For example, a value of **8** specifies 8 observations, a value of **.782k** specifies 801 observations, and a value of **3m** specifies 3,145,728 observations.

hexX

specifies the number of observations as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** specifies 45 observations.

MIN

specifies 0 observations.

MAX

specifies 2,147,483,647 observations.

Details

When you specify SORTPGM=BEST and SAS determines that the database sort utility is not to be used, SAS uses the value of the SORTCUT and SORTCUTP options to determine whether to use SyncSort or the SAS sort. If the data set to be sorted is larger than the number of bytes (or kilobytes or megabytes) that you specify with SORTCUTP, SyncSort is used instead of the SAS sort program. The value that you specify must be less than or equal to 2,147,483,647 bytes. If both SORTCUT and SORTCUTP are either not defined or are set to 0, the SAS sort is used. If you specify both options and either condition is true, SAS uses SyncSort.

See Also

- “SORTCUTP System Option” on page 566
- “SORTPGM System Option” on page 569
- “Sorting Based on Size or Observations” on page 444

SORTCUTP System Option

Specifies the number of bytes above which SyncSort is used instead of the SAS sort program.

Default: 0

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

`-SORTCUTP n | nK | nM | nG | hexX | MIN | MAX`

`SORTCUTP=n | nK | nM | nG | hexX | MIN | MAX`

n* | *nK* | *nM* | *nG

specifies the number of bytes in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); and 1,073,741,824 (gigabytes), respectively. You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the number of bytes as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** specifies 45 bytes.

MIN

specifies 0 bytes.

MAX

specifies 2,147,483,647 bytes.

Details

When you specify SORTPGM=BEST and SAS determines that the database sort utility is not to be used, SAS uses the value of the SORTCUTP and SORTCUT options to determine whether to use SyncSort or the SAS sort. If the data set to be sorted is larger than the number of bytes (or kilobytes or megabytes) that you specify with SORTCUTP, SyncSort is used instead of the SAS sort program. The value that you specify must be less than or equal to 2,147,483,647 bytes. If both SORTCUTP and SORTCUT are either not defined or are set to 0, the SAS sort is used. If you specify both options and either condition is true, SAS uses SyncSort.

The following equation computes the number of bytes to be sorted:

$$\text{number of bytes} = ((\text{length-of-obs}) + (\text{length-of-all-keys})) * \text{number-of-obs}$$

See Also

- “SORTPGM System Option” on page 569
- “SORTCUT System Option” on page 565
- “Sorting Based on Size or Observations” on page 444

SORTDEV System Option

Specifies the pathname used for temporary files created by the SyncSort utility.

Default: same location as -WORK, which is set in the configuration file

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

-SORTDEV “*pathname*”

SORTDEV =“*pathname*”

“*pathname*”

specifies a valid Windows pathname.

Details

The SORTDEV option specifies an alternative pathname for temporary files created by the SyncSort utility. The pathname must be enclosed in quotation marks.

See Also

- “WORK System Option” on page 585
- “Passing Parameters to SyncSort” on page 445

SORTNAME System Option

Specifies the name to the host sort utility

Default: none

Valid in: configuration file, SAS invocation, SASV9_OPTIONS environment variable, OPTIONS statement

PROC OPTIONS GROUP= SORT

WINDOWS specifics: all

Syntax

SORTNAME=*“host-sort-utility-name”*

-SORTNAME *host-sort-utility-name*

Details

The SORTNAME= option specifies the name of the default host sort utility. You can specify syncsort.

See Also

“SORTPGM System Option” on page 569

SORTPARM System Option

Specifies parameters for the SyncSort utility.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

SORTPARM=*“SyncSort-parameters”*

-SORTPARM *“SyncSort-parameters”*

SyncSort-parameters

specifies any parameters that you want to pass to the SyncSort utility. Enclose *SyncSort- parameters* in quotation marks.

Details

See the SyncSort for Windows documentation for a description of *SyncSort- parameters*.

SORTPGM System Option

Specifies the sort utility that is used in the SORT procedure.

Default: BEST

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options

PROC OPTIONS GROUP= SORT

Windows specifics: all

Syntax

-SORTPGM SAS | BEST | HOST

SORTPGM = SAS | BEST | HOST

SAS

tells SAS to sort by using the SAS sort routine.

BEST

tells SAS to determine the best sort routine to sort the data: a database sort, the SAS sort, or SyncSort. When SAS determines that the sort is not to be done by the database, SAS looks at the values for both SORTCUT and SORTCUTP. If they both are set to zero, the SAS sort is used. If both options are set and either condition is met, SAS uses the SyncSort routine.

HOST

tells SAS to sort by using SyncSort for Windows.

See Also

- “SORT Procedure” on page 441
- “SORTCUT System Option” on page 565
- “SORTCUTP System Option” on page 566

SORTSIZE System Option

Specifies the amount of memory available to the SORT procedure.

Default: 64M

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Sort: Procedure options
 System administration: Memory

PROC OPTIONS GROUP= MEMORY
 SORT

Windows specifics: Default value

See: SORTSIZE System Option in *SAS Language Reference: Dictionary*

Syntax

`-SORTSIZE n | nK | nM | nG | hexX | MIN | MAX`
`SORTSIZE= n | nK | nM | nG | hexX | MIN | MAX`

n* | *nK* | *nM* | *nG

specifies the amount of memory in multiples of 1; 1,024 (kilobytes); 1,048,576 (megabytes); and 1,073,741,824 (gigabytes) respectively. You can specify decimal values for the number of kilobytes, megabytes, or gigabytes. For example, a value of **8** specifies 8 bytes, a value of **.782k** specifies 801 bytes, and a value of **3m** specifies 3,145,728 bytes.

hexX

specifies the amount of memory as a hexadecimal value. You must specify the value beginning with a number (0–9), followed by an X. For example, the value **2dx** sets the amount of memory to 45 bytes.

MIN

specifies the minimum amount of memory available.

MAX

specifies the maximum amount of memory available.

Details

By default, this option is set to the maximum amount of memory available. The SORTSIZE system option can reduce the amount of swapping SAS must do to sort the data set. If PROC SORT needs more memory than you specify, it creates a temporary utility file in your Saswork directory in which to store the data. The SORT procedure's algorithm can swap unneeded data more efficiently than Windows can.

Comparisons

The SORTSIZE option is similar to the REALMEMSIZE option. SORTSIZE only affects the SORT procedure. REALMEMSIZE affects multiple procedures.

See Also

- “SORT Procedure” on page 441
- “Improving Performance of the SORT Procedure” on page 208

SPLASH System Option

Specifies whether to display the splash screen (logo screen) when SAS starts.

Default: SPLASH
Valid in: configuration file, SAS invocation
Category: Environment control: Display
PROC OPTIONS GROUP= ENVDISPLAY
Windows specifics: all

Syntax

-SPLASH | -NOSPLASH
 -SPLASH ON | -SPLASH OFF

SPLASH or SPLASH ON

specifies to display the logo screen when SAS initiates.

NOSPLASH or SPLASH OFF

specifies to not display the logo screen when SAS initiates.

Details

The SPLASH system option displays the SAS logo screen when SAS initiates.

You can specify a custom splash screen to display with the SPLASHLOC system option.

See Also

- “SPLASHLOC System Option” on page 571

SPLASHLOC System Option

Specifies the location of the splash screen bitmap that appears when SAS starts.

Default: none
Valid in: configuration file, SAS invocation
Category: Environment control: Display
PROC OPTIONS GROUP= ENVDISPLAY
Windows specifics: all

Syntax

-SPLASHLOC *DLL-name* <res-number> | *BMP-filename*

DLL-name

specifies the dynamic link library (DLL) where your customized logo and copyright screen reside.

res-number

specifies the resource number connected with the dynamic link library (DLL) name.

BMP-filename

specifies the path and name of a stand-alone Windows bitmap (BMP) file to use as a splash screen.

Details

You can create a bitmap resource (a customized logo and copyright screen) and build it into a dynamic link library (DLL). The DLL that you use must be 32-bit if you are running a 32-bit version of SAS or it must be 64-bit if you are running a 64-bit version of SAS (that is, created using the libraries from the Microsoft Platform SDK). If you specify a *DLL-name* without a resource number (*res-number*), the default resource number is 1.

Alternatively, you can specify the path and name of a stand-alone Windows bitmap (BMP) file to use as a splash screen. The path must be a valid Windows pathname. If the pathname contains spaces, it must be enclosed in quotation marks.

STIMEFMT System Option

Specifies the format to use for displaying the time on STIMER output.

Default: M

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: all

Syntax

-STIMEFMT S | M | H | SECONDS | MINUTES | HOURS

STIMEFMT=S | M | H | SECONDS | MINUTES | HOURS

S, SECONDS

specifies that SAS software display the STIMER output as **seconds**.

M, MINUTES

specifies that SAS software display the STIMER output as **minutes:seconds**

H, HOURS

specifies that SAS software display the STIMER output as **hours:minutes:seconds**.

Details

The STIMEFMT system option specifies the format to use to display STIMER output as either **seconds**, **minutes:seconds**, or **hours:minutes:seconds**.

See Also

- The SAS Log in *SAS Language Reference: Concepts*.

STIMER System Option

Writes a subset of system performance statistics to the SAS log.

Default: STIMER

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: Reported statistics

Syntax

-STIMER | -NOSTIMER

STIMER | NOSTIMER

STIMER

writes real-time and CPU time to the SAS log.

NOSTIMER

does not write real-time and CPU time to the SAS log.

Details

The STIMER system option prints to the SAS log the amount of time it took for SAS to complete a DATA step or procedure task.

The following is an example of STIMER output:

```
real time      0.96 seconds
cpu time       0.01 seconds
```

STIMER displays the following statistics:

Table 23.3 Description of STIMER Statistics

Statistic	Description
Real-Time	the amount of time spent to process the SAS job. Real-time is also referred to as elapsed time.
CPU Time	the total time spent to execute your SAS code and spent to perform system overhead tasks on behalf of the SAS process. This value is the combination of the user CPU and system CPU statistics from FULLSTIMER.

Note: Starting in SAS 9, some procedures use multiple threads. On computers with multiple CPUs, the operating system can run more than one thread simultaneously. Consequently, CPU time might exceed real-time in your STIMER output. △

For example, a SAS procedure could use two threads that run on two separate CPUs simultaneously. The value of CPU time would be calculated as the following:

```

CPU1 time + CPU2 time = total CPU time
1 second + 1 second = 2 seconds

```

Since CPU1 can run a thread at the same time that CPU2 runs a separate thread for the same SAS process, you can theoretically consume 2 CPU seconds in 1 second of real-time.

Comparisons

The STIMER system option specifies whether a subset of all the performance statistics of your operating environment that are available to SAS are written to the SAS log. The FULLSTIMER system option specifies whether all of the available performance statistics are written to the SAS log.

See Also

- “FULLSTIMER System Option” on page 516
- The chapter on optimizing system performance in *SAS Language Reference: Concepts*.

SYSGUIFONT System Option

Specifies a font to use for the button text and the descriptive text.

Default: depends upon display settings

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-SYSGUIFONT "*font-name*" <*font-size*>

“font-name”

specifies the name of the font for text in screen and dialog box text elements. This name must be a valid font name (for example, “Times New Roman” or “Courier”) that matches the name of the font as it is installed on your system. The *font-name* must be enclosed in double quotation marks, and is a required argument.

font-size

specifies the font size to use for the window text. If you omit *font-size*, SAS uses the default.

Details

The SYSGUIFONT system option controls the font size of the text for screen text and dialog box text elements. Use the FONT system option to change the fonts for the

window contents. You might need to maximize the SAS window in order to allow space for large fonts to be readable.

See Also

- “FONT System Option” on page 513
- “Selecting Fonts” on page 58

SYSIN System Option

Specifies a batch mode source file.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *file-specification*

Syntax

`-SYSIN file-specification | -NOSYSIN`

SYSIN *file-specification*

specifies to start SAS and submit the file in batch mode. The value of *file-specification* must be a valid Windows filename.

NOSYSIN

specifies to start SAS in batch mode, but do not submit any files. This option is useful for testing your SAS autoexec file; after your autoexec file is processed, SAS exits.

Details

The SYSIN system option specifies a file containing a SAS program. This option indicates to SAS that you are executing in noninteractive mode and can be specified only in the SAS invocation.

SYSPARM System Option

Specifies a character string that can be passed to SAS programs.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values and syntax for *characters*

See: SYSPARM System Option in *SAS Macro Language: Reference*

Syntax

-SYSPARM <">*characters*<">

SYSPARM=<">*characters*<">

characters

writes the character string in all uppercase.

"*characters*"

preserves the case of the character string.

Details

The SYSPARM system option specifies a character string that can be passed to SAS programs.

The character string specified can be accessed in a SAS DATA step by the SYSPARM() function or anywhere in a SAS program by using the automatic macro variable referenced by &SYSPARM.

SYSPRINT System Option

Specifies a destination printer for printing SAS output.

Default: Default system printer

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: Procedure output

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: all

Syntax

-SYSPRINT “*printer-name*” <“*destination*”>

SYSPRINT=“*printer-name*” <“*destination*”>

“*printer-name*”

specifies the name of the printer as it is installed under Windows (for example, “Charlie’s HP LaserJet”). You can find the list of installed printers on your system by selecting the Printers item in the Windows Control Panel. The *printer-name* must be enclosed in double quotation marks.

“*destination*”

specifies a filename to write the print file to disk. If specified, then all printer output generated by SAS is routed to this file, overwriting any existing file with the same name. Even though the output is not sent directly to a printer, it is still formatted using the printer driver associated with *printer-name*. The *destination* must be enclosed in double quotation marks.

Details

The SYSPRINT system option specifies the destination of a printer where you want to print your SAS output.

If you select a different printer by using the Print Setup dialog box, the value of the SYSPRINT system option (shown by PROC OPTIONS) reflects that selection.

If you do not specify the SYSPRINT system option or the PRTPERSISTDEFAULT system option, the *printer-name* and *destination* arguments use the default system printer value.

If PRTPERSISTDEFAULT is specified when SAS starts, the value of SYSPRINT persists from SAS session to SAS session. If both SYSPRINT and PRTPERSISTDEFAULT are specified when SAS starts, the value of SYSPRINT is the printer specified by SYSPRINT.

CAUTION:

Modifying print options by using the Windows printing dialog boxes can change the values of SAS printing system options. If you set printing options using SAS system options such as SYSPRINT, and then use the Windows printing dialog boxes to set printing options, the SAS system options are set to the values specified in the Windows print dialog boxes. △

See Also

- “Printing” on page 168
- “PRTPERSISTDEFAULT System Option” on page 551
- “SYSPRINTFONT System Option” on page 578

SYSPRINTFONT System Option

Specifies the font to use when SAS is printing to the current default printer.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Log and procedure output control: Procedure output

PROC OPTIONS GROUP= LISTCONTROL

Windows specifics: all

See: SYSPRINTFONT System Option in *SAS Language Reference: Dictionary*

Syntax

```
-SYSPRINTFONT ("font-name" <BOLD | NORMAL><REGULAR |  
ITALIC><character-set> <point-size> <NAMED "printer-name" | UPRINT=  
"printer-name" | DEFAULT | ALL>
```

```
SYSPRINTFONT="font-name" <BOLD | NORMAL><REGULAR |  
ITALIC><character-set> <point-size> <NAMED "printer-name" | UPRINT=  
"printer-name" | DEFAULT | ALL>
```

"font-name"

specifies the name of the font to use for printing. This name must be a valid font name (for example, "SAS Monospace" or "Courier") that matches the name of the font as it is installed on your system. The *font-name* must be enclosed in double quotation marks, and is a required argument.

BOLD | NORMAL

specifies the weight of the font. The default is NORMAL.

REGULAR | ITALIC

specifies the style of the font. The default is REGULAR.

character-set

specifies the character set to use for printing. The default is "Windows". Valid values are Western, Central European, Cyrillic, Greek, Turkish, Arabic, Baltic, and Thai. If the font does not support the specified character set, the default character set is used. If the default character set is not supported by the font, the font's default character set is used.

point-size

specifies the point size to use for printing. This value must be an integer from 1 to 7200, inclusive. If you omit this argument, SAS uses 10 points.

NAMED "*printer-name*"

updates the font information for the named printer in the Sasuser.Profile2 catalog. The printer name must exactly match the name shown in the Print Setup dialog box (except that the printer name is not case sensitive). The *printer-name* must be enclosed in double quotation marks. This keyword is optional.

UPRINT="*printer-name*"

specifies a Universal Printer to which these settings apply. UPRINT is valid only for printers that are listed in the SAS registry. The *printer-name* must exactly match

the name shown in the Print Setup dialog box, except that the printer name is not case sensitive. If the Universal Prints is more than one word, *printer-name* must be enclosed in single or double quotation marks. The quotation marks are stored with the printer-name.

DEFAULT

specifies the default font information for the printer used by the -SYSPRINT system option in the Sasuser.Profile2 catalog.

ALL

updates the font information for all installed printers in the Sasuser.Profile2 catalog. This keyword is optional.

Details

The SYSPRINTFONT system option sets the font to use when SAS is printing to the current default printer (which might be specified in the SYSPRINT system option) or to the printer identified with the optional keywords NAMED or ALL. This information is stored in the Sasuser.Profile2 catalog.

Enclose the SYSPRINTFONT option arguments in parenthesis when you specify the option in a configuration file, on the command line, or in the SAS System Options window. Parenthesis are not required if you specify the SYSPRINTFONT system option in the OPTIONS statement.

If you use SYSPRINTFONT with either the DEFAULT or no keyword and later use the SYSPRINT system option or the Print Setup dialog box to change the current default printer, then the font used with the current default printer will be

- 1 The font specified in Sasuser.Profile2 for the given printer, if any.
- 2 The font specified with SYSPRINTFONT, if the specified font exists on the printer.
- 3 If there is no font defined for the printer in Sasuser.Profile2, and SYSPRINTFONT doesn't specify a valid font for the printer, and the current display font is scalable, then SAS will use the display font to print.
- 4 If the current display font is not scalable, SAS will use 10-point SAS Monospace.
- 5 If the SAS Monospace font is not available, SAS will use the printer's default font to print.

Note: To ensure that row and column separators and boxed tabular reports will be printed legibly when using the standard forms characters, you must use these resources: Δ

- the SAS Monospace or the SAS Monospace Bold font
- a printer that supports TrueType fonts

Examples

Example 1: Specifying a Font to the Default Printer This example specifies to use the 12-point SAS Monospace font on the default printer:

```
-sysprintfont ("SAS Monospace" 12)
```

Example 2: Specifying a Font to a Named Printer This example specifies to use 10-point Courier New on the printer named HP LaserJet IIIsi Postscript, attached to LPT1:. Note that the name given for the printer is how it appears in the Print Setup dialog box in SAS:

```
-sysprintfont ("Courier New" named
"HP LaserJet IIIsi Postscript on LPT1:")
```

Example 3: Specifying a Font to a Universal Printer on the SAS command line This example specifies the Albany AMT font for the PDF Universal Printer:

```
sysprintfont=('courier' 11 uprint='PDF')
```

See Also

- “SYSPRINT System Option” on page 576

TOOLDEF System Option

Specifies the Toolbox display location.

Default: TOP RIGHT

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-TOOLDEF TOP | CENTER | BOTTOM <LEFT | CENTER | RIGHT>

TOP | CENTER | BOTTOM

specifies the vertical position of the Toolbox. The default value is TOP.

LEFT | CENTER | RIGHT

specifies the horizontal position of the Toolbox. The default value is RIGHT.

Details

The TOOLDEF system option specifies where the Toolbox is located within your display when it is viewable.

You must specify a vertical position first. You do not have to specify a horizontal position, but if you omit it, RIGHT is used.

Note: The Toolbox is positioned with respect to your entire display, not to the main SAS window. This option has no effect if you are using the toolbar instead of the Toolbox. Δ

See Also

- “Customizing a Toolbar” on page 69
- “Using the Toolbar to Issue Commands” on page 41

UPRINTMENUSWITCH System Option

Enables the universal print commands in the File menu.

Default: NOUPRINTMENUSWITCH

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: ODS printing

PROC OPTIONS GROUP= ODSPRINT

Windows specifics: all

Syntax

-UPRINTMENUSWITCH | -NOUPRINTMENUSWITCH

UPRINTMENUSWITCH

specifies that the print commands in the File menu invoke the Universal Printing dialog boxes.

NOUPRINTMENUSWITCH

specifies that the print commands in the File menu will invoke the Windows dialog boxes.

Details

To enable the Universal Printing menus and dialog boxes, you must specify both the UNIVERSALPRINT system option and the UPRINTMENUSWITCH system option when you start SAS. Specifying the UPRINTMENUSWITCH option without specifying the UNIVERSALPRINT option will not invoke the Universal Printing menus and dialog boxes.

See Also

- “Introduction to Printing in SAS within the Windows Environment” on page 168

USER System Option

Specifies the name of the default permanent SAS library.

Default: none

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *library-specification*

See: USER System Option in *SAS Language Reference: Dictionary*

Syntax

-USER “*library-specification*”

USER=“*library-specification*”

library-specification

specifies the default libref, an environment variable, or Windows pathname in which to store data sets that are created during a SAS session. Remember that a pathname is only to the directory or subdirectory level. The value of *library-specification* must resolve to a valid Windows pathname.

Details

When you specify the USER system option, any data set that you create with a one-level name will be permanently stored in the specified library. If you want to create a temporary data set, use a two-level name for the data set, with the first part being Work (for example, **work.tempdata**).

USERICON System Option

Specifies the pathname of the resource file associated with your user-defined icon.

Default: none

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-USERICON *icon-resource-filename number-of-icons*

icon-resource-filename

specifies the fully qualified Windows pathname of the resource file associated with your user-defined icons. If the pathname contains spaces, it must be enclosed in quotation marks.

number-of-icons

specifies the maximum number of icons stored in the resource file that you specified.

Details

The USERICON system option specifies the fully qualified Windows pathname of the resource file associated with your icons, along with the maximum number of icons stored in the resource file that you specified.

The icon resource file must be compiled using the Win32 Software Development Kit (SDK). For more information, refer to the SDK documentation. User-defined icons can be incorporated into applications developed with SAS/AF or SAS/EIS software.

Example

The following USERICON system option specifies 10 icons that are stored in C:\MYSTUFF\MYICONS.DLL:

```
-usericon c:\mystuff\myicons.dll 10
```

VERBOSE System Option

Controls whether SAS writes the settings of all the system options specified in the configuration file to either the terminal or the batch log.

Default: NOVERBOSE

Valid in: configuration file, SAS invocation

Category: Log and procedure output control: SAS log

PROC OPTIONS GROUP= LOGCONTROL

Windows specifics: Amount of information reported

Syntax

-VERBOSE | -NOVERBOSE

VERBOSE

specifies to write the settings of the system options to the log.

NOVERBOSE

specifies not to write the settings of the system options to the log. NOVERBOSE is the default.

Details

The VERBOSE system option writes the settings of SAS system options that were set at SAS invocation either on the command line or as part of the configuration file. If you invoke SAS at a terminal, the settings are displayed at the terminal. If you invoke SAS as a part of a batch job, the settings are written to the batch log. You cannot change the settings of the SAS system options with the VERBOSE system option.

The VERBOSE system option is a good error diagnostic tool. If you receive an error message when you invoke SAS, you can use this option to see whether you have an error in your system option specifications.

See Also

- The SAS Log in *SAS Language Reference: Concepts*.

WEBUI System Option

Specifies to enable Web enhancements.

Default: NOWEBUI

Valid in: configuration file, SAS invocation

Category: Input control: Data processing

PROC OPTIONS GROUP= INPUTCONTROL

Windows specifics: all

Syntax

-WEBUI | -NOWEBUI

WEBUI

specifies to enable Web enhancements.

NOWEBUI

specifies to disable Web enhancements.

Details

If you have installed Microsoft Internet Explorer 5.0 (IE) or later and specify the WEBUI system option, certain windows, such as the SAS Explorer window, work like an IE Web page where pointing to an object with the mouse selects the object and a single mouse-click invokes the object's default action.

To select a range of objects, press and hold down the SHIFT key, and point to the first and last objects in the group.

To select multiple items, press and hold down the CTRL key, and point to individual items in the group.

WINDOWSMENU System Option

Specifies to include or suppress the Window menu in windows that display menus.

Default: NOWINDOWSMENU

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-WINDOWSMENU | -NOWINDOWSMENU

WINDOWSMENU | NOWINDOWSMENU

WINDOWSMENU

specifies to include the Window menu in the main menu if the NOAWSMENUMERGE system option is specified.

NOWINDOWSMENU

specifies to suppress the Window menu in the main menu if the NOAWSMENUMERGE system option is specified.

Details

The WINDOWSMENU system option is valid only if the NOAWSMENUMERGE system option is specified.

See Also

- “AWSMENUMERGE System Option” on page 500

WORK System Option

Specifies the pathname for the directory containing the Work data library.

Default: !TEMP\SAS Temporary Files

Valid in: configuration file, SAS invocation

Category: Environment control: Files

PROC OPTIONS GROUP= ENVFILES

Windows specifics: Valid values for *library-specification*

See: WORK System Option in *SAS Language Reference: Dictionary*

Syntax

-WORK “*library-specification*”

“*library-specification*”

specifies an environment variable or a Windows pathname. Remember that a pathname is only to the directory or subdirectory level. The value of *library-specification* must resolve to a valid Windows pathname. The *library-specification* must be enclosed in double quotation marks.

Details

The default SAS configuration file creates the Work data library in a folder named “SAS Temporary Files” located in your system’s designated temporary area (as specified by the TEMP environment variable).

SAS creates a subdirectory called TDnnnnn for each SAS process under the directory you specify in the WORK option, where nnnnn is a unique number.

If *library-specification* is a directory, then the work-data library will be stored in the directory. If *library-specification* is a file, then SAS will select a directory from the file to store the work-data library. The file must be a plain-text file. The following types of lines are valid in the file:

- blank line, which are ignored
- lines wrapped in C-style comments (*/*...*/*), which are ignored
- lines that contain unquoted paths to a directory, only one path per line is allowed
- lines that contain instructions on how to choose a path using the argument *method=space* or *method=random*. If there are multiple *method=* lines, only the last line is processed. If there are no *method=* lines in the file, then *method=random* will be processed.

The error message, **Library WORK does not exist** is displayed for the following conditions:

- the path does not exist
- a path, not a directory, is specified for the argument.

See Also

- “Work Data Library” on page 21

XCMD System Option

Specifies that the X command is valid in the current SAS session.

Default: XCMD

Valid in: configuration file, SAS invocation

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-XCMD | -NOXCMD

-XCMD ON | -XCMD OFF

XCMD or XCMD ON

specifies to allow the X command to be valid in the current SAS session.

NOXCMD or XCMD OFF

specifies not to allow the X command to be valid in the current SAS session.

Details

The XCMD allows the X command to be active in the current SAS session.

If you specify NOXCMD, the following are disabled:

- PIPE and NAMEPIPE device types in the FILENAME statement
- CALL SYSTEM routine

- X command
- Dynamic Data Exchange (DDE)
- %SYSEXEC macro
- SYSTASK statement
- FILENAME function.

See Also

- “X Command” on page 377

XMIN System Option

Specifies to open the application specified in the X command in a minimized state or in the default active state.

Default: NOXMIN

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-XMIN | -NOXMIN

XMIN | NOXMIN

XMIN

specifies to start the application specified in the X command in a minimized state.

NOXMIN

specifies to start the application specified in the X command in the default active state.

Details

The XMIN system option allows you to open an application specified in the X command in a minimized state or in the default active state.

XSYNC System Option

Controls whether an X command or statement executes synchronously or asynchronously.

Default: XSYNC

Valid in: configuration file, SAS invocation, OPTIONS statement, SAS System Options window

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-XSYNC | -NOXSYNC

XSYNC | NOXSYNC

XSYNC

specifies that the operating system command execute synchronously with your SAS session. That is, control is not returned to SAS until the command has completed.

You cannot return to your SAS session until the process spawned by the X command or statement is closed. XSYNC is the default.

NOXSYNC

specifies that the operating system command execute asynchronously with your SAS session. That is, control is returned immediately to SAS and the command continues executing without interfering with your SAS session. With NOXSYNC in effect, you can execute an X command or X statement and return to your SAS session without closing the process spawned by the X command or X statement.

Details

The value of the XSYNC system option affects the execution of the following:

- X statement
- X command
- CALL SYSTEM routine
- %SYSEXEC statement.

See Also

- “Running Windows or MS-DOS Commands from within SAS” on page 26
- “XWAIT System Option” on page 589
- “X Statement” on page 471
- “X Command” on page 377
- “CALL SYSTEM Routine” on page 391
- “Macro Statements” on page 597

XWAIT System Option

Specifies whether you have to type EXIT at the DOS prompt before the DOS shell closes.

Default: XWAIT

Valid in: configuration file, SAS invocation, OPTIONS statement

Category: Environment control: Display

PROC OPTIONS GROUP= ENVDISPLAY

Windows specifics: all

Syntax

-XWAIT | -NOXWAIT

XWAIT | NOXWAIT

XWAIT

specifies that you must type EXIT to return to your SAS session. XWAIT is the default.

NOXWAIT

specifies that the command processor automatically returns to the SAS session after the specified command is executed. You do not have to type EXIT.

Details

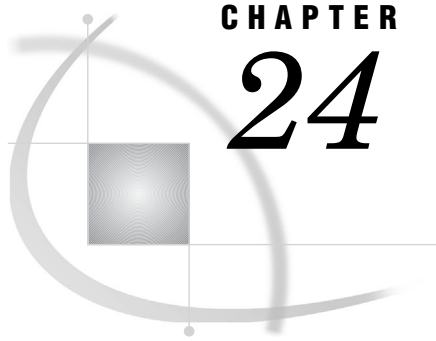
The XWAIT system option does not affect Windows applications, such as Excel. It only applies to applications that execute in a Command Prompt window.

The XWAIT system option affects the Command Prompt window started by any of the following:

- X statement
- X command
- CALL SYSTEM routine
- %SYSEXEC statement.

See Also

- “Running Windows or MS-DOS Commands from within SAS” on page 26
- “XSYNC System Option” on page 588
- “X Statement” on page 471
- “X Command” on page 377
- “CALL SYSTEM Routine” on page 391
- “Macro Statements” on page 597



CHAPTER

24

Length and Precision of Variables

Length and Precision of Variables under Windows 591

Numeric Variables 591

Character Variables 592

Length and Precision of Variables under Windows

For detailed information about how SAS stores representations of numeric and character data, see *SAS Language Reference: Concepts*. Data representation issues vary among different operating environments; the topics in this section discuss how data are represented in SAS under Windows.

Numeric Variables

The default length of numeric variables in SAS data sets is 8 bytes. (You can control the length of SAS numeric variables with the LENGTH statement in the DATA step.) In SAS under Windows, the Windows data type of numeric values that have a length of 8 is LONG REAL. The precision of floating-point values is accurate to approximately 15 digits. Depending upon the number, the precision can be 16 digits of accuracy. For more information about the representation of the LONG REAL Windows data type, see Intel's developer Web site. Table 24.1 on page 591 specifies the significant digits and largest integer values that can be stored in SAS numeric variables.

Table 24.1 Significant Digits and Largest Integer by Length for SAS Variables under Windows

Length in Bytes	Largest Integer Represented Exactly	Exponential Notation	Significant Digits Retained
3	8,192	2^{13}	3
4	2,097,152	2^{21}	6
5	536,870,912	2^{29}	8
6	137,438,953,472	2^{37}	11

Length in Bytes	Largest Integer Represented Exactly	Exponential Notation	Significant Digits Retained
7	35,184,372,088,832	2^{45}	13
8	9,007,199,254,740,992	2^{53}	15

For example, if you know that a numeric variable always has values between 0 and 100, you can use a length of 3 to store the number and thus save space in your data set. Here is an example:

```
data mydata;
  length num 3;
  more data lines
run;
```

Note: *Dummy variables* (those variables whose only purpose is to hold 0 or 1) can be stored in a variable whose length is 3 bytes. Δ

CAUTION:

Use the 3-byte limit for only those variables whose values are small, preferably integers.

If the value of a variable becomes large or has many significant digits, you can lose precision when saving the results of arithmetic calculations if the length of a variable is less than 8 bytes. Δ

The maximum number of variables is limited by the first encountered limitation:

- the observation length
- the total storage possible for names, labels, and metadata
- the amount of available memory on the machine where the data set is stored.

You can define a data set with an observation length of up to 2GB on a 32-bit platform and approximately 2^{46} bytes on a 64-bit platform. The observation length cannot exceed the value of the BUFSIZE option.

Assuming a single-byte character set, and that you use the maximum 352 bytes possible for name, label, and other data, for each variable, you can have a maximum of approximately 1,350,000 variables. If the names, labels, and format names are shorter, you can have more than 66,666,666. There is a maximum of 1GB to store all the variable names and other metadata (data set label, compression name, and other data).

Assuming that the above limits are not exceeded the maximum possible number of variables is 412,977,617 on 32-bit hosts and 2GB on 64-bit hosts.

Character Variables

In SAS under Windows, character values are sorted using the ASCII collating sequence. As an alternative to the numeric dummy variables discussed previously, you can choose a character variable with a length of 1 byte to serve the same purpose.

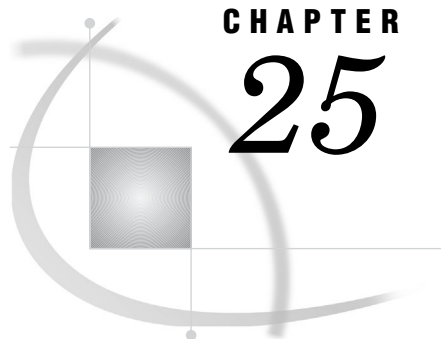
The maximum number of variables is limited by the first encountered limitation:

- the observation length
- the total storage possible for names, labels, and metadata
- the amount of available memory on the machine where the data set is stored.

You can define a data set with an observation length of up to 2GB on a 32-bit platform and approximately 2^{46} bytes on a 64-bit platform. The observation length cannot exceed the value of the BUFSIZE option.

Assuming a single-byte character set, and that you use the maximum 352 bytes possible for name, label, and other data, for each variable, you can have a maximum of about 4,050,000 variables. If the names, labels, and format names are shorter, you can have more than 200,000,000. There is a maximum of 1GB to store all the variable names and other metadata (data set label, compression name, and other data).

Assuming that the above limits are not exceeded the maximum possible number of variables is 412,977,617 on 32-bit hosts and 2GB on 64-bit hosts.



CHAPTER

25

SAS Macro Facility under Windows

<i>SAS Macro Facility under Windows</i>	595
<i>Automatic Macro Variables</i>	595
<i>Macro Statements</i>	597
<i>Macro Functions</i>	598
<i>Autocall Libraries</i>	598
<i>SASAUTOS System Option</i>	599

SAS Macro Facility under Windows

In general, the SAS macro language is portable across operating environments. This section discusses those components of the macro facility that have system dependencies. For more information, see the *SAS Macro Language: Reference* and *SAS Language Reference: Dictionary*.

Note: The words CON, NUL, PRN, COM1 through COM9, and LPT1 through LPT9 are reserved words under Windows. Do not use these reserved words as the name of a macro variable. △

Automatic Macro Variables

The following automatic macro variables have values that are specific to Windows:

SYSCC

contains the current SAS condition code that SAS returns to Windows when SAS exits. Upon exit, SAS translates this condition code to a return code that has a meaningful value for the operating environment.

Note: When ERRORCHECK=NORMAL, the return code will be 0 even if an error exists in a LIBNAME or FILENAME statement, or in a LOCK statement in SAS/SHARE software. Also, the SAS job or session will not end when the %INCLUDE statement fails due to a nonexistent file. For more information, see the ERRORCHECK= system option in the *SAS Language Reference: Dictionary* △

SYSDEVIC

gives the name of the current graphics device. The current graphics device is determined by the DEVICE system option. Contact your on-site SAS support personnel to determine which graphics devices are available at your site. For information about the DEVICE system option, see “DEVICE System Option” on page 506 and *SAS Language Reference: Dictionary*.

SYSENV

always contains the value **FORE** under Windows.

SYSJOBID

returns a number that uniquely identifies the SAS task under Windows.

SYSMAXLONG

returns the maximum long integer value that is allowed under Windows, which is 2,147,483,647.

SYSRC

holds the Windows status of Windows commands that are issued during your SAS session. The variable holds a character string that is the text form of the decimal value of the Windows command status.

For example, consider the following statements:

```
options noxwait;
x 'dirf'; /* Invalid Windows command */
%put This Windows status is &sysrc;
x 'dir'; /* Valid Windows command */
%put The corrected Windows status is &sysrc;
```

The following lines are written to the SAS log:

```
This Windows status is 1
The corrected Windows status is 1
```

The **OPTIONS** statement turns the **XWAIT** option off so that the Windows command prompt window closes automatically. You do not have to type **exit** to return to your SAS session. The value of “This Windows status is” will be 1, and the value for “The corrected Windows status is” will be 1. If you run this example with the **XWAIT** option, you would need to type **exit** before SAS would run the code. After you type **exit**, a value of 9009 is returned for the statement “This Windows status is”, and 0 is the value for “The corrected Windows status is”. If you use the **NOXSYNC** system option, the value of **SYSRC** is automatically 0.

SYSSCP

returns the operating environment abbreviation **WIN**.

SYSSCPL

returns the name of the specific Windows environment that you are using. The possible return values are

NET_ASRV

Microsoft Windows Server 2003 Enterprise Edition

NET_DSRV

Microsoft Windows Server 2003 Datacenter Edition

NET_SRV

Microsoft Windows Server 2003 Standard Edition

W32_DSRV08

Microsoft Windows 2008 Datacenter Server

W32_ESRV08

Microsoft Windows 2008 Enterprise Server

W32_SRV08

Microsoft Windows Server 2008

W32_VSPRO

Microsoft Windows Vista or Windows 7

X64_VSPRO	Microsoft Windows Vista x64 or Windows 7 x64
W64_ASRV	Microsoft Windows Server 2003 Enterprise 64-bit Edition for Itanium-based computers
W64_DSRV	Microsoft Windows Server 2003 Datacenter 64-bit Edition for Itanium-based computers
W64_DSRV08	Microsoft Windows Server 2008 Datacenter 64-bit edition for Itanium-based computers
W64_ESRV08	Microsoft Windows Server 2008 Enterprise 64-bit edition for Itanium-based computers
W64_SRV08	Microsoft Windows Server 2008 Standard 64-bit edition for Itanium-based computers
X64_DSRV	Microsoft Windows Server 2003 Datacenter 64-bit edition for x64 based computers
X64_ESRV	Microsoft Windows Server 2003 Enterprise 64-bit edition for x64 based computers
X64_SRV	Microsoft Windows Server 2003 Standard 64-bit edition for x64 based computers
X64_DSRV08	Microsoft Windows Server 2008 Datacenter 64-bit edition for x64-based computers
X64_ESRV08	Microsoft Windows Server 2008 Enterprise 64-bit edition for x64-based computers
X64_PRO	Microsoft Windows XP Professional x64 edition
X64_SRV08	Microsoft Windows Server 2008 Standard 64-bit edition for x64-based computers
XP_PRO	Microsoft Windows XP Professional

Macro Statements

The following macro statement has behavior specific to Windows:

`%SYSEXEC`

executes operating environment commands immediately and places the return code in the `SYSRC` automatic macro variable. The `%SYSEXEC` statement is similar to

the X statement that is described in “Running Windows or MS-DOS Commands from within SAS” on page 26. You can use the %SYSEXEC statement inside a macro or in open code. The %SYSEXEC statement has the following syntax:

```
%SYSEXEC <command>;
```

The *command* argument can be any operating environment command or any sequence of macro operations that generates an operating environment command. You can also use the *command* argument to invoke a Windows application such as Notepad.

Omitting the *command* argument launches a command prompt subprocess, which is interactive. To return to your SAS session, type EXIT at the command prompt and press ENTER. The SYSRC automatic variable is set to 0 if you omit the *command* argument in the %SYSEXEC statement.

Here is a simple example of %SYSEXEC:

```
%sysexec time;
```

This statement launches a command prompt session that displays the following lines:

```
The current time is: 16:32:45.16
Enter new time:
```

Note: The %SYSEXEC statement uses the XSYNC and XWAIT system option values just like the X statement and X command do. For more information about these system options, see “XSYNC System Option” on page 588 and “XWAIT System Option” on page 589. Δ

Macro Functions

The behavior of the %SYSGET macro function is specific to Windows:

%SYSGET

returns the character string that is the value of the Windows environment variable that is passed as the argument. Both Windows and SAS environment variables can be translated by using the %SYSGET function. A warning message is printed if the environment variable does not exist. The %SYSGET function has the following syntax:

```
%SYSGET(environment-variable-name);
```

Here is an example of using the %SYSGET function:

```
%let var1=%sysget(comspec);
%put The COMSPEC environment variable
    is &var1;
```

The following line is written to the SAS log:

```
The COMSPEC environment variable is
C:\winnt\system\command.exe
```

Autocall Libraries

This section discusses the system dependencies of using autocall libraries. For general information, see *SAS Macro Language: Reference*.

An autocall library contains files that define SAS macros. SAS supplies some autocall macros. To use the autocall facility, you must have the SAS system option MAUTOSOURCE set. When SAS is installed, the SASAUTOS system option is used in the SAS configuration file to tell SAS where to find the default macros that are supplied by SAS Institute. You can also define your own autocall macros and store them in a Windows directory.

If you store autocall macros in a Windows directory, the file extension must be .SAS. Each macro file in the directory must contain a macro definition that has a macro name that is the same as the filename. For example, a file named PRTRDATA.SAS that is stored in a directory must define a macro named PRTRDATA.

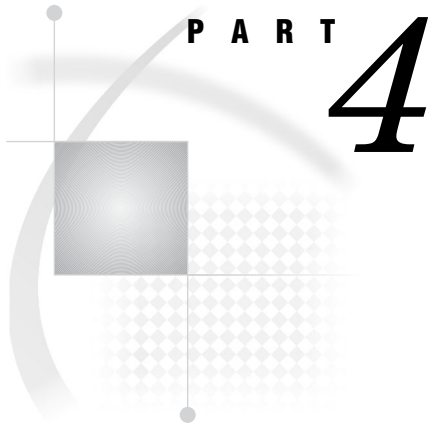
SASAUTOS System Option

To use your own autocall macros in your SAS programs, you must tell SAS where to find them using the SASAUTOS system option. The syntax of the SASAUTOS option is given in “SASAUTOS System Option” on page 557.

You can set the SASAUTOS system option when you start SAS, or you can use it in an OPTIONS statement during your SAS session. You should edit your SAS configuration file to add your autocall library to the library concatenation that is supplied by SAS Institute, as in the following example:

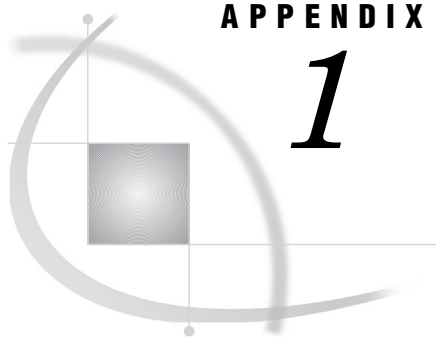
```
-sasautos (c:\mymacros
           !sasroot\core\sasmacro
           !sasroot\base\sasmacro
           !sasroot\stat\sasmacro
           more library specifications
           )
```

Autocall libraries are searched in the order that you specify them. If you use the preceding SASAUTOS option setting and call a macro named PRTRDATA, the directory C:\MYMACROS is searched first for the macro; then each of the !SASROOT libraries is searched.



Appendixes

- Appendix 1* **SCL Methods for Automating OLE Objects** 603
- Appendix 2* **Error Messages for SAS under Windows** 613
- Appendix 3* **Graphics Considerations** 621
- Appendix 4* **Default Key Settings for Interactive SAS Sessions** 623
- Appendix 5* **SAS Disk Cleanup Handler** 631
- Appendix 6* **Recommended Reading** 635



APPENDIX

1

SCL Methods for Automating OLE Objects

<i>Summary of OLE Class Methods</i>	603
<i>_COMPUTE_</i>	604
<i>_DISABLE_DEFAULT_ACTION_</i>	605
<i>_DO_</i>	605
<i>_ENABLE_DEFAULT_ACTION_</i>	606
<i>_EXECUTE_</i>	606
<i>_GET_EVENT_</i>	607
<i>_GET_PROPERTY_</i>	607
<i>_GET_REFERENCE_ID_</i>	608
<i>_GET_TYPE_</i>	608
<i>_IN_ERROR_</i>	609
<i>_NEW_</i>	610
<i>_SET_PROPERTY_</i>	610
<i>_UPDATE_</i>	611

Summary of OLE Class Methods

Table A1.1 on page 603 contains a list of SCL methods you can use with object linking and embedding (OLE) and indicates which of the OLE classes they apply to.

Table A1.1 SCL Methods Valid for OLE and OLE Automation

Method	SAS OLE class	SAS OLE Automation class
<i>_COMPUTE_</i>	Yes	Yes
<i>_DISABLE_DEFAULT_ACTION_</i>	Yes	No
<i>_DO_</i>	Yes	Yes
<i>_ENABLE_DEFAULT_ACTION_</i>	Yes	No
<i>_EXECUTE_</i>	Yes	No
<i>_GET_EVENT_</i>	Yes	No
<i>_GET_PROPERTY_</i>	Yes	Yes
<i>_GET_REFERENCE_ID_</i>	Yes	Yes
<i>_GET_TYPE_</i>	Yes	No
<i>_IN_ERROR_</i>	Yes	Yes
<i>_NEW_</i>	No	Yes

Method	SAS OLE class	SAS OLE Automation class
<code>_SET_PROPERTY_</code>	Yes	Yes
<code>_UPDATE_</code>	Yes	No

Note: The `_NEW_` method can be used with any class, but the OLE Automation class overrides this method because of special requirements. Δ

The remainder of this section contains the reference information for these methods.

`_COMPUTE_`

Invokes a method on an OLE automation object and returns a value.

Syntax

CALL NOTIFY(*OLE-object-name*, `'_COMPUTE_'`, *in-OLE-method* < *in-parm* ..., *in-parm* >, *out-value*);

CALL SEND(*OLE-object-id*, `'_COMPUTE_'`, *in-OLE-method* < *in-parm* ..., *in-parm* >, *out-value*);

Argument	Character (C) or Numeric (N)	Description
<i>in-OLE-method</i>	C	specifies the OLE method name.
<i>in-parm</i>	C or N	provides a parameter to the OLE method.
<i>out-value</i>	C or N	contains the value returned by the OLE method.

Details

The `_COMPUTE_` method invokes a method (with parameters) that is exposed by an OLE automation server. The number of parameters (*in-parm* arguments) needed varies among different objects and methods. Only methods that have a return value should be used with the `_COMPUTE_` method. For methods with no return values, use the `_DO_` method.

Examples

The following example stores the contents of the item in position 2 of an OLE control in the variable *item2obj*:

```
length item2obj $ 200;
call notify('oleobj', '_COMPUTE_',
           'GetItem', 2, item2obj);
```


The following example uses the `cells` method of a spreadsheet object to compute the location of the cell at row 2, column 5, and then sets the value of that cell to 100:

```
call send(oleobj, '_COMPUTE_', 'Cells',
         2, 5, cellobj1);
call send(cellobj1, '_SET_PROPERTY_',
         'Value', 100);
```

_DISABLE_DEFAULT_ACTION_

Disables the OLE object's default action.

Syntax

CALL NOTIFY(*OLE-object-name*, '_DISABLE_DEFAULT_ACTION_');

Details

This method prevents the default verb for an OLE object from executing when the object is double-clicked. By default, the default action is enabled.

DO

Invokes a method on an OLE automation object with no return value.

Syntax

CALL NOTIFY(*OLE-object-name*, '_DO_', *in-OLE-method*<, *in-parm*..., *in-parm*>);

CALL SEND(*OLE-object-id*, '_DO_', *in-OLE-method*<, *in-parm*..., *in-parm*>);

Argument	Character (C) or Numeric (N)	Description
<i>in-OLE-method</i>	C	specifies the OLE method name.
<i>in-parm</i>	C or N	provides a parameter to the OLE method.

Details

The `_DO_` method invokes a method (with parameters) that is exposed by an OLE automation server. The number of parameters (*in-parm* arguments) needed varies

among different OLE objects and methods. Only methods that have no return value should be used with the `_DO_` method. For methods with return values, use the `_COMPUTE_` method.

Example

The following example sends the `AboutBox` method to an OLE control, which displays the About Box for the control:

```
call notify('oleobj', '_DO_', 'AboutBox');
```

`_ENABLE_DEFAULT_ACTION_`

Enables the OLE object's default action.

Syntax

```
CALL NOTIFY(OLE-object-name, '_ENABLE_DEFAULT_ACTION_');
```

Details

This method enables the default verb for an OLE object to execute when the object is double-clicked. By default, the default action is enabled.

`_EXECUTE_`

Executes an OLE verb for the object.

Syntax

```
CALL NOTIFY(OLE-object-name, '_EXECUTE_', in-verb<,in-verb...in-verb>);
```

Argument	Character (C) or Numeric (N)	Description
<i>in-verb</i>	C	specifies the OLE verb to execute.

Details

A list of verbs supported by this object are listed in the Associated Verbs window for the OLE object (after the object has been created). You can specify more than one OLE verb at a time.

If you attempt to execute a verb that is not valid for the object, the SCL program halts and returns a message that the verb does not exist.

_GET_EVENT_

Returns the name of the last OLE control event received.

Syntax

CALL NOTIFY(*OLE-object-name*,'_GET_EVENT_',*out-event*);

Argument	Character (C) or Numeric (N)	Description
<i>out-event</i>	C	contains the returned name of the last OLE control event received.

Details

This method returns the name of the event that the specified OLE control most recently sent.

_GET_PROPERTY_

Returns the value of a property of an automation object.

Syntax

CALL NOTIFY(*OLE-object-name*,'_GET_PROPERTY_',*in-OLE-property*,*out-property-value*);

CALL SEND(*OLE-object-id*,'_GET_PROPERTY_',*in-OLE-property*,*out-property-value*);

Argument	Character (C) or Numeric (N)	Description
<i>in-OLE-property</i>	C	specifies the name of the OLE property.
<i>out-property-value</i>	C or N	contains the returned value of the property.

Details

The `_GET_PROPERTY_` method is used to get the value of a property of an automation object.

`_GET_REFERENCE_ID_`

Returns a reference identifier for use with any automation object method that requires an automation object as one of its parameters.

Syntax

`CALL NOTIFY(OLE-object-name,'_GET_REFERENCE_ID_',out-refid);`

`CALL SEND(OLE-object-id,'_GET_REFERENCE_ID_',out-refid);`

Argument	Character (C) or Numeric (N)	Description
<i>out-refid</i>	C	contains the returned reference identifier.

Details

The `_GET_REFERENCE_ID_` method is used to get the automation object identifier. The value returned is used in subsequent `_DO_` or `_COMPUTE_` calls where the object method requires an automation object as one of its parameters. This value should be used for the object parameter.

Example

The following example returns the reference identifier for the automation object. This identifier is then sent as a parameter value to an automation method requiring an object identifier.

```
call notify('oleobj1', '_GET_REFERENCE_ID_',
           refid);
call notify('oleobj2', '_DO_', 'NewAppl',
           refid, p1, p2);
```

`_GET_TYPE_`

Returns the object's type.

Syntax

```
CALL NOTIFY(OLE-object-name,'_GET_TYPE_',out-type);
```

Argument	Character (C) or Numeric (N)	Description
<i>out-type</i>	C	contains the returned object type.

Details

The `_GET_TYPE_` method is used to get the type of the object. Valid types include Embedded, Linked, Bitmap, Device Independent Bitmap, and Picture.

_IN_ERROR_

Returns an object's ERROR status.

Syntax

```
CALL NOTIFY(OLE-object-name,'_IN_ERROR_',error-status<,error-msg>);
```

```
CALL SEND(OLE-object-id,'_IN_ERROR_',error-status<,error-msg>);
```

Argument	Character (C) or Numeric (N)	Description
<i>error-status</i>	N	returns a value indicating whether an automation error has been encountered for the object.
<i>error-msg</i>	C	returns the automation error message.

Details

Errors encountered from automation calls can be detected using `_IN_ERROR_`. The `_IN_ERROR_` method returns the status of the last automation call and should be called before any subsequent automation calls.

Example

The following example detects that an error was encountered during the previous `_GET_PROPERTY_` call:

```
length errmsg $ 200;
call send(objid,'_GET_PROPERTY_',
         'ActiveObject', actobj);
call send(objid,'_IN_ERROR_',inerror, errmsg);
if inerror then
    link handle_err;
```

`_NEW_`

Creates a new instance of an OLE automation server.

Syntax

CALL SEND(*OLE-instance*,'_NEW_',*new-OLE-id*,*init-arg*,*OLE-auto-app*);

Details

Before you can use SCL code to refer to an OLE Automation server, you must first create an instance of the OLE Automation class.

For more information about the `_INIT_` method, see the description of the Object class in the online documentation for SAS/AF software.

Example

The following example creates a new instance of an OLE Automation server and assigns the SCL identifier `exclauto` to the new object. Note that in this example, `Excel.Application.8` is the identifier for Microsoft Excel in the system registry:

```
hostcl=loadclass('sashelp.fsp.hauto');
call send (hostcl, '_NEW_', exclauto, 0,
         'Excel.Application.8');
```

`_SET_PROPERTY_`

Assigns a value to a property of an automation object.

Syntax

CALL NOTIFY(*OLE-object-name*,'_SET_PROPERTY_',*in-OLE-property*,*in-value*);

CALL SEND(*OLE-object-id*,'_SET_PROPERTY_',*in-OLE-property*,*in-value*);

Argument	Character (C) or Numeric (N)	Description
<i>in-OLE-property</i>	C	specifies the OLE property name.
<i>in-value</i>	C or N	contains the value to assign to the OLE property.

Details

The **_SET_PROPERTY_** method assigns a value to a property of an automation object.

UPDATE

Updates the object based on its current contents or on the contents of a different HSERVICE entry.

Syntax

CALL NOTIFY(*OLE-object-name*,'_UPDATE_'<*in-hservice*>);

Argument	Character (C) or Numeric (N)	Description
<i>in-hservice</i>	C	specifies the name of the HSERVICE entry to use to update the object.

Details

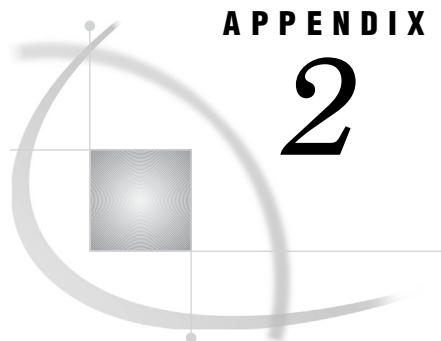
The **_UPDATE_** method recreates an object and updates its contents based on its current attributes. The *in-hservice* parameter is used only with OLE objects and is the name of an HSERVICE catalog entry. When you specify the *in-hservice* parameter, the object specified by *OLE-object* is changed to the object stored in the HSERVICE entry referenced by the *in-hservice* parameter.

If you use the **_UPDATE_** method without specifying *in-hservice*, the object's contents are updated with the current OLE object source. This process is useful for manually updating a linked object.

Example

In the following example, the object stored in OBJ1 is replaced by the Sasuser.Examples.Sound1.Hservice object:

```
length refid $ 30;  
call notify('obj1','_update_',  
           'sasuser.examples.sound1.hservice');
```

APPENDIX

2

Error Messages for SAS under Windows

<i>Overview of SAS Error Messages</i>	613
<i>Return Codes and Completion Status</i>	613
<i>Accessing Files</i>	614
<i>Using SAS Features</i>	615
<i>Using OLE</i>	616
<i>Using Networks</i>	617
<i>Resolving Internal Errors</i>	617
<i>Resolving Operating System and Windows Error Messages</i>	618
<i>Initialization and Termination Error Messages</i>	619

Overview of SAS Error Messages

This section contains completion codes and error messages that you might find helpful. In the error message lists, the messages are in monospace. Words in *italic* in the messages represent items that are variable, such as a filename or number. Each description tells you where the message comes from and explains its meaning and what you can do to correct the possible problem.

Return Codes and Completion Status

The return code for the completion of a SAS job is returned in the Windows batch variable, `ERRORLEVEL`. A value of 0 indicates normal termination. You can affect the value of `ERRORLEVEL` by using the `ABORT` statement. The `ABORT` statement takes an option argument, *n*, which is an integer. The `ABORT` statement also takes the `RETURN` or `ABEND` argument. If you issue these statements without specifying *n*, the `ERRORLEVEL` variable is set to the following values:

<code>abort;</code>	sets the <code>ERRORLEVEL</code> variable to 3.
<code>abort return;</code>	sets the <code>ERRORLEVEL</code> variable to 4.
<code>abort abend;</code>	sets the <code>ERRORLEVEL</code> variable to 5.

The *n* argument can range from 1 to 65,535. The `ERRORLEVEL` variable is used as a condition in the `IF` command in a Windows batch file. Refer to your Window's user's guide for more information on the `ERRORLEVEL` variable. The following table summarizes the values of the `ERRORLEVEL` variable.

Note: To check the `ERRORLEVEL` variable, start SAS using the `START/ WAIT` command. Δ

Table A2.1 Values for the ERRORLEVEL Variable

Condition	Severity	Return Code Value
All steps terminated normally	SUCCESS	0
SAS issued warning(s)	WARNING	1
SAS issued error(s)	ERROR	2
User issued the ABORT statement	INFORMATIONAL	3
User issued the ABORT RETURN statement	FATAL	4
User issued the ABORT ABEND statement	FATAL	5
SAS internal error	INFORMATIONAL	6

Accessing Files

This section describes errors you might receive while trying to use SAS to access files (either external files or SAS files). Whenever you have trouble accessing files, always check the validity of your FILENAME and LIBNAME statements and functions to make sure they point to the right files. Also, be sure you are using the correct fileref or libref.

Core catalog cannot be initialized. Please verify the system's date/time.

The date or time stamp of SAS CORE catalog is in the future. Make sure the date and time on your machine are set correctly. This message is issued in conjunction with internal error 602 (see “Resolving Internal Errors” on page 617).

Error: Date/time is in the future.

The date or time stamp of the file you are trying to access is in the future. Make sure the date and time on your machine are set correctly.

Error: File is in use, filename.

The file you are trying to access is in use by another Windows process, such as another Windows application.

Error: File not found loading filename-1. File contributing to error: filename-2.

A DLL-dependent file cannot be found when the requested file is loaded. For SAS, the !SASROOT\CORE\SASEXE file (usually specified with the PATHDLL system option in the SAS configuration file) might be unavailable. The requested file might not be available due to a network error or other drive failure. Ensure that PATHDLL specifies the location of !SASROOT\CORE\SASDLL.

ERROR: Member or library filename unavailable for use.

The file *filename* is being used by another Windows application.

ERROR: Module module-name not found in search paths.

This error is caused by one of the following:

- incorrect PATH system option in the SAS configuration file
- the product you called is not installed
- a dependent image is not installed.

ERROR: Unable to clear or reassign the library library-name because it is still in use.

You are trying to reassign a libref while the library is in use.

ERROR: Operating system error number *n* occurred while accessing *filename*.

An unexpected return code has been received by SAS from the operating system. For more information, see “Resolving Operating System and Windows Error Messages” on page 618.

ERROR: Physical file does not exist *filename*.

The file you are trying to access does not exist. Verify that you have specified the correct drive and directory. This error can also occur if you are trying to write to a write-protected diskette.

ERROR: Write access to member *member-name* is denied.

You are trying to update a file on a write-protected diskette or you are trying to update a file marked as read-only.

Using SAS Features

This section describes errors you can receive while using features of the SAS language and procedures under Windows. Always check the syntax of the statement or procedure you are using. Also, if you do not get the results you expect, check the contents of any external files or SAS files to be sure they are correct.

An interrupt has occurred.

You have canceled a print job by clicking on **Abort**.

ERROR: Out of disk space for spooling.

Not enough disk space is currently available for spooling a print job. This message implies that no more disk space can be made available.

ERROR: Not enough memory is available for spooling.

Not enough memory is available for spooling. This message implies, however, that more space can become available at some point.

WARNING: SAS option *option-name* is valid only at startup of the SAS System or startup of an environment within SAS. The SAS option is ignored.

Several SAS system options can be set only in the SAS configuration file or in the SAS command. For more information, see “SAS System Options under Windows” on page 475.

ERROR: Unknown configuration option *option-name*.

Check your SAS command and SAS configuration file for an invalid SAS system option. For more information on system options under Windows, see “SAS System Options under Windows” on page 475.

ERROR: User terminated the job through the Print Manager.

You terminated (that is, deleted) your print job by using the Print Manager.

Invalid toolbox catalog: *catalog-name*.

You have tried to load a nonexistent toolbox from a SAS catalog with the TOOLLOAD command. Check the spelling of the toolbox name and the catalog name in the command. You can use the SAS Explorer window to see a listing of a SAS catalog.

No tools defined.

The toolbox you have attempted to load has no tools defined. You must have at least one tool defined in a toolbox.

Unable to access the specified printer driver.

SAS cannot access the printer driver. Make sure the correct printer driver has been specified by either the SYSPRINT system option or with the Printer Setup dialog box.

Unable to find the printer name.

SAS cannot find the printer specified in the Printer Setup dialog box.

Using OLE

This section describes errors you can receive while using the Windows object linking and embedding (OLE) capability in your SAS applications.

OLE Error: nnnnnnnn <error message text>

An OLE error not documented in this section has occurred. If you receive this error message and cannot determine its cause from the given error message text, contact your SAS Installation Representative, who can determine the cause of the error. The SAS Installation Representative might have to call the SAS Institute Technical Support Division.

OLE: Unable to Paste Special. The clipboard contains no supported formats.

The Windows clipboard does not contain any formats that SAS/AF software can use in the FRAME entry.

... Do you want to invoke the Links dialog box?

The data source of the link could not be found. You have the option of invoking the Links dialog box to redirect the link to another data source.

OLE: Operation not allowed on static object.

Static objects do not support this operation. A static object is basically a picture of an object; it does not contain nor is it linked to any data.

Static objects cannot be converted.

You cannot convert static objects to another type.

OLE: Verb is invalid for the object.

The OLE verb that was passed to the object was invalid or could not be sent. Check your SCL code for a misspelled verb.

OLE: Server application could not be launched.

The server application for the object could not be invoked. You can be missing some executables, or perhaps your network connection is down.

OLE: Member or one of the named parameters is not known.

You specified a member (that is, a property or method) that is not valid for the OLE object you are automating. For information about the members that are supported, see the documentation for the OLE server application.

OLE: Access to multi-dimensional arrays not supported.

SAS does not support multi-dimensional arrays. If you want to access multi-dimensional data from a server application, you must first use the server application to present the data in a one-dimensional format.

OLE: Object cannot be automated.

This object does not support automation.

OLE: One of the parameters is of the wrong type.**OLE: One of the parameters is not a valid type.****OLE: One of the parameters is out of the present range.**

A parameter passed to an OLE automation server's method is not the correct type and cannot be interpreted.

OLE: Application is busy.

The OLE server application is busy with a task and cannot honor the current request.

OLE: Control is not licensed for use.

You do not have appropriate licensing to use a control of this type. For more information, see the control's documentation.

OLE: Unable to connect to network device:*UNC-drive-name*

The linked object exists on a network drive that is currently not connected. The UNC name for the drive follows the message.

There is no object selected for conversion.

The Convert dialog box was invoked but there are no selected objects to convert.

There are no linked objects in this window.

The Links dialog box was invoked but the frame does not contain any linked OLE objects.

Using Networks

This section describes errors you can receive while using SAS on a network.

Any of the following errors can occur on a network if you do not have proper access rights:

- **ERROR: Deletion of old member *filename* failed.**
- **ERROR: File deletion failed for *filename*.**
- **ERROR: Rename of temporary member for *filename* failed.**
- **ERROR: User does not have appropriate authorization level for file *filename***

Network software enables the network supervisor to control access to network files. Access rights can be set up so that you can read a file, but are unable to update that file. The last message in this list can also appear if you try to access a directory as if it were a file.

Resolving Internal Errors

Internal errors are fatal errors that keep SAS from starting. While you should not usually see these error messages, with a bit of investigation you might be able to solve the problem that generated the message. The following list describes the most common of these messages:

10 Host internal error: 10

CTRL+BREAK was pressed during the initialization of SAS. Therefore, SAS terminated.

11 Host internal error: 11

SAS needs more memory. To correct the problem, change swapping to a disk with more free space or delete enough files from the present swap disk to free up at least 20 megabytes of memory.

12 Host internal error: 12

SAS has determined that there is an error in the specified SAS configuration. A descriptive message is displayed that indicates which system option is in error.

13 Host internal error: 13

Some part of SAS cannot be loaded. The part in question is indicated via a descriptive message. Restore the missing part to the appropriate directory.

24 Host internal error: 24

SAS was unable to initialize the windowing environment. A descriptive message is displayed indicating the appropriate action.

208 Unable to open profile catalog.

SAS must have access to your Sasuser.Profile catalog or be able to create one if one does not exist. Check to ensure that you have enough disk space, or if you are running SAS on a network, that you have access to the correct files. The Sasuser.Profile catalog is opened in the directory specified by the SASUSER system option, which is described in "SASUSER System Option" on page 560. Also see "Profile Catalog" on page 20.

Work library is undefined. Sasuser library is undefined. Sashelp library is undefined.

Check your SAS command or SAS configuration file to ensure that you have specified the directory path correctly for these libraries.

302 Sasmsg library is undefined.

Check your SAS command or SAS configuration file to ensure that you have specified the directory path correctly for this library.

Unable to initialize Work library. Unable to initialize Sasuser library.

Check your SAS command or SAS configuration file to ensure that you have specified the correct directory for the Work and Sasuser libraries. If you are running SAS on a network, be sure you have access to the necessary files.

401 Unable to initialize the message subsystem.

Check your SAS command or SAS configuration file to ensure that you have specified the directory path correctly for all SAS libraries. Also check to determine whether your SAS configuration file is where it should be. If you are sure you have specified the directory paths correctly, contact your SAS Site Representative. It is possible that SAS message files have become corrupt or have been inadvertently deleted.

601 Invalid setinit information.

Check your setinit information for errors. For more information, see the installation instructions for SAS 9.2 for Windows.

602 CORE catalog could not be accessed for options initialization.

The CORE catalog cannot be accessed. This action might be caused by having the date on your PC set incorrectly. Use the Windows DATE command to verify and set the date.

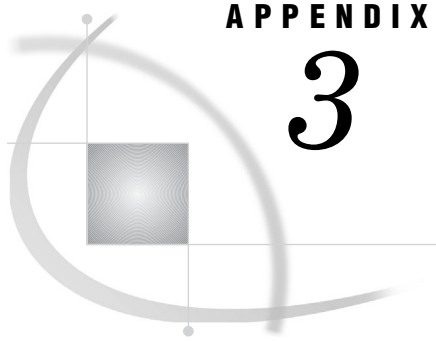
Resolving Operating System and Windows Error Messages

In situations where unexpected return codes are returned from Windows, the Windows error number is written to the SAS log. If you have access to Windows programming manuals or Windows user documentation, you can look up the error

number to determine the cause of the error. Alternatively, you can report the error number to your SAS Installation Representative.

Initialization and Termination Error Messages

If SAS issues error messages during SAS initialization or termination, the SAS log can contain error messages that explain the error. Any error message that SAS issues before the SAS log is initialized or after is closed are written to the MSG window if it is available or the SAS console log, which is a Windows file. Under Windows Vista, Windows 7, and Windows Server 2008, the SAS console log is typically located in **c:\Users\user ID\AppData**. In all other Windows operating environments the SAS console log is typically located in the **c:\Documents and Settings\user ID\Application Data** folder. You can obtain the location and filename for the SAS Console Log from the Application Event Log. To open the application Event Log, submit **eventvwr** from the Run dialog box and click on **Application**.



APPENDIX

3

Graphics Considerations

Using TrueType Fonts with SAS/GRAPH Software 621

Using TrueType Fonts with SAS/GRAPH Software

TrueType fonts can be used with the WIN, WINPRTx, WMF, EMF, and GIF device drivers, among others. Before you can use a TrueType font to print (other than the default), you must identify its name. To identify TrueType fonts, select **Start ► Settings ► Control Panel** and double-click on the Fonts icon. TrueType fonts will have a double 'T' icon or will have TrueType beside the font.

In SAS/GRAPH programs, you can use the font name to specify a TrueType font with the FONT= or F= option. For example, you can specify the following:

```
title2 font="arial"  
  'This is TrueType font arial';
```

Note: You must put truetype system font names in quotes. Δ

For more information about the FONT= option, such as how to use alternate fonts with hard copy devices and how to make an alternate font the default font, see *SAS/GRAPH: Reference*.

APPENDIX

4

Default Key Settings for Interactive SAS Sessions

<i>Default Key Definitions under Windows</i>	623
<i>Keyboard Shortcuts within the SAS Main Window</i>	624
<i>Keyboard Shortcuts within the Enhanced Editor</i>	626
<i>Keyboard Shortcuts within Print Preview</i>	629

Default Key Definitions under Windows

The following table lists the default key definitions for the primary SAS application windows (such as Program Editor, Log, and Output), excluding the Enhanced Editor. “Keyboard Shortcuts within the Enhanced Editor” on page 626 lists the default key definitions for the Enhanced Editor. Any other key combination that is not listed in this table is either reserved by Windows or has a definition that you cannot change within SAS (see “Keyboard Shortcuts within the SAS Main Window” on page 624).

If you want to browse or change any of the key definitions that are listed in this table, you can do so by selecting **Tools ► Options ► Keys** or by issuing the KEYS command.

Table A4.1 Default Key Settings for SAS under Windows

Key	Default Setting	Key	Default Setting
F1	help	Alt + F1	
F2	reshow	Alt + F2	
F3	end	Alt + F3	
F4	recall	Alt + F11	
F5	wpgm	Alt + F12	
F6	log	Ctrl + B	libref
F7	output	Ctrl + D	dir
F8	zoom off; submit	Ctrl + E	clear
F9	keys	Ctrl + G	
F11	command focus	Ctrl + H	help
F12		Ctrl + I	options
Shift + F1	subtop	Ctrl + J	
Shift + F2		Ctrl + K	cut (Program Editor only)
Shift + F6		Ctrl + L	log

Key	Default Setting	Key	Default Setting
Shift + F7	left	Ctrl + M	mark
Shift + F8	right	Ctrl + Q	filename
Shift + F9		Ctrl + R	rfind
Shift + F10	wpopup	Ctrl + T	title
Shift + F11		Ctrl + U	unmark
Shift + F12	dmcopyslv	Ctrl + W	access Explorer window
Ctrl + F1		Ctrl + Y	
Ctrl + F2		RMB	wpopup
Ctrl + F3		Shift + RMB	
Ctrl + F11		Ctrl + RMB	
Ctrl + F12		MMB	
		Shift + MMB	
		Ctrl + MMB	

Note:

- 1 RMB is the right mouse button.
- 2 MMB is the middle mouse button. (Not all mouse devices have a middle mouse button.)

Δ

Keyboard Shortcuts within the SAS Main Window

The keys that are listed here are not listed in the KEYS window. You might find these keys to be useful as shortcuts for editing and other tasks.

Table A4.2 Key Settings for the Main SAS Window

Key Combination	Action
<i>Dialog boxes and Entry Fields</i>	
Tab	move to next field
Shift + Tab	move to previous field
<i>Navigate around Text</i>	
Ctrl + -> (right arrow)	move to next word
Ctrl + <- (left arrow)	move to previous word
Home	move to beginning of line
End	move to end of line
Ctrl + Home	move to top
Ctrl + End	move to bottom
Page Up	page up

Key Combination	Action
Page Down	page down
Ctrl + Page Up	move to top
Ctrl + Page Down	move to bottom
Ctrl + Tab	navigate to the next open SAS window (NEXTWIND command)
Ctrl + Shift + Tab	navigate to the previous open SAS window (PREVWIND command)
<i>Mark Text</i>	
Shift + -> (right arrow)	mark while going to the right
Shift + <- (left arrow)	mark while going to the left
Shift + Home	mark to beginning of line
Shift + End	mark to end of line
Shift + Ctrl + Home	mark to top
Shift + Ctrl + End	mark to bottom
Shift + Page Up	page up and mark
Shift + Page Down	page down and mark
Shift + Ctrl + Page Up	mark to top
Shift + Ctrl + Page Down	mark to bottom
Shift + MB1	extend the current marked text selection to the click position
<i>Cut, Copy, and Paste</i>	
Delete	delete the next character (or marked text)
Ctrl + Delete	delete from the insertion point position to the end of the current word
Ctrl + Backspace	delete from the insertion point position to the start of the current word
Ctrl + MB1	selects the entire line (clicked line)
Ctrl + Z	undo previous action
Ctrl + X	cut selected text
Ctrl + C	copy selected text to paste buffer
Ctrl + V	paste text
<i>Window Control</i>	
Alt	switch focus to or from the main menu bar
Shift + F5	cascade the windows
Shift + F4	tile the windows vertically
Shift + F3	tile the windows horizontally
Ctrl + F6	next window
Alt + F4	exit SAS
Ctrl + F4	close the active window

Key Combination	Action
Shift + F10	open context menu
<i>Resizing the Docking View</i>	
Alt + W + S	start docking view resizing
-> (right arrow)	move the split bar a small amount to the right
<- (left arrow)	move the split bar a small amount to the right
Ctrl + -> (right arrow)	move the split bar a larger amount to the right
Ctrl + <- (left arrow)	move the split bar a larger amount to the left
Home	move the split bar all the way to the left
End	move the split bar all the way to the right
Return	accept the current size of the docking view and exit docking view resizing
Esc	end docking view resizing without resizing the docking view
<i>Miscellaneous</i>	
Alt + Enter	open the Properties dialog box for a selected object This command is valid only in a Tree view or a List view.
Esc + letter (or number)	color or highlighting attributes in NOTEPAD window

Keyboard Shortcuts within the Enhanced Editor

The keyboard shortcuts that are listed here are the default shortcuts.

Table A4.3 Default Keyboard Shortcuts for the Enhanced Editor

Category	Command	Keyboard Shortcut
Abbreviation	Add a new abbreviation	Ctrl + Shift + A
	Bring up word tip	Alt + F1 + No Selection
	Hide the current word tip	Esc
Code Folding	Collapse all folding blocks	Alt + Ctrl + Number pad -
	Collapse current line	Alt + Number pad -
	Expand all folding blocks	Alt + Ctrl + Number pad +
	Expand current line	Alt + Number pad +
	Toggle expand current line	Alt + Number pad *
Command/Macro Support	Add or change macros	Ctrl + Shift + M
	Execute the last recorded macro	Ctrl + F1
	Play a command/macro	Alt + F8
	Start/Complete macro	Alt + Shift + R

Category	Command	Keyboard Shortcut
Edit	Copy selection	Ctrl + C
	Cut selection	Ctrl + X
	Delete current character	Delete
	Delete previous character	Backspace or Shift + Backspace
	Delete to next word start	Ctrl + Delete
	Delete to previous word start	Ctrl + Backspace
	Insert a carriage return	Enter
	Paste from clipboard	Ctrl + V
	Redo	Ctrl + Y Alt + Shift + Backspace
	Undo	Ctrl + Z Alt + Backspace
	Help	Get Help for a SAS procedure
Context Help		F1
Line Markers	Go to the next marked line	F2
	Go to the previous marked line	Shift + F2
	Toggle marker on the current line	Ctrl + F2
Navigation	Go to line (interactive)	Ctrl + G
	Move cursor to the top of the file	Ctrl + Page Up Ctrl + Home
	Move cursor to the bottom of the file	Ctrl + Page Down Ctrl + End
	Move cursor down	Down
	Move cursor down a page	Page Down
	Move cursor left	Left
	Move cursor right	Right
	Move cursor to beginning of line	Home
	Move cursor to end of line	End
	Move cursor to matching brace/parentheses	Ctrl + [Ctrl +]
	Move cursor to matching DO/END keyword	Alt + [Alt +]
	Move cursor to next case change	Alt + Right
	Move cursor to next word start	Ctrl + Right

Category	Command	Keyboard Shortcut
	Move cursor to previous case change	Alt + Left
	Move cursor to previous word start	Ctrl + Left
	Move cursor up	Up
	Move cursor up a page	Page Up
	Move cursor to the first visible line	Alt + Up
	Move cursor to the last visible line	Alt + Down
	Scroll screen down	Ctrl + Up
	Scroll screen up	Ctrl + Down
Option Setting	Toggle insert/overwrite mode	Insert
Selection	Extend selection character left	Shift + Left
	Extend selection character right	Shift + Right
	Extend selection down	Shift + Down
	Extend selection down a page	Shift + Page Down
	Extend selection to beginning of document	Ctrl + Shift + Home Ctrl + Shift + Page Up
	Extend selection to beginning of line	Shift + Home
	Extend selection to end of document	Ctrl + Shift + End Ctrl + Shift + Page Down
	Extend selection to end of line	Shift + End
	Extend selection to next case change	Alt + Shift + Right
	Extend selection to previous case change	Alt + Shift + Left
	Extend selection up	Shift + Up
	Extend selection up a page	Shift + Page Up
	Extend selection to previous word start	Ctrl + Shift + Left
	Extend selection to the next word start	Ctrl + Shift + Right
	Select all	Ctrl + A
Selection Operations	Clean up whitespace	Ctrl + Shift + W
	Comment the selection with line comments	Ctrl + /
	Convert the selected text to lowercase	Ctrl + Shift + L

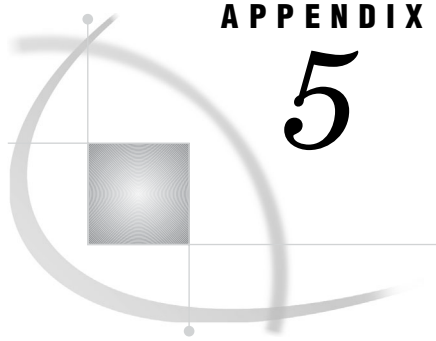
Category	Command	Keyboard Shortcut
	Convert the selected text to uppercase	Ctrl + Shift + U
	Tab selection	Tab + Selection
	Undo the Comment	Ctrl + Shift + /
	Left Tab selection	Shift + Tab + Selection

Keyboard Shortcuts within Print Preview

You can use the keyboard shortcuts in the following table in the Print Preview window.

Table A4.4 Keyboard Shortcuts for the Print Preview Window

Action	Keyboard Shortcut
Next page or Page Down	Alt + N
Previous page or Page Up	Alt + P
Zoom	Alt + Z
Help	Alt + H
Print	Alt + R
Close the window	Alt + C or Alt + F4



APPENDIX

5

SAS Disk Cleanup Handler

<i>The SAS Disk Cleanup Handler Utility</i>	631
<i>Description</i>	631
<i>Requirements</i>	632
<i>Using the Disk Cleanup Handler</i>	632
<i>Automating Cleanup with Microsoft Task Scheduler</i>	632

The SAS Disk Cleanup Handler Utility

Description

The SAS Disk Cleanup Handler searches for and cleans any temporary files that SAS generates, as well as any SAS Work and SAS utility directories. SAS Disk Cleanup Handler is a COM hook into the Microsoft Disk Cleanup Handler (cleanmgr.exe).

SAS Work directories have the format, *#TD pid* or *_TD pid*, where *#TD* is the SAS V6.X prefix and *_TD* is the SAS V7+ prefix. The *pid* part of the directory entry is interpreted as the process ID. If the process ID is no longer in use, the SAS Disk Cleanup Handler deletes the entry and the contents of the directory.

SAS Disk Cleanup Handler also removes SAS utility directories that have the following format:

SAS_utilNNNNPPPPPPP_nodename

where

NNNN is a unique random number

PPPPPPP is the hexadecimal representation of the process ID

nodename is the host name of the machine that created the directory.

SAS Disk Cleanup Handler deletes the utility directories and contents only under the following conditions:

- SAS Disk Cleanup Handler is run on the machine that represents the *nodename* and the process ID
- PPPPPPP* is no longer in use.

Additionally, you can use the SAS Disk Cleanup Handler to clean SAS automatically generated log files. These log filenames have the format *module name.PID.DATE.log*. The PID represents the process ID of the process that creates the log file. If the process is no longer running, the log file will be deleted.

Requirements

The SAS Disk Cleanup Handler requires Microsoft .Net Framework 2.0 or greater for 32-bit Windows, Windows Itanium, and Windows x64 editions.

Using the Disk Cleanup Handler

To run the Disk Cleanup Handler, complete these steps:

- 1 Type **cleanmgr** from the command prompt.

Note: You can also start the SAS Disk Cleanup Handler from Windows Explorer. Access **My computer** and right-click a local physical hard disk. Select **Properties** and double click **Disk Cleanup**. \triangle

Note: Disk Cleanup Manager will start. This process might take a few minutes. \triangle

- 2 Select **SAS Temporary Files**.

Note: If **SAS Temporary Files** is not listed, the SAS Disk Cleanup Handler is not installed. \triangle

- 3 Click **View Files** to list the currently detected SAS temporary files and directories. If a process is still active, then the file or directory will not be listed. Any files or directories to be saved should be cleared.
- 4 Click **OK** to save changes. Click **Cancel** to discard.
- 5 Click **OK** in the Disk Cleanup window to start the cleanup.
- 6 Check the **EventViewer** for any errors.

Note: Windows Server 2008 does not automatically install Microsoft Disk Cleanup Manager (cleanmgr.exe). In order to have Microsoft Disk Cleanup Manager installed as a default application, you must install **Desktop Experience**. To install **Desktop Experience** do the following steps:

- 1 Open **Server Manager**.
- 2 Select **Add Features** from the Actions menu.
- 3 Select **Desktop Experience**.

\triangle

Automating Cleanup with Microsoft Task Scheduler

With cleanmgr.exe you can configure specific tasks to perform the desired cleanups. To configure Disk Cleanup Manager:

- 1 Select **Start ► Run**.
- 2 Type the following text in the **Run** dialog box: **cleanmgr /sageset:n**, where *n* can be any number between 0 and 65535.
- 3 Select the items that you want to be cleaned.
- 4 Select OK.

Note: You can also create a shortcut in your Windows folder to **cleanmgr /sagerun:n** (where *n* is the number in step 2). Type a name for the shortcut (for example, cleanuptask). \triangle

- 5 If you want to verify the settings, repeat steps 1 through 3.

The following steps apply to Windows XP Professional and Windows Server 2003:

- 1 Select **Start ► All Programs ► Accessories ► System Tools ► Schedule Task**.
- 2 Add the scheduled task.
- 3 Select **Next**.
- 4 Select **Disk Cleanup** or the shortcut that you created in step 2. If you are using the shortcut, select **Next**.
- 5 Select **Next** and configure.

Note: You must provide your user ID and password to run this task. △

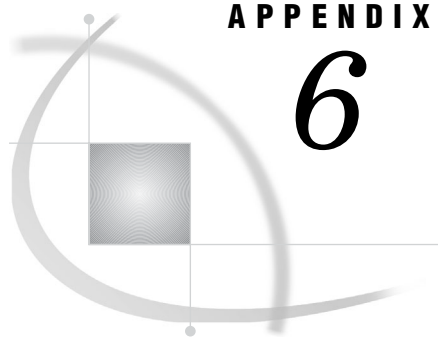
- 6 If not using the shortcut, then select the **Open advanced properties** for this task when you click **Finish**.
- 7 Select **Finish** when the step is complete.
- 8 If you are not using the shortcut, then the **Properties** dialog box should be displayed. Select the **Task** tab.
- 9 In the **Run** text box append **/sagerun:#**, where # is the number from step 2.
- 10 Check **Event Viewer** for any errors under **Application**.

The following steps apply to Windows Vista and Windows 7.

- 1 Select **Start ► All Programs ► Accessories ► System Tools ► Task Scheduler**.
- 2 Select **Create Basic Task**.
- 3 Type a name for the task in the **Name** field.
- 4 Select **Next**.
- 5 Select the appropriate triggers and options.

Note: Select **Next** to advance through the trigger options. △

- 6 Select **Action ► Start Program**.
- 7 Select **Next**.
- 8 Type **cleanmgr** in the **Program/script:** text box.
- 9 Type the appropriate arguments for **:/sagerun:#**, where # is the number from step 2.
- 10 Select **Next**.
- 11 Select **Finish**.



APPENDIX

6

Recommended Reading

Recommended Reading 635

Recommended Reading

Here is the recommended reading list for this title:

- Base SAS Procedures Guide*
- Moving and Accessing SAS Files*
- SAS/CONNECT User's Guide*
- SAS Language Reference: Concepts*
- SAS Language Reference: Dictionary*
- SAS National Language Support (NLS): Reference Guide*
- SAS Output Delivery System: User's Guide*

For a complete list of SAS publications, go to support.sas.com/bookstore. If you have questions about which titles you need, please contact a SAS Publishing Sales Representative at:

SAS Publishing Sales

SAS Campus Drive

Cary, NC 27513

Telephone: 1-800-727-3228

Fax: 1-919-531-9439

E-mail: sasbook@sas.com

Web address: support.sas.com/bookstore

Customers outside the United States and Canada, please contact your local SAS office for assistance.

Glossary

active window

a window that is open and displayed, and to which keyboard input is directed. Only one window can be active at a time.

American Standard Code for Information Interchange

a 7-bit character encoding that is the U.S. national variant of the ISO 646 standard. The ASCII encoding includes the upper- and lowercase letters A-Z, digits, symbols (such as &, #, and mathematical symbols), punctuation marks, and control characters. This set of 128 characters is also included in most other encodings. Short form: ASCII. See also Extended Binary Coded Decimal Interchange Code and encoding.

application workspace

a window that contains other windows or from which other windows can be invoked, but which is not contained within any window that is part of the same software application. The SAS application workspace (SAS AWS) is also referred to as the main SAS window. Short form: AWS.

ASCII

See American Standard Code for Information Interchange.

ASCII collating sequence

the rules that are used by a specific ASCII encoding for sorting textual data. Sort order is determined by the location of each code point in the code page of an ASCII encoding. In the Windows Latin1 code page, the sort order of precedence is punctuation characters, numbers, uppercase characters, and lowercase characters. Because the uppercase A (code point 41) precedes the lowercase g (code point 67), A is sorted before g. See also American Standard Code for Information Interchange and EBCDIC collating sequence.

autocall macro

a macro whose uncompiled source code and text are stored in an autocall macro library. Unlike a stored compiled macro, an autocall macro is compiled before execution the first time it is called.

AUTOEXEC.SAS

a file containing SAS statements that are executed automatically when SAS is invoked. The autoexec file can be used to specify some SAS system options, as well as to assign librefs and filerefs to folders or directories that are used frequently.

automatic macro variable

a macro variable that is defined by SAS rather than by the user and that supplies information about the SAS session. For example, the SYSPROCESSID automatic macro variable contains the process ID of the current SAS process.

AWS

See application workspace.

batch file

a file that contains operating-system commands, which are processed sequentially when the file is executed.

batch mode

a method of executing SAS programs in which a file that contains SAS statements plus any necessary operating environment commands is submitted to the computer's batch queue. After you submit the program, control returns to your computer or workstation, and you can perform other tasks. Batch mode is sometimes referred to as running in the background. The program output can be written to files or printed on an output device. Under Windows, a Status window is associated with a SAS batch job. The Status window indicates which batch job is running and shows the pathnames and filenames of the log file and the procedure output file.

binary

the name of the base 2 number system. A binary digit can have one of two values: 0 or 1. A binary digit is called a bit and is considered to be off when its value is 0 and on when its value is 1. See also binary file.

binary file

a file that contains information that can be read by one or more software applications but not by humans. Some binary files are executable programs. Others store images, sounds, data, or a combination of printable and non-printable characters. Binary files cannot be edited with a text editor.

buffer

an area of computer memory that is reserved for use in performing input/output (I/O) operations.

cache

a small, fast memory area that holds recently accessed data. The cache is designed to speed up subsequent access to the same data.

catalog

See SAS catalog.

catalog entry

See SAS catalog entry.

central processing unit

the main hardware component of a computer. The CPU executes program instructions and controls the operation of other parts of the computer. Short form: CPU.

character constant

a character string that is enclosed in quotation marks in a SAS statement to indicate a fixed value rather than the name of a variable. The maximum number of characters that is allowed is 32,767. Character constants are sometimes referred to as character literals. See also character string.

character set

the set of characters that are used by a language or group of languages. A character set includes national characters, special characters (such as punctuation marks and mathematical symbols), the digits 0-9, and control characters that are needed by the

computer. Most character sets also include the unaccented upper- and lowercase letters A-Z. See also national character.

character string

one or more alphanumeric characters or other keyboard characters or both. See also character constant.

character value

a value that can contain alphabetic characters, the numeric characters 0 through 9, and other special characters.

class

in object-oriented programming, a template for an object. A class includes data that describes the object's characteristics (such as attributes or instance variables), as well as the operations (methods) that the object can perform. See also subclassing and object.

client

(1) a computer or application that requests services, data, or other resources from a server. (2) in the context of named pipes and in DDE and OLE, an application that sends data to or receives data from an application that is acting as a server. See also server.

clipboard

a temporary storage place for data that is being passed from one application to another. For example, in Windows operating environments, you can use the clipboard to pass information between Excel and your SAS session.

COM

See Component Object Model.

COM/DCOM client

a program that uses the Microsoft Component Object Model (COM) or Distributed Component Object Model (DCOM) to make requests to a server. COM/DCOM clients can be written in Visual Basic, C++, Perl, or other programming languages in the Windows environment. See also Component Object Model and Distributed Component Object Model.

command prompt

the symbol after which you enter operating system commands.

component

a self-contained, reusable programming object that provides some type of service to other components in an object-oriented programming environment.

Component Object Model

an object-oriented programming model that defines how software components interact within a single process or between processes. For example, COM includes standard rules of communication that enable a user-interface object to be dragged and dropped from one application window to another. Short form: COM.

CONFIG.SYS

a system file that contains DOS configuration commands that specify the properties of the operating system, including device drivers, file-handling elements, and memory-management options.

configuration file

(1) in SAS software, an external file that contains SAS system options. These system options take effect each time you invoke SAS. (2) under DOS, the CONFIG.SYS file that specifies the properties of the operating system. See also CONFIG.SYS

Control Panel

under Windows, an application that enables you to specify characteristics of your Windows session, such as mouse tracking speed and the color of the title bar.

conventional memory

in servers that are running 32-bit operating systems, the first 4 gigabytes of main memory. In servers that are running 64-bit operating systems, all of the main memory is conventional memory.

CPU

See central processing unit.

CPU time

the amount of time it takes for the central processing unit of a computer system to perform the calculations or other operations that you request.

current folder

the folder to which commands and actions apply when you execute an application.

DCOM

See Distributed Component Object Model.

DDE

See Dynamic Data Exchange.

device driver

a program that controls the interaction between a computer and an external device such as a printer or a disk drive.

directory

another term for folder. See also folder.

Distributed Component Object Model

an extension to the Component Object Model (COM) that enables components to request services from components that are on other computers in a network. Short form: DCOM. See also component and Component Object Model.

DLL

See dynamic link library.

docking view

a view of the main SAS window in which one or more windows, such as the Explorer and Results windows, are integrated with the left side of the main SAS window.

DOS

a disk operating system for personal computers. In SAS documentation, the acronym DOS refers specifically to MS-DOS, the Microsoft disk operating system, which was developed by Microsoft for IBM.

drag

in a graphical user interface, to move an object such as an icon or a window around on a display screen. To drag the object, you usually use a mouse button to select the object, and move the mouse while keeping the mouse button pressed down.

Dynamic Data Exchange

a standard mechanism in the PC environment for sharing data among applications. Short form: DDE.

dynamic link library

a collection of executable program modules that are loaded at run time as needed. Short form: DLL.

EBCDIC

See Extended Binary Coded Decimal Interchange Code.

encoding

a set of characters (letters, logograms, digits, punctuation, symbols, control characters, and so on) that have been mapped to numeric values (called code points) that can be used by computers. The code points are assigned to the characters in the character set by applying an encoding method. Some examples of encodings are wlatin1, wcyrillic, and shift-jis.

encoding method

a set of rules that are used to map characters (letters, logograms, digits, punctuation, symbols, control characters, and so on) to numeric values. Some examples of encoding methods are ASCII, EBCDIC, EUC, and PCMS.

Enhanced Editor

an ASCII text editor that provides features such as color coding and code sections to help SAS users write and debug SAS programs. The Enhanced Editor also provides familiar features of the SAS Program Editor.

environment variable

under Windows, a variable that equates one character string to another by using the SAS system option SET, the Windows SET command, or the Windows System Properties dialog box. SAS environment variables cannot be accessed by other Windows applications. By contrast, Windows environment variables can be accessed by all Windows applications.

error message

a message in the SAS log or Message window that indicates that SAS was not able to continue processing the program.

Extended Binary Coded Decimal Interchange Code

a group of 8-bit character encodings that each include up to 256 characters. EBCDIC is used on IBM mainframes and on most IBM mid-range computers, and it includes both graphic (printable) codes and control (nonprintable) codes. Short form: EBCDIC. See also American Standard Code for Information Interchange and encoding.

extended memory

See extended server memory.

extended server memory

on a server that is running a 32-bit operating system, the part of main memory that exceeds the 4 gigabytes of conventional memory. See also conventional memory.

external file

a file that is created and maintained by a host operating system or by another vendor's software application. SAS can read data from and route output to external files. External files can contain raw data, SAS programming statements, procedure output, or output that was created by the PUT statement. A SAS data set is not an external file. See also fileref.

fatal error

an error that causes a program to end abnormally or that prevents the program from starting.

field

a window area in which users can view, enter, or modify a value.

file extension

the classification of a file in a directory that identifies what type of information is stored in the file. For example, .sas7bcat is the file extension for UNIX, and .pdf is the file extension for Adobe Acrobat.

filename

the identifier that is used for a file. The filename includes the file extension, as in `<charvar-value>PROFILE.SC2</charvar-value>`. See also fully qualified filename and pathname.

fileref

a name that is temporarily assigned to an external file or to an aggregate storage location such as a directory or a folder. The fileref identifies the file or the storage location to SAS. Under Windows, you can assign a fileref with a FILENAME statement, the SAS system option SET, the Windows SET command, or from the SAS Explorer window.

folder

a named subdivision that is used for organizing files on a disk, diskette, CD-ROM, or DVD-ROM. A folder also contains information about each file that it contains, such as size and date of last change.

font

a complete set of all the characters of the same design and style. The characters in a font can be figures or symbols as well as alphanumeric characters.

fully qualified filename

a file specification that includes both the pathname and the filename, as in `<charvar-value>C:\SAS\SASUSER\PROFILE.SC2</charvar-value>`. See also filename and pathname.

graphical user interface

any system that uses graphical objects such as windows, menus, icons, buttons, and check boxes to represent the functions of a software application and to enable the user to interact with the application. By contrast, a command-line interface requires users to interact with the software application by entering text. Many graphical user interfaces use visual metaphors for real-world objects such as file cabinets, folders, rulers, and scissors. Short form: GUI.

GUI

See graphical user interface.

host option

in a SAS statement, an option that is specific to a particular operating environment.

HTML

See HyperText Markup Language.

HyperText Markup Language

a coding system in which the codes indicate the layout and style of the text in a text file. Other HTML codes enable you to embed electronic objects such as images, sounds, video streams, and applets (small software applications) into HTML documents. All Web browsers can process HTML documents. Short form: HTML.

I/O time

an abbreviation for input/output time. I/O time is the time the computer spends on moving data from storage areas, such as disk or tape, into memory for work (input time) and moving the result out of memory to storage or to a display device, such as a terminal or a printer (output time).

icon

in a graphical user interface, a pictorial representation of a window, an action (such as sending e-mail or printing a document), or an option (such as double-spacing) that is available to the user. The user clicks on (or otherwise selects) the icon in order to expand the icon into a window, to perform the action, or to specify the option.

libref

a name that is temporarily associated with a SAS library. The complete name of a SAS file consists of two words, separated by a period. The libref, which is the first word, indicates the library. The second word is the name of the specific SAS file. For example, in VLIB.NEWBDAY, the libref VLIB tells SAS which library contains the file NEWBDAY. You assign a libref with a LIBNAME statement or with an operating system command.

maximize

in a graphical user interface, to cause a resizable window to instantly be displayed at its largest size, usually by clicking on (or otherwise selecting) an icon or on the maximize button of an active window.

member

a SAS file in a SAS library.

member name

a name that is assigned to a SAS file in a SAS library. Under Windows, the member name is the same as the filename for files that are stored in a SAS library.

memory

the size of the work area that the central processing unit (CPU) must devote to the operations in a program.

memory-based library

a SAS library that is stored either in conventional memory or in extended server memory (rather than on a data storage device) for the duration of a SAS session or job. See also conventional memory and extended server memory.

menu bar

the primary list of items at the top of a window, which represent the actions or classes of actions that can be executed. Selecting an item executes an action, opens a menu, or opens a dialog box that requests additional information. See also pop-up menu and menu.

message area

the area of the status bar (at the bottom of the main SAS window) that displays messages from SAS.

minimize

in a graphical user interface, to click on the minimize button of an active window, causing the window to be replaced by an icon elsewhere on the desktop. The window can be restored to its former size, location, and active status by clicking on (or otherwise selecting) the icon.

named pipe

a named object that provides client-to-server, server-to-client, or duplex communication between unrelated processes. You can use named pipes to establish communication between Windows applications, including multiple SAS sessions. See also pipe.

national character

any character that is specific to a language as it is written in a particular nation or group of nations.

network

an interconnected group of computers.

NT file system

an advanced system for organizing directories and files. NTFS supports long filenames, full security access control, file system recovery, and extremely large storage media. Short form: NTFS.

NTFS

See NT file system.

object

in object-oriented methodology, a specific representation of a class. An object inherits the characteristics (attributes or instance variables) of its class as well as the operations (methods) that class can execute. For example, a push button object is an instance of the Push Button class. The terms object and instance are often used interchangeably.

Object Linking and Embedding

a method of interprocess communication supported by Windows that involves a client/server architecture. OLE enables an object that was created by one application to be embedded in or linked to another application. Short form: OLE.

ODBC

See Open Database Connectivity.

ODBC driver

a loadable library module that provides a standardized interface for accessing, manipulating, and updating data that is created and maintained by a particular vendor's data management software. For example, the SAS ODBC driver enables you to access, manipulate, and update SAS data sources from any application that conforms to the ODBC standard. See also Open Database Connectivity.

ODS

See Output Delivery System.

OLE

See Object Linking and Embedding.

Open Database Connectivity

an interface standard that provides a common application programming interface (API) for accessing data. Many software products that run in the Windows operating environment conform to this standard so that you can access data that was created using other software products. Short form: ODBC.

Output Delivery System

a component of SAS software that can produce output in a variety of formats such as markup languages (HTML, XML), PDF, listing, RTF, Postscript, and SAS data sets. Short form: ODS.

pathname

in Windows operating environments, a specification of a drive, directories, and subdirectories, such as `<charvar-value>C:\SAS\SASUSER</charvar-value>`.

PCL

See Printer Command Language.

PID

See process ID.

pipe

an object that provides direct access to STDIN, STDOUT, and STDERR between processes. Pipe is synonymous with unnamed pipe. See also named pipe.

pop-up menu

a menu that appears when it is requested. These menus are context-specific, depending on which window is active and on the cursor location. See also, menu.

portability

the ability of a program to execute in an operating environment other than the one for which it was written.

portable

See portability.

Printer Command Language

a command language that was developed by Hewlett-Packard for controlling Hewlett-Packard printers. Each PCL command consists of an escape key followed by a series of code numbers. Different versions of PCL have been developed for use with different models or types of Hewlett-Packard printers. Short form: PCL.

process

a functional unit of a program or task.

process ID

a unique number that is assigned to each process by the operating system. Short form: PID.

menu

the list of menu items or choices that appears when you choose an item from a menu bar or from another menu.

raw data

data that has not been read into a SAS data set.

record

a logical unit of information that consists of fields of related data. A collection of records are stored in a file. A record is analogous to a SAS observation.

SAS AWS

See application workspace.

SAS windowing environment

a graphical user interface for SAS software, through which you can perform many different tasks, including preparing and submitting programs, viewing and printing results, and debugging and resubmitting programs. See also graphical user interface.

sasroot

a term that represents the name of the directory or folder in which SAS is installed at your site or on your computer.

Sasuser.Profile catalog

a SAS catalog in which SAS stores information about attributes of your SAS windowing environment. For example, this catalog contains function-key definitions, fonts for graphics applications, window attributes, and other information that is used by interactive SAS procedures. See also SAS catalog.

Secure Socket Layer

a protocol that was developed by Netscape for transmitting private documents across the Internet. SSL uses a private key to encrypt data that is transmitted between a Web browser and a server.

sequential access

a method of file access in which the records are read or written one after the other from the beginning of the file to the end.

serial port

an I/O port (usually using an RS-232 interface) through which data are transmitted one bit at a time. Most plotters and some laser printers are connected to the host computer via a serial port.

server

a computer system that provides data or services to multiple users on a network. The term 'server' sometimes refers to the computer system's hardware and software, but it often refers only to the software that provides the data or services. In a network, users might log on to a file server (to store and retrieve data files), a print server (to use centrally located printers), or a database server (to query or update databases). In a client/server implementation, a server is a program that waits for and fulfills requests from client programs for data or services. The client programs might be running on the same computer or on other computers. See also client.

signature line

in the Enhanced Editor, a line of SAS code in which a step keyword (DATA, PROC, or MACRO) appears.

SMP

See symmetric multiprocessing.

standard input

the primary source of data going into a command. Standard input comes from the keyboard unless it is being redirected from a file or piped from another command.

standard output

the primary destination of data coming from a command. Standard output goes to the display unless it is being redirected to a file or piped to another command.

step boundary

a point in a SAS program when SAS recognizes that a DATA step or PROC step is complete.

subclassing

in object-oriented methodology, the process of deriving a new class from an existing class. A new class inherits the characteristics (attributes or instance variables) and operations (methods) of its parent. It can also contain custom attributes (or instance variables) and methods.

swap

to move data or program code from a computer system's main memory to a storage device such as a hard disk, or vice versa.

swapping

See swap.

symmetric multiprocessing

a hardware and software architecture that can improve the speed of I/O and processing. An SMP machine has multiple CPUs and a thread-enabled operating system. An SMP machine is usually configured with multiple controllers and with multiple disk drives per controller. Short form: SMP.

system menu

under Windows, a menu that is typically activated by clicking on (or otherwise selecting) an icon in the top left corner of an application window. You can use the system menu to move, resize, minimize, or maximize the window or to close the application. In SAS, you use the SAS system option AWSCONTROL to control whether this menu is available in the main SAS window or not.

system option

See SAS system option.

taskbar

the bar at the bottom of the Windows desktop that displays active applications. The taskbar enables you to easily switch between applications and to restore, move, size, minimize, maximize, and close applications.

TCP/IP

an abbreviation for a pair of networking protocols. Transmission Control Protocol (TCP) is a standard protocol for transferring information on local area networks such as Ethernets. TCP ensures that process-to-process information is delivered in the appropriate order. Internet Protocol (IP) is a protocol for managing connections between operating environments. IP routes information through the network to a particular operating environment and fragments and reassembles information in transfers.

thread

a single path of execution of a process in a single CPU, or a basic unit of program execution in a thread-enabled operating system. In an SMP environment, which uses multiple CPUs, multiple threads can be spawned and processed simultaneously. Regardless of whether there is one CPU or many, each thread is an independent flow of control that is scheduled by the operating system. See also symmetric multiprocessing, thread-enabled operating system, and threading.

thread-enabled operating system

an operating system that can coordinate symmetric access by multiple CPUs to a shared main memory space. This coordinated access enables threads from the same process to share data very efficiently.

threading

a high-performance method of data I/O or data processing in which the I/O or processing is divided into multiple threads that are executed in parallel. In the boss-worker model of threading, the same code for the I/O or calculation process is executed simultaneously in separate threads on multiple CPUs. In the pipeline model, a process is divided into steps, which are then executed simultaneously in separate threads on multiple CPUs.

title bar

under Windows, an element of a window that displays the title of the window. The title bar is at the top of the window and is highlighted if the window is active.

toolbar

in Windows, a part of the SAS windowing environment that contains icons that you can associate with SAS commands or macros. Selecting an icon executes its associated command or string of commands. The toolbar is located in the menu bar area of the main SAS window. See also toolbox.

toolbox

a part of the SAS windowing environment in which you can place icons that you can associate with SAS commands or macros. Selecting an icon executes its associated command or string of commands. Unlike the toolbar, the toolbox is not attached to the main SAS window.

Universal Printing

a feature of SAS software that enables you to send SAS output to PDF, Postscript, GIF, PNG, SVG, and PCL files, as well as directly to printers. The Universal Printing system also provides many options that enable you to customize your output, and it is available in all of the operating environments that SAS supports.

unnamed pipe

See pipe.

window bar

the bar at the bottom of the SAS main window that includes a button for each SAS window that is open in your current SAS session. When you select one of the buttons, the window that is associated with that button becomes the active window

and appears on top of the other windows. You can also right-click on a button to access a menu that enables you to move, size, minimize, maximize, or close the associated window, or to access a different menu that is specific to that window.

working directory

another term for current folder. See also current folder.

Index

A

abbreviations 96
 ABEND option
 ABORT statement 450
 abort printing 550
 ABORT statement 450
 About SAS System dialog box 75, 335
 ACCESS member type 124
 accessibility features 77, 492
 Customize Tools dialog box 80
 docking view 81
 fonts 81
 icons 81
 menu access 82
 Property dialog boxes 80
 resizing list view detail columns 82
 sorting list views by column 82
 user interface 79
 windows and dialog boxes 78
 ACCESSIBILITY system option 79, 492
 Advanced preferences 63
 aggregate syntax 151
 ALL option
 SYSTASK statement 468
 ALTLOG system option 493
 ALTPRINT system option 494
 ANY option
 WAITFOR statement 470
 APPEND system option 495
 appending data
 to external files 163
 Application Log
 messages to, with LOGEVENT.EXE 227
 messages to, with user-written functions 225
 Windows 7 224
 Windows Server 2003 224
 Windows Vista 224
 Windows XP 225
 application performance
 Windows 7 200
 Windows Server 2003 201
 Windows Vista 200
 Windows XP 201
 applications
 adding to Tools menu 66, 553
 minimized 587
 toolbars for 71
 ARG statement
 DLLs 301

ASCII

alternate characters 58
 ASCII collating sequence
 position of characters in 413
 returning a string 393
 returning one character in 390
 attachment format 365
 ATTRIB statement 450
 authentication domain server
 searching for secure server logins 496
 authentication providers
 associating domain suffix with 496
 AUTHPROVIDERDOMAIN system option 496
 AUTHSERVER system option 496
 autocall libraries 598
 SASAUTOS system option 599
 specifying 557
 AutoComplete 41
 autoexec file 18
 alternate file 497
 default 18
 locating a renamed file 19
 suppressing 19
 text editor for creating 18
 uses for 19
 AUTOEXEC system option 497
 automatic indentation 95
 automatic macro variables 595
 Autosave 61, 117, 360
 autosave files 89
 AutoScroll 55
 AUTOSCROLL command 329
 AWSCONTROL system option 498
 AWSDEF system option 499
 AWSMAXIMIZE command 330
 AWSMENU system option 499
 AWSMENUMERGE system option 500
 AWSMINIMIZE command 330
 AWSRESTORE command 331
 AWSTITLE system option 501

B

batch jobs
 canceling 8
 Status window 8
 submitting 8
 windowing procedures in 8

- batch mode 6, 24
 - log files for 529
 - printing in 180
 - procedure output file for 549
 - source files 575
 - binary data
 - reading 419
 - writing 379
 - bitmaps
 - pasting into SAS sessions 57
 - printing 176
 - BMDP engine 142
 - BMDP files
 - converting to SAS data sets 433
 - reading 142
 - bookmarking lines 96
 - browsers
 - invoking 361
 - selecting 62
 - start page 62
 - buffers
 - number for processing data sets 501
 - page size 502
 - BUFNO system option 501
 - BUFSIZE system option 502
 - bus speed 199
 - Busy property 273
 - BYTE function 390
 - \$BYVALw. format
 - DLLs 310
- C**
- C language
 - DLL formats 307
 - CALL RECONNECT routine 295
 - CALL routines 389
 - CAPS command 331
 - carriage control characters 185
 - catalog entries
 - saving window contents to 353
 - catalog member type 124
 - CATALOG procedure 429
 - catalogs 124
 - converting Releases 6.03 and 6.04 to 9.2 141
 - converting Releases 6.08 to 9.2 140
 - converting to 9.2 format 137
 - converting Version 6 in 9.2 140
 - migrating from previous releases 137
 - number to keep open 503
 - Profile catalog 20
 - Versions 7 and 8 139
 - CATCACHE system option 503
 - performance and 207
 - CGM drivers 194
 - CGM files
 - creating from SAS/GRAPH 194
 - exporting to other applications 194
 - Change Folder dialog box 335
 - character data
 - converting hexadecimal data to 422
 - character expressions
 - translating specific characters 414
 - character strings
 - passing to programs 576
 - character values
 - converting to hexadecimal 381
 - character variables
 - length and precision 592
 - CIMPORT procedure 430
 - SAS 9.2 files with previous releases 141
 - CLEANUP system option 504
 - clearing librefs 132
 - clipboard 55
 - copying window contents 354, 361, 362
 - data formats supported 55
 - pasting bitmaps into SAS sessions 57
 - pasting graphics from 191, 193
 - pasting OLE objects from 245
 - pasting with WPASTE command 372
 - selecting and copying in nontext windows 56
 - selecting and copying text 56
 - submitting code 24, 57, 349
 - submitting statements 162
 - COBOL
 - DLL formats 308
 - code, submitting 23
 - batch mode 24
 - by dragging and dropping 25
 - from clipboard 24, 57, 349
 - from Enhanced Editor 23
 - from Program Editor 23
 - from registered file types 26
 - from SAS NOTEPAD text editor 23
 - coding errors 94
 - collapsible code sections 102
 - COLLATE function 393
 - collating sequence
 - creating 443
 - color
 - changing window colors 64
 - color attributes for text 57
 - of selected window portions 332
 - printing in color 175
 - COLOR command 332
 - Column Settings dialog box 335
 - combo boxes
 - adding items to 264
 - finding items in 265
 - COMDEF system option 505
 - command bar 36
 - Help from 73
 - issuing commands 41
 - setting options for 333
 - COMMAND command 333
 - command line 5
 - issuing commands 42
 - toggling 353
 - Command method 270
 - COMMAND option
 - SYSTASK statement 467
 - command prompt
 - starting SAS from 7
 - Command window
 - display location 505
 - commands
 - accessing external files 161
 - AutoComplete feature 41
 - customizing windowing environment 63
 - Enhanced Editor window 89
 - issuing 41

- issuing from command bar 41
 - issuing from command line 42
 - issuing from menus 41
 - issuing from toolbar 41
 - not supported in Windows 329
 - OLE automation of 270
 - printing with 179
 - Windows environment 328
 - CommandWindow property 273
 - CommandWindowVisible property 273
 - communications ports
 - reading from 157, 164
 - timeouts 165, 166
 - compatibility 5, 137
 - completion status 613
 - COMPRESS data set option
 - performance and 207
 - _COMPUTE_ method 604
 - concatenated data libraries 133
 - input access 133
 - output access 134
 - update access 133
 - with same name 134
 - concatenated directories
 - accessing 155
 - assigning filerefs 153
 - concatenated files
 - accessing 156
 - assigning filerefs 154
 - CONFIG system option 506
 - configuration files 7, 12
 - alternate 14, 506
 - custom 14
 - default 13
 - editing 14
 - naming conventions 14
 - processing options 18
 - processing order 15
 - purpose of 12
 - search order for 15
 - specifying system options in 13
 - system options in 477
 - CONTENTS procedure 431
 - Convert dialog box 336
 - CONVERT procedure 433
 - converting catalogs
 - Release 6.08 to 9.2 140
 - Releases 6.03 and 6.04 to 9.2 141
 - to 9.2 format 137
 - Version 6 to 9.2 140
 - converting data sets
 - Releases 6.08 through 6.12 139
 - copying text 56
 - counters 229, 230
 - CPORT procedure 435
 - SAS 9.2 files with previous releases 141
 - §CSTRw. format
 - DLLs 309
 - current folder 9, 39
 - changing 39
 - changing with statements 40
 - interactively selecting 40
 - setting initial path for 67
 - cursor
 - hiding 63
 - home position 350
 - scroll bar flash and 561
 - suppressing display of 367
 - Customize Tools dialog box 68
 - accessibility features 80, 492
 - opening 356
 - CUT command 334
- ## D
- data
 - accessing from other applications 146
 - data directives
 - for e-mail 48
 - populating Lotus Notes database 216
 - data files 123
 - exceeding maximum size 136
 - interface 123
 - native 123
 - data libraries 127
 - assigning with LIBNAME statement 128
 - assigning with OLE 269
 - concatenated 133
 - default permanent library 582
 - libref specification 127
 - listing attributes 466
 - Multi Engine Architecture and 124
 - New Library dialog box 128
 - Sasuser 134
 - Work 21, 135
 - data set options 325
 - data sets 122
 - buffer number 501
 - buffer size 502
 - calculating size 209
 - converting Releases 6.08 through 6.12 139
 - converting to 9.2 format 137
 - creating, Releases 6.08 through 6.12 141
 - performance and 209
 - reading and writing from previous releases 5
 - Releases 6.03 and 6.04 139
 - Releases 6.08 through 8.2 138
 - Scatter-read/Gather-write for 325
 - DATA step
 - OLE automation of 272
 - printing output 179
 - scheduling start time 415
 - sending e-mail 46, 49
 - suspending 413
 - data views 123
 - database files
 - accessing with SAS/ACCESS 145
 - DATASETS procedure 436
 - DDE (Dynamic Data Exchange) 275
 - controlling applications with 278
 - DDE triplets 277
 - !DDE_FLUSH string 283
 - dynamic data transfer 283
 - examples 278
 - HOTLINK option 282
 - invoking application commands 280
 - missing values 276, 284
 - NOTAB option with 281
 - reading from Excel 279
 - reading from Word 279
 - referencing external file 276
 - syntax 276

- tab characters 281
 - writing to Excel 278
 - writing to Word 279
 - DDE servers
 - opening with X command 278
 - DDE triplets 277
 - !DDE_FLUSH string 283
 - default engine 126
 - descriptor files 124
 - device drivers 507
 - DEVICE system option 507
 - dialog boxes
 - accessibility features 78
 - Help in 74
 - DINFO function 394
 - directories
 - deleting when empty 397
 - existence of 399
 - identifier values 396
 - information about 394
 - name of information item 396
 - number of information items 397
 - directory listings 392
 - _DISABLE_DEFAULT_ACTION_ method 605
 - disk cleanup 631
 - automating 632
 - disk controllers 199
 - disk space 199
 - DLGABOUT command 335
 - DLGCDIR command 335
 - DLGCOLUMNSIZE command 335
 - DLGCOLUMNSORT command 336
 - DLGCONVERT command 336
 - DLGENDR command 337
 - DLGFIND command 337
 - DLGFONT command 338
 - DLGLIB command 338
 - DLGLINKS command 338
 - DLGOPEN command 339
 - DLGPAGESETUP command 341
 - DLGPREF command 341
 - DLGPRT command 342
 - DLGPRTPREVIEW command 343
 - DLGPRTSETUP command 343
 - DLGREPLACE command 344
 - DLGRUN command 344
 - DLGSAVE command 345
 - DLGSMail command 346
 - DLLs 297
 - accessing efficiently 304
 - accessing from SAS 320
 - accessing returned pointers 314
 - calling 410
 - character string arguments 303
 - constants as arguments to MODULE 306
 - expressions as arguments to MODULE 306
 - formats for MODULE arguments 307
 - grouping variables as structure arguments 305
 - informat for MODULE arguments 307
 - invoking routines from IML procedure 315
 - MODULE functions 410
 - MODULE log messages 311
 - passing arguments by value 313
 - PEEK functions 303
 - SASCBTBL attribute table 298
 - structures 314
 - updating character string arguments 312
 - _DO_ method 605
 - docking view 37, 61
 - docking and undocking windows 38
 - enabling and disabling 38
 - minimizing and restoring 38
 - resizing 38, 81
 - Docking View window
 - minimizing 363
 - Resize mode for split bar 364
 - restoring from task bar 364
 - toggling on/off 362
 - documentation 73
 - index files for 519
 - location of Help files 520
 - table of contents files 522
 - domain suffix
 - associating with authentication provider 496
 - DOPEN function 396
 - DOPTNAME function 396
 - DOPTNUM function 397
 - DOS shell
 - enabling EXIT command 589
 - exiting from 28
 - drag and drop
 - Enhanced Editor window 93
 - nondefault action 247
 - overriding default action 115
 - Program Editor 115
 - submitting code 25
 - drag modifiers 247
 - drag scrolling 116
 - dummy variables
 - length and precision 592
 - Dynamic Data Exchange
 - See DDE (Dynamic Data Exchange)
 - dynamic link libraries
 - See DLLs
- ## E
- e-mail
 - attaching window contents to 359
 - attachment format 365
 - data directives for 48
 - DATA step for sending 46, 49
 - e-mail software for sending 43
 - FILENAME statement for sending 46
 - in SAS/AF applications 322
 - initializing 43
 - mailing current window as attachment 60
 - SCL for sending 46, 51
 - Send Mail dialog box 44, 346
 - sending window contents 45
 - sending with SAS 42
 - SMTP for sending 52
 - supported interfaces 42
 - e-mail dialog box 508
 - e-mail interface 509
 - ECHO system option 507
 - Edit preferences 61
 - editors
 - Enhanced Editor 86
 - Program Editor 111
 - EMAILDLG system option 508
 - EMAILSYS system option 509

- `_ENABLE_DEFAULT_ACTION_` method 606
- ENCODING= option
 - FILE statement 451
 - FILENAME statement 455
 - %INCLUDE statement 460
 - INFILE statement 461
- end-of-line character 452, 463
- ENGINE system option 510
- engines 125
 - assigning 129, 130
 - assigning multiple 130
 - assigning to environment variables 130
 - BMDP 142
 - changing, for Sasuser data library 135
 - changing, for Work data library 135
 - default engine 126
 - library engines 125
 - NOTESDB 215
 - OSIRIS 143
 - rules for determining 127
 - SPSS 144
 - view engines 125
- Enhanced Editor 86
 - See also* Enhanced Editor window
 - appearance options 107, 108
 - associating file extensions with file types 105
 - autosave files 89
 - creating keywords 104
 - disabling 8
 - enabling/disabling 110, 365, 511
 - features 86
 - General options 106
 - keyboard shortcuts 626
 - keyboard shortcuts for customizing 109
 - Open dialog box 348
 - opening files in 348
 - preference setting for 61
 - schemes 109
 - setting options 105
 - submitting code 23
 - switching to Program Editor 111
 - toggling between windows 371
- Enhanced Editor Options window 105
- Enhanced Editor window 87
 - abbreviations 96
 - automatic indentation 95
 - bookmarking lines 96
 - coding errors 94
 - collapsible code sections 102
 - dragging text 93
 - editing text 91
 - filename for submitted code/catalog entries 98
 - finding and replacing text 93
 - insertion point 90
 - keyboard macros 100
 - keyboard shortcuts 100
 - line number commands 89
 - multiple views of same file 89
 - opening 365
 - opening files 88
 - overview 87
 - path for submitted code/catalog entries 98
 - saving contents to catalog entry 353
 - saving files 88
 - scrolling commands 89
 - selecting text 91
 - submitting programs 97
 - tabs 95
 - Word Tips 97
- ENHANCEDEDITOR system option 511
- environment variables
 - assigning librefs 130
 - defining 562
 - defining with SET system option 131
 - defining with SET Windows command 131
 - Enhanced Editor 98
 - filerefs for external files 150
 - in Work data library 136
- error checking
 - Enhanced Editor 94
- error messages 613
 - accessing files 614
 - completion status 613
 - initialization 619
 - internal errors 617
 - library for 537
 - networks 617
 - OLE 616
 - resolving 618
 - return codes 613
 - SAS features 615
 - termination 619
 - uppercasing 537
- ERRORLEVEL batch variable 613
- Event Map dialog box 262
- event viewer
 - writing log messages to 186
- Event Viewer
 - Application Log 224
 - viewing SAS events 225
- Excel applications
 - reading with DDE 279
- Excel spreadsheets
 - OLE and 257
- executable files
 - search path for 545
- `_EXECUTE_` method 606
- existence of directories 399
- existence of external files 399
- Exit dialog box 337
- exit preference 60
- Explorer window
 - clearing librefs 132
- exporting graphics 192
- external DLLs
 - See* DLLs
- external files 148
 - accessing with commands 161
 - accessing with statements 158
 - altering record format 162
 - appending to 163
 - communications port timeouts 165, 166
 - concatenated files 156
 - concatenating 150
 - copying lines to a window 351
 - copying to text editor window 161
 - default file extensions 152
 - deleting 397
 - FILE command 161
 - FILE statement 158
 - filerefs for 149
 - GSUBMIT command 162

- I/O techniques 162
 - in working directories 158
 - INCLUDE command 161
 - %INCLUDE statement 160
 - INFILE statement 159
 - long filenames 154
 - name of information item 404
 - national characters in 164
 - quoted Windows filenames 157
 - reading from COM ports 157, 164
 - reading with %INCLUDE statement 160
 - reading with INFILE statement 159
 - referencing 148, 458, 463
 - reserved physical names 157
 - saving window contents to 347
 - saving windows to 53
 - UNC paths 154
 - value of information items 401
 - verification by fileref 398
 - verification by physical name 399
 - wildcards for 150
 - writing to LPT ports 157
 - writing window contents to 161
 - writing with FILE statement 158
- F**
- FDELETE function 397
 - FEXIST function 398
 - file access
 - error messages for 614
 - file cache
 - memory-based libraries as 205, 533
 - FILE command 161, 347
 - file extensions 121
 - associating with file types 105
 - changing 122
 - file filters 512
 - file formats
 - compatibility among releases 137
 - File menu
 - listing recently used files 369
 - Universal Printing commands 581
 - file resource tracking system 556
 - file resources
 - list of 556
 - file shortcuts 149
 - FILE statement 451
 - writing to external files 158
 - file types
 - associating file extensions with 105
 - FILEEXIST function 399
 - FILELOCKWAITMAX= system option 512
 - FILENAME function 399
 - FILENAME statement 453
 - DDE syntax 276
 - named pipes 288
 - sending e-mail 46
 - unnamed pipes 286
 - filenames
 - clearing 54
 - FILEOPEN command 348
 - FILEREF function 400
 - filerefs 149
 - assigning file shortcuts 149
 - assigning to concatenated directories 153
 - assigning to concatenated files 154
 - assigning to directories 151
 - assigning with FILENAME function 399
 - clearing 155
 - deassigning 399
 - environment variables and 150
 - FILENAME statement and 149
 - listing 155
 - SET command and 151
 - SET system option and 151
 - verification of 400
 - files 120
 - compatibility 137
 - file extensions 121
 - from multiple SAS sessions 136
 - from remote hosts 142
 - locked files 512
 - migrating 137
 - number of information items 406
 - opening in Enhanced Editor 88
 - opening in Program Editor 111
 - printing to 179
 - remote host SAS files in SAS 9.2 142
 - SAS 9.2 files with previous releases 141
 - saving in Enhanced Editor 88
 - saving in Program Editor 117
 - sharing 136
 - submitting on opening 60
 - transferring 145
 - types of 121
 - fill character 349
 - FILL command 349
 - FILTERLIST system option 512
 - find and replace
 - Enhanced Editor 93
 - Program Editor 114
 - Find dialog box 337
 - FINFO function 401
 - firewalls
 - remote browsing and 76
 - fixed-point binary values
 - converting hexadecimal values to 421
 - fixed-point data
 - reading 423, 425
 - writing 382
 - flat files 206
 - floating-point binary values
 - converting hexadecimal values to 421
 - floating-point data
 - converting to hexadecimal 381
 - reading 426
 - writing 386
 - folders
 - assigning librefs to 128
 - assigning librefs to working folder 129
 - current folder 39
 - default structure 22
 - for HTML output files 62
 - for Sasuser libref 134
 - setting current folder 9
 - WORK folder 62
 - FONT system option 513
 - FONTALIAS system option 514
 - fonts 58
 - assigning Windows font to SAS font 514
 - changing 171

- directory location 515
- enlarging 81
- for printing 578
- for window contents 574
- for windows 513
- TrueType 621
- Fonts dialog box 338
- FONTSLLOC system option 515
- FOOTNOTE statement 459
- FOPTNAME function 404
- FOPTNUM function 406
- FORM window 178
- formats 379
 - writing binary data 379
- formatting characters
 - default 516
- FORMCHAR system option 516
- FORTRAN
 - DLL formats 307
- FRAME entries
 - editing OLE objects in 248
 - inserting OLE objects 244
- FULLSTIMER system option 517
- function keys
 - mapping 546
 - number of 540
- functions 389

G

- General preferences 60
 - customizing toolbars 68
- _GET_EVENT_ method 607
- _GET_PROPERTY_ method 607
- _GET_REFERENCE_ID_ method 608
- Getting Started with SAS Software 74
- _GET_TYPE_ method 609
- graphical interface 5
- graphics
 - CGM drivers 194
 - exporting as WMF files 195
 - exporting CGM files 194
 - exporting for other applications 192
 - exporting to SAS/GRAPH 192
 - import file formats 191
 - importing from other applications 190
 - importing from SAS/GRAPH 191
 - pasting from clipboard 191, 193
 - printing 187
 - producing 195
 - producing on display 186
- graphics adapters 199
- graphics output
 - device driver for 507
- GSUBMIT command 162, 349
- GUI 5

H

- hard drives 199
 - configuration 199
 - mapping 163
- hardware 197
 - disk space for I/O 199
 - graphics adapter 199
 - memory 198

- processor speed 198
- Height property 273
- Help
 - adding to Help menu 66
 - for main SAS window 37
 - for SAS products 74
 - from command bar 73
 - from Help Menu 74
 - from Web sites 75
 - in dialog boxes 74
 - index files for 519
 - Microsoft HTML Help 73
 - online 73
 - table of contents files 522
 - viewing in remote browser 75
- help files
 - displaying in main SAS window Help menu 521
 - location for Microsoft HTML Help 520
 - registering 521
- Help menu 74
 - adding Help to 66
- HELPHOST system option 77, 518
- HELPINDEX system option 519
- HELPLLOC system option 520
- HELPPORT system option 77
- HELPPREGISTER system option 521
- HELPTOC system option 522
- hexadecimal values
 - converting character values to 381
 - converting real binary values to 381
 - converting to character data 422
 - converting to fixed-point binary 421
 - converting to floating-point binary 421
- \$HEXw. format 381
- HEXw. format 381
- \$HEXw. informat 422
- HEXw. informat 421
- highlighting 57
- HOME command 350
- host commands
 - executing conditionally 392
 - executing from SAS sessions 471
 - submitting 391
 - submitting from SAS sessions 377
- host computer
 - specifying name of 77, 518
- host sort utility
 - name of 568
- HOSTPRINT system option 524
- HOTLINK option
 - DDE 282
- HSERVICE entries
 - reading OLE objects from 246
- HTML Help 73
- HTML output 62
 - ODS 182
 - preferences 182

I

- I/O disk space 199
- I/O enhancements for multiple processors 201
- IBw.d format 382
- IBw.d informat 423
- ICON command 350
- ICON system option 525

- icons
 - enlarging 81
 - in SAS/AF applications 321
 - user-defined 67, 582
- image usage statistics 517
- importing graphics 190
- in-memory macro variables
 - size of 539
- INCLUDE command 161, 351
- %INCLUDE statement 459
 - reading external files 160
- indentation
 - automatic 95
- index files
 - for SAS Help and Documentation 519
- indexes 123
- _IN_ERROR_ method 609
- INFILE statement 461
 - reading external files 159
- informats 419
 - converting to 9.1 420
 - reading binary data 419
- .INI files 234
 - creating with ASCII editor 238
 - creating with SSCU 235
- initialization error messages 619
- INITSTMT system option 525
- insert mode
 - toggling on/off 368
- INSERT system option 526
- insertion point
 - Enhanced Editor 90
 - Program Editor 112
- integer binary data
 - reading 423
 - writing 382
- IntelliMouse 55
- interactive processing 211
- interactive sessions 6
 - dragging files in 25
- interface 35
 - accessibility and 79
- interface data files 123
- interface library engines 126
- internal errors 617
- interrupting SAS sessions 26
- invocation file
 - system options in 477

J

- Java Runtime Environment (JRE) options 527
- JREOPTIONS system option 527

K

- key definitions 54, 623
- keyboard macros 100
- keyboard shortcuts
 - assigning 109
 - bookmarking lines 96
 - customizing the Enhanced Editor 109
 - deleting 110
 - Enhanced Editor 100, 626
 - for keyboard macros 100
 - main SAS window 624

- Print Preview window 629
 - resetting 110
 - selecting and editing text 91, 92
- Keys window
 - saving contents to catalog entry 353
- KEYS window
 - mouse buttons 541
- keywords
 - user-defined 104
- KILL option
 - SYSTASK statement 467

L

- Learning SAS Programming 74
- length of variables 591
- LENGTH statement 464
- LIBNAME function 407
 - clearing librefs 133
- LIBNAME statement 464
 - assigning librefs 128
 - clearing librefs 133
- LIBNAME window
 - clearing librefs 133
- libraries
 - concatenating in system options 478
 - default access method 510
 - memory-based 201, 204
- Libraries dialog box 338
- library engines 125
- librefs 124, 127
 - associating 466
 - available at startup 129
 - clearing 132, 407
 - listing 132
 - User 136
- librefs, assigning
 - multiple to one directory 130
 - to a single directory 128
 - to a working folder 128
 - to multiple folders 129
 - with environment variables 130
 - with GUI 128
 - with LIBNAME function 407
- line breaks
 - Program Editor 113
- line numbers 175
 - Enhanced Editor 89
 - Program Editor 112
- line size 175
- LINESIZE system option 528
- Links dialog box
 - opening 338
 - updating linked OLE objects 250
- LIST option
 - SYSTASK statement 467
- list views
 - resizing detail columns 82
 - sorting by column 82
- load security settings 204
- LOADMEMSIZE system option 528
- locked files 512
- log
 - alternate log 493
 - batch mode 529
 - echoing messages 507

- news file for messages 540
 - routing to file 184
 - routing with PRINTTO procedure 184
 - routing with Save As dialog box 184
 - routing with system options 185
 - writing messages to Windows event viewer 186
 - log events
 - writing to Windows event viewer 186
 - LOG system option 529
 - Log window
 - line size 528
 - saving contents to catalog entry 353
 - scroll frequency 329
 - LOGEVENT.EXE utility 227
 - logo screen 67
 - bitmap location 571
 - displaying at startup 571
 - logos
 - in SAS/AF applications 321
 - long filenames 154
 - Lotus Notes 215
 - client requirements 215
 - creating Notes documents 216
 - NOTESDB engine 215
 - NotesSQL ODBC driver 221
 - populating databases 216
 - retrieving information from 221
 - SAS/GRAPH output for 220
- M**
- macro facility 595
 - autocall libraries 598
 - automatic macro variables 595
 - macro functions 598
 - macro statements 597
 - macro functions 598
 - macro statements 597
 - macro variable symbol tables 538
 - macro variables
 - size of in-memory variables 539
 - macros, keyboard 100
 - main SAS window 35
 - adding applications to Tools menu 553
 - appearance and behavior of 317
 - components of 35
 - controlling 317
 - controlling windows within 558
 - customizing 498
 - dimensions of 499
 - docking view 37
 - embedding menu options 500
 - height setting 273
 - help files 521
 - help for 37
 - keyboard shortcuts 624
 - location of 499
 - maximizing 330
 - menu bar 499
 - menus 39
 - minimizing 330, 525
 - parent window 273
 - restoring to previous state 331
 - saving windows to external files 53
 - Screen Tips 37
 - size and placement 65
 - status line 37
 - system options for controlling 317
 - title 273, 501
 - width setting 273
 - window bar 39
 - windowing environment commands for 318
 - X Y coordinates 273
 - map data sets
 - library name for 531
 - mapping function keys 546
 - MAPS system option 531
 - MAXMEMQUERY system option 531
 - MCIPISLP function 408
 - MCIPISTR function 409
 - member-name syntax 151
 - resolving 153
 - member types 121
 - access 124
 - catalog 124
 - program 124
 - table 122
 - view 122
 - members 121
 - MEMBLKSZ system option 532
 - MEMCACHE system option 533
 - 64-bit Windows environments 203
 - MEMLIB option
 - LIBNAME statement 465
 - MEMLIB system option 534
 - 64-bit Windows environments 203
 - MEMMAXSZ system option 535
 - memory
 - block size for memory-based libraries 532
 - executables loaded by SAS 528
 - in-memory macro variables 539
 - limit for SORT procedure 570
 - limit on total amount 535
 - macro variable symbol tables 538
 - maximum for procedures 531
 - performance and 198
 - requirements for 198
 - usage statistics 517
 - virtual memory 553
 - memory address
 - storing 412
 - memory-based libraries 201
 - as file cache 205, 533
 - maximum amount of memory 535
 - processing SAS libraries as 204
 - Windows 2003 Servers 202
 - Windows XP Professional 203
 - Work library as 534
 - MEMSIZE system option 535
 - menu bars 36
 - displaying 499
 - menus 39
 - accessibility features 82
 - displaying descriptions of menu items 37
 - embedding menu items 500
 - issuing commands 41
 - system/control menu 558
 - messages
 - writing log messages to Windows event viewer 186
 - Microsoft HTML Help 73, 520
 - Microsoft IntelliMouse 55

- Microsoft Task Scheduler
 - automating disk cleanup 632
- migrating from previous releases 137
- minimizing windows 350
- missing values
 - DDE 276, 284
- MNAME= option
 - SYSTASK statement 468
- MODULE functions 410
 - constants as arguments to 306
 - expressions as arguments to 306
 - formats for 307
 - informats for 307
 - log messages 311
- mouse
 - IntelliMouse 55
- mouse buttons 541
- MS-DOS commands
 - running from SAS 26
- MSG system option 537
- MSGCASE system option 537
- MSYMTABMAX system option 538
- Multi Engine Architecture 124, 125
- multimedia equipment
 - submitting MCI string commands to 409
 - waiting for activation 408
- MVARSIZE system option 539

N

- named pipes 288
 - CALL RECONNECT routine 290
 - connecting to next client 290, 295
 - definition 285
 - examples 290
 - in SCL 290
 - NOBLOCK option 293
 - one client, one server 290
 - one server, several clients 291
 - syntax 288
 - waiting for data 293
- naming conventions
 - configuration files 14
- national characters
 - in external files 164
- native data files 123
- native library engines 125
- network performance 207
- networks
 - error messages for 617
- New Library dialog box 128
- _NEW_ method 610
- NEWS system option 540
- NOBLOCK option
 - named pipes 293
- nondefault drag and drop 115
- NOTAB option
 - DDE 281
- NOTEPAD text editor
 - submitting code from 23
- Notepad window
 - saving contents to catalog entry 353
- notes
 - uppercasing 537
- NOTESDB engine 215
- NotesSQL ODBC driver 221

- numeric variables
 - length and precision 591
- NUMKEYS system option 540
- NUMMOUSEKEYS system option 541

O

- OBS system option 542
- observations
 - end point for processing 542
- OCXs
 - See OLE custom controls (OCXs)
- ODBC driver 146
- ODS HTML output 182
- ODS output
 - remote browsing with 76
- OLE 244
 - automating objects and applications 252
 - converting objects 251
 - editing objects in FRAME entries 248
 - error messages for 616
 - inserting objects as FRAME entries 244
 - invoking OLE verbs 249
 - linked objects 249
 - OCXs in SAS/AF applications 259
 - SAS/AF catalog compatibility 244
- OLE automation 252, 267
 - array values returned by server 253
 - Command method 270
 - creating an instance of SAS 267
 - creating external instances 255
 - examples 269
 - feedback from SAS sessions 268
 - methods and properties for objects 270
 - optional parameters in server methods 255
 - populating Excel spreadsheets 257
 - QueryWindow method 271
 - Quit method 271
 - Submit method 272
 - Top method 272
 - value properties 254
 - Visual Basic code and SCL equivalents 258
- OLE automation properties
 - Busy 273
 - CommandWindow 273
 - CommandWindowVisible 273
 - Height 273
 - Parent 273
 - RC 273
 - ResultString 273
 - Title 273
 - Visible 273
 - Width 273
 - X 273
 - Y 274
- OLE class methods 603
- OLE custom controls (OCXs) 259
 - adding items to combo boxes 264
 - assigning SCL code to events 262
 - event handling 262, 263
 - Event Map dialog box 262
 - finding items in combo boxes 265
 - inserting in FRAME entries 260
 - properties 260
 - registering 260
 - retrieving argument values from events 263

- retrieving text value of 265
 - SCL methods and 261
 - subclassing 264
 - OLE linked objects 249
 - updating programmatically 251
 - updating with Links dialog box 250
 - OLE objects
 - automating 252
 - automation methods and properties 270
 - converting 251
 - editing within FRAME entries 248
 - inserting in FRAME entries 244, 246
 - pasting from clipboard 245
 - reading from HSERVICE entries 246
 - OLE verbs
 - invoking 249
 - online documentation 73
 - online Help 73
 - Open dialog box
 - file filters 512
 - folders 560
 - opening for default editor 339
 - opening for Enhanced Editor 348
 - paths specified in 67
 - optimizing performance 200
 - OPTIONS procedure 437
 - OPTIONS statement
 - system options in 478
 - OSIRIS engine 143
 - OSIRIS files
 - converting to data sets 433
 - reading 142
 - out-of-resource condition 504
 - output
 - formatting characters 516
 - page size 544
 - previewing 176
 - viewing in remote browser 75
 - Output window
 - line size 528
 - saving contents to catalog entry 353
 - scroll frequency 329
 - overtime mode 61
- P**
- packed decimal data
 - reading 424
 - writing 383
 - page numbers 175
 - resetting 543
 - page range to print 176
 - page setup 172
 - Page Setup dialog box 341
 - page size 175, 544
 - PAGENO system option 543
 - PAGESIZE system option 544
 - paper type 544
 - PAPERTYPE system option 544
 - Parent property 273
 - PATH system option 545
 - pathnames
 - appending to system options 495
 - inserting into system option values 526
 - PCLEAR command 329
 - PDw.d format 383
 - PDw.d informat 424
 - PEEKLONG functions 412
 - accessing character string arguments 303
 - performance
 - data set size, calculating 209
 - DLLs 304
 - hardware 197
 - I/O enhancements for multiple processors 201
 - interactive processing 211
 - memory-based libraries 201
 - networks 207
 - optimizing 200
 - responsiveness 200
 - SAS features for 206
 - SORT procedure 208, 231
 - tuning methods 208
 - Windows 7 applications 200
 - Windows Vista applications 200
 - Windows XP applications 201
 - performance counters 229
 - performance monitors 228
 - configuring 230
 - PROC SQL queries 232
 - starting 228
 - performance objects 229
 - PFKEY system option 546
 - PIBw.d format 384
 - PIBw.d informat 425
 - pipes 285
 - file attributes and 405
 - named 288
 - unnamed 286
 - PL/I
 - DLL formats 308
 - PLIST command 329
 - PMENU command 353
 - PMENU procedure 439
 - pointers
 - passing to structures 306
 - returning 314
 - pop-up menus
 - displaying 373
 - tooggling on/off 369
 - port number
 - for remote browser server 77
 - positive integer binary data
 - reading 425
 - writing 384
 - precision of variables 591
 - preferences
 - Advanced 63
 - Edit 61
 - for HTML output 182
 - General 60
 - Results tab 62
 - saving on exit 366
 - session preferences 59
 - View 61
 - Web 62
 - Preferences dialog box 59, 341
 - previewing output 176
 - Print Abort dialog box 550
 - Print dialog box 170, 342
 - print forms 177
 - Print Manager 524
 - print options 169

- Print Preview window 177
 - invoking 343
 - keyboard shortcuts 629
 - shortcut keys 177
 - Print Setup dialog box
 - opening 343
 - Use Forms check box 552
 - PRINT system option 549
 - printing 168
 - aborting 550
 - batch mode 180
 - bitmaps 176
 - canceling jobs 181
 - changing the printer 171
 - color printing 175
 - commands for 179
 - DATA step output 179
 - default printer 180
 - destination printer 551, 577
 - font specification 171
 - fonts 578
 - FORM window 178
 - forms 552
 - from GRAPH window 190
 - graphics 187
 - line numbers 175
 - line size 175
 - number of copies 176
 - options for 169
 - page numbers 175
 - page ranges 176
 - page setup 172
 - page size 175
 - paper type 544
 - previewing a window 176
 - previewing from GRAPH window 190
 - Print dialog box 171
 - print forms 177
 - printer specification 171
 - problems with 12
 - procedure output file for batch mode 549
 - recognizing printers attached to the system 549
 - SAS/GRAPH generic drivers for 188
 - SAS/GRAPH native drivers for 189, 190
 - setting printer settings 343
 - to a file 179
 - windows 170
 - Windows Print Manager 524
 - windows that can be printed 170
 - WINPxxx drivers for 188, 190
 - within a window 168
 - PRINTTO procedure 440
 - routing procedure output 184
 - PRNGETLIST system option 549
 - PROC SQL queries 232
 - procedure output
 - alternate file 494
 - batch mode 549
 - carriage control characters 185
 - routing to a file 184
 - routing to a Web browser 181
 - routing with PRINTTO procedure 184
 - routing with Save As dialog box 184
 - routing with system options 185
 - procedures 429
 - maximum memory for 531
 - processor speed 198
 - processors
 - I/O enhancements for multiple 201
 - Profile catalog 20
 - changing location of 20
 - default 20
 - deleting 20
 - Program Editor 111
 - Autosave 117
 - deleting text 114
 - drag and drop 115
 - drag scrolling 116
 - features 117
 - find and replace 114
 - insertion point 112
 - line breaks 113
 - line numbers 112
 - opening files 111
 - overriding drag/drop action 115
 - RTF text 116
 - saving files 117
 - selecting text 113
 - starting when SAS starts 8
 - submitting code 23
 - switching to Enhanced Editor 111
 - tabs 112
 - Program Editor window
 - saving contents to catalog entry 353
 - program items
 - starting SAS from 6
 - program member type 124
 - programs, submitting 355
 - Property dialog boxes
 - accessibility features 80
 - PRTABORTDLGS system option 550
 - PRTPERSISTDEFAULT system option 551
 - PRTSETFORMS system option 552
- ## Q
- QueryWindow method 271
 - Quit method 271
 - quoted Windows filenames 157
- ## R
- RANK function 413
 - RBw.d format 386
 - RBw.d informat 426
 - RC property 273
 - real binary data
 - converting to hexadecimal 381
 - reading 426
 - writing 386
 - REALMEMSIZE system option 553
 - recently used file list 60, 369
 - REGISTER system option 553
 - registered file types 26
 - registry files 22
 - regressing files
 - SAS 9.2 files with previous releases 141
 - Release 6.08 catalogs
 - converting to 9.2 140
 - Releases 6.03 and 6.04 data sets 139
 - Releases 6.08 through 8.2 data sets 138

- remote browser server 75
 - installing 77
 - port number for 77
 - remote browsing 75
 - computer name for 518
 - firewalls and 76
 - ODS output with 76
 - system options for 77
 - viewing output and Help 75
 - remote host
 - SAS files in SAS 9.2 142
 - Replace dialog box 344
 - resources directory 554
 - RESOURCESLOC system option 554
 - responsiveness 200
 - restricted options 476
 - Results tab 62
 - Results Viewer window 182
 - ResultString property 273
 - return codes 273, 613
 - RETURN option
 - ABORT statement 450
 - rich text format (RTF) 116
 - saving window contents to 373
 - ROUTINE statement
 - DLLs 299
 - RSASUSER system option 555
 - RTF (rich text format) 116
 - saving window contents to 373
 - RTRACE system option 556
 - RTRACELOC system option 556
 - Run dialog box
 - opening 344
 - starting SAS from 7
- S**
- SAS
 - batch mode 24
 - Help for SAS products 74
 - SAS, starting 6
 - as a Windows service 234
 - batch mode 6
 - from command prompt 7
 - from program items 6
 - from Run dialog box 7
 - from SAS files 7
 - from shortcuts 6
 - from Start Menu 6
 - if SAS does not start 12
 - interactive mode 6
 - with alternate configuration file 14
 - SAS 9.2 files
 - remote host files 142
 - with previous releases 141
 - SAS/AF applications
 - e-mail interface in 322
 - icons in 321
 - invoking automatically 321
 - logos in 321
 - OCXs in 259
 - SAS/AF catalogs
 - OLE compatibility 244
 - SAS automation objects 269
 - SAS command 7
 - appending system options to 6
 - SAS Disk Cleanup Handler 631
 - SAS files 12
 - See also* files
 - autoexec file 18
 - configuration files 12
 - Profile catalog 20
 - registry files 22
 - starting SAS from 7
 - Work data library 21
 - SAS/GRAPH
 - creating CGM files from 194
 - generic drivers 188
 - native drivers 189, 190
 - preparing output for a Notes document 220
 - SAS Help and Documentation 74
 - SAS Institute Web sites 75
 - SAS logging facility 186
 - SAS NOTEPAD text editor
 - submitting code from 23
 - SAS on the Web 75
 - SAS processes
 - terminating 30
 - SAS resources
 - directory location of 554
 - SAS responsiveness 200
 - SAS Service
 - configuration utility (SSCU) 234
 - installing 240
 - removing 242
 - starting 242
 - SAS session preferences
 - Advanced 63
 - Edit 61
 - General 60
 - View 61
 - Web 62
 - SAS sessions 37
 - bringing to foreground 272
 - checking busy status 269, 273
 - confirming exit 60
 - customizing 58
 - ending 30
 - interrupting 26
 - minimizing 66
 - pasting bitmaps into 57
 - sample 9
 - saving settings on exit 60
 - selecting fonts 58
 - setting session preferences 59
 - setting window title 269
 - terminating 270, 271
 - titles 66
 - tooggling visible/invisible 269, 273
 - SASAUTOS system option 557, 599
 - SASCBTBL attribute table 298
 - ARG statement 301
 - importance of 302
 - ROUTINE statement 299
 - syntax 298
 - SASCONTROL system option 558
 - SAS_EXECFILENAME environment variable 98
 - SAS_EXECFILEPATH environment variable 98
 - Sashelp catalog
 - searching entries 559
 - SASHELP system option 559
 - SASINITIALFOLDER system option 560

- Sasuser data library 134
 - changing engines 135
- Sasuser library
 - name specification 560
 - read/write access control 555
- Sasuser libref
 - folders for 134
- SASUSER system option 560
- Save As dialog box
 - file filters 512
 - folders 560
 - opening 345
- SAVE command 353
- Save dialog box
 - paths specified in 67
- saving automatically 360
- Scatter-read/Gather-write 207, 563
 - activating for data sets 325
- schemes 109
- SCL
 - sending e-mail 46, 51
- SCL methods
 - for OLE 603
 - OLE controls and 261
- ScreenTips 37
 - toggling 374
- scroll bars
 - disabling focus 63
 - flashing cursor and 561
 - horizontal 367
 - toggling on/off 367, 376
- SCROLLBAR command 329
- SCROLLBARFLASH system option 561
- scrolling
 - drag scrolling 116
 - Enhanced Editor 89
 - preferences for 63
- search path
 - for executable files 545
- Section 508 77, 492
- secure server logins
 - searching for 496
- selecting and copying text 56
- selecting text
 - Enhanced Editor 91
 - Program Editor 113
- Send Mail dialog box 44, 346
- server logins 496
- session preferences 59
- SET command
 - filerefs for external files 151
- SET system option 562
 - filerefs for external files 151
- SET Windows command 131
- _SET_PROPERTY_ method 611
- SGIO data set option 325
- SGIO system option 563
- sharing files
 - between UNIX and Windows 452, 463
- SHELL= option
 - SYSTASK statement 468
- shortcuts
 - starting SAS from 6
- signature line 102
- SLEEP function 413
- SLEEP window
 - enabling/disabling 564
- SLEEPWINDOW system option 564
- SMARK command 329
- SMP (symmetric multiprocessing) 201
- SMTP
 - sending e-mail 52
- sort algorithm
 - SyncSort 443
- Sort Columns dialog box 336
- SORT procedure 441
 - memory limit 570
 - performance and 208, 231
 - sort utility 569
 - SyncSort 443
- sort utility 569
 - name of host sort utility 568
- SORTANOM system option 564
- SORTCUT system option 565
- SORTCUTP system option 566
- SORTDEV system option 567
- sorting
 - list views by column 82
 - with SyncSort 443
- SORTNAME system option 568
- SORTPARM system option 568
- SORTPGM system option 569
- SORTSEQ= option
 - PROC SORT statement 445
- SORTSIZE= option
 - PROC SORT statement 442
- SORTSIZE= system option 570
 - performance and 208
- SOUND call routine 390
- sound generation 390
- source files
 - batch mode 575
- special character attributes 57
- speed 198
- splash screen 67
 - bitmap location 571
 - displaying at startup 571
- SPLASH system option 571
- SPLASHLOC system option 571
- SPSS engine 144
- SPSS files
 - converting to data sets 433
 - reading 142
 - reformatting 144
- SSCU (SAS service configuration utility) 234
- Start Menu 6
- starting SAS
 - See SAS, starting
- STATE option
 - SYSTASK statement 468
- statements 449
 - accessing external files 158
 - execution instructions 525
 - submitting from clipboard 162
- statistics
 - system performance 573
- status line 36, 37, 61
 - area proportions 374
 - toggling on/off 374
- STATUS= option
 - SYSTASK statement 468

- Status window 8
 - STATVAR option
 - SYSTASK statement 468
 - STIMEFMT system option 572
 - STIMER system option 573
 - STORE command 354
 - stored program files 124
 - subclassing 264
 - Submit method 272
 - submitting code
 - See* code, submitting
 - submitting programs 355
 - Enhanced Editor 97
 - SUBTOP command 97, 355
 - symmetric multiprocessing (SMP) 201
 - SyncSort 443
 - activation 565, 566
 - location of temporary files 444
 - options specification 564
 - parameters specification 568
 - passing options to 445
 - passing parameters to 445
 - pathname for temporary files 567
 - setting as sort algorithm 443
 - sorting based on size or observations 444
 - SYSCC automatic macro variable 595
 - SYSDEVIC automatic macro variable 595
 - SYSENV automatic macro variable 596
 - %SYSEXEC statement 597
 - %SYSGET function 598
 - SYSGUIFONT system option 574
 - SYSIN system option 575
 - SYSJOBID automatic macro variable 596
 - SYSMAXLONG automatic macro variable 596
 - SYSARM system option 576
 - SYSRINT system option 577
 - SYSRINTFONT system option 578
 - SYSRC automatic macro variable 596
 - SYSSCP automatic macro variable 596
 - SYSSCPL automatic macro variable 596
 - SYSTASK statement 467
 - system administrators
 - firewalls and remote browsing 76
 - SYSTEM call routine 391
 - system options 475
 - appending pathnames to 495
 - appending to SAS command 6
 - changing settings 476
 - concatenating libraries in 478
 - controlling main SAS window with 317
 - customizing windowing environment 65
 - displaying settings 476
 - for remote browsing 77
 - in configuration file 477
 - in invocation file 477
 - in OPTIONS statement 478
 - inserting pathnames 526
 - logging 583
 - restricted 476
 - sending e-mail 43
 - set in multiple places 478
 - specifying in configuration file 13
 - summary of 479
 - writing to terminal 583
 - system performance statistics 573
- ## T
- tab characters
 - DDE 281
 - table member type 122
 - table of contents files 522
 - tabs
 - Enhanced Editor 95
 - Program Editor 112
 - TAGSORT option
 - performance and 208
 - PROC SORT statement 442
 - Tasking Manager window 360
 - TASKNAME= option
 - SYSTASK statement 468
 - terminating processes 30, 360
 - termination error messages 619
 - TERMSTR= option
 - FILE statement 452, 463
 - text
 - unmarking 370
 - text editor
 - submitting code from 23
 - text editor windows 111
 - Autosave frequency 61
 - deleting text 114
 - overtyping mode as default 61
 - preferences 61
 - time display 572
 - TIMEOUT= option
 - WAITFOR statement 470
 - title bar 501
 - Title property 273
 - TITLE statement 469
 - toolbars 36, 37
 - adding tools to 70
 - button size 356
 - closing 355
 - custom controls 321
 - customizing 68
 - examples of creating tools 72
 - issuing commands 41
 - removing tools 71
 - removing tools from 71
 - restoring defaults 72
 - saving 71
 - setting General preferences 68
 - toolboxes
 - button size 356
 - closing 355
 - display location 580
 - loading 357
 - tool switching 358
 - TOOLCLOSE command 355
 - TOOLDEF system option 580
 - TOOLEDIT command 356
 - TOOLLARGE command 356
 - TOOLLOAD command 357
 - Tools menu
 - adding applications to 66, 553
 - TOOLSWITCH command 358
 - ToolTips
 - toggling on/off 358
 - TOOLTIPS command 358
 - Top method 272
 - TRANSLATE function 414
 - TrueType fonts 621

U

undo 376
 Universal Printing 168
 enabling commands for 581
 UNIVERSALPRINT system option 168
 UNIX
 sharing files with Windows 452, 463
 unmarking text 61, 370
 unnamed pipes 286
 definition 285
 example 287
 redirection sequences 287
 syntax 286
 UPDATE method 611
 uppercase
 converting to 331
 for warnings and messages 537
 UPRINTMENUSWITCH system option 168, 581
 user-defined icons 67, 582
 user-defined keywords 104
 User libref 136
 USER system option 582
 USERICON system option 582
 Using this Window 74

V

value properties 254
 variables
 grouping as structure arguments 305
 length and precision 591
 VERBOSE system option 583
 Version 6 catalogs
 converting in 9.2 140
 Version 6 files 137
 Versions 7 and 8 catalogs 139
 Versions 7 and 8 files 137
 view engines 125
 view member type 122
 View preferences 61
 virtual memory 553
 Visible property 273
 Visual Basic code
 SCL equivalents 258

W

WAIT option
 SYSTASK statement 467
 WAITFOR statement 470
 WAKEUP function 415
 warnings
 uppercasing 537
 WATTACH command 359
 WATTENTION command 360
 WAUTOSAVE command 360
 WBROWSE command 361
 WCOPY command 361
 WCUT command 362
 WDOCKVIEW command 362
 WDOCKVIEWMINIMIZE command 363
 WDOCKVIEWRESIZE command 364
 WDOCKVIEWRESTORE command 364
 WDRAG command 329

Web browsers
 invoking 361
 routing procedure output to 181
 selecting 62
 start page 62
 Web enhancements 584
 enabling 68
 Web preferences 62
 Web sites
 Help from 75
 WEBUI system option 584
 WEDIT command 365
 WEMAILFMT command 365
 WEXITSAVE command 366
 WFILE command 366
 WGROW command 329
 WHIDECURSOR command 367
 WHSBAR command 367
 Width property 273
 wildcards 150
 window bar 36, 39, 61
 toggling 376
 Window menu 585
 windowing environment 35, 36
 color 64
 commands for controlling main SAS window 318
 customizing with commands 63
 customizing with system options 65
 windowing procedures
 in batch jobs 8
 windows
 accessibility features 78
 attaching contents to e-mail 359
 changing active window to last edited window 372
 checking existence of 271
 clearing 54, 371
 color of 57, 332
 copying lines from external files 351
 copying to clipboard 354, 361
 cutting text from 334
 cutting to clipboard 362
 fonts for 513, 574
 mailing current window as attachment 60
 maximizing 378
 minimizing 350
 pasting from clipboard 372
 position of 63
 printing 170
 printing from within 168
 saving contents to file 347, 366
 saving to external files 53
 saving to RTF file 373
 sending contents by e-mail 45
 special character attributes 57
 text highlighting 57
 toolbars for 71
 Windows 4
 enterprise environments 4
 error messages 618
 memory-based libraries 535
 memory block size 532
 sharing files with UNIX 452, 463
 supported editions 4
 system tools 223
 Windows 2003 Servers
 memory-based libraries 202

- Windows 7
 - Application Log 224
 - application performance 200
 - automating cleanup with Microsoft Task Scheduler 633
 - creating .INI files 236
 - memory-based libraries 202, 203
 - performance monitors and 228
 - SASUSER system option 560
 - starting a SAS Service 242
 - supported editions 4
 - SYSSCPL automatic macro variable 596
 - Windows applications
 - executing from SAS sessions 471
 - submitting 391
 - Windows commands
 - issuing conditionally 27
 - running from SAS 26
 - running with X statement or command 27
 - synchronous versus asynchronous execution 29
 - XWAIT system option and 28
 - XWAIT system option versus XSYNC 29
 - Windows event viewer
 - writing log messages to 186
 - Windows fonts 514
 - Windows Print Manager 524
 - Windows Server 2003
 - Application Log 224
 - application performance 201
 - supported editions 4
 - Windows service
 - starting SAS as 234
 - Windows Vista
 - Application Log 224
 - application performance 200
 - supported editions 4
 - Windows XP
 - Application Log 225
 - application performance 201
 - supported editions 4
 - Windows XP Professional
 - memory-based libraries 203
 - WINDOWSMENU system option 585
 - WINPxxx drivers 188, 190
 - WINSERT command 368
 - WMENUPOP command 369
 - WMF files
 - exporting graphics as 195
 - WMOVE command 329
 - WMRU command 369
 - WNAVKEYUNMARK command 370
 - WNEWTITLE command 371
 - WNEXTEDIT command 371
 - Word
 - reading from with DDE 279
 - writing to with DDE 279
 - Word Tips 97
 - Work data library 21, 135
 - as memory-based library 534
 - changing engines 135
 - default folder 21
 - deleting the folder 21
 - location of 21
 - pathname 585
 - specifying with environment variables 136
 - temporary subfolders 21
 - WORK folder 62
 - WORK system option 585
 - WPASTE command 372
 - WPGM command 372
 - WPOPUP command 373
 - writing log messages
 - to Windows event viewer 186
 - WRTFSAVE command 373
 - WSCREENTIPS command 374
 - WSHRINK command 329
 - WSTATUSLN command 374
 - WUNDO command 376
 - WVSBAR command 376
 - WWINDOWBAR command 376
- ## X
- X command 377
 - opening DDE server with 278
 - opening minimized applications 587
 - running Windows commands 27
 - synchronous versus asynchronous 588
 - valid in current SAS session 586
 - X property 273
 - X statement 471
 - running Windows commands 27
 - synchronous versus asynchronous 588
 - XCMD system option 586
 - XMIN system option 587
 - XSYNC system option 588
 - synchronous versus asynchronous command execution 29
 - XWAIT system option versus 29
 - XWAIT system option 589
 - exiting from DOS shell 28
 - XSYNC system option versus 29
- ## Y
- Y property 274
- ## Z
- ZDw.d format 387
 - ZDw.d informat 427
 - zoned decimal data
 - reading 427
 - writing 387
 - ZOOM command 378

Your Turn

We welcome your feedback.

- If you have comments about this book, please send them to **yourturn@sas.com**. Include the full title and page numbers (if applicable).
- If you have comments about the software, please send them to **suggest@sas.com**.

SAS® Publishing Delivers!

Whether you are new to the work force or an experienced professional, you need to distinguish yourself in this rapidly changing and competitive job market. SAS® Publishing provides you with a wide range of resources to help you set yourself apart. Visit us online at support.sas.com/bookstore.

SAS® Press

Need to learn the basics? Struggling with a programming problem? You'll find the expert answers that you need in example-rich books from SAS Press. Written by experienced SAS professionals from around the world, SAS Press books deliver real-world insights on a broad range of topics for all skill levels.

support.sas.com/saspress

SAS® Documentation

To successfully implement applications using SAS software, companies in every industry and on every continent all turn to the one source for accurate, timely, and reliable information: SAS documentation. We currently produce the following types of reference documentation to improve your work experience:

- Online help that is built into the software.
- Tutorials that are integrated into the product.
- Reference documentation delivered in HTML and PDF – free on the Web.
- Hard-copy books.

support.sas.com/publishing

SAS® Publishing News

Subscribe to SAS Publishing News to receive up-to-date information about all new SAS titles, author podcasts, and new Web site features via e-mail. Complete instructions on how to subscribe, as well as access to past issues, are available at our Web site.

support.sas.com/spn



THE
POWER
TO KNOW®

