

## CHAPTER

## 1

## Getting Started

<i>The SAS System: Exploiting the Power of Microsoft Windows</i>	4
<i>Optimum Performance</i>	4
<i>An Integral Part of your Desktop Solution</i>	4
<i>Compatible and Maintainable</i>	4
<i>Starting the SAS System</i>	5
<i>Starting from the Start Menu</i>	5
<i>Starting from Custom Shortcuts or Program Items</i>	5
<i>Starting from the Run Command or Command Prompt</i>	5
<i>Using the Run Command</i>	6
<i>Using the SAS Command from the Command Prompt</i>	6
<i>Invoking the SAS System in Interactive Mode versus Batch Mode</i>	6
<i>Submitting a Batch SAS Job</i>	6
<i>Setting the Current Folder</i>	7
<i>Sample SAS Session</i>	7
<i>Files Used by the SAS System</i>	10
<i>SAS Configuration Files</i>	10
<i>Specifying SAS System Options in the SAS Configuration File</i>	10
<i>Naming Conventions for the SAS Configuration File</i>	11
<i>How the SAS System Finds and Processes Configuration Files</i>	11
<i>SAS Autoexec File</i>	14
<i>Suppressing the SAS Autoexec File</i>	15
<i>Profile Catalog</i>	15
<i>WORK Data Library</i>	16
<i>SAS Registry Files</i>	17
<i>SAS Default Folder Structure</i>	17
<i>Submitting SAS Code</i>	18
<i>Submitting Code from the Program Editor or Enhanced Editor</i>	18
<i>Submitting Code from the SAS Text Editor</i>	18
<i>Submitting Code from the Clipboard</i>	18
<i>Submitting Code by Dragging and Dropping</i>	19
<i>Dragging Text from Other Windows</i>	19
<i>Dragging Files in an Interactive Session</i>	19
<i>Dragging Files to Start a Batch Session</i>	20
<i>Submitting Code Stored in Registered SAS File Types</i>	20
<i>Interrupting Your SAS Session</i>	20
<i>Running DOS or Windows Commands from within SAS</i>	20
<i>Executing Operating System Commands Conditionally</i>	21
<i>XWAIT System Option</i>	22
<i>XSYNC System Option</i>	22
<i>Comparison of the XWAIT and XSYNC System Options</i>	23
<i>Ending Your Interactive SAS Session</i>	24

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## The SAS System: Exploiting the Power of Microsoft Windows

Windows is an operating environment developed by Microsoft Corporation to allow more control over the capabilities of your personal computer. It provides a flexible, easy-to-use working environment for which there are thousands of software applications. Version 8 of the SAS System under Windows is a complete implementation of the SAS System. The following Windows environments support Version 8:

- Microsoft Windows NT 4.0 (Build 1981, Service Pack 4)
- Microsoft Windows 95 (Build 950 or greater)
- Microsoft Windows 98 (Build 1998)

*Note:* Except where noted, the examples and instructions provided in this book assume that you are running the SAS System under Windows 95 or Windows NT 4.0. For more information about how to use the Windows interface, see the documentation for the Windows environment that you use.  $\Delta$

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### Optimum Performance

Version 8 of the SAS System takes advantage of the improved performance of the operating environment. For example, the following operating environment improvements will positively affect your SAS programs:

- the 32-bit operating system enables your SAS programs to execute faster.
- the improved fault isolation capabilities ensure that if another application fails, your SAS session is not affected.
- the additional resources reduce resource contention, so your SAS programs execute more efficiently.
- the redesigned interface in Windows 95 and Windows NT makes SAS easier to use.

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### An Integral Part of your Desktop Solution

The SAS System is an integrated suite of software for enterprise-wide information delivery that supports data access, data management, data analysis, and data presentation. The SAS System 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. The SAS System 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)
- electronic mail system
- Windows “groupware” applications such as Lotus Notes
- pipes and named pipes
- the Windows clipboard.

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### Compatible and Maintainable

Version 8 of the SAS System under Windows can read and write SAS data sets created by earlier releases of SAS. However, in order to bridge the upgrades in SAS

System catalog architecture and differences in operating system structure, catalogs must be converted from earlier formats (such as Release 6.04 under DOS or Release 6.08 under Windows) to Version 8 format using the transport procedures CPORT and CIMPORT.

Compatibility with previous releases of the SAS System has been balanced against a desire to take advantage of Windows features. Specifically, the SAS System under Windows takes full advantage of the graphical interface. Most existing SAS commands and windows are implemented, but where appropriate, interactive dialog boxes and various graphical user interface controls are used so the selection of operations is highly intuitive and interactive.

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## Starting the SAS System

The following sections describe several ways in which you can invoke the SAS System from your Windows environment.

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### Starting from the Start Menu

To start SAS from the Windows Start Menu:

- 1 Click on **Start** to open the Start menu.
- 2 Point to **Programs**.
- 3 Select **The SAS System**.
- 4 Select **The SAS System for Windows V8**.

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### Starting from Custom Shortcuts or Program Items

During installation, the SAS System Setup program automatically creates a program item or shortcut that you can use to start the SAS System. 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 on creating shortcuts, see your Windows documentation. Display 1.1 on page 7 shows an example of a SAS item from the Start menu in Windows NT Workstation.

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### Starting from the Run Command or Command Prompt

When starting the SAS System using a command line (either from the Run dialog box or the Command prompt), you might want to specify the SAS configuration file location using the CONFIG system option, even if you use the default name of SASV $x$ .CFG ( $x$  is the version of the SAS System), to ensure that the SAS System uses the configuration file you want. For more information about how the SAS System searches for the configuration file, see “How the SAS System Finds and Processes Configuration Files” on page 11.

When these 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 on the SASUSER data library, see “Profile Catalog” on page 15. For more information on the WORK data library, see “WORK Data Library” on page 16

## Using the Run Command

To start an interactive session using the **Run** command, select **Run** from the Start menu. Type the path and the exact name of the program file, including the extension and options, in the Run dialog box. Click on **OK**.

For example, if SAS is installed in C:\SAS, you would type **c:\sas\sas**, plus any 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 **SAS** 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:\SAS\SAS.EXE -LS 80 -PS 60
               -CONFIG C:\SAS\SASV8.CFG
```

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

```
C:\SAS\SAS.EXE -SYSIN C:\SAS\PROGRAMS\PROG1.SAS
               -CONFIG C:\SAS\SASV8.CFG
```

---

## Invoking the SAS System in Interactive Mode versus Batch Mode

When running the SAS System under Windows, you can use an interactive session, which lets you interact with the SAS System interface to submit programs and view the resulting output, or you can execute batch SAS jobs, which run without any interaction with you, and whose output you can view later. You can use any of the previously discussed methods to start the SAS System in either mode. By default, invoking the SAS System begins an interactive SAS session. If you have a SAS program that you want to submit as a batch job, specify the **SYSIN** system option with the name of the SAS program file when you invoke the SAS System.

## Submitting a Batch SAS Job

When you run SAS in batch mode, SAS displays a Status window for the SAS job 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.

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

If you do not want to see the Status window while your batch SAS job is running, invoke the SAS System 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 on **Icon** when the window appears. The icon shows the busy cursor (usually an hourglass) while the SAS job is running and disappears when the job is complete. You can cancel a batch job by either pressing **CTRL+BREAK** or clicking on **Cancel** in the Status window.

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 the Run dialog box) to specify the SAS program to submit.
- Use the right mouse button to click on a file with a **.SAS**, **.SS2**, **SS7**, or **.SASV7BPGM** file extension. From the pop-up menu, select **Batch Submit**.

- Use the Windows Explorer and drag your SAS program file icon (for the file containing the SAS code) and drop it on the SAS.EXE file icon or shortcut.

---

## Setting the Current Folder

The SAS System uses a current folder as the default location to read and write SAS files when you do not explicitly specify a different path. (In Version 7 of the SAS System, the working folder also contained the system profile catalog. In Version 8, the system profiles are kept separated from the working files.)

Under Windows, the following rules are used for determining the current folder for the SAS System:

- 1 If you use a program item or shortcut to start SAS and a path is specified in the Windows Properties **Shortcut** page (**Start in** field), the SAS System uses that path as the working folder.
- 2 If you don't use the program item or shortcut to start SAS (using the Run dialog box or DOS command line instead), and Windows successfully loads the SAS.EXE file from the path specified in the SAS command, that path is the working folder. In other words, the working folder is the path you specify as part of the SAS command, regardless of where Windows actually finds SAS.EXE. If you don't specify a path as part of the SAS command, then the working folder is the path from which you issued the command.

*Note:* If Windows cannot find the SAS.EXE file in the specified folder, the folder specified in the SAS command still becomes the working folder and Windows searches for the SAS.EXE file using the Windows PATH environment variable.  $\Delta$

For example, if you specify the following command, C:\SAS is the working folder, regardless of whether the SAS.EXE file is actually in that folder:

```
C:\SAS\SAS.EXE -CONFIG C:\SAS\SASV8.CFG
```

You can change the SAS working folder from within your SAS session. For more information, see “Changing the SAS Current Folder” on page 44.

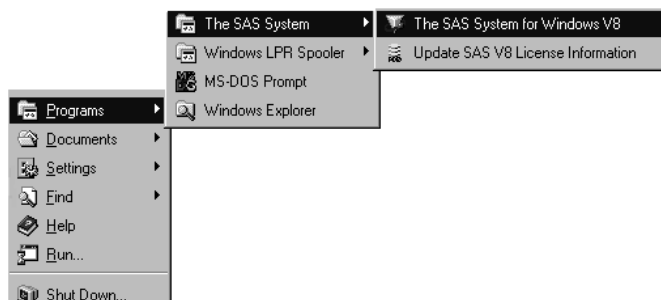
*Note:* Do not confuse the SAS working folder with the SASWORK data library. For more information, see “WORK Data Library” on page 16.  $\Delta$

---

## Sample SAS Session

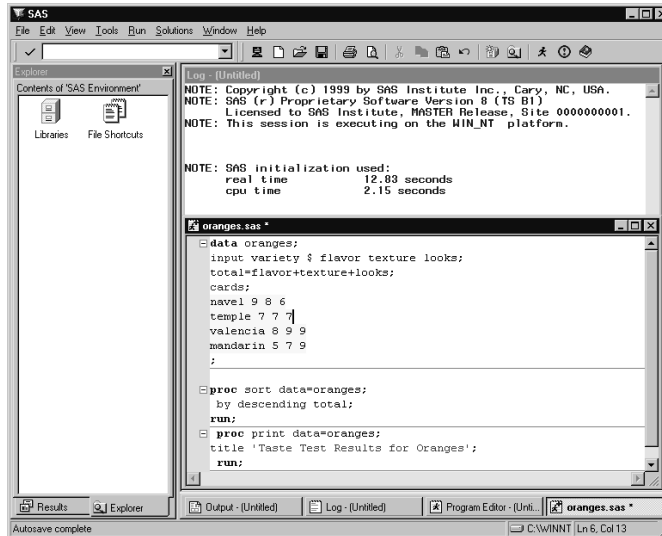
This section illustrates invoking the SAS System from the Start menu, submitting a sample SAS program, examining the program output, and ending the SAS session. Display 1.1 on page 7 shows a possible configuration of the SAS program item in the Start menu. Select **The SAS System for Windows V8** to start the SAS System.

**Display 1.1** Starting the SAS System



Display 1.2 on page 8 shows the Enhanced Editor and Log windows with a sample SAS program 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. Then the program sorts the data set by the total test score and prints the data set.

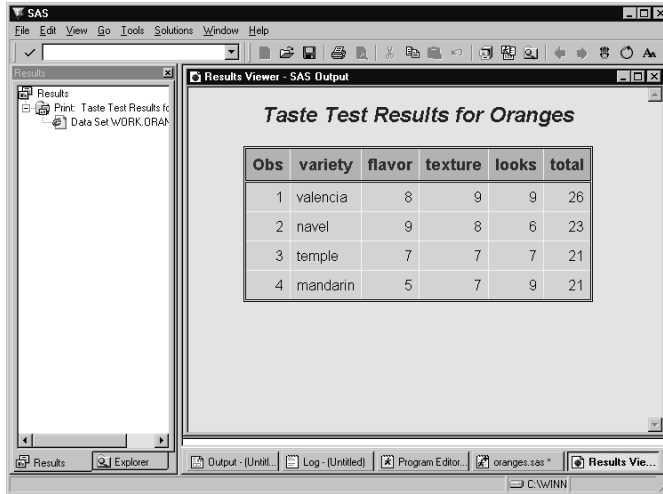
**Display 1.2** Submitting the Sample SAS Program



The following is the SAS code that appears in the Enhanced Editor window:

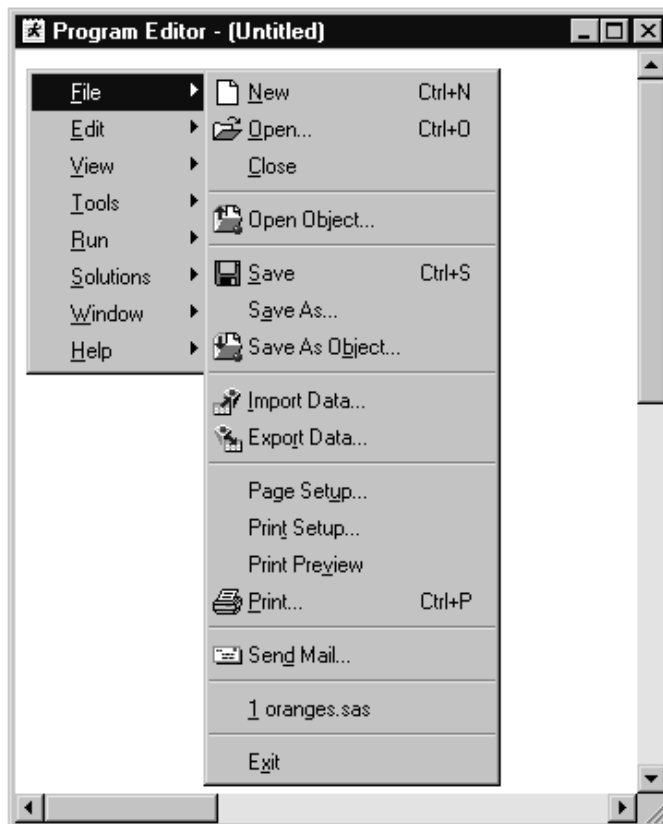
```
data oranges;
  input variety $ flavor texture looks;
  total=flavor+texture+looks;
  cards;
navel 9 8 6
temple 7 7 7
valencia 8 9 9
mandarin 5 7 8
;
proc sort data=oranges;
  by descending total;
run;
proc print data=oranges;
  title 'Taste Test Results for Oranges';
run;
```

Once you submit the program, the output appears in the Results Viewer window, as shown in Display 1.3 on page 9.

**Display 1.3** 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 main SAS System menu bar at the top of the 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. To access the pop-up menus, click the right mouse button with the cursor in the window for which you want to see menus. Display 1.4 on page 9 shows a series of menus in the Program Editor window. This series was generated by first clicking the right mouse button with the cursor in the Program Editor window, then selecting **File** and **New**.

**Display 1.4** Pop-up Menus in the Program Editor Window

When you are ready to end your SAS session, double-click on the SAS System control menu (the small icon in the upper-left corner of the main SAS window) or click on the  (in the upper-right corner) and click on  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 63. △

---

## Files Used by the SAS System

The SAS System 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)
- WORK data library (“SAS Temporary Files” folder in your system’s designated TEMP area)
- SAS Registry Files

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### SAS 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 System help and message files and the paths 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 the SAS System to initialize; you can have multiple configuration files that are all processed while your SAS session begins. For a list of system options you can use in your SAS configuration file, see “Summary of System Options for Windows” on page 398. For more information about system options, see the section on SAS system options in this document and in *SAS Language Reference: Dictionary*.

A default SAS configuration file named SASVx.CFG (*x* is the version number of the SAS System) is created during the installation process and is stored in the !SASROOT folder. (The !SASROOT folder is the folder in which you install the SAS System. For more information on the !SASROOT folder, see “SAS Default Folder Structure” on page 17.) The SAS System requires a configuration file, so you must use a SAS configuration file regardless of whether you are using interactive or batch mode.

### Specifying SAS System Options in the SAS Configuration File

You can specify any SAS system option in the SAS command when you start the SAS System. However, it is generally more convenient to place frequently used system options in your SAS configuration file rather than repeatedly specifying the same options at invocation. The syntax for specifying system options in the SAS configuration file is discussed in “Syntax for System Options in the SAS Invocation or SAS Configuration File” on page 396.

You can edit the default configuration file to add to or change the system option settings, or you can create your own SAS configuration file. “Naming Conventions for the SAS Configuration File” on page 11 discusses how to modify your SAS configuration file.



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

```
/* DO NOT EDIT BELOW THIS LINE - INSTALL */
/* application edits below this line      */
```

The SAS System Setup application deletes all data below this text string but does not affect the options specified above it. The Setup application appends the following system options below this text string: DMSEXP, DOCLOC, HELPLLOC, MAPS, MSG, PATH, SASHELP, SASUSER, WORK, and SET. (The SET system option defines the following SAS environment variables: SASAUTOS, SASCFG, SASFOLDER, SASROOT, INSTALL, SAMPSIO, SAMPSRC, and SASEXT0).

**CAUTION:**

**Use the SAS text editor to edit your configuration file.** The text editor you choose to edit the SAS configuration file is important to preserve some of the special character formatting in the file. The recommended method is to edit your configuration file using the SAS text editor (such as the Program 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 that comes with Windows. Using such an editor can insert carriage control characters into your configuration file or corrupt the characters that are there.  $\Delta$

## Naming Conventions for the SAS Configuration File

When you install the SAS System under Windows for Version 8, a SASV8.CFG file is created in the !SASROOT folder.

You can specify your own file to act as the SAS configuration file, overriding the default file, SASV8.CFG. When you use a file located in a different place or under a different name as your default SAS configuration file, you must tell the SAS System where to find the configuration file. For example, the **target** field of the SAS System properties might contain:

```
C:\SAS\SAS.EXE -CONFIG C:\SAS\MySASConfig.CFG
```

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

**CAUTION:**

**You must add several required system options if you create your SAS configuration file from scratch.** If you use your own configuration file instead of the default configuration file, you must add several required options. For example, you must either use the SET option to define the environment variable, !SASROOT, or define SASROOT as a Windows environment variable. Therefore, if you do not want to use the default configuration file, you should copy the default file (SASV8.CFG) and modify the copy instead of creating your own file from scratch.  $\Delta$

## How the SAS System Finds and Processes Configuration Files

When you invoke the SAS System, 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 SAS configuration file. On a multi-user Windows NT 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

On 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 current folder

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

SASVx.CFG in the folder where SAS.EXE resides

SAS looks for a file that is named SASVx.CFG in the folder that contains the SAS.EXE executable *only if* you do not specify a -CONFIG option on the SAS invocation *and* there is no SASVx.CFG file in the current folder.

SAS\_USER\_CONFIG operating system environment variable

This environment variable, if defined, must resolve to a valid SAS configuration file. On a multi-user Windows NT 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

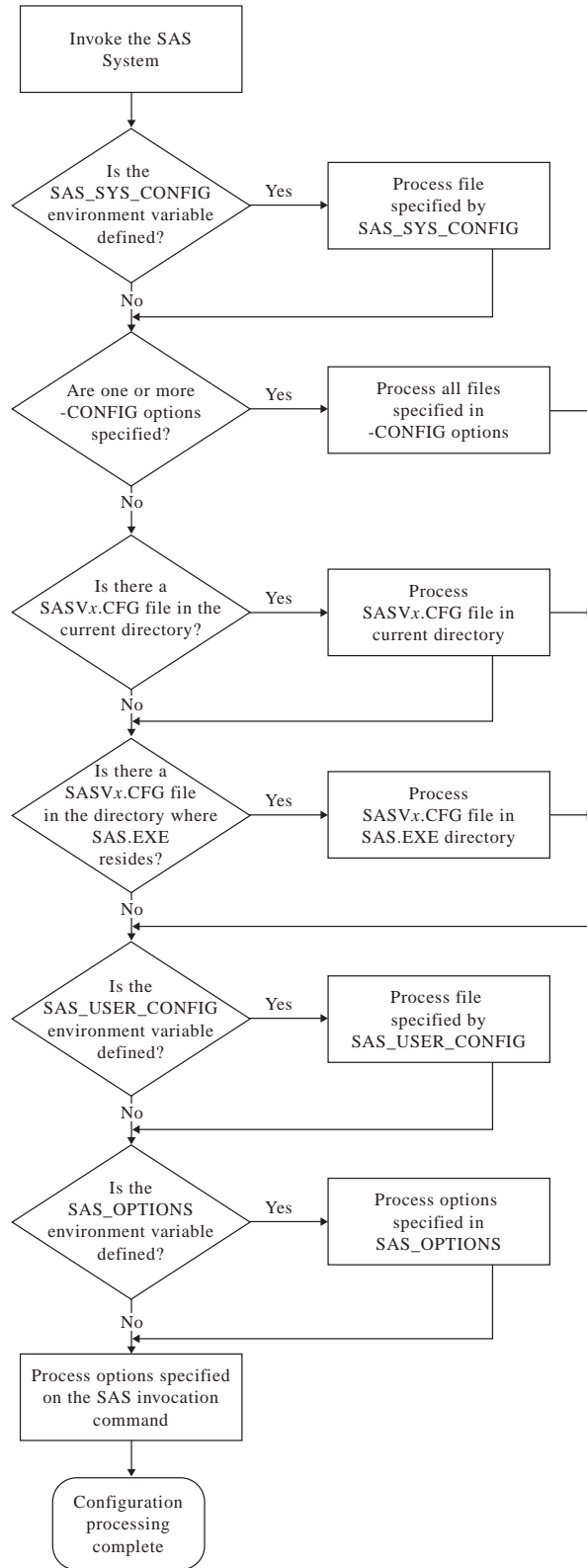
This environment variable, if defined, contains a string of option specifications for any other SAS System options that you want to process each time that you invoke the SAS System.

SAS invocation command line

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

You can also specify additional -CONFIG options within any of the above configuration files. When the SAS System 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 System 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 specified by the SAS\_SYS\_CONFIG environment variable, and then -NOICON in the file specified by the SAS\_USER\_CONFIG environment variable, the -NOICON option is used. Since the options that you specify on the SAS invocation command are always processed last, those option values will always override the option values specified in configuration files. Figure 1.1 on page 13 illustrates the flow of SAS System configuration file processing.

For more information about the CONFIG system option, see "CONFIG" on page 417.

**Figure 1.1** Order of Processing for SAS Configuration Files

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## SAS Autoexec File

The SAS *autoexec file* contains SAS statements that are executed immediately after the SAS System 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. Unlike the SAS configuration file, a SAS autoexec file is not required in order to run the SAS System, but if you do have a SAS autoexec file, the default name is AUTOEXEC.SAS. The SAS System uses the following search order to find the AUTOEXEC.SAS file:

- 1 Search the current folder.
- 2 Search the paths 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 the SAS System assumes that there is no AUTOEXEC file to process. For more information about the AUTOEXEC system option, see “AUTOEXEC” on page 409.

You do not have to name your SAS autoexec file AUTOEXEC.SAS, but if you name it something else, you must use the AUTOEXEC system option to tell the SAS System where to find the SAS 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 System Windows shortcut:

```
-AUTOEXEC C:\MySASFiles\INIT.SAS
```

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

The SAS autoexec file is a convenient way to execute a standard set of SAS program statements each time you invoke the SAS System. You may want to include OPTIONS, LIBNAME or FILENAME statements, or any other SAS statements and system options 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:\sas\connect\saslink\vms.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';
```

### CAUTION:

**Use a SAS text editor to create your SAS autoexec file.** The text editor you choose to create the SAS autoexec file is important. The recommended method is to create it using the SAS text editor (such as the Program 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 that comes with Windows. Using such an editor can insert special carriage control characters into your SAS autoexec file that the SAS System cannot interpret when it tries to execute the statements in the file.  $\triangle$

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

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

For more information about the CONFIG, AUTOEXEC, and SYSIN system options, see "SAS System Options under Windows" on page 395. For more information about the INITCMD and INITSTMT system options, see *SAS Language Reference: Dictionary*.

## Suppressing the SAS Autoexec File

If you have an AUTOEXEC.SAS file in your current folder but do not want the SAS System to use it, specify the NOAUTOEXEC option in the SAS command, as in the following example:

```
C:\SAS\SAS.EXE -NOAUTOEXEC
```

## Profile Catalog

Each time you invoke a SAS session, the SAS System 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 so on. If you invoke the SAS System without accessing an existing profile catalog, SAS creates one with the default key definitions and window configuration.

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\V8). This option is useful if you want to customize your SAS sessions when sharing a machine with other users or if users are accessing the SAS System from a network.

The SASUSER system option takes the following form:

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

*Note:* Parentheses () are used to specify multiple *library-specifications*, and quotes (") are used when special characters are used in the *library-specification*.  $\Delta$

If *library-specification* (which specifies a valid Windows pathname) does not exist, the SAS System 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
```

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

- For Windows 95 and Windows 98:

```
-sasuser c:\My Documents\My SAS Files\V8\
```

- For Windows NT:

```
-sasuser !USERPROFILE\Personal\My SAS Files\V8\
```

!USERPROFILE is an environment variable set to the location of the NT user profile. To determine the !USERPROFILE environment variable, open a DOS Command Prompt window and enter `echo %userprofile%`.  $\Delta$

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

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.

For more information about the SASUSER system option, see "SASUSER" on page 459.

---

## WORK Data Library

The SAS System requires some temporary disk space during a SAS session. This temporary disk space is called the *WORK data library*. By default, the SAS System 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 data library in which SAS files with one-level names are stored. For more information, see "Using the USER Libref" on page 93.

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 the SAS System. Usually, you use the WORK option specified in the default configuration file.

The default configuration file for the SAS System 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:

- For Windows 95, WORK is defined as
 

```
-work "C:WIN95\TEMP\SAS Temporary Files"
```
- For Windows 98, WORK is defined as
 

```
-work "C:WIN98\TEMP\SAS Temporary Files"
```
- For Windows NT, WORK is defined as **!TEMP\SAS Temporary Files**. To determine TEMP environment variable, refer to the System Properties dialog box that you access from the Control Panel.

Because you can run multiple SAS sessions at one time, the SAS System creates temporary subfolders under the folder you specify with the WORK option. These temporary subfolders are created in the unique form #TDnnnnn, where TD means temporary folder and nnnnn is the process ID for each SAS session. These subfolders enable multiple SAS sessions to be invoked using the same configuration file, and they prevent the WORK folder from being shared. The SAS System creates any temporary files 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. However, if for some reason the SAS session ends abnormally, these temporary files are not deleted.

If you do not want the SAS System to create a temporary subfolder under the specified WORK folder, but would rather use the actual folder specified in the WORK system option, specify the USE suboption in the WORK option. For example, you can specify the following in the **target** field of the SAS System properties:

```
-work "C:\TEMP\SAS Temporary Files" use
```

This creates a folder called “C:\TEMP\SAS Temporary Files” and all temporary SAS files are stored in this folder, not in a subfolder.

For more information about using the WORK data library and overriding the default location, see “Using the WORK Data Library” on page 92.

If the SAS System terminates abnormally, determine if the WORK library was deleted. If not, remove it by using Windows commands.

*Note:* Do not attempt to delete the WORK folder while the SAS System is running. △

If you want to verify the location of the current WORK folder, it is displayed in the current folder area of the status line. You can also verify the location of the current WORK folder by opening the Libraries folder in the SAS Explorer window and then click the right mouse button on the WORK folder. Select **Properties** from the pop-up menu and then click on the down arrow to see the location of the WORK folder.

## SAS Registry Files

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

### **CAUTION:**

**For Experienced Users Only.** Registry customization is generally performed by more advanced users with experience and knowledge of the SAS System and their operating environment. △

## SAS Default Folder Structure

The SAS System Setup program creates a number of subfolders during the installation process. Understanding the organization of the SAS folders can help you to use the SAS System more efficiently. The SAS System can be installed on a single drive or across multiple drives. It is not recommended that a single product of the SAS System be split over multiple drives.

The root folder of the SAS System is the folder in which you install the SAS System. Within SAS, this folder has the logical name !SASROOT. In many installations, the real physical name of this folder is **SAS\V8**, but this is not required. (The examples in this document assume the !SASROOT folder is called SAS\V8.)

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

!SASROOT\CORE\HELP

contains the SAS help information in HTML Help format.

!SASROOT\CORE\RESOURCE

contains SAS resources such as fonts and images.

!SASROOT\CORE\SASINST

contains the installation process software.

For each SAS product installed, the following subfolders might be created (but 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 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 SAS Support Consultant.

## Submitting SAS Code

The SAS System 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.

### Submitting Code from the Program Editor or Enhanced Editor

To submit SAS code that you have typed into the Program Editor window, you issue the SUBMIT command. SAS provides a few ways to issue SUBMIT:

- Press F8 with the Program Editor window active.
- Click on the Submit toolbar button.
- Enter **submit** in the command bar.
- From the Run pull-down menu, select **Submit**.

### Submitting Code from the SAS Text Editor

SAS allows you to submit SAS code that you have typed into the SAS text editor (NOTEPAD). The SAS text editor may be invoked using the **Tools** menu and selecting **Text Editor**. SAS provides several ways to submit the code in the text editor:

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



### Submitting Code from the Clipboard

You can submit SAS code that you copied from another Windows application (such as an editor or word processor) or from SAS System Help. When you copy text from another Windows application, that text is stored in the Windows clipboard.



From the Run pull-down menu in the Program Editor window, select **Submit clipboard**. The code is submitted from the clipboard directly to the SAS System (without appearing in the Program Editor window), and notes and results are sent to the SAS log and Output window, respectively. You can still issue the RECALL command (or press F4) to recall the submitted program 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” on page 290.

## 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 Program Editor window, that text is moved or copied 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 dragging the text using the *right* mouse button (if the application supports non-default dragging and dropping). When you drop the selection on the Program Editor window, SAS pops up a menu to let you choose between copying the code and submitting it.

## Dragging Files in an Interactive Session

Using the My Favorite Folders window, you can access files that exist outside the SAS environment. Files that contain SAS code can be dragged and dropped into your interactive SAS session for execution. The My Favorite Folders window can be accessed using the **View** menu.

If you drag a file that contains SAS code and drop it on the Program Editor window or the Enhanced 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 an minimized SAS session, the code is automatically submitted.

*Note:* When you minimize a SAS session, its icon appears on the Windows task bar. You cannot drag and 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 will restore to normal size, after which you can drop the file on the open SAS session.  $\Delta$

Dragging and dropping the file C:\MYPROG.SAS onto a window (other than the Program Editor or Enhanced 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 once by selecting a group of files containing SAS programs and then dragging and 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 drag and drop each program file separately.

*Note:* If the SAS System 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.  $\Delta$

## Dragging Files to Start a Batch Session

If you drag a file containing SAS code and drop it on a SAS System program icon, the SAS System starts in batch mode and submits the code for processing.

---

## 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 on those types of objects. For example, files with a file extension of .SS7 or .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 on a file with this extension (or with this icon) the SAS System is invoked and the contents of the file are included (using the INCLUDE command) in the Program Editor window. The SAS code contained in the file is not processed until you submit it (for example, by pressing F8 or clicking the Submit tool). If you already have a SAS session running, double-clicking on a file begins a second SAS session; it does not use the already-existing session.

---

## Interrupting Your SAS Session

You can click on the circled exclamation point (!) in the toolbar or press CTRL+BREAK to interrupt processing in your SAS session. Depending on what tasks the SAS System 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, the SAS System may require several seconds to stop processing.  $\Delta$

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

---

## Running DOS or Windows Commands from within SAS

You can execute DOS or Windows commands from your SAS session 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. To run a command asynchronously, you must use the SYSTASK statement. For more information on running asynchronous commands using the SYSTASK statement, see "SYSTASK" on page 386.

When you execute one or more DOS or Windows commands synchronously, then you must wait for those commands to finish executing before you can continue working in

your SAS session. You can use the CALL SYSTEM routine, X statement, and X command to execute DOS or Windows commands synchronously. The CALL SYSTEM routine can be executed with a DATA step and the X statement can be used outside of DATA steps. You can enter the X command on any SAS command line.

You can submit the X statement to 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.

*Note:* 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.  $\Delta$

If you want to execute 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 execute several operating system commands, submit the X statement without an argument. A command prompt appears where you can execute an unlimited number of operating system commands. Remember, however, that the commands you issue from the command prompt do not affect the SAS process. For example, if you change from the SAS working folder to MYDATA at the command prompt, the SAS System still uses the SAS folder as its working folder. Also, any environment variables you define are not available to the SAS System. If you submit an X statement or command without a *command* argument, type EXIT to return to your SAS session.

Other methods of temporarily exiting your SAS session include:

- using the command bar or Command dialog box to issue the X command.
- clicking on MS-DOS on the toolbar.

---

## Executing Operating System Commands Conditionally

If you want to execute 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;
  cards;
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.

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'.

For more information about the CALL SYSTEM routine, see "CALL SYSTEM" on page 330 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 a 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:

XWAIT	specifies that you must type EXIT to return to your SAS session. This is the default value.
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.

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 the SAS System without exiting from the command processor causes the SAS System 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 on MS-DOS 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 the SAS System until the command has completed. You cannot return to your SAS session until the command prompt session spawned by the X command or 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 the SAS System 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 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 the command prompt session waits for you to type EXIT before you can go back to your SAS session.
XSYNC	means the SAS System waits for you to finish with the other application before you can go back to your SAS session.

The various option combinations are summarized in Table 1.1 on page 23.

**Table 1.1** 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 the SAS System waits for the application to finish.
XWAIT NOXSYNC	The command prompt window waits for you to type EXIT before closing, and the SAS System does not wait for the application to finish.

---

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

---

---

## Ending Your Interactive SAS Session

- You can end your interactive SAS session using several methods, including
- selecting **Close** from the control menu of the main SAS window
  - 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 the SAS System) and selecting **End Task**
  - selecting **Exit SAS** from the File pull-down menu in the main SAS window menu bar
  - selecting **Exit** from the File pop-up menu
  - pressing the **ALT+F4** accelerator-key combination defined by Windows.