Using the SAS® System Release 6.12 on Windows™

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ABSTRACT

Release 6.12 of the SAS System for Personal Computers provides support for Microsoft Windows (version 3.1 using Win32s technology, Windows 95, Windows NT), and OS/2® (Warp). With this release, the SAS System incrementally improves both its user interface and its interoperability with other PC applications. This paper discusses both new features and incremental enhancements to the user interface. This paper also describes the SAS System for Windows 95 and Windows NT 4.0, detailing the new user interface features that are consistent with the look and feel for Windows 95 and Windows NT 4.0. The SAS System Viewer, production for 6.12, is described as is the GUI-based SETUP program. Interoperability topics include Windows Explorer integration, electronic mail, Lotus Notes, OLE, OBDC, and access to external DLLs. This paper also discusses the support provided by the SAS System for Windows NT.

INTRODUCTION

Release 6.12 of the SAS System under Windows and under OS/2 is a complete implementation of the SAS System. This release takes advantage of the 32-bit performance of the operating system. For example, the following operating system improvements over 16-bit environments 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.

This paper provides an overview of the new Release 6.12 enhancements. You should view this paper as an introduction but you should refer to the *SAS Companion for the Microsoft Windows Environment* and the *OS/2 Environment: Changes and Enhancements of the SAS System* for more details as well as online documentation, which is more extensive in Release 6.12. Release 6.12 continues to provide incremental enhancements to the user interface and interoperability areas of the SAS System. In other areas such as the SAS System Viewer and the SETUP application, new features have also been added.

THE SAS SYSTEM VIEWER

The SAS System Viewer is a freely redistributable application for viewing and printing files that were created by the SAS System. The Viewer provides a quick and convenient way to view the contents of a SAS data set or catalog without invoking the entire SAS System, or even having the SAS System installed on your computer.

When you install the SAS System Viewer under Windows 95 or Windows NT 4.0, the Setup procedure automatically updates the Windows registry to associate the Viewer program with SAS data set files (.SD2), catalog files (.SC2), and other files (.SAS, .LOG, .LST) associated with the SAS System. When you click on the right-mouse button from an Explorer view of one of these files, you can select SASView to launch the SAS System Viewer

The SAS System Viewer lets you view the following types of SAS files:

- SAS data sets (.sd2 and .ssd files), up to two gigabytes in size, generated by Release 6.04 and later of the SAS System for Windows, OS/2, or DOS. These data sets can be compressed and/or encrypted. (If you

attempt to access an encrypted data set, the SAS System Viewer prompts you for the read password.)

- SAS catalogs (.sc2 files) generated by the SAS System for Windows or OS/2.

- SAS programs (.sas files), output listings (.lst files), logs (.log files), text files (.txt files), and RTF files (.rtf files).

- Files created by SAS Institute's JMP product (.jmp files) that reside on a local or network disk.

- If you have the SAS System for Windows installed with SAS/CONNECT, you can also view cross-platform data sets and catalogs (VMS, Macintosh, UNIX, OS/2, Windows, and DOS) that you can access from a disk, file server, or network using the HTTP and FTP network protocols.
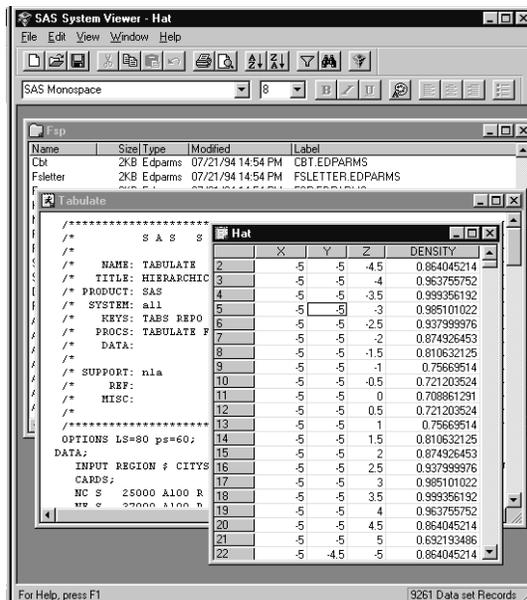

Figure 1. The SAS System Viewer, displaying the contents of three SAS System files: a catalog, a SAS program, and a dataset.

The SAS System Viewer is primarily a "Quick Viewer" like those provided by other software vendors to support browsing of program files. A Quick Viewer does not require the entire software application and as the name implies, can be used more quickly than the complete application. The SAS System Viewer supports many other fea-

tures as well. Using the SAS System Viewer you can:

- View SAS data sets and SAS catalogs in a grid format. You can view SAS files that have been created using the SAS System Release 6.04 or later. You can also view SAS files created by versions of the SAS System that run on other platforms.

- View a SAS data set or catalog by dragging and dropping its icon on an icon representing the SAS System Viewer, or on an existing instance of the Viewer.

- View and edit SAS programs, text files, LST files, LOG files, and RTF files.

- Print the contents of any SAS file that you can view.

- View multiple SAS files within a single instance of the Viewer.

- Sort your view of a SAS file by column by selecting a cell in a column and then selecting a sort option from the View menu.

- Subset the data (using a WHERE clause) displayed by the viewer by selecting Where from the View menu (or pressing Ctrl-W).

- Email a copy of all or selected grid cells using a MAPI-compliant mail program by selecting Send from the File menu.

- Resize columns and rows by grabbing and dragging the separator between the headers.

- Copy the entire table, column, row and block selections to the clipboard.

The SAS System Viewer is shipped with the SAS System. You can always download the latest version of the SAS System Viewer from SAS Institute's World Wide Web site or FTP site on the internet:

WWW: **http://www.sas.com**

The SAS System Viewer is also available in the download section of the Technical Support area at:
FTP: **ftp.sas.com/techsup/download/**

IMPROVED GUI FEATURES

GUI enhancements to the Release 6.12 SAS System continue the trend to provide a more native look and feel familiar to PC users. Some of the new GUI features include a print preview utility, rich text support, additional toolbar support, Program Editor enhancements, and Windows 95 support.

Print Preview
To see how the contents of a window will appear as printed output, select the window you want to preview and then select **Print Preview** from the **File** menu (or click the **Print Preview** tool bar button).

In the Preview window, you can use the Next and Previous buttons to navigate through the pages to be printed. The current page number and total number of pages are displayed at the bottom of the window. You can also magnify your view of the current page (by 100%) by clicking Zoom, or by simply clicking inside of the page. To reduce your view, click Zoom or inside of the page again.

In the Print Preview window, you can navigate by using the following shortcut keys:

Key	Full Page mode action	Zoom mode action
PgDn	Advance to next page	Scroll down on current page
PgUp	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

A new command, **DLGPRTPREVIEW**, can be used to invoke the Print Preview window

Toolbar support
The SAS System uses industry standard tools on the default toolbar. The Tool Editor browser contains more tools for you to choose from when you create custom toolbars. You can choose to display the SAS toolbar with either large or small tools.

Tooltips provide concise help information for the tools on the SAS toolbar, the command bar, and the status line. The tooltips are displayed as you move your mouse cursor over these controls. Tooltips are additional detailed help that is displayed on the status line. The Tool Editor allows you to modify tooltip text as you modify your default tool settings.

Program Editor Enhancements
You can use the mouse (or the SHIFT key in combination with the cursor movement keys) to select text. The marking of an area of text continues until you release the mouse button or press a key that is not a cursor movement key (or release the SHIFT key). To select all of the text in the active window, choose Select All from the Edit menu. Here are some advanced text selection methods (new for Release 6.12):

- Double-click on a single word to select it. To select an entire line, hold down the CTRL key as you double-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.

- Use the SHIFT key in combination with the mouse button to select the text between the current text cursor and the position in the text where you click. (You can use this feature only within the current page.)

- If characters are marked and you start typing text, the marked area is replaced with the new text. This occurs even if you have moved the cursor away from the marked area. See Using the Clipboard for information about marking and copying text with a mouse.

Rich Text Format Support
Beginning with Release 6.11 for Windows, two new TrueType fixed pitch fonts are provided: SAS Monospace and SAS Monospace Bold. These fonts contain several extended ASCII line drawing characters in positions that are normally undefined in an ANSI font. Using these line drawing char-

acters with the TABULATE procedure provides a smooth line drawing capability resulting in tabular output that is more visually appealing.

The Sasfont bitmap font displays faster and looks better on the display, so it is the default display font when you install the SAS System. The SAS Monospace font looks better in printed output and scales to many point sizes, so it is the default printer font. For similar reasons, the SAS Monospace font is the default font used in the Rich Text Format (RTF) clipboard format. The RTF clipboard format, available since 6.11, allows you to copy selected text and tables to the clipboard and to paste them into other applications while preserving the correct appearance. This allows you to copy a table generated by PROC Tabulate into Microsoft Word to produce an aligned table in the Word document. RTF uses the SAS Monospace TrueType font when the default display font is either Sasfont or SAS Monospace. Otherwise, RTF uses the default display font.

You can use the **Save As** dialog to create RTF files containing the content of text windows.

A new command, **WRTFSAVE**, saves the contents of the current text window to an RTF file. It can be used with syntax like: **WRTFSAVE "filename" <NOPROMPT>.** The command performs the same action as the *Save As* dialog when you choose RTF from the Save file as type list; however, WRTFSAVE saves the file without displaying an intermediate dialog.

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 a ".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.

Cursor Control
A new command, **WHIDECURSOR**, suppresses the display of the cursor in SAS windows that do not allow text input, such as those in SAS/ASSIST, SAS/EIS, and SAS/AF software. With syntax: **WHIDECURSOR <ON | OFF>**, if no argument is specified, the command toggles between hiding and displaying the cursor. The argument **ON** hides the cursor, while **OFF** displays the cursor.

Windows 95 Support
The SAS System for Windows, Release 6.11 TS040 carries the *Designed for Windows 95* logo. It has been tested by an independent testing firm to verify that it meets a set of guidelines that are meant to ensure that the application operates well under and integrates tightly with Windows 95 (and NT 4.0). In addition, the entire SAS System supports long filenames, Universal Naming Convention (UNC) names and shortcuts.

APPLICATION INTEGRATION

With each successive release, the SAS System has provided increased application integration through several methods. The SAS System supports named pipes, unnamed pipes, DDE, the system clipboard, Media Control Interface (MCI), ODBC, external DLL access, the ability to support import and export of graphics to and from common PC file formats, support for electronic mail, Lotus Notes, and full support of OLE 2.0.

Windows Explorer Integration
The SAS System integrates well with the Windows 95 and Windows NT 4.0 Explorer since the installation process for Windows registers all of the SAS System file types. Each file type has a unique icon, as shown below.

Catalog   Dataset   SAS Program

Figure 2, Standard SAS System Icons

When a SAS System icon is selected from the Windows Explorer, an appropriate action for that type of file is performed by the SAS System or the SAS System Viewer. As shown below, the Windows 95 and Windows NT 4.0 Explorer makes these actions available to the user.
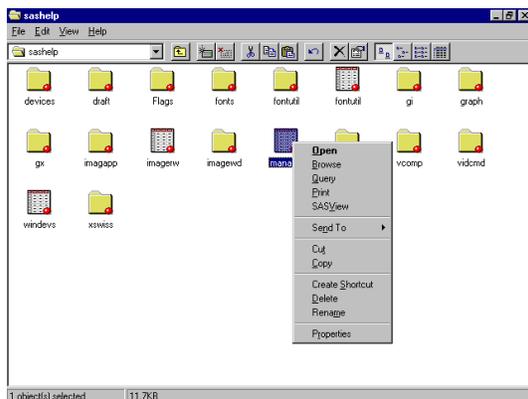

Figure 3, SAS System Contents in the Windows Explorer

E-mail Support

E-mail support is available interactively through the Send Mail dialog or programmatically through the DATA step or SCL. This implementation supports both industry standards VIM (Vendor-Independent Messaging) and MAPI (Messaging Application Programming Interface). Most popular e-mail packages provide support for either VIM or MAPI.

Support for using an SMTP (Simple Mail Transfer Protocol) server to send e-mail from within SAS is experimental for Release 6.12. The **EMAILSERVER** System Option specifies the SMTP server to use when sending e-mail through SAS. This option is valid as part of your configuration file, or the SAS System invocation. This option has the syntax: **-EMAILSERVER host.domain.net**, where **host.domain.net** specifies the name of the SMTP server through which to route

e-mail that you send from within the SAS System, either interactively or using the DATA step. Although you can send e-mail interactively by using the Send Mail dialog provided by the SAS System, note that e-mail file attachments are not supported while using SMTP. A key benefit of SMTP-based mail is that it does not require a client e-mail package in order to process mail, unlike VIM or MAPI e-mail protocols.

The Send Mail dialog allows you to enter a note describing the mail message. Data and reports, which are the actual contents of the messages, are sent as attachments. Attachments are files that you saved previously.

When you are using an e-mail package that supports MAPI under Windows NT or Windows 95, the SAS System uses the native e-mail dialog. This dialog allows you to attach the contents of the current SAS window.
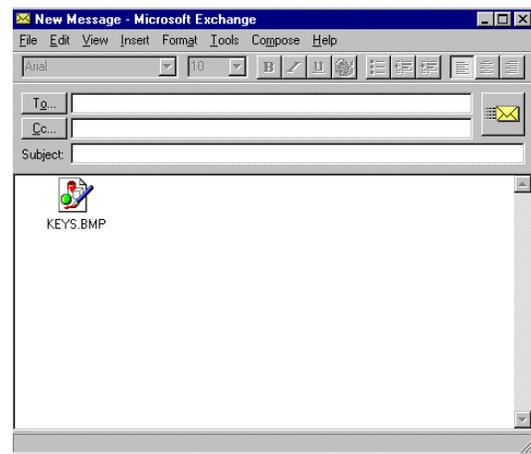

Figure 4, Sending e-mail with an Auto-attachment

You can also access e-mail through the FILENAME statement using the Device type of EMAIL. Additionally, you can embed a set of directives in put statements to allow even more flexibility when writing a data step that conditionally sends multiple e-mail messages.

World-Wide-Web Integration

The SAS System supports integration with the world-wide-web in several ways.

Through SAS System SETUP registration of MIME types, SAS data referenced in web pages (as shown in the example below) are able to use the SAS System or the SAS System Viewer to display themselves if selected. Post 6.12 updates of the SAS System Viewer will support viewing SAS data embedded In web documents within the web browser window. At present, this support is available in separate application windows.
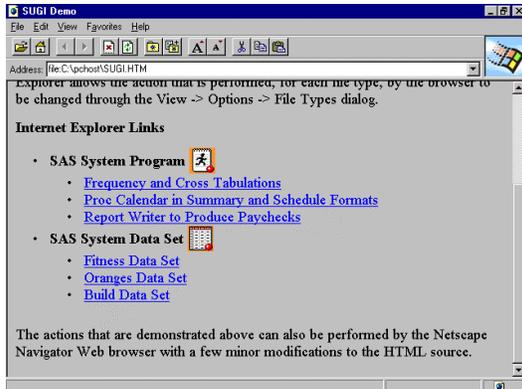

Figure 5, Accessing SAS System data from a web page

The SAS System can function well on a web server and service web-based computing requests. The output of these requests can be generated in a format that is understood by web browsers (HTML) for complete integration into a web-based computing model.

In addition, a new command, **WBROWSE**, invokes the default web browser, which displays SAS Insititute's home page (**http://www.sas.com**) by default. If you specify a url (uniform resource locator), then that location is displayed instead. Note that you must enclose the URL in double quotes.

Another command, **DLGWBROWSE,** invokes a dialog in which you can specify the location of your preferred web browser. The browser you specify will be invoked when you click the Browse tool bar button or enter a URL (uniform resource locator) in the command bar. Use of this command by Windows 95 and Windows NT 4.0 users is optional, since on these platforms the SAS System automatically uses the web browser

associated with URLs in the Windows registry.

Lotus Notes

The SAS System provides an access engine, NOTESDB, which allows you to add new notes documents to an existing Lotus Notes database. You can use the DATA step or SCL to populate the Notes database. You do not need to have Notes running to access it from the SAS System, but you must have a workstation copy of Lotus Notes installed on your machine with a valid user ID certification.

DATA step or SCL code that interacts with a Notes database generally uses the following components:

- A FILENAME statement with 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.

OLE Support

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 System under Windows 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 Release 6.12 supports, provides many new features that you can use to enhance your SAS/AF frames and SAS/EIS applications. Note that the SAS System under Windows (and OLE 2.0 in general) still supports all the features from OLE 1.0.

The OLE 2.0 features supported by the SAS System under Windows include: visual editing, drag and drop, OLE automation, OLE custom controls**,** object conversion, and OLE automation server. Since Release 6.11, the SAS System has been able to perform as an OLE automation server. Previously an experimental feature of SAS, this

is now a production-level capability in Release 6.12.

For more in-depth description of the OLE support available in the SAS System, refer to the paper "OLE and the SAS System for Windows Release 6.12".

SAS ODBC Driver

The SAS ODBC Driver for the SAS System allows third party ODBC compliant Windows applications, such as Microsoft's Excel or Visual Basic, open access to SAS data sets. The SAS ODBC Driver is a multi-tiered driver meaning that it does not directly access SAS data sets but rather communicates with either a local SAS ODBC server or a remote SAS/SHARE server. The SAS ODBC Driver does not connect to a SAS/CONNECT single user server.

SAS System servers transparently handle all cross architecture issues such as floating point data translation between different hardware/OS platforms. The same SAS ODBC Driver comes included with either the base SAS System or with SAS/SHARE*NET software. The local SAS ODBC server also comes with the base SAS System and allows access to local SAS data. To access SAS data remote from the local machine, you use the SAS ODBC Driver to connect to a SAS/SHARE server that has the SAS/SHARE*NET software installed.

When used in conjunction with SAS/ACCESS software on the local or remote server machines, the SAS ODBC Driver serves as a read/only gateway to the wide variety of DBMS data supported by the various SAS/ACCESS engines. The SAS ODBC Driver supports both local and network DDE and TCP/IP for connection to local ODBC or remote SAS/SHARE servers. SAS Institute will expand the available access methods for the SAS ODBC Driver in the future.

Both the local SAS ODBC server and the SAS/SHARE server support multiple ODBC client connections. The SAS ODBC Driver provides level 1 API conformance and minimum SQL grammar conformance and does not support cursors.

SAS/SHARE*NET

SAS/SHARE*NET software is added to a SAS/SHARE server to allow third party ODBC compliant Windows applications, such as Microsoft's Excel or Visual Basic, open access to remote SAS System data sets in shared read/write mode. When used in conjunction with SAS/ACCESS software on the server machine, the SAS/SHARE server becomes a read/only gateway for the ODBC client applications to the wide variety of data supported by the various SAS/ACCESS engines.

The SAS/SHARE*NET software provides the same SAS ODBC Driver software that comes with the base SAS System in addition to server side licensing that enables SAS/SHARE servers to support

Accessing External DLLS

You can access external DLLs through the DATA step or SCL with the MODULE family of SAS call routines and functions. This functionality allows you to access either external DLLs that you create or DLLs that you purchase. You can even access operating system DLLs. To use, you create a SASCBTBL attribute table that describes the DLL routine you want to access.

ENHANCEMENTS TO THE SAS SYSTEM SETUP PROGRAM

The SAS System SETUP program, first available with Release 6.11 of the SAS System for Windows and for OS/2 adds features that simplify installation of the SAS System. In addition, features of the SAS System for Windows require that the SETUP program be used for full functionality of the SAS System on your PC. An automated mode of operation, new in 6.12, makes enterprise installation of SAS System software on Windows systems makes large-scale installations manageable.

Easily-selectable default installation types are available to facilitate easy use of the SAS System SETUP program for typical users. A **Typical** configuration will install the most commonly-used parts of all prod-

ucts for which you are licensed, and a **Compact** configuration will install commonly-used parts of only the Base SAS System.

A capability of the installation program for the SAS System is called a **CDROM** installation. In this mode of operation, only a limited subset of SAS System files need to reside on the PC's hard drive or in a user's network directory. Instead, all SAS System files are accessed from the remote fileserver or the SAS System CD-ROM. Only files and data generated by the user need to be stored on their own disk space.
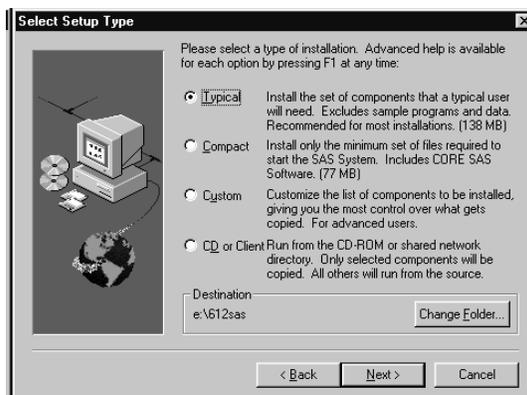

Figure 6, SAS System SETUP selection screen showing the main installation types.

Other enhancements include partial CD-ROM installation which allows a mixed-mode installation between CD-ROM and user disk, CD35 media that allows the SETUP program to generate floppy diskette images for non-networked installation onto systems lacking CD-ROM drives, Uninstallation support, and improved logging and detection of problems at installation time.

SUPPORT FOR WINDOWS NT

Release 6.12 is a full production release of the SAS System for Windows, which fully includes Windows NT. The Institute provides two types of licenses for Windows NT users:

1. The SAS System for Windows Workstations - a license providing support for all Windows platforms including Windows 3.1 using Win 32s, Windows 95 and Windows NT.

2. The SAS System for Windows Enterprise - a license providing support for all Windows platforms including Windows 3.1 using Win 32s, Windows 95, Windows NT Workstation, and Windows NT Server.

A unified Windows image is shipped by the Institute for the three Windows platforms supported: Windows with Win32s, Windows 95, and Windows NT. At installation time and at run-time, the SAS System will determine the type of system being used and enable access to extended features available under advanced operating systems such as Windows NT.

Under Windows NT, the SAS System automatically takes advantage of the 64-bit file I/O features of the NT file system (NTFS). As a result, you can create, sort, and subset data sets and manipulate external files greater than the 2 gigabyte size limit placed on many other environments. The size limit for a SAS data set on NTFS is 2^{63} (9,223,372,036,854,775,808) bytes, with a maximum of 2^{31} (2,147,483,648) observations.

The SAS System under Windows NT supports a SAS/CONNECT® Spawner. This spawner allows a Windows NT machine to service SAS/CONNECT remote requests without requiring you to first log into the Windows NT machine and execute the spawner. Additionally, the spawner honors the access rights of the Window NT registry with respect to the requesting user.

In addition to these specific Windows NT support areas, operation of the SAS System on Windows NT benefits from NT-specific features, including:

- recovery support such as automatic restart, which in conjunction with the SAS/CONNECT Spawner provides a high-availability platform for NT SAS services.

- performance benefits from NTFS support for disk striping, which allows several disk drives to be used in parallel for decreased latency

- reliability benefits due to NT support for disk mirroring and duplexing in addition to its recoverable, transaction-based nature.

- multi-session abilities resulting from NT support for multiprocessor machines.

- among Windows systems, Windows NT is the only fully 32-bit operating system, which can enhance performance in many types of applications.

- NT's support for Volume Sets allows disk capacity to be added to existing volumes as needed, without reformatting as storage needs increase.

- Windows NT 4.0 increases performance over NT 3.51 by 50-66% in some areas.

- Performance optimizations available on NT Server 4.0 in the areas of task scheduling, memory allocation, I/O throughput, and file caching can lead to better performance on this platform for large SAS applications.

For more details on the support provided for Windows NT, refer to the paper "Comparing the SAS System Release 6.11 for Microsoft Windows 95 and Windows NT".

CONCLUSIONS

This paper summarized some of the many features available in Release 6.12 of the SAS System for Personal Computers. New features such as Print Preview and the SAS System Viewer as well as incremental enhancements in other areas extend the graphical user interface available with the SAS System. In the areas of application integration and SETUP program enhancements, improvements continue over previous releases.

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