

Installation Instructions and System Manager's Guide for the SAS[®] System under OpenVMS[™] for VAX Systems, Release 6.09 Enhanced, TS460 and above

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Introduction

This document is divided into two sections and seventeen appendices. Section I includes the installation instructions. Section II provides set up and maintenance instructions. You should keep both sections as a reference after you have completed the installation. The appendices provide more information about particular SAS System products and tailoring your SAS System installation to your site configuration.

Part I of Section I contains installation instructions for the SAS System, Release 6.09E under OpenVMS. In order to install Release 6.09E, you must have OpenVMS Version 5.5-2 or later. SAS software products and VMS-specific product extensions having other requirements are documented in "Check Your Version of OpenVMS " in Section I.

The installation procedure uses the `VMSINSTAL` utility and can be executed in full-screen mode, allowing you to make choices from on-screen menus. You can also use a hardcopy console. The installation procedure produces a log file of all installation-related activities.

Notes: An on-line representation of the installation instructions is now available. The installation procedure loads it automatically in `SAS$ROOT:[TOOLS]INSTALLATION.INSTRUCTIONS`. This text representation does **not** include any formatting. It is strictly a textual representation of the installation instructions you receive in your customer package.

This document makes several references to the logical name `SAS$ROOT`. `SAS$ROOT` designates a rooted logical name defined to reference the device and root directory on which the SAS System, Release 6.09E is installed, such as, `SASdisk:[SASroot.]`. If you are unfamiliar with this designation, see "Setting Up and Maintaining the SAS System" in Section II for more information on logical name designations for the SAS System.

Reader's Guide

Section I of this document, *Installation Instructions*, details all of the steps required for installing the SAS System. Complete this section before continuing with any other section.

- Section I, Part 1, "Preinstallation Checklist," gives you an overview of installation requirements and defines the installation parameters you need to supply for the install process. It also describes various installation options from which you can choose.
- Section I, Part 2, "Installing the SAS System," contains separate sections for each installation option. Each section outlines the steps that are necessary for you to install the SAS System.

Section II, *System Manager's Guide*, contains information on setting up and maintaining your SAS System. Keep this document as a reference after you complete the installation.

- ❑ Section II, Part 1, "Setting up and Maintaining the SAS System" describes how you can customize SAS System invocation at your site, and how to modify start-up procedures and maintain multiple versions of the SAS System. It also addresses issues that pertain to running the SAS System effectively at any site. We recommend that you carefully review all of this information.
- ❑ Section II, Part 2, "Optimizing System Performance," describes how to optimize performance of the SAS System by offering suggestions on different methods that you can use to improve performance.

The appendices supply information for specialized concerns, including notes on special implementation processing for individual products. Review these sections for processing relevant to products you received. In most cases, you need to perform the steps described to run the products successfully at your site.

Appendix A describes post-installation setup for SAS/ACCESS software.

Appendix B describes post-installation setup for the ALL-IN-1 Integration of Release 6.09E of the SAS System.

Appendix C describes post-installation setup for SAS/ASSIST software.

Appendix D describes post-installation setup for SAS/TUTOR courses.

Appendix E describes post-installation setup for SAS/CONNECT software.

Appendix F describes post-installation setup for SAS/SHARE software.

Appendix G describes for site representatives how to apply patches and install SAS Notes.

Appendix H describes how to use the logical names for Release 6.09E of the SAS System.

Appendix I describes how to customize site forms.

Appendix J describes the use of the SITEINFO file and how to access it from the SAS System.

Appendix K contains information on creating your own translate tables using PROC TRANTAB.

Appendix L contains instructions specific to graphics devices for OpenVMS.

Appendix M contains information on using the vector processing option.

Appendix N describes how to access the SAS Sample library.

Appendix O tells site representatives how to add a SAS help member to their OpenVMS help library.

Appendix P describes the directory structure for SAS/TOOLKIT software.

Appendix Q describes the post-installation setup procedure for National Language Support.

References

Digital Equipment Corporation (1988), "VMS Authorize Utility Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA42A-TE.

Digital Equipment Corporation (1988), "Guide to VMS Performance Management." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA43A-TE.

Digital Equipment Corporation (1988), "Guide to Setting Up a VMS System." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA25A-TE.

Digital Equipment Corporation (1990), "VMS Developer's Guide to VMSINSTAL." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA99A-TE.

Digital Equipment Corporation (1988), "VMS Install Utility Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA29A-TE.

Digital Equipment Corporation (1988), "VMS Monitor Utility Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA45A-TE.

Digital Equipment Corporation (1988), "VMS System Generation Utility Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA30A-TE.

Digital Equipment Corporation, "VAX SPM Reference Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-R580C-TE.

Digital Equipment Corporation (1989), "VMS System Manager's Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA00B-TE.

Digital Equipment Corporation (1988), "VMS Access Control List Editor Manual." Maynard, Massachusetts: Digital Equipment Corporation, Order No. AA-LA41A-TE.

Goldenberg, Ruth E. and Kenah, Lawrence J. "VAX/VMS Internals and Data Structures." Bedford, MA: Digital Press, 1991, Order No. EY-C171E-DP.

The following SAS Institute Manuals can assist you with Version 6 of the SAS System:

SAS Companion for the OpenVMS Environment, Version 6, Second Edition

What's New for the 6.09 Enhanced Release of SAS Software: Changes and Enhancements

Technical Report P-242, *SAS Software: Changes and Enhancements, Release 6.08*

Technical Support Document #268, *BETA Version of the ALL-IN-1 Integration of Release 6.08 of the SAS System Under VMS*

Technical Report P-207, *Using the ALL-IN-1 Integration of the SAS System Under VMS, Release 6.06*

SAS/GRAPH Software: Using Graphics Devices with the OpenVMS System

SAS/GRAPH Software: Reference, Volumes 1 and 2, Version 6, First Edition

SAS Language: Reference, Version 6, First Edition

SAS Consultant's Guide: Supporting the SAS System

Contacting SAS Institute

If you have difficulty with this documentation or any of the procedures documented in it, please contact the SAS Institute Technical Support Division at (919)677-8008. Support is available between 9:00 a.m. and 5:00 p.m., EST during Institute business days. If you are a non-U.S./non-Canadian site, contact your SAS Representative for the SAS Institute office nearest you.

Section I, Installation Instructions

Part I, Pre-Installation Checklist

Part II, Installing the SAS[®] System

Part I, Pre-Installation Checklist

This is a list of things you should do BEFORE starting the installation procedure. Each item is discussed in detail in the following sections.

- Check your account privileges. You should be logged on to the `SYSTEM` account, or a comparably privileged account, since some privileges are required to load the software.
- Verify that your version of OpenVMS is 5.5-2 or later.
- Check the available disk space to see if you have room to install all of your SAS software. Refer to the system requirements sheet in your customer package for the list of disk space requirements.
- Determine whether you will work from a CRT or hardcopy console.
- Check system parameters and account quotas to be sure that they meet the minimum values required to load the SAS System.
- Back up the disk on which you are loading the SAS System.

Check Your Account Privileges

The SAS System must be installed from a privileged account, preferably the system manager's account, `SYSTEM`. However, any account with the `SETPRV` and `OPER` privileges is sufficient.

Check Your Version of OpenVMS

Release 6.09 Enhanced (6.09E) SAS System software runs on OpenVMS Version 5.5-2 or later. If your OpenVMS system is not Version 5.5-2 or later, either update your OpenVMS system or contact SAS Institute to see if an earlier version of the SAS System is available to run on your system.

Requirements for specific SAS products and OpenVMS-specific product extensions include:

SAS Software Products:

- SAS/ACCESS Interface to INGRES:
 - OpenVMS Version 5.5-2 or higher
 - INGRES Version 6.3, INGRES Version 1.1/04 or higher.

- SAS/ACCESS Interface to ORACLE:
 - OpenVMS Version 5.5-2 or higher
 - ORACLE Version 6.0, ORACLE Version 7.0 or higher
 - ORACLE VMS Mailbox Driver Version 1.2.6, 1.2.8 or higher.

- SAS/ACCESS Interface to Rdb:
 - OpenVMS Version 5.5-2 or higher
 - Rdb Version 4.0 or higher.

- SAS/ACCESS to SYBASE
 - OpenVMS Version 5.5-2 or higher
 - SYBASE Version 4.2, SYBASE Version 10.0 or higher.

- SAS/CONNECT Software:
 - DECnet must be installed.
 - or
 - TCP/IP services for OpenVMS or compatible services must be available.

Note: See Appendix F, "Storing and Locating SAS/CONNECT script files" for more information.

- SAS/SHARE Software
 - DECnet must be installed
 - or
 - TCP/IP services for OpenVMS or compatible services must be available
 - or
 - GBL Access Method must be available.

OpenVMS-Specific Product Extensions:

- The ALL-IN-1 Integration of Release 6.09E of the SAS System under OpenVMS:
 - Base SAS Software
 - OpenVMS Version 5.5-2 or higher
 - ALL-IN-1 Version 2.4 or higher.

Note: See Appendix B, "Post-installation Setup for the ALL-IN-1 Integration of Release 6.09E of the SAS System under OpenVMS" for optional SAS software product requirements.

- CDA Support:
 - Base SAS Software
 - OpenVMS Version 5.5-2 or higher.

- CDD Engine:
 - Base SAS Software
 - OpenVMS Version 5.5-2 or higher
 - CDD/PLUS Version 4.1 or higher.

- Running SAS under DECwindows Motif:
 - OpenVMS Version 5.5-2 or higher
 - DECwindows Motif 1.0.

- Vector Processing:
 - Base SAS Software
 - OpenVMS Version 5.5-2 with at least one vector processor.

Note: See Appendix M, "Using the Vector Processing Option" for further information on additional system requirements and considerations.

Check Available Disk Space

Please check your system disk quota for the disk on which you intend to install the SAS System against the space requirements listed in the *System Requirements* document included in your installation package.

Check the Installation Terminal

The installation procedure detects the type of terminal you are using. If you have a choice, use a CRT. If you are installing with a hardcopy terminal, Help screens are not *pop-up* screens; they are written out sequentially. The HELP and EXIT keys, PF1 and PF4, are valid on hardcopy terminals. If your hardcopy terminal does not have PF keys, you can use single-letter commands, H and E, to perform the same function when prompted for a PF1 or PF4 key. Enter the appropriate letter, then press RETURN.

Check System Parameters

There are several parameters and quotas that you may need to modify to install and accommodate the SAS System, Release 6.09E. You can check and/or change them in one of two ways:

1. Start the installation procedure which checks the relevant parameters. If changes must be made, you have a choice of the following:
 - allow the installation procedure to make the changes
 - or**
 - exit the installation program to make the changes manually.

If the installation procedure makes the changes, the parameters are set to the minimum required to run the installation procedure.

2. Check the parameters manually before you start the installation program. Use SYSGEN or AUTOGEN, and AUTHORIZE to check and change the appropriate parameters and quotas.

The following sections explain how to manually change the parameters and quotas. If you plan to let the installation program check and modify values for you, you can skip to "Protection Settings on SAS Directories."

Note: Whether you make the changes manually or allow the installation procedure to make them for you, you must reboot the system (SYSGEN parameter changes) or log off and then log on again (AUTHORIZE quota changes) in order for the changes to take effect.

AUTHORIZE Quotas

The following lists the affected quotas and their MINIMUM values that must be set to execute the installation procedure:

FILLM	255
PGFLQUOTA	15000
BYTLM	15000

The following dialog shows how to inspect, change, and verify the quotas for the "user" account. A `HELP` command is available. Again, we recommend that you use the `SYSTEM` account.

```
$ SET DEFAULT SYS$SYSTEM
$ SET PROC/PRIV=(SYSPRV) ! Ensure access to SYSUAF.DAT file
$ RUN AUTHORIZE
UAF> SHOW user
---- "user" attributes and quotas displayed ----
UAF> MODIFY user/PGFLQUOTA=15000/FILLM=100/BYTLM=15000
UAF> SHOW user
---- "user" attributes and quotas displayed ----
UAF> EXIT
```

When you have finished, the modified quotas will be in effect when "user" next logs on. See "Making New Parameter Values Active" for more information.

SYSGEN Parameters

The following lists the affected parameters and their `MINIMUM` values for running the installation procedure:

CHANNELCNT	150
VIRTUALPAGECNT	25000
PROCSECTCNT	300
WSMAX	3000

Note: See "Parameters for Installing the SAS Image as a Known Image," (`GBLPAGES` and `GBLSECTIONS`) for more information.

Using AUTOGEN

You can use either `AUTOGEN` or `SYSGEN` to modify `SYSGEN` parameters. Although both programs are documented in these instructions, the advantages of `AUTOGEN` include:

- ❑ Using `AUTOGEN` allows you to keep a permanent record of your parameter changes.
- ❑ Adjusting some system parameters can effect other parameters. `AUTOGEN` adjusts any related parameters automatically. Using `AUTOGEN` is also easier. To use it, complete the following steps:
 1. Edit `SYSS$SYSTEM:MODPARAMS.DAT` to include your parameter specifications. The following is an example of the format for each line:

```
parameter name=value          ! comment
```

For example, to modify the parameter file to incorporate changes required by the SAS System, Release 6.09E, include these lines:

```
CHANNELCNT=150          ! This is needed for SAS software
PROCSECTCNT=300        ! This is needed for SAS software
VIRTUALPAGECNT=25000   ! This is needed for SAS software
WSMAX=3000             ! This is needed for SAS software
```

Note: Do not alter these values if they are already present in the `SYSS$SYSTEM:MODPARAMS.DAT` file at values above these recommended minimum values.

2. Invoke `AUTOGEN`:

```
$ @SYS$UPDATE:AUTOGEN SAVPARAMS SETPARAMS
```

`AUTOGEN` processes `MODPARAMS.DAT` and sets the existing system parameters to the values specified there. Several informational messages print out as `AUTOGEN` executes.

`AUTOGEN` changes the `CURRENT` system parameters. You can verify that `AUTOGEN` worked correctly by using `SYSGEN` to check the `CURRENT` parameters, as described in the next section.

For more information on `AUTOGEN`, refer to *VMS System Manager's Manual*.

If you do not want `AUTOGEN` to collect and use `FEEDBACK` information in configuring your final `SYSGEN` parameters, you should be sure to specify the `NOFEEDBACK` mode on the `AUTOGEN` invocation line.

Refer to *Guide To Setting Up a VMS System* in the VMS Version 5 documentation set.

Using SYSGEN

The following dialog shows how to inspect, change, and verify the **CURRENT** parameters without using `AUTOGEN`. The **CURRENT** parameters take effect when the system is rebooted.

```

$ SET PROC/PRIV=(SYSPRV)
$ SET DEFAULT SYS$SYSTEM
$ RUN SYSGEN

SYSGEN> USE CURRENT
SYSGEN> SHOW VIRTUALPAGECNT

Parameter-name Current Default Minimum Maximum Units.Dynamic
VIRTUALPAGECNT 8192      8192    512     300000  Pages

SYSGEN> SET VIRTUALPAGECNT 25000
SYSGEN> SHOW VIRTUALPAGECNT

Parameter-name Current Default Minimum Maximum Units.Dynamic
VIRTUALPAGECNT 25000    8192    512     300000  Pages

----- repeat for other parameters -----

SYSGEN> WRITE CURRENT
SYSGEN> EXIT

```

Making New Parameter Values Active

`AUTHORIZE` parameters become effective for an account the **next** time a user logs into that account. If you are logged in to the account you are changing, you must log off and log on again to make the parameters effective once you have updated the parameter values.

The required `SYSGEN` parameter changes become effective the **next** time the system is booted. If you changed a `SYSGEN` parameter, you **must** reboot the system before proceeding to install the SAS System.

For more information on using `SYSGEN`, consult *VMS System Generation Utility Manual*. For more information on using `AUTHORIZE`, consult *VMS Authorize Utility Manual*.

Protection Settings on SAS Directories and Files

The SAS root directory, subdirectories, and files are created with the ownership of UIC [1,4] and the protection of (S:RWED, O:RWED, G:RE, W:RE). The protection settings are to ensure that the SAS System installed at your site operates correctly. We strongly recommend that you preserve the original protection on these directories or files.

Note: Changing the protection on any directories or files can result in unpredictable behavior.

Creating the SAS Root Directory Before Installation (Optional)

By default, the installation procedure attempts to create the SAS root directory for you. You have the option of creating the SAS root directory before invoking the installation procedure and applying an access control list (ACL) for added system security. If you choose to create an ACL for the SAS root directory:

- You need to make sure that `DEFAULT` is specified in your access control entry (ACE) for the SAS root directory so that the ACE is propagated throughout the SAS directory tree.
- When associating an ACE with an `IDENTIFIER`, the installing account must have the same identifier. You can use the OpenVMS authorize utility, `AUTHORIZE`, to give the account the appropriate resource identifier.

Note: By default, `VMSINSTAL` sets your UIC to [1,4] when you are running the installation procedure.

If you do not set up your ACL correctly, application of SETINIT licensing information, SETINIT testing, or any Installation Certification Procedure testing will **fail** when running the installation procedure. You will receive a message from the SAS System indicating that you have insufficient privileges to create a SAS work library in the `SAS$ROOT:[TOOLS]` directory. No SAS System output logs will be created and the installation procedure will abort.

For more information on creating and maintaining ACLs, refer to *VMS Access Control List Editor Manual*.

Backup the Target Disk

Backup your target disk before invoking the installation procedure. This allows you to restore the system to its previously defined defaults if a power failure or other severe problem occurs during installation.

Part II, Installing the SAS® System

This section provides step-by-step instructions for installing the SAS System. The following functions are performed as the installation procedure runs. Each function is discussed in detail in subsequent sections.

- Invoking the Installation Procedure
- Choosing Options in the Main Menu
- Running the Set Up Procedure
- Running a Full Installation or Installing SAS System Add-on Products
- Installing Source Maintenance Files
- Installing SAS Notes and Loading Patches
- Licensing the SAS System
- Post-processing Installed SAS System Products
- Applying Patches
- Running the Installation Certification Procedure.

Before you read this section, be sure that you have already read the previous section, "Preinstallation Checklist," and completed all of the appropriate tasks on the checklist.

Note: An on-line text representation of the installation instructions is now available. The installation procedure will load it for you automatically in:

```
SAS$ROOT: [ TOOLS ] INSTALLATION . INSTRUCTIONS
```

This text representation of the installation instructions does NOT include any type of formatting. It is strictly a textual representation of the installation instructions that you receive in your customer package.

If You Interrupt Installation

You can exit the installation procedure at any time by pressing the PF4 key or by executing the `EXIT` command. If you exit before all products are loaded, you must restart from the beginning, as described in Part I of the Installation Procedure, "Invoking the Installation Procedure." By default the installation procedure eliminates existing files and directories left in the `VMSINSTAL` working directory, `SYS$SYSROOT:[SYSUPD.SAS060]`, from the previous attempt, or in the alternate installation working directory specified by the option `AWD=disk:[dir.SAS060]`.

If you exit after all products are loaded but before:

- source maintenance files, SAS Notes and patches are loaded
- the `SETINIT` is applied
- post-processing is run
- patches are applied
- the `ICP` is run

then you must restart the installation procedure. Then you must choose the appropriate options from the Main Menu, load the SAS Notes, patches, and source maintenance files, run the `SETINIT`, run the post-processing procedures, apply patches, and run the `ICP`.

For more information on `VMSINSTAL` refer to the *VMS Developer's Guide to VMSINSTAL*.

Getting Help

You can get help at any time by pressing PF1 or by typing `HELP` and then pressing `RETURN`.

Recovering from Errors

If the installation procedure or the `ICP` fails, you must correct the cause of failure and restart installation from the beginning. To diagnose the failure:

- Read `SAS$ROOT:[TOOLS]SAS609E_INSTALL.LOG`, the log file of the installation procedure.
- Check all of the test result files (`TEST*.RES`) in `SAS$INSTALL:[ICP]`. These files are created when the `ICP` executes.

If you need help interpreting the log file, or otherwise cannot install your SAS products successfully, call the Technical Support Division of SAS Institute Inc. at (919) 677-8008 and ask for OpenVMS System support. If you are a non-U.S./non-Canadian site, contact your SAS Representative for the SAS Institute office nearest you.

Saving Copies of Modified Files

Files modified by the installation procedure should be copied and saved. The saved copies make it easier to restore the state of the system if problems should occur. If the saved files consume too much disk space, back them up to tape.

Invoking the Installation Procedure

Use VMSINSTAL only as specified in these instructions. All parameters to VMSINSTAL that apply to the installation procedure are documented in this section. Make sure you are logged on with appropriate privileges (preferably as SYSTEM), and then proceed.

To perform a full-screen installation, specify:

```
$ SET TERMINAL/INQUIRE/WIDTH=80/PAGE=24
```

If you want to perform the installation using the hardcopy implementation, set the page size to 24 and the page width to 80. Use the INQUIRE qualifier as well to make sure the terminal type is set correctly, as shown below:

```
$ SET TERMINAL/INQUIRE/WIDTH=80/PAGE=24/HARDCOPY
```

VMSINSTAL temporarily loads installation tools into:

```
SYS$SYSROOT:[SYSUPD.SAS060]
```

unless `OPTIONS AWD=disk:[dir]` is used to specify an alternate working device for the temporary working directory.

It then starts the installation procedure. A banner screen appears, followed by a screen that displays special information about keys that are used by the installation procedure.

Steps for Installing Release 6.09E of the SAS System under OpenVMS

Note: Running the installation procedure for Release 6.09E of the SAS System will **NOT** affect the current installed version of the SAS System already at your site. All logical names and commands used during the install remain in effect only during installation. Only PROCESS level logical names are used at install time. SAS users may continue to execute the existing SAS System while you install the new SAS System release.

Follow these steps to install Release 6.09E of the SAS System under OpenVMS:

1. Allocate your media drive using the following command:

```
$ ALLOCATE device_name
```

where `device_name` refers to the media drive from which you are installing the SAS System.

2. Invoke the installation procedure using one of the following commands:

- For 9-track tapes and TK50s:

```
$ @SYS$UPDATE:VMSINSTAL SAS060 device_name options...
```

where `device_name` also refers to the tape drive from which you are installing the SAS System.

- ❑ For CD-ROM:

```
$ MOUNT/OVER=ID cd-rom drive
$ @SYS$UPDATE:VMSINSTAL SAS060 cdrom_drive:[save_sets] options...
```

where `cdrom_drive:[save_sets]` refers to the location of the save sets on your customer CD.

Notes:

- ❑ If you are running the installation procedure from disk, you should provide a full directory specification when you specify the device name in the above command.
- ❑ If you load all of the save sets from your customer tape onto disk on a local node, you can now run the install from a remote node via DECnet. When running a remote install:
 1. Make sure that `WORLD` has `READ` access to the directory on the local node.
 2. Specify the node name as part of the directory path on the `VMSINSTAL` command line. For example,

```
$ @SYS$UPDATE:VMSINSTAL SAS060 VX4000::disk:[directory]
```

where `VX4000` is the node where the save sets were loaded.

The following options are available but are not required for your use on the `VMSINSTAL` command line. When specifying the `options` parameter on the `VMSINSTAL` command line, delimit the options with commas only. If you delimit the option with spaces, the option is ignored. The following is an example of correct usage of the `options` parameter:

```
$ @SYS$UPDATE:VMSINSTAL SAS060 MUA0: OPTIONS
  AWD=DISK:[DIR],IDX=DISK:[DIR]SAS.INDEX.LIST
```

- ❑ `IDX=disk:[directory]file_name.file_extension:` External SAS index list option. This option allows you to specify where a SAS index list exists on your system. The installation procedure will read from this index file rather than from the one provided on your customer tape located in `SAS$ROOT:[TOOLS]SAS_INDEX.LIST`.
- ❑ `AWD=disk:[directory]:` Alternate work directory option. This option allows you to specify a temporary working directory used by `VMSINSTAL` other than `SYS$SYSROOT:[SYSUPD.SAS060]`

Note: The `VMSINSTAL G` option is not supported. You are given the opportunity to copy the save sets to disk at the beginning of the Installation Procedure. Refer to item 9 for an alternative to the `VMSINSTAL G` option.

WARNING: Do not attempt to install the SAS System using the following command:

```
$ @SYS$UPDATE:VMSINSTAL * 'source' ! DO NOT USE THIS SYNTAX
```

where 'source' refers to either a CD or tape device or a directory specification where the SAS System save sets exist. The SAS System save sets used by the installation procedure do not support this syntax.

3. VMSINSTAL checks to see if your system meets the minimum requirements for performing an installation. If you receive a warning message here, check the "Guide to Setting Up an OpenVMS System" to determine whether all minimum requirements are met. You may have to exit at this point if they are not.
4. VMSINSTAL tells you if there are any active processes and then asks if you would like to continue anyway. Active processes do not affect the installation procedure. Respond **YES** and proceed.
5. VMSINSTAL asks if you have backed up the system disk. If your output destination disk is fully backed up, respond **YES** and proceed.
6. If you are installing from media, the installation procedure asks:

Are you ready?

Mount the media, put it on line, respond **YES** and proceed.

Note: Responding before the media is mounted and online aborts the installation procedure.

7. The installation procedure restores the following files to `VMI$KWD`, the temporary work directory used by VMSINSTAL:
 - the installation procedure files from `SAS060.A`
 - the SAS index list from `SAS060.B`.
8. The installation procedure reads the SAS index list to determine the type of media you are installing from. Valid media classes include:
 - Base SAS software product installation media
 - SAS software add-on product media
 - Monthly SAS Notes media.

9. The installation procedure then asks you if you would like to see what products were shipped on your customer media:

```
*Do you want to see a list of what is on your customer media [Y]?
```

If you answer N, the installation procedure goes onto step 10.

If you answer Y, the installation procedure creates a customer media list and offers the following options:

Customer Media List Options:

1. Display customer media contents
2. Print customer media contents
3. Both 1 and 2
4. None of the above

It then asks you to make a selection:

```
* Enter choice [1]:
```

If you selection option 2 or 3, the following prompt is issued:

```
Note: The width of this report is 132 characters. If possible, we  
recommend that you print the report in landscape format.
```

```
* Would you like to specify printer options [Y]:
```

If you do not have a printer that supports a landscape qualifier, respond N. Otherwise, if you have a printer that supports a landscape qualifier (e.g., /FORM=LANDSCAPE or /PARAMETER=("PAGE_ORIENTATION=LANDSCAPE")), respond Y. You then can specify a print command qualifier after the following prompt or use the default printer option, /FORM=LANDSCAPE, then press RETURN.

```
* Specify printer options [/FORM=LANDSCAPE]:
```

The default print command qualifier is /FORM=LANDSCAPE; however, you can specify any print command qualifier after the prompt.

```
* Enter printer queue name [SYS$PRINT]:
```

You can respond with a different queue name or use the default, SYS\$PRINT. Then, the installation procedure issues:

```
* Press RETURN to continue
```

Note: We recommend that you review the contents of your customer media before continuing with the installation procedure. Release 6.09E of the SAS System is available on CD-ROM. For media other than CD-ROM, media includes maintenance save sets only. Any maintenance delivered on CD-ROM will include both the maintenance save sets and the production save sets for all products for which you are licensed. This will not affect your source maintenance installation (Option 2 on the SAS Installation main menu).

10. The installation procedure informs you what release of the SAS System you are installing:

```
%SAS-I-RELNUM, You are installing Release 6.09E of the  
-SAS-I-RELNUM, SAS System Under OpenVMS for VAX Systems...
```

11. The installation procedure checks to see if the OpenVMS Version installed on your system meets the minimum OpenVMS Version 5.5-2:

```
%SAS-I-CHK_VMSVERS, Checking the Version of OpenVMS running on your  
system...
```

12. Then, the installation procedure checks the system's interactive login limit:

```
%SAS-I-CHK_LGNLMT, Checking the login interactive limit...
```

Because the installation procedure spawns subprocesses, the interactive login limit must exceed the current interactive login value by 2. Therefore, if the difference between the interactive login limit and the current interactive login value is:

- greater** than 2, no changes are required.
- less** than 2, the installation procedure temporarily increases the interactive login limit so that it is 2 greater than the current interactive login value.
- equal**, the installation procedure increases the interactive login value by 2.

Note: The original interactive login value is retained. This value will only change for the duration of the install, then will be restored upon exiting from the installation procedure.

13. The installation procedure checks your broadcast message settings:

```
%SAS-I-CHK_BRDCST, Checking current settings for broadcast messages...
```

If any broadcast message classes are turned on, the installation procedure disables all broadcast messages for the duration of the installation procedure, then restores the original settings upon exiting from the installation procedure.

14. The installation procedure notifies you of Release Notes options. Release Notes inform you of changes between Release 6.07 or 6.08 and Release 6.09E of the SAS System under OpenVMS. You will have the opportunity to browse the Release Notes during installation and/or spool a hard copy to a printer attached to your system.

Additional Release Notes Options are as follows:

1. Display release notes
2. Print release notes
3. Both 1 and 2
4. None of the above.

It then asks you to make a selection:

```
* Select option [2]:
```

If you select option 2 or 3, VMSINSTAL issues the prompt:

```
* Queue name [SYS$PRINT]:
```

You can respond with a different queue name or use the default, SYS\$PRINT. VMSINSTAL then prompts:

```
* Do you want to continue the installation [NO]?
```

Respond YES and proceed.

The prompt below then appears:

```
* Do you want to copy the release notes to SYS$HELP [Y]?
```

If you answer Y, the release notes are copied to SYS\$HELP:SAS609E.RELEASE_NOTES.

If you answer N, you can specify an alternate directory destination after the following prompt:

```
* Enter the directory destination for the release notes:
```

If the directory specified exists, VMSINSTAL moves the release notes to that location and deletes the temporary copy, SYS\$UPDATE:SAS609E.RELEASE_NOTES.

If the directory specified does not exist, you are notified, then asked:

```
* Do you want the installation procedure to create the directory for you [Y]?
```

If you answer N, you can specify a different directory location.

If you answer Y, VMSINSTAL creates the directory, copies the release notes to that directory, and deletes the temporary copy of the release notes, SYS\$UPDATE:SAS609E.RELEASE_NOTES.

If you are installing Release 6.09E of the SAS System under OpenVMS for the first time, we recommend that you review the Release Notes before continuing with the installation procedure.

15. If you are running from a tape device (such as 9-track tape or TK50), you are asked if you want to load the save sets from the media device to a disk directory of your choice. By doing so, you can run the installation procedure from disk instead of from a media device at a later time.

Note: If you choose to load the save sets on disk at a later time, be sure to take into account the amount of disk space required to store the save sets on disk, as well as the amount of disk space required to install the SAS System.

```
You have the option of loading the save sets from 'device_name'
to a directory on disk. This will allow you to run the
installation procedure at a later time.
```

```
* Do you want to load the save sets onto disk now [N]:
```

If you choose `N`, the installation procedure will NOT load the save sets to a disk directory at this time, and the installation procedure continues. You receive several informational messages to help you monitor what the installation procedure is doing.

If you choose `Y`, the installation procedure loads the save sets to a disk directory at this time. You will then see messages indicating that installation procedure files and the government notice file will be loaded by default.

Next, the following message appears:

```
The installation procedure will read the contents of the SAS index
file, VMI$KWD:SAS_INDEX.LIST, and will ask you which save sets you
would like to load from media onto disk.
```

- * If you want to load ALL save sets onto disk, type "A" as your response at any time.
- * If you want to load a particular save set, type "Y".
- * If you do not want to load a particular save set, type "N".

Note: As previously mentioned, the installation save sets, SAS060.*, will be loaded onto your system by default. The disk space required by these save sets will be included in the total amount of space required by your selection(s) made below.

```
Do you want to load:
```

- * Base SAS System (nnnnn disk blocks) [Y]:Y
- * Base SAS Sample Programs (nnnnn disk blocks) [Y]:Y
- * Base SAS System User-Written Extensions etc. (nnnnn disk blocks) [Y]:Y

After you have made your selection, the total block size requirement is calculated and displayed:

```
Required disk space for your selection is: nnnnnn blocks
```

```
Press RETURN to continue:
```

VMSINSTAL prompts you for a directory destination for the save sets you selected to load onto disk. Be sure that the disk device that you choose has the required amount of disk space available. The following information appears on your screen:

```
You must enter a full directory specification for the destination of
the save sets that you want to load onto your system.
```

```
Note:  Directory specifications such as "[ ]" or "[.SAVE_SETS]" are
       not valid because save sets cannot be stored in or under the
       temporary installation procedure directory.
```

```
Make sure that you have enough disk space available on the
destination disk before entering a directory specification below.
```

```
* Enter the directory destination:
```

If the directory does not exist, the installation procedure attempts to create it.

The amount of required disk space is checked against what is available on the destination disk before the save sets are restored to disk. If there is NOT enough space on the destination disk, the installation procedure gives you the opportunity to:

- exit the installation procedure.
- specify a different disk destination for the save sets.

After all the save sets have been restored to disk, you exit from the installation procedure.

If you want to run the installation procedure from disk at a later time, issue the following command to invoke the installation procedure for the SAS System Release 6.09E:

```
$ @SYS$UPDATE:VMSINSTAL SAS060 disk:[directory]
```

where `disk:[directory]` is the directory location of all of the save sets.

Note: If you receive more than one customer package (e.g., a customer package that contains the Base SAS System (either alone or with other products) and another customer package that contains add-on product(s), and you want to load the save sets to disk, you **MUST** load the save sets from each customer package into **DIFFERENT** directories.

For example,

- Customer package #1 contains the Base SAS System and SAS/GRAPH software. Load these save sets into: `disk:[directory.SAS1]*.*`.
- Customer package #2 contains SAS/QC software. Load the save sets into `disk:[directory.SAS2]`.

You will need to install the save set that contains the Base SAS System first. After that installation procedure has completed, invoke the installation procedure and install the add-on product(s) on top of the installed version of the SAS System.

For example,

- Invoke the installation procedure for customer package #1:

```
$ @SYS$UPDATE:VMSINSTAL SAS060 disk:[directory.SAS1]
```

For the sake of the example, say that you installed this customer package into:

```
disk:[SAS609E...]
```

- After the installation for customer package #1 has completed, invoke the installation procedure for customer package #2:

```
$ @SYS$UPDATE:VMSINSTAL SAS060 disk:[directory.SAS2]
```

When you get to the part of the installation procedure that asks you for the SAS root directory, specify the same directory that you specified when installing customer package #1 since these are add-on products: `disk:[SAS609E]`.

16. The installation procedure restores SETINIT files from the SAS060.C save set to VMI\$KWD:

```
%SAS-I-RQ_SPC, SETINIT files require(s)
-SAS-I-RQ_SPC, nnn blocks of disk space -->
-SAS-I-RQ_SPC, nnnn blocks available on VMI$KWD...
```

```
%SAS-I-RSTR_FILE, Restoring SETINIT files
-SAS-I-RSTR_FILE, to VMI$KWD:...
```

After the files have been loaded, the installation procedure checks to make sure that they were restored correctly to VMI\$KWD.

Note: The text in the above messages will vary depending on the type of media from which you are installing:

- media that contains the Base SAS System and/or other SAS software products will list the maintenance core catalog, and a SETINIT text file.
- media that contains any SAS System add-on products will list a SETINIT text file.
- SAS Notes media and maintenance-only media will NOT attempt to load the maintenance core catalog or SETINIT text file.

17. Miscellaneous installation tool files are restored from SAS060.D to VMI\$TOOLDIR:

```
%SAS-I-RQ_SPC, Miscellaneous Installation Tools require(s)
-SAS-I-RQ_SPC, nnn blocks of disk space -->
-SAS-I-RQ_SPC, nnnnn blocks available on VMI$KWD...
```

```
%SAS-I-RSTR_FILE, Restoring Miscellaneous Installation Tools to
-SAS-I-RSTR_FILE, VMI$TOOLDIR:...
```

The installation tool files consist of pre- and post-processing command procedures and other files that are required for running the installation to completion.

18. The installation procedure restores the government notice file from SAS060.G to VMI\$KWD:

```
%SAS-I-RQ_SPC, Government Notice require(s)
-SAS-I-RQ_SPC, nnn blocks of disk space -->
-SAS-I-RQ_SPC, nnnnn blocks available on VMI$KWD...
```

```
%SAS-I-RSTR_FILE, Restoring Government Notice, GOVERNMENT.NOTICE, to
-SAS-I-RSTR_FILE, V VMI$KWD:...
```

```
%VMSINSTAL-I-RESTORE, Restoring product save set G ...
```

Once loaded, the installation procedure notifies you that the government notice file was successfully moved to VMI\$KWD.

Figure 2 tells you how to get help or exit the installation procedure.

Note: If your keyboard is not equipped with PF keys, type the keyword that corresponds to a task and press RETURN.

```
OPEN VMS SAS SYSTEM INSTALLATION PROCEDURE

The installation procedure is being logged in VMI$KWD:SASnmn_INSTALL.LOG
(where "nmn" reflects the current release number for the SAS System).
Upon exiting the installation procedure, this file will be moved to
SAS$ROOT:[TOOLS]. Use these special keys at any time:

PF1      HELP      Get help on the current input field
PF2      IGNORE    Continue without making a selection
PF3      MORE      Continue to next screen for more information
PF4      EXIT      Terminate the installation process
CTRL-W   REFRESH   Refresh the screen

If your terminal is not equipped with PF keys, you may type the
corresponding keyword. You should have already read the "Installation
Instructions and System Manager's Guide for the SAS System Under
Open VMS." If you have further questions or problems with the
installation procedure, contact SAS Institute Technical Support.

Press RETURN to continue
Press PF1 for HELP                                     Press PF4 to EXIT
```

Figure 2: The PF key definitions for installation procedure

After you have familiarized yourself with the PF keys, press RETURN and continue.

Choosing Options in the Main Menu

Figure 3 is an example of the Main Menu where you can choose the part of the installation procedure that you want to run.

```
* WELCOME TO THE INSTALLATION PROCEDURE FOR THE SAS SYSTEM UNDER OPENVMS *

What do you want to do:
-----
1. Full Installation or Installation of SAS System Add-On Products
2. Install Source Maintenance Files
3. Install SAS Notes and Load Patches
4. License the SAS System
5. Post-process Installed SAS System Products
6. Apply Patches
7. Run the Installation Certification Procedure
8. Exit from the installation procedure

SAS_INSTALL>>> 1

Press PF1 for HELP
```

Figure 3: Selecting the procedure

Option 1: Full Installation or Installation of SAS System Add-on Products

Choose this option if you are installing the SAS System for the first time or are installing an add-on product. This option loads the products onto your system and automatically executes Options 2 through 7.

If you have already installed all of your SAS software products on your system, you can choose other options to perform additional tasks. After any of the following options are executed, you are automatically returned to the Main Menu screen to make another choice.

Option 2: Install Source Maintenance Files (Not Available)

This option does not contain any source maintenance files with this release. See Option 3, "Install SAS Notes and Load Patches."

Option 3: Install SAS Notes and Load Patches

Choose this option if you want to install SAS Notes, patches, source maintenance files and tools.

Option 4: License the SAS System

Choose this option if:

- you experienced problems during the SETINIT phase of the installation procedure and need to apply a different SETINIT to your SAS System.
- your hardware has changed or been upgraded, and you need to apply a new SETINIT (generated by the SAS Institute Customer Service Department) in order to make the SAS System run on your new system configuration.
- you renewed a license for a SAS System software product.

Option 5: Post-Process Installed SAS System Products

Choose this option to post-process installed SAS System products. This option must be chosen in order to complete product installation for certain SAS System products. Post processing for specific products is discussed in appendices pertaining to those products.

Option 6: Apply Patches

Choose this option to apply patches to the SAS System. The SAS Institute Technical Support Division recommends that all required, highly recommended, and recommended patches be applied to your SAS System.

Option 7: Run the Installation Certification Procedure

Choose this option if:

- you exited from the installation prematurely and did not run the tests on the SAS software products that you installed on your system.
- you applied any patches or loaded the source maintenance files to your SAS System.

Note: This option is very important in helping to determine that your SAS System is running correctly.

Choose the option that you would like to execute, and press RETURN.

If you have not executed any other options during this session, the SET UP Procedure is automatically executed. Otherwise, you will go directly to the screen that contains information and instructions on the option you chose.

Running the SET UP Procedure

During the "SET UP" portion of the installation procedure:

- Requisite `SYSGEN` parameters and `AUTHORIZE` quotas are checked.
- You specify a root directory location for the SAS Release 6.09E directory structure.
- You specify a media device name that will be equated to the logical name, `SASTAPE`.

Figure 4 displays the screen that initiates a verification of your `SYSGEN` parameters and `AUTHORIZE` quotas to confirm that minimum requirements are met for a successful installation of the SAS System. If they are met, you are informed. Press `RETURN` to continue.

```
                CHECK SYSGEN PARAMETERS AND AUTHORIZE QUOTAS

Press RETURN to check the SYSGEN parameters and AUTHORIZE quotas to
ensure that they meet minimum required values for installation.

If they meet minimum values, the procedure will continue.

If they DO NOT meet minimum values:

  o You will see a warning that you need to change SYSGEN
    parameters and/or AUTHORIZE quotas.
  o You are given a chance to have them changed automatically or
    exit and change the parameters and/or quotas yourself.

Press RETURN to continue
Press PF1 for HELP                                     Press PF4 to EXIT
```

Figure 4: Checking SYSGEN Parameters and AUTHORIZE Quotas

If the installation procedure tells you that minimum requirements are not met, a command procedure that contains commands to set the appropriate parameters and quotas, `SAS_QUOTA.COM`, is created automatically.

Change your configuration by performing one of the following procedures:

1. To automatically correct system requirements:
 - Execute `SAS_QUOTA.COM` from within the installation procedure.
 - Exit the installation procedure. You will be prompted for a destination for `SAS_QUOTA.COM` upon leaving the installation procedure.
 - Put the new parameters into effect by rebooting for `SYSGEN` parameter changes, or by logging off and logging on for `AUTHORIZE` quota changes.
 - Restart installation.

2. To perform the correction manually:
 - Exit the installation procedure. You will be prompted for a destination for `SAS_QUOTA.COM`.
 - Change the necessary parameters. See "Check System Parameters" for minimum values and how to change them. You can also simply run `SAS_QUOTA.COM` manually at this point.
 - Put the new parameters into effect by rebooting for `SYSGEN` parameter changes or by logging off and logging on for `AUTHORIZE` quota changes.
 - Restart installation.

Figure 5 displays recommended parameters and quotas.

```
RECOMMENDED SYSGEN PARAMETERS AND AUTHORIZE QUOTAS

After installation, we recommend that you apply the following SYSGEN
parameters and AUTHORIZE quotas for optimal performance of the SAS
System.

Large production SAS jobs will NOT run successfully unless you make
the recommended adjustments.

SYSGEN Parameters:                AUTHORIZE Quotas:
PROCSECTCNT      300 sections      FILLM           255
CTLPAGES         100 pages         BYTLM           35000
CTLMGLIM         60 pages         JTQUOTA        3072
VIRTUALPAGECNT  64000 pages       PGFLQUOTA     64000
CHANNELCNT       300 channels     WSDEFAULT       500
GBLSECTIONS     +2 free sections  WSQUOTA        4000
GBLPAGES        +438 free pages   WSEXTENT       6000
WSMAX           7500 pages

Press RETURN to continue
```

Figure 5: Recommended Parameters

Press RETURN and continue.

Figure 6 displays the screen in which you specify the root directory.

```
                SPECIFY THE ROOT DIRECTORY OF THE SAS SYSTEM

Enter the specification to use as the "target" or "root directory" for
the SAS System. This specification should be a device name, a complete
directory path, or a rooted logical.

The directory name, [SASnnn], (where "nnn" is the release number of the
SAS System) will be used as the root for the SAS System and will be
appended to the specification you provide if not specified explicitly.

SAS_INSTALL>>> DISK:[SAS609E]

Press PF1 for HELP                                Press PF4 to EXIT
```

Figure 6: Specifying the Root Directory

The root directory is the top-level directory name under which you want the SAS System directories to reside. We recommend `disk:[SAS609E]`. Supply the device name, a complete directory path or a rooted logical, press RETURN, and proceed.

On the next screen, Figure 7, the installation procedure verifies the root directory location.

```

                                VERIFICATION OF TARGET LOCATION

The target location you specified has been expanded and the [SASnnn]
directory has been added if omitted from your specification.  If you
wish to change this specification, press PF2 at this time.  If you
press RETURN, the installation procedure will continue and perform
additional verification to ensure write access to the location
indicated below.

DISK: [SAS609E]

Press RETURN to continue                Press PF1 for HELP
Press PF2 to select a NEW target location Press PF4 to EXIT
```

Figure 7: Verifying the Root Directory Location

If the directory specification is acceptable, press RETURN to continue.

If the installation procedure discovers that the Base SAS System already exists under your root directory, the following screen, Figure 8, is displayed:

```

                                ROOT DIRECTORY ALREADY CONTAINS A SAS SYSTEM

The root directory specified already contains a SAS System. For add-
on products or maintenance, this is the correct specification. You
should do one of the following:

o For add-on products, maintenance or options 2-7 on the MAIN MENU,
  you should use the specified root directory. Continue with the
  installation procedure.

Otherwise,

o Choose a different root directory specification.

o Exit from the installation procedure and check out what currently
  exists in the root directory that you entered. If want to use
  that root directory, clean up what is currently there before re-
  starting the installation procedure.

Press RETURN to continue                               Press PF1 for HELP
Press PF2 to select a NEW target location               Press PF4 to EXIT
```

Figure 8: Root Directory Information Screen

If you press PF2 or type `IGNORE` and press RETURN, you are prompted for the target location again.

If you press RETURN the installation procedure will once again warn you that it will use an existing SAS root directory. In Figure 9 you are asked to enter the name of any valid media drive attached to your system. The media drive name that you supply is equated to `SASTAPE` and entered in the SAS System startup command file, `SAS$ROOT:[TOOLS]SAS609E.COM`.

```

                                DEFINE THE DEFAULT MEDIA DRIVE

Enter a media drive specification. The media drive specified must be
attached to the system where you are running the installation procedure;
otherwise, you can specify the null device, NL:.

The media drive you specify will be defined to the logical name,
SASTAPE, in SAS$ROOT:[TOOLS]SASnnn.COM (where "nnn" is the release
number of the SAS System).

If you are running from a media device, the default is the device that
you are now using to install the SAS System. If you are running from a
disk device, the default is defined as NL:.

SAS_INSTALL>>> DKA400:

Press PF1 for HELP                                Press PF4 to EXIT

```

Figure 9: Defining the Default Media Drive

The media drive name is verified. If you do not have a media device attached to this system, you can specify the null device, NL:, and it will be assigned to the logical name SASTAPE.

Supply the name and press RETURN. You receive the following messages if you are installing the SAS System for the first time:

```

%SAS-I-CRT-SASDIR, Creating disk:[SAS609E.HELP]...

%SAS-I-CRT-SASDIR, Creating disk:[SAS609E.TOOLS]...

* Do you want the installation save sets copied to disk:[SAS609E.INSTALL.SRC] [N]?

%SAS-I-RQ_SPC, Miscellaneous Installation Tools require(s)
-SAS-I-RQ_SPC, nnn blocks of disk space ->
-SAS-I-RQ_SPC, mnnn blocks available on 'device'...

%SAS-I-RSTR-CPY, Moving Miscellaneous Installation Tools, VMI$TOOLDIR:*.*,
-SAS-I-RSTR-CPY, to disk:[SAS609E.TOOLS]...

%SAS-I-CHK-FILE, Checking for disk:[SAS609E.TOOLS]*.*;...

%SAS-I-RSTR-SCS, Miscellaneous Installation Tools were SUCCESSFULLY moved to
-SAS-I-RSTR-SCS, disk:[SAS609E.TOOLS]...

%SAS-I-TLFL-CPY, Copying SAS index list from
-SAS-I-TLFL-CPY, VMI$KWD:SAS_INDEX.LIST
-SAS-I-TLFL-CPY, to disk:[SAS609E.TOOLS]*.*;...

```

```
%SAS-I-TLFL-SCS, SAS index list was SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.TOOLS]...

%SAS-I-RQ-SPC, Government Notice require(s)
-SAS-I-RQ-SPC, nnn blocks of disk space ->
-SAS-I-RQ-SPC, nnn blocks available on 'device'

%SAS-I-RSTR-CPY, Moving Government Notice, VMI$KWD:GOVERNMENT.NOTICE;, to
-SAS-I-RSTR-CPY, disk:[SAS609E.TOOLS]...

%SAS-I-CHK-FILE, Checking for disk:[SAS609E.TOOLS]GOVERNMENT.NOTICE;...

%SAS-I-RSTR-SCS, Government notice was SUCCESSFULLY moved to
-SAS-I-RSTR-SCS, disk:[SAS609E.TOOLS]...

%SAS-I-TLFL-CPY, Copying Media checking tool from
-SAS-I-TLFL-CPY, VMI$KWD:SAS_CHECK_TPCNTNTS.COM;
-SAS-I-TLFL-CPY, to disk:[SAS609E.TOOLS]*.*;...

%SAS-I-TLFL-SCS, Media checking tool was SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.TOOLS]*.*;...

%SAS-I-TLFL-CPY, Copying Maintenance core catalog from
-SAS-I-TLFL-CPY, VMI$KWD:CORE.SASEB$CATALOG;
-SAS-I-TLFL-CPY, to disk:[SAS609E.HELP]*.*;...

%SAS-I-TLFL-SCS, Maintenance core catalog was SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.HELP]*.*;...

%SAS-I-TLFL-CPY, Copying SETINIT files from
-SAS-I-TLFL-CPY, VMI$KWD:SETINIT*.SAS
-SAS-I-TLFL-CPY, to disk:[SAS609E.TOOLS]*.*;...

%SAS-I-TLFL-SCS, SETINIT files were SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.TOOLS]...

%SAS-I-TLFL-CPY, Copying SAS quota checking command procedure from
-SAS-I-TLFL-CPY, VMI$KWD:SAS-QUOTA.COM
-SAS-I-TLFL-CPY, to disk:[SAS609E.TOOLS]*.*;...

%SAS-I-TLFL-SCS, SAS quota checking command procedure was SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.TOOLS]...

%SAS-I-CRT_INSTRTP, Creating the SAS System startup file,
-SAS-I-CRT_INSTRTP, VMI$KWD:INSTALL_SAS609E.COM,
-SAS-I-CRT_INSTRTP, that will be used during the installation procedure only...

%SAS-I-CHK_INSTRTP, Checking for the installation procedure's SAS System
-SAS-I-CHK_INSTRTP, startup file,VMI$KWD:INSTALL_SAS609E.COM...

%SAS-I-RUN_INSTRTP, Executing VMI$KWD:INSTALL_SAS609E.COM to set up all SAS
-SAS-I-RUN_INSTRTP, process logical names...

%SAS-I-CHK_STRTUP, Checking for an existing version of
-SAS-I-CHK_STRTUP, disk:[SAS609E.TOOLS]SAS609E.COM...

%SAS-I-CRT_SYSTRTP, Creating your system-specific SAS System startup file,
-SAS-I-CRT_SYSTRTP, SAS609E.COM...
```

```
%SAS-I-TLFL-CPY, Copying SAS System startup file from
-SAS-I-TLFL-CPY, VMI$KWD:SAS609E.COM
-SAS-I-TLFL-CPY, to disk:[SAS609E.TOOLS]SAS609E.COM;...
```

```
%SAS-I-TLFL-SCS, SAS System startup file was SUCCESSFULLY moved to
-SAS-I-TLFL-SCS, disk:[SAS609E.TOOLS]SAS609E.COM;...
```

1. You will be asked if you want installation save sets copied to `SAS$INSTALL:[SRC]` only if you are running from a tape device (such as 9-track or TK50).
 - If you answer `Y`, the installation save sets, `SAS060.*`, will be copied to `SAS$INSTALL:[SRC]` in the event that you need to run the installation procedure after all products are loaded.
 - If you answer `N`, the installation procedure will continue.
2. If a version of the SAS System startup file, `SAS$ROOT:[TOOLS]SAS609E.COM`, already exists, you will be asked if you would like to replace it with a new version generated by the installation procedure.

If you choose:

- to replace the current version of the SAS System startup file, the previous version will be renamed to `SAS$ROOT:[TOOLS]SAS609E.ORIGINAL_COM`, and the new version, `SAS$ROOT:[TOOLS]SAS609E.COM` will be created.
- not to replace the current version, no changes will be made to `SAS$ROOT:[TOOLS]SAS609E.COM`.

If you are running from 9-track tape or TK50 and are installing:

- SAS System Add-On products, you will not see any messages about the maintenance catalog, `CORE.SASEB$CATALOG`. The maintenance catalog is ONLY shipped with the Base SAS System.

You will also receive an additional prompt that asks if you want to copy the SETINIT text file from your customer media to `SAS$ROOT:[TOOLS]`. Answer `Y` if you want to use the SETINIT text file from your customer media rather than an existing SETINIT text file that already exists on disk.

- monthly SAS Notes, you will not see all of the messages listed above. The monthly SAS Notes should be installed into an existing Release 6.09E SAS System directory structure.

After you have received the messages above, you are returned to the option screen that you chose in the Main Menu. Or, for a full install, go directly to "Running a Full Installation or Installing SAS System Add-on Products."

Running a Full Installation or Installing SAS System Add-On Products

For all SAS software products, you have the opportunity to choose the product, as well as the product extensions that are associated with it, as described in Figure 10.

```
SELECT SAS SOFTWARE

You will now be prompted to select which SAS System products you wish
to unload from your customer media. You will be prompted for each item
(listed with disk space requirements). Respond with either "Y" or
"N". If you need more information about an item, press PF1 for HELP.

After you have finished making your product selections, a product
selection verification screen will appear. If you want to change
your product selection at that time, you will be re-prompted for each
product again.

Base SAS System (68850 disk blocks) Y
Base SAS Sample Programs (2000 disk blocks) Y
Base SAS System User-Written Extensions (200 disk blocks) Y

Press PF1 for HELP Press PF4 to EXIT
```

Figure 10: Selecting SAS System Products

- Enter Y if you want to load the product onto your system, and then press RETURN.
- Enter N if you do not want the product loaded onto your system, and then press RETURN.

The installation procedure then asks you if you want other extensions of the SAS System product (e.g., sample programs, user-written extensions, map data sets, OpenVMS-specific product extensions, etc.). Just as you did for the products, do the following:

- Enter Y if you want a particular extension for that product loaded onto your system, and then press RETURN.
- Enter N if you do not want a particular extension for that product loaded onto your system, and then press RETURN.

Once you have made all of your product selections, a product selection validation screen similar to Figure 11 appears. What you see on this screen depends upon the SAS products on the distribution media, and the products you have chosen.

```

                                VERIFY PRODUCT SELECTIONS

Base SAS System
Base SAS Sample Programs
Base SAS System User-Written Extensions
ALL-IN-1 Integration of the SAS System
CDA Support
CDD Engine
PROC FSDEVICE
Vector Processing Support
SAS/ASSIST Software
SAS/CONNECT Software
SAS/CONNECT Sample Programs
SAS/CALC Software
CBT101 - Fundamentals of the SAS System
CBT102 - Reading Raw Data & Fmtg. Values
CBT103 - Create & Modify Variables in DS
CBT104 - Developing Custom Applications
CBT105 - Create & Enhance Graph Output
CBT106 - Creating Tables - PROC TABULATE
SAS/EIS Software
SAS/ENGLISH Software
SAS/ENGLISH Sample Programs
SAS/INSIGHT Software
SAS/INSIGHT Sample Programs
SAS/LAB Software
SAS/PH-Clinical Software
SAS/PH-Clinical Sample Programs
SAS/SHARE Software
SAS/TOOLKIT Software - Required Files
SAS/TOOLKIT Software - C Component
SAS/TOOLKIT Software - PL/I Component

Press RETURN to install current selection          Press PF3 (more)
Press PF2 to CHANGE your product selection        Press PF4 to EXIT

```

Figure 11: Verifying Product Selections

You have the following options:

- ❑ If you do not need to review your entire selection or have finished reviewing your selection, press RETURN. You will leave full-screen mode and the installation of your selection begins.
- ❑ If the Press PF3 (more) prompt appears on your screen, you can continue to view your selection by pressing PF3. If you are running the installation procedure from a hardcopy console, press PF3, or type MORE, then press RETURN. You can continue to press PF3 until you reach the end of your product selection.
- ❑ If you want to change your product selection, press PF2 or type IGNORE and press RETURN. You will be re-prompted for each SAS software product contained on your customer tape.

Once you are satisfied with the product selection list, press RETURN to continue the installation procedure.

You will then see the following message on your screen:

```
Updating SAS$ROOT:[TOOLS]SAS_PRODUCT.LIST with your product
selection...
```

The installation procedure updates this file with the list of products selected for installation.

Note: Do NOT delete this file, as it will be used by other parts of the installation procedure.

You will then leave full-screen mode. The installation procedure will check for a pre-processing command procedure.

Loading Selections Onto Your System

In the next step, the installation procedure checks for available disk space before loading your product selection.

```
%SAS-I-CHK_SPACE, < product > require(s)
-SAS-I-CHK_SPACE, nnnnn blocks of disk space --->
-SAS-I-CHK_SPACE, nnnnn blocks available

%SAS-I-SPACE_OK, Disk space is OK for the installation of
-SAS-I-SPACE_OK, < product >...
```

where nnnnn represents the required amount of space and the amount of space available on the target disk and <product> is the name of the product you selected.

You will then receive messages indicating that the item selected during product selection is being loaded onto your system.

```
%SAS-I-LD_SVST, Loading < product >
-SAS-I-LD_SVST, onto your system...
```

If you are running the installation procedure from 9-track tape or TK50 and the SAS software product you want to load is on the next piece of media, you will receive the following prompt from the installation procedure:

```
%SAS-I-DSMNT_TP, Dismount media volume #nnnnnn and mount media volume
#nnnnnn...

<product> exists on media volume #nnnnnn. Please mount media volume
#nnnnnn.

*Press RETURN after you have mounted media volume #nnnnnn.
```

where nnnnnn refers to media volume numbers.

When all SAS products and extensions are loaded, the SAS System has been completely restored to disk. If you must exit at this time, you need not repeat the entire installation procedure; however, it is important that you do the following:

- rerun the installation procedure
- choose the options to install SAS Notes and load patches,
- apply license information,
- post-process all installed SAS software products,
- apply patches and source maintenance files, and
- run the ICP.

Installing SAS Notes and Loading Patches

This section of the installation procedure enables you to load SAS Notes that consist of Usage and Compatibility notes. Usage and Compatibility notes report SAS System usage tips, known problems, potential solutions to the problems, and compatibility issues that report differences between the SAS System releases.

Note: SAS System maintenance is loaded, and patches are ALWAYS loaded but not applied, during this part of the installation procedure.

The following pages progress through the procedure as it is displayed on the screen (or hardcopy console).

In the screen displayed in Figure 12,

- pressing RETURN causes the SAS Notes and patches to be loaded onto your system.
- pressing PF2 causes the SAS Notes and patches **not** to be loaded.

```

                                INSTALLATION OF SAS NOTES

SAS Notes consist of Usage and Compatibility Notes. In addition, SAS
Notes include current patches to the SAS System and source maintenance
files.

If you do not wish to install the Usage and Compatibility Notes now,
you may install them at a later time.

Patches will be loaded into SAS$ROOT:[USAGE,PATCH].

Source maintenance files will be loaded into the appropriate location
based on the products installed.

Press RETURN to install the SAS Notes, patches and source maintenance
files at this time.

Press RETURN to continue                               Press PF1 for HELP
Press PF2 to continue WITHOUT installing SAS Notes     Press PF4 to EXIT
```

Figure 12: Installing SAS Notes

If you chose to load SAS Notes and patches, the following messages are displayed:

```
%SAS-I-MVUSG_FLS, Moving SAS NOTES from source to:  
-SAS-I-MVUSG_FLS, disk:[SAS609E.USAGE]...
```

```
%SAS-I-LD_SVST, Loading SAS NOTES...
```

```
%SAS-I-MVUSG_FLS, Moving PATCHES from source to:  
-SAS-I-MVUSG_FLS, disk:[SAS609E.USAGE.PATCH]...
```

```
%SAS-I-LD_SVST, Loading PATCHES...
```

Included in this section of the installation procedure is the loading of the source maintenance files (if any are available). These files contain fixes to the SAS System and must be installed to update your version of the SAS System to the maintenance level supported by SAS Institute Technical Support.

Note: The install compares the TS level of the SAS System on your system to the TS level of source maintenance files on your media. If they are equal, source maintenance files are installed. If the TS level of the installed SAS System is *greater than* the TS level of the source maintenance files on your media, source maintenance files will not install. This condition signals that the media is older than the version of the installed SAS System.

At this point, the SAS Notes, source maintenance files, and patches have been loaded onto your system. If you are running a full or add-on installation, continue with "Licensing the SAS System." If you are not performing a full or add-on installation, return to the Main Menu where you can make another selection.

Licensing the SAS System

If you are installing the SAS System for the first time, you have the option of using the maintenance catalog that contains all your site-specific licensing information, or a license file that you have on disk.

If you are installing the Base SAS System, licensing information is pre-applied to a maintenance catalog that contains important site-specific information. You have the option of using this maintenance catalog information, applying the licensing file (or SETINIT) that was supplied on your customer media, or specifying a SETINIT file (that already exists on your system) that you would like applied to your SAS System.

Note: The maintenance catalog is only shipped with the Base SAS product; therefore, you will only see this screen when you are installing the Base SAS product. If you are installing Add-On products, you are asked to specify the location of your SETINIT file on disk (see Figure 18: Supply a SETINIT Licensing File).

Figure 13 displays the first licensing screen.

```

                                LICENSE THE SAS SYSTEM

The SAS System maintenance catalog contains site-specific, pre-applied
licensing information. You have the option of using the maintenance
catalog that was supplied on your customer media or specifying the
name of a licensing (or SETINIT) file that currently exists on your
system and have it applied to your SAS System.

If you press RETURN, the maintenance catalog will be used for licensing
your SAS System.

Press RETURN to continue          Press PF1 for HELP
Press PF2 to supply your own SETINIT  Press PF4 to EXIT
```

Figure 13: The First Licensing Screen

If you choose to use the maintenance catalog, press RETURN.

If you must use your own SETINIT, press PF2 and proceed to the next screen, Figure 14. The next screen appears if you:

- installed the Base SAS product and chose NOT to use the maintenance catalog that was supplied on media
- installed SAS add-on products without Base SAS software.

```
                SUPPLY A SETINIT LICENSING FILE

You have the option of using the SETINIT licensing file from your
customer media, or to enter a full file specification for a different
SETINIT licensing file that currently exists on your system.

The SETINIT licensing file from your customer media has been loaded
previously into SAS$ROOT:[TOOLS]. To use this SETINIT, press RETURN.

Otherwise, specify a full file specification for a different SETINIT
file that exists on your system.

SAS_INSTALL>>> DISK:[SAS609E,TOOLS]SETINIT,SAS

Press PF1 for HELP                                Press PF4 to EXIT
```

Figure 14: Supply a SETINIT Licensing File

Enter the location of your SETINIT, press RETURN, and proceed.

If you choose:

- to use the maintenance catalog, a small test will run to make sure that the license has been applied correctly
- to use the SETINIT licensing file from your customer tape, your SETINIT will be applied to the SAS System
- to specify your own SETINIT, a copy of your SETINIT will be moved to SAS\$ROOT:[TOOLS], and your SETINIT will be applied to the SAS System.

Depending on which choice you made, you will see one of the following two messages:

```
%SAS-I-CHK_STNT, Since you chose to use the licensing information that
%SAS-I-CHK_STNT, already exists in SAS$ROOT:[HELP]CORE.SASEB$CATALOG,
%SAS-I-CHK_STNT, a short test will be run to ensure that the SETINIT
%SAS-I-CHK_STNT, licensing information was applied correctly.
```

or

```
%SAS-I-APPLY_STNT, The SETINIT will now be applied to your SAS System.
-SAS-I-APPLY_STNT,
-SAS-I-APPLY_STNT, SETINIT process started at 'date_time'
```

where `date_time` represents the date and time when the SETINIT process began to execute.

Regardless of the method you chose, you see the following messages:

```
%SAS-I-SET_DEF, Setting your default directory to
-SAS-I-SET_DEF, disk:[SAS609E.TOOLS]...

%SAS-I-DFN_SASIMG, Defining the logical, SAS$IMAGE, to
-SAS-I-DFN_SASIMG, disk:[SAS609E.IMAGE]SAS609E.EXE...

%SAS-I-CHK_CLD, Checking for VMI$KWD:SAS609E.CLD...

%SAS-I-CLD_FND, VMI$KWD:SAS609E.CLD was located...
```

Note: If `VMI$KWD:SAS609E.CLD` is not found, the installation procedure attempts to locate a copy of the installed `CLD` file in `SAS$ROOT:[IMAGE]`. Once located, the file is copied to `VMI$KWD` and the verb name is filtered out to `SASTEMP`.

```
%SAS-I-FLTR_CLD, Filtering VMI$KWD:SAS609E.CLD to change
-SAS-I-FLTR_CLD, verb name to SASTEMP...
```

Then, you will see a message indicating that either the SETINIT is being applied or that a short test will run to ensure that the SETINIT licensing information was applied correctly in `SAS$ROOT:[HELP]CORE.SASEB$CATALOG`.

```
%SAS-I-CHKFOR_STNTLOG, Checking for
-SAS-I-CHKFOR_STNTLOG, disk:[SAS609E.TOOLS]'test'.LOG...
```

where `'test'` will either be the file name for the SETINIT test file, or the SETINIT you specified.

```
%SAS-I-CHKFOR_STNTLOG, Checking disk:[SAS609E.TOOLS]'test'.log
-SAS-I-CHKFOR_STNTLOG, for errors...
```

Again, depending on the choice you made, one of the following two messages appears after the test has successfully completed:

```
%SAS-I-STNT_TST_SCS, The SETINIT test ran successfully...
```

or

```
%SAS-I-STNT_SCS, The SETINIT was applied successfully...
```

If you are running a full install, continue with "Post-Processing Installed SAS System Products." Otherwise, return to the Main Menu where you can make another selection.

Note: If your attempt to license the SAS System is unsuccessful, refer to the section titled "Non-Standard Licensing" in Section II, Part I, "Setting up and Maintaining the SAS System," of these installation instructions.

Post-Processing Procedure

When the installation process completes, post-processing begins. At the beginning of the post-processing procedure, you see the following screen:

```

                                POST-PROCESSING INSTALLED SAS SYSTEM PRODUCTS

Some of the SAS System products that have been installed on your system
require post-processing in order to be completely operational. It is
important to run all post-processing procedures in order to get full
support from the Technical Support Division.

We strongly recommend that you run all post-processing procedures during
installation so no manual post-processing is required once the
installation procedure is finished.

Press RETURN to continue                                Press PF1 for HELP
Press PF2 to continue WITHOUT post-processing products Press PF4 to EXIT
```

Figure 15: Post-Processing Screen

Some SAS System software products require post-processing after they are loaded onto your system. If a post-processing procedure exists, it is stored in:

```
SAS$ROOT:[TOOLS]POST_'save_set'.COM.
```

where 'save_set' represents the save set name for the product that requires post-processing. For example, if Base SAS software requires any post-processing, the post-processing procedure, SAS\$ROOT:[TOOLS]POST_BASE.COM, is invoked.

After a SAS software product that requires post-processing is loaded onto your system, the post-processing procedure is invoked. If any errors occur, you need to refer to the installation procedure log, SAS\$ROOT:[TOOLS]SAS609E_INSTALL.LOG, to see what caused the post-processing procedure to fail. You should also refer to the post-processing output log, SAS\$ROOT:[TOOLS]POST_'save_set'.LOG. After you have determined what caused the error and corrected it, simply reinvoke the post-processing procedure interactively:

```
$ @SAS$ROOT:[TOOLS]POST_'save_set'.COM
```

Note: There is only one post-processing file for all SAS/TUTOR courses:
SAS\$ROOT:[TOOLS]POST_CBT.COM. A log file will be generated by this post-processing procedure. It is located in SAS\$ROOT:[TOOLS]POST_CBT.LOG.

Applying Patches

You are prompted whether or not to apply patches to your SAS System. **SPECIAL CONSIDERATION** patches are loaded onto your system by default. You can apply these to your system either during the installation procedure or at a later time. See Appendix G, "Applying Patches and Installing SAS Notes" for more information.

Patches are applied to the products for which you are licensed in your installed version of Release 6.09E of the SAS System. The following patches are included on the tape:

- REQUIRED** — fix problems that may result in incorrect statistical output or data integrity problems.
- HIGHLY RECOMMENDED** — fix problems that are serious but that do not exhibit data integrity problems or problems that may invalidate statistical output.
- RECOMMENDED** — fix less serious problems that may affect output and formatting. These patches are applied only if requested.
- SPECIAL CONSIDERATION** — are not required and should not be applied until the corresponding Usage Note is read.

Note: You **MUST** have already executed option 3 of "Installing SAS Notes and Loading Patches" in order to apply patches to the SAS System at this point in the installation procedure.

If you choose to apply patches during installation, patches that have already been applied to your version of the SAS System are not reapplied.

The screen displayed in Figure 16 offers you the opportunity to apply patches to the product automatically. SAS Institute encourages you to apply the patches at this time to be sure you are at the highest possible support level.

```

                APPLYING PATCHES TO SAS SOFTWARE PRODUCTS

Patches to correct the SAS System are included on the installation
media. At this time, you may select to have them applied automatically
or continue without applying the patches. If you decide to apply the
patches now, the required and highly recommended patches for each
product installed on your system will be applied.

You will be given the opportunity to review information about each
patch and decide whether you wish to apply the recommended patches for
each product. Special consideration patches will not be applied at this
time.

Press RETURN to continue                Press PF1 for HELP
Press PF2 to continue WITHOUT applying patches  Press PF4 to EXIT
```

Figure 16: Applying Patches

Press RETURN to continue with the installation.

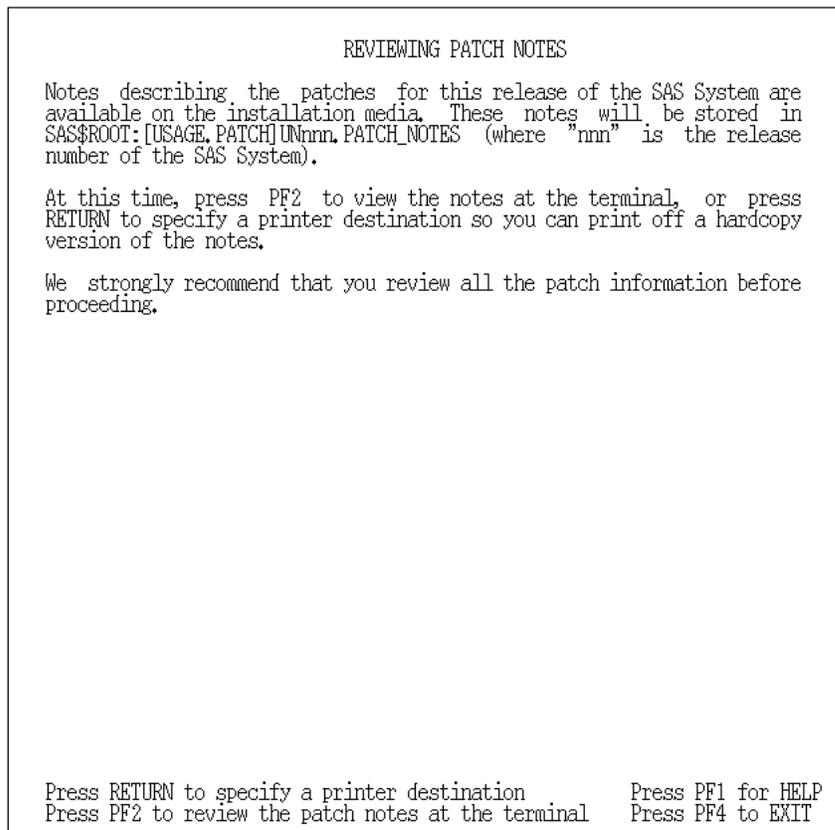


Figure 17: Reviewing Patch Notes

In the screen displayed in Figure 17 you are given the options for reviewing patch notes.

- Press RETURN to spool the patch notes information to the printer defined as SYS\$PRINT on your system.
- Press PF2 to display the patch notes information on your terminal.

We recommend that you review the patch notes information before proceeding with the installation.

If you choose to print the patch notes, the screen shown in Figure 18 appears.

```
                SPECIFY A PRINTER DESTINATION FOR PATCH NOTES

You have the option of specifying a printer destination for patch notes
at this time. When specifying a printer destination, be sure to specify
a printer device attached to your system.

If you want to use the default printer destination, SYS$PRINT, press
RETURN; otherwise, type an alternate printer destination, then press
RETURN.

SAS_INSTALL>>> SYS$PRINT

Press PF1 for HELP                                Press PF4 to EXIT
```

Figure 18: Specifying a Printer Destination for Patch Notes

You have the option of using the default printer, `SYS$PRINT`, or you can specify an alternate printer destination. When specifying an alternate printer destination, be sure that the printer is one that is currently attached to your system.

Files modified by the installation procedure should be copied and saved. The saved copies enable you to restore the system, if necessary. If the saved files consume too much disk space, back them up to tape. In Figure 23 you are provided with options for saving files and purging older versions.

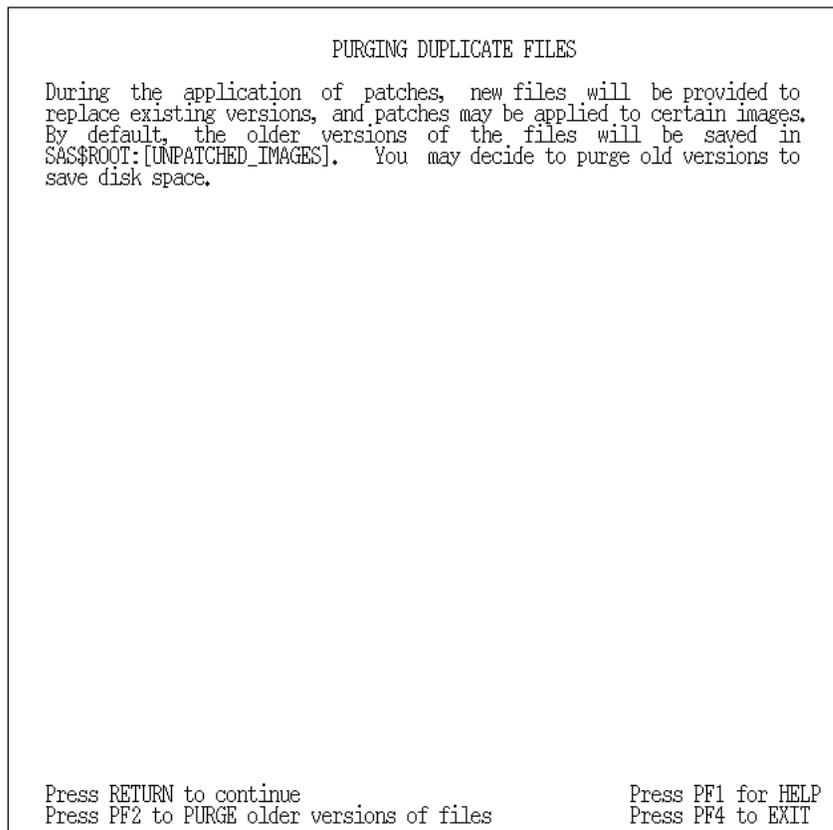


Figure 19: Purging Duplicate Files

If you press :

- RETURN, the installation procedure saves copies of images in SAS\$ROOT:[UNPATCHED_IMAGES] before patches are applied.
- PF2, the installation procedure continues without saving copies of the unpatched images.

When you continue, Figure 20 appears, giving you the option to apply `RECOMMENDED` patches. Review the patch notes to see what patches are available and decide whether you want to apply the `RECOMMENDED` patches for that product.

```

                APPLYING PATCHES DURING INSTALLATION

The installation media contains patches for certain executable images of
the SAS System. Some of these patches are REQUIRED, others are
RECOMMENDED. The patches that are considered REQUIRED and HIGHLY
RECOMMENDED will be automatically applied for all installed products.

You will be prompted before the RECOMMENDED patches are applied to each
of the SAS System products that are installed on your system.

The REQUIRED and HIGHLY RECOMMENDED patches will be applied for
Base SAS System

Do you wish to apply the RECOMMENDED patches for
Base SAS System

Press RETURN to continue                Press PF1 for HELP
Press PF2 to NOT apply RECOMMENDED patches    Press PF4 to EXIT

```

Figure 20: Applying Patches

Press `RETURN` if you want to apply the `RECOMMENDED` patches. You will leave full-screen mode and receive informational messages as patches are applied to your SAS System. If you do not want to apply recommended patches, press `PF2`. If you decide later to apply the `RECOMMENDED` patches, invoke the installation procedure again and choose Option 6 from the Main Menu.

Running the Installation Certification Procedure (ICP)

```
                INSTALLATION CERTIFICATION PROCEDURE

When you press RETURN, your SAS System will be tested by running the
Installation Certification Procedure (ICP). By default, the test for
the Base SAS System will run first.

Upon completion of the ICP, you will be notified if the ICP was
successful. The following SAS software products will also be tested:

SAS/LAB Software
SAS/GRAPH Software
SAS/STAT Software
SAS/ETS Software
SAS/OR Software
SAS/ACCESS Interface to ORACLE
SAS/ACCESS Interface to Rdb
SAS/ACCESS Interface to Sybase
SAS/IML Software
SAS/QC Software

Press RETURN to continue                               Press PF1 for HELP
```

Figure 21: Installation Certification Procedure

You have the following options:

- If you do not need to review the list of products that will be tested, or have finished reviewing the list, press RETURN. You leave full-screen mode and the Installation Certification Procedure test begins to run.
- If the Press PF3 (more) prompt appears on your screen, you can continue to view the list of products to be tested by pressing PF3. If you are running the installation procedure from a hardcopy console, you can either press PF3 or type MORE, then press RETURN. You can continue to press PF3 until you reach the end of the list of products to be tested.

Installation of the SAS System is then verified by the ICP. By default, the test for the base SAS System is executed. You are informed when the ICP has begun, when it ends, and whether or not it was successful.

If any test within the ICP fails, see "Recovering from Errors" at the beginning of this section. Otherwise, the ICP completes successfully and VMSINSTAL indicates that the installation procedure has completed.

You can install any products not loaded during this session by restarting the installation procedure and choosing Option 1 from the Main Menu, Full Installation or Installation of SAS System Add-on Products.

Section II, System Manager's Guide

Part I, Setting up and Maintaining the SAS[®] System

Part II, Optimizing System Performance

Part III, Appendices

Part I, Setting up and Maintaining the SAS® System

After the installation procedure has successfully completed, there are several things that need to be done to make access to the SAS System easier for users. There are also several `SYSGEN` parameters and `AUTHORIZE` quotas that can be adjusted for better SAS System performance. This section contains information on the following:

- SAS System Startup Command File
- `SAS$LIBRARY` Search List
- `SAS$IMAGE` Logical Name
- `SAS$EXTENSION` Logical Name
- parameters for installing the SAS image as a known image
- SAS Invocation via Command Language Definition
- running multiple versions of the SAS System
- non-standard licensing
- SAS Notes and Utilities
- special considerations for OpenVMS
- requirements for running the SAS System under the Display Manager.

The SAS System Startup Command File

The installation procedure places a copy of the command file, `SAS609E.COM`, in `SAS$ROOT:[TOOLS]`. This command file contains the logical name assignments necessary to run the SAS System, Release 6.09E.

```
$!-----
-----
$! Copyright (C), 1989, 1992 SAS Institute Inc.
$! Cary, N.C. 27513, U.S.A., All rights reserved.
$!-----
-
$! Name: SAS$ROOT:[TOOLS]SAS609E.COM
$! Purpose: This command file makes the necessary logical name assignments
$! needed to run the SAS System, Release 6.09E. It enters the
$! logical names in the SYSTEM logical name table.
$!
$! This command file should be invoked by the system startup command
$! file if Release 6.09E is to be the default version on
$! your system.
$!-----
-----
$
$ DEFINE/NOLOG/SYSTEM SASTAPE -
NL:
$ DEFINE/NOLOG/SYSTEM/TRANSLATION=(CONCEALED) SAS$ROOT -
SASdisk:[SASroot.]
$
$ DEFINE/NOLOG/SYSTEM/TRANSLATION=(CONCEALED) SAS$CBT -
SASdisk:[SASroot.CBT.]
$ DEFINE/NOLOG/SYSTEM/TRANSLATION=(CONCEALED) SAS$EXTENSION -
SASdisk:[SASroot.USER.]
```

```

$ DEFINE/NOLOG/SYSTEM/TRANSLATION=( CONCEALED)      SAS$INSTALL -
  SASdisk:[SASroot.INSTALL.]
$ DEFINE/NOLOG/SYSTEM/TRANSLATION=( CONCEALED)      SAS$SAMPLES -
  SASdisk:[SASroot.SAMPLES.]
$
$ DEFINE/NOLOG/SYSTEM SAS$LIBRARY                   SYS$DISK:[ ],-
  SAS$ROOT:[ PROCS ],-
  SAS$ROOT:[ IMAGE ],-
  SAS$EXTENSION:[ LOAD]
$
$ DEFINE/NOLOG/SYSTEM SAS$IMAGE                     SAS$ROOT:[ IMAGE]SAS609E.EXE
$ DEFINE/NOLOG/SYSTEM SAS$SHR                       SAS$LIBRARY:SAS$SHR.EXE
$ DEFINE/NOLOG/SYSTEM SAS$MSG                       SAS$LIBRARY:SAS$MSG.EXE
$ DEFINE/NOLOG/SYSTEM SAS$SING                     SAS$LIBRARY:SAS$SING.EXE
$ DEFINE/NOLOG/SYSTEM SAS$SORA                     SAS$LIBRARY:SAS$SORA_V6.EXE
$ DEFINE/NOLOG/SYSTEM SAS$SRDB                     SAS$LIBRARY:SAS$SRDB.EXE
$ DEFINE/NOLOG/SYSTEM SAS$SYB                      SAS$LIBRARY:SAS$SYB.EXE
$ DEFINE/NOLOG/SYSTEM SAS$UCX$ETC_SERVICES          SAS$ROOT:[ TOOLS]SERVICES.
$ DEFINE/NOLOG/SYSTEM SAS$WXFR                     SAS$LIBRARY:SAS$WXFR.EXE
$ DEFINE/NOLOG/SYSTEM/EXEC SAS$USS_PRIV             SAS$ROOT:[ IMAGE]SAS$USS_PRIV.EXE
$
$ DEFINE/NOLOG/SYSTEM SAS$AUTOS                     SAS$ROOT:[ HELP.AUTO]
$ DEFINE/NOLOG/SYSTEM SAS$HELP                     SAS$ROOT:[ HELP]
$ DEFINE/NOLOG/SYSTEM SAS$APPL                     SAS$HELP
$ DEFINE/NOLOG/SYSTEM SAS$FNT                      SAS$HELP
$ DEFINE/NOLOG/SYSTEM SAS$NEWS                     SAS$HELP:NEWS.DOC
$ DEFINE/NOLOG/SYSTEM SAS$CNTMISC                   SAS$ROOT:[ TOOLS]
$ DEFINE/NOLOG/SYSTEM SAS$MAPS                     SAS$ROOT:[ MAPS]
$ DEFINE/NOLOG/SYSTEM SAS$MSG                      SAS$ROOT:[ MESSAGE]
$ DEFINE/NOLOG/SYSTEM SAS$SITEINFO                 SAS$ROOT:[ TOOLS]SITEINFO.TXT
$
$ DEFINE/NOLOG/SYSTEM SAS$ALLIN1                    SAS$ROOT:[ ALLIN1]
$
$! Set up defaults for all users:
$
$ DEFINE/NOLOG/SYSTEM SAS$TERMINAL                  SYS$OUTPUT
$ DEFINE/NOLOG/SYSTEM SAS$LSEENV                    SAS$EXTENSION:[ LSEEDIT]SAS.ENV
$ DEFINE/NOLOG/SYSTEM SAS$GDEVICE                   SAS$TERMINAL
$ DEFINE/NOLOG/SYSTEM SAS$TPUDIR                    SAS$ROOT:[ TOOLS]
$ DEFINE/NOLOG/SYSTEM SAS$SECTION                   SAS$TPUDIR:SAS$IO.TPU$SECTION
$ DEFINE/NOLOG/SYSTEM SAS$WORKROOT                  SYS$DISK:[ ]
$ DEFINE/NOLOG/SYSTEM SAS$XDEFAULTS                 SYS$LOGIN:SAS$XDEFAULTS.DAT
$ DEFINE/NOLOG/SYSTEM SAS$USER                      SYS$LOGIN
$
$! These logicals are used by the sample programs:
$ DEFINE/NOLOG/SYSTEM SAS$SAMP_SIO                   SAS$SAMPLES:[ SAS$DATA]
$ DEFINE/NOLOG/SYSTEM SAS$MAPS                      SAS$MAPS
$
$ EXIT

```

Note: The installed version of the SAS System startup command file includes comments describing the purpose of each logical name definition.

The SAS\$LIBRARY Search List

SAS\$LIBRARY is a site-specific search string logical that determines search criteria for Release 6.09E. The SAS System searches for images to load for execution during a SAS session according to the SAS\$LIBRARY search list, whether they are user-created images or images supplied by SAS Institute. SAS\$LIBRARY is defined by the following search path:

```
$ DEFINE SAS$LIBRARY      SYS$DISK:[ ],-
                          SAS$ROOT:[ PROCS ],-
                          SAS$ROOT:[ IMAGE ],-
                          SAS$EXTENSION:[ LOAD]
```

The SAS System searches initially for the executable image (for example, a function or procedure) in your default directory; then, in the directory referenced by SAS\$ROOT:[PROCS] that contains SAS procedures, formats, informats, and functions; then, in SAS\$ROOT:[IMAGE] that contains the Base SAS image; and finally, in the directory SAS\$EXTENSION:[LOAD] for user-written images or samples of user images supplied by SAS Institute or customized at your site.

This search string can be modified for site specifications. For example, if you stored formats, procedures, informats, and site-specific functions in a local directory, you might tailor your SAS\$LIBRARY as follows:

```
$ DEFINE SAS$LIBRARY      SYS$DISK:[ ],-
                          SAS$ROOT:[ PROCS ],-
                          SAS$ROOT:[ IMAGE ],-
                          SAS$EXTENSION:[ LOAD ],-
                          DISK1:[ LOCAL_SAS_IMAGES]
```

The SAS\$IMAGE Logical Name

SAS\$IMAGE is a logical name that is used to activate the main SAS System image. It is defined, by default, as SAS\$ROOT:[IMAGE]SAS609E.EXE.

The SAS\$EXTENSION Logical Name

SAS\$EXTENSION is the logical name for SAS\$ROOT:[USER.]. The SAS\$ROOT:[USER] directory is the root directory for subdirectories containing extensions to the SAS language. These subdirectories contain the source code and samples for formats, functions, informats, drivers, and procedures supplied as examples by SAS Institute. Executable example files are in the SAS\$EXTENSION:[LOAD] directory, which is part of the SAS\$LIBRARY search path.

The user may search the SAS\$EXTENSION subdirectories and read the source code comments for examples of extensions to the language. These examples may serve the user as a model for user-written applications or as extensions to the SAS language.

Parameters for Installing the SAS Image as a Known Image

You have the option of installing the Base SAS image, `SAS$ROOT:[IMAGE]SAS609E.EXE`, as a known image. Doing so may improve performance, but requires that you dedicate more system resources to the SAS System.

Notes:

- ❑ If you plan on running multiple versions of the SAS System concurrently, please use caution with installing images in the known image table. The images `SASXKERN.EXE`, `SASAXDM.EXE`, `SASXKINI.EXE` and `SASDS.EXE` are common images between all releases of the SAS System. If you have installed these images for one release of the SAS System, you cannot install these images for another release of the SAS System. This is a limitation of the `INSTALL` utility under OpenVMS.
- ❑ V6-SYS.SYS-4365 documents this problem.

If you do choose to install the base SAS image as a known image, the following resources are required:

```
GBLPAGES      +438
GBLSECTIONS   +2
```

To check the parameters and their current usage, use the following commands:

```
$ INSTALL:== $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL LIST/GLOBAL/SUMMARY
```

```
Summary of Local Memory Global Sections
```

```
174 Global Sections Used,      21706/14294 Global Pages Used/Unused
```

Run `SYSGEN` to find out the maximum available global sections:

```
$ SET DEFAULT SYS$SYSTEM
$ RUN SYSGEN
```

```
SYSGEN> SHOW GBLSECTIONS
```

```
Parameter-name  Current  Default  Minimum  Maximum  Units  Dynamic
```

```
-----
```

```
GBLSECTIONS    190     128     20     4095    Sections
```

```
SYSGEN> EXIT
```

In the example, the number of available `GBLSECTIONS` is $190 - 174 = 16$. The number of free `GBLPAGES` is 14294. Both values exceed the minimum required, so you could install the SAS image as a known image without modifying the system parameters.

If the values do not meet the minimum requirement, increase the parameter values by adding the following lines to the `SYS$SYSTEM:MODPARAMS.DAT` file (see the section "SYSGEN Parameters"):

```
ADD_GBLSECTIONS=2
ADD_GBLPAGES=438
```

To ensure that the Base SAS image is installed as a known image and is available to users each time the system is booted, you should place these commands in the system start-up file:

```
$ @SASdisk:[SASroot.TOOLS]SAS609E.COM
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL ADD SAS$ROOT:[IMAGE]SAS609E.EXE/OPEN/SHARED
```

where `SASdisk` is the disk containing the SAS System, and `SASroot` is the root directory of the SAS System.

The same procedure should be followed for these images:

IMAGE	GLOBAL SECTIONS	GLOBAL PAGES
<code>SAS\$LIBRARY:SASXKERN.EXE</code>	3	643
<code>SAS\$LIBRARY:SASXKINI.EXE</code>	3	71
<code>SAS\$LIBRARY:SASXDM.EXE</code>	3	164
<code>SAS\$LIBRARY:SASDS.EXE</code>	3	493

Refer to "Privileged Image Unloading" in Special Considerations for OpenVMS for information on installing the system service, `SAS_USS_PRIV.EXE`, to enable privileged unloading.

SAS Invocation via Command Language Definition File

In Release 6.09E, the SAS System is invoked by a CLD command. The `SAS` command is defined by the command language definition file `SAS$LIBRARY:SAS609E.CLD`. This file defines the verb `SAS` to invoke the image, `SAS$IMAGE`, that is defined in `SAS$ROOT:[TOOLS]SAS609E.COM`.

The SAS command line options are defined as qualifiers in the `CLD` file. Refer to the *VMS Command Definition Utility Reference Manual* for more information regarding `CLD` files. The system DCL command table contains all verb definitions known to the system. It must be modified to make the verb, `SAS`, available to users. Due to the importance of the system DCL tables to all users, it is wise to verify its location before issuing the commands specified below. There is only one `DCLTABLES.EXE` that is accessed when users log on; if there are multiple copies of the file in different directories on your system, you must check to see which one is actually installed on your system as a known image. Failure to update and install the correct image can result in users being locked out of your system until you have fixed the problem.

The DCL tables normally reside in `SYS$LIBRARY`. However, since `SYS$LIBRARY` is a search string logical, you must use the `INSTALL` utility to determine where the active DCL tables reside. Note that the image is installed with the parameters `OPEN`, `HDR`, `SHAR`, and `LNKBL`. These options must be connected with the image to make it available and usable to all users on your system. For example, you might execute the following commands:

```
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL LIST SYS$SPECIFIC:[SYSLIB]DCLTABLES
$ INSTALL LIST SYS$COMMON:[SYSLIB]DCLTABLES
```

The first command above simply provides a convenient abbreviation for accessing the OpenVMS `INSTALL` utility. Only one of the last two commands generates the desired information. The path displayed for the file is the proper path to that file.

If the SAS System is licensed for a single node and/or you are maintaining node-specific DCL Tables, issue the following command on the licensed node:

```
$ SET COMMAND/TABLES=SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE -
  /OUTPUT=SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE -
  SAS$ROOT:[IMAGE]SAS609E.CLD
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL REPLACE SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE
```

To make the `SAS` command known to all users, you must issue the following commands if your active DCL tables reference the `SYS$COMMON` directory:

```
$ SET COMMAND/TABLES=SYS$COMMON:[SYSLIB]DCLTABLES.EXE -
  /OUTPUT=SYS$COMMON:[SYSLIB]DCLTABLES.EXE -
  SAS$ROOT:[IMAGE]SAS609E.CLD
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL REPLACE SYS$COMMON:[SYSLIB]DCLTABLES.EXE
```

Users then have access to Release 6.09E of the SAS System by executing the command: `SAS` at the DCL prompt (`$`).

Because OpenVMS requires that command qualifiers be unique through the first four characters, several options use an alias on the command line. If the option is not a command line or configuration-only option, the complete name, as well as its alias, is accepted on the `OPTIONS` statement when the SAS System is invoked. Refer to *SAS Companion for the OpenVMS Environment, Version 6, Second Edition*, for a complete list of options and their appropriate aliases.

Deleting a SAS Command Definition from a Command Table

If you want to remove an old version of the SAS command from the DCL tables, delete the SAS command from the DCL tables, then re-install the DCLTABLES image.

Execute the following commands:

- ❑ if the SAS command has been made available to all users and your active DCL tables reference the SYS\$COMMON directory.

```
$ SET COMMAND/DELETE=(SAS_COMMAND)-
    /TABLE=SYS$COMMON:[SYSLIB]DCLTABLES.EXE-
    /OUTPUT=SYS$COMMON:[SYSLIB]DCLTABLES.EXE
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL REPLACE SYS$COMMON:[SYSLIB]DCLTABLES.EXE
```

where SAS_COMMAND refers to the SAS command used at your site (e.g., SAS or SAS609E).

- ❑ if the SAS System is licensed for a single node and/or you are maintaining node-specific DCL tables.

```
$ SET COMMAND/DELETE=(SAS_COMMAND)-
    /TABLE=SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE-
    /OUTPUT=SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE
$ INSTALL ::= $SYS$SYSTEM:INSTALL/COMMAND
$ INSTALL REPLACE SYS$SPECIFIC:[SYSLIB]DCLTABLES.EXE
```

where SAS_COMMAND refers to the SAS command used at your site (e.g., SAS or SAS609E).

Running Multiple Versions of the SAS System

If you set up the environment as documented in "Setting Up and Maintaining the SAS System," you invoke Release 6.09E of the SAS System when you type SAS at the system prompt (\$). If you would like to have Release 6.08 be a secondary version for a test period, you can modify the file SAS\$ROOT:[TOOLS]SAS608.COM, to specify PROCESS or USER level logicals. Edit the CLD file, SAS\$ROOT:[IMAGE]SAS608.CLD, and change the SAS verb name to SAS608. After executing SAS608.COM, you can invoke Release 6.08 of the SAS System by executing the new SAS608 verb.

You can also access earlier versions of the SAS System after the latest version has been installed. Each version of the SAS System has a number of distinct support files necessary to execute that particular version of the SAS System. These support files are not interchangeable with support files for other versions. To invoke an earlier version of the SAS System, you can create a command file that temporarily changes the logical name definitions to point to the earlier version for those users who want to access it.

Note: See "Defining a Release of the SAS System as a Secondary Version," later in this chapter for more information.

Running Release 6.09E of the SAS System in Compatibility Mode

In Releases 6.07, 6.08, and 6.09E data files that are created by the SAS System are faster and smaller than data files created by Release 6.06 of the SAS System; however, the data files created by Releases 6.07, 6.08, and 6.09E are not readable by Release 6.06 software.

You should install Release 6.09E of the SAS System to run in compatibility mode if either of the following is true:

you want to run Releases 6.09E and 6.06 of the SAS System concurrently

or

you want SAS data files created by Release 6.09E to be read by Release 6.06.

Compatibility mode implies that files will be larger and that I/O will be somewhat slower.

To run Release 6.09E in compatibility mode, invoke Release 6.09E from a privileged account and run the following SAS statements:

```
proc nickname;  
  add n=v607 module=saseb release=6.09 filefmt=607 np;  
  add n=v606 module=saseb release=6.09 filefmt=606 p;  
quit;
```

where **P** stands for "Preferred" and **NP** means "Not Preferred". To reverse the process (when conversion to Release 6.09E is complete), reverse the **P** and **NP** specifications and rerun the code. By executing these SAS statements, the V606 engine becomes the preferred engine for Release 6.09E by default and the V607 engine becomes the optional engine.

Note: The default engine for Release 6.09E is **V609**.

In order for these statements to take effect, you must have **WRITE** access to the **CORE** catalog in the **SAS\$ROOT:[HELP]** directory.

The purpose of this process is to change the default engine to be used when running Release 6.09E of the SAS System under OpenVMS to the Release 6.06 engine so that newly created files and catalogs can be used by Release 6.06 of the SAS System under OpenVMS. You may also explicitly specify engines in **LIBNAME** statements; this will override the default specification.

Note: Because of performance enhancement and new functionality in the Release 6.09E engine, we recommend converting Release 6.06 files if they are to be used in production jobs. If your site does not have a large collection of 6.06 files in production, this procedure is unnecessary.

Defining a Release of the SAS System as a Secondary Version

It is possible to run more than one version of the SAS System at the same time. A site may choose to do this when running the current release as production and a new release in "test" mode during transition from one release to another. In order to run two releases of the SAS System concurrently, there are a few steps to follow so that both releases can coexist on your system. This section describes one way of setting up a release of the SAS System as a secondary, or test release without disrupting users of the current production release.

Although this section refers to Release 6.08 of the SAS System as the current production release, and Release 6.09E of the SAS System as the new release for the sake of example, the concepts covered apply to any release of the SAS System from Release 5.18 to Release 6.09E.

One of the main advantages of the technique described here is that you will be able to run either release of the SAS System from the same session without logging off to reset your environment.

All releases of the SAS System require that a set of logical names and an OpenVMS command verb be defined. In order to avoid logical name and command verb collisions, care must be taken. Assume that the following conditions at your site are true:

- ❑ the command verb `SAS` is defined for the current release
- ❑ the current release logical names are defined as `SYSTEM` mode logical names. When you issue the command, `SHOW LOGICAL SAS*`, the list of logical names will include the reference `"(LNM$SYSTEM_TABLE)"`.

For the secondary release, you define the new release logical names so that they do not conflict with the production release logical names, and define a unique command verb to invoke the new release.

To achieve these results, follow these steps:

- ❑ Set up a command file that defines the new release logical names as `USER_MODE` logical names. You may modify the existing command file `SAS$ROOT:[TOOLS]SASnnn.COM` where `nnn` refers to the SAS release level.
- ❑ Because `USER_MODE` logical names only exist for the duration of the command file execution, invoke the new release of the SAS System in the same command file.
- ❑ Define a new command verb for the new release.
- ❑ Define a symbol that will execute the command file and invoke the new release.

The following is an abbreviated version of the new command file. Using the command file generated for your site during the installation of Release 6.09E, SAS\$ROOT:[TOOLS]SAS609E.COM, the first step is to change all references of DEFINE/NOLOG/SYSTEM to DEFINE/NOLOG/USER, and then add two lines to the end of the file (indicated by *).

```

$ DEFINE/NOLOG/USER  SASTAPE                               NL:
$ DEFINE/NOLOG/USER/TRANSLATION=(CONCEALED) SAS$ROOT -
    USER$DISK:[SAS609E.]
.
.
$ DEFINE/NOLOG/USER MAPS                               SAS$MAPS
$! THE NEXT TWO LINES ARE THE NEW ADDITIONS:
* $ DEASSIGN SYS$INPUT
* $ SASV6 'P2 'P3 'P4 'P5
$
$ EXIT

```

The command DEASSIGN SYS\$INPUT is required because it returns control to the user from this command file. If it is not issued, the SAS System expects commands from the command file, rather than the user.

Notice that you must invoke Release 6.09E with a command verb that differs from the one previously defined for Release 6.08. The actual command verb used is not pertinent because your users will be accessing this command file with a symbol that is different from BOTH command verbs. Since there are many command line options available at SAS invocation, it is recommended that users be provided with multiple parameter placeholders, as in the example, 'P2 'P3 'P4 'P5. Four parameters should cover most needs, but you may add more.

Next you edit the file SAS\$ROOT:[IMAGE]SAS609E.CLD to change the command verb. Look for a line that begins with DEFINE VERB and change it to DEFINE VERB SASV6.

Note: An important consideration when changing a command verb is that some versions of OpenVMS require that the first 4 characters of the verb be uniquely defined. Using two command verbs such as SASV5 and SASV6 on your system does not meet this criteria.

Next, you can define the new command verb permanently to your system by following the instructions in the section entitled "SAS Invocation via Command Language Definition File," or you can define the command verb at login time. The advantage of the first option is that once it is done, you do not have to worry about it. The disadvantage is that it is harder to remove an entry in the system DCLTABLES once it is in place. In addition, because the second choice only effects a process memory-resident version of the DCLTABLES that is reconstructed whenever a user logs in, there may be a slightly longer wait at login time.

To define the new command verb temporarily at login time in the process memory-resident `DCLTABLES` the following command should be added to the `SYS$MANAGER:SYSLOGIN.COM` file for all users, or placed in individual users' `LOGIN.COM` files. In this example, assume that Release 6.09E is installed on a disk called `USER$DISK1` in directory `[SOFTWARE]`. You should make the appropriate changes for your site.

```
$ SET COMMAND USER$DISK1:[SOFTWARE.SAS609E.IMAGE]SAS609E.CLD
```

The next steps are to define a symbol that invokes the command file, and run the "test" version of the SAS System. The following example can be defined in the system `SYLOGIN.COM`, or in individual user `LOGIN.COM` files. Once again, assume Release 6.09E was installed in `USER$DISK1:[SOFTWARE.SAS609E]`.

```
$ SAS609E ::= "@USER$DISK1:[SOFTWARE.SAS609E.TOOLS]SAS609E.COM FILLER"
```

The `@` is a command that takes one qualifier, `/OUTPUT`, and may ignore whatever the user enters as their first parameter for SAS. Using `FILLER` and beginning with parameter `P2` allows user parameters to be passed to the command file.

You now have a command file that is invoked by a symbol, `SAS609E`, which defines the Release 6.09E logical names temporarily and invokes Release 6.09E of the SAS System using the command verb `SASV6`. You may name the symbol and the command verb whatever you like, but they cannot be the same name for both purposes, and they cannot be the same as the one used for Release 6.08.

Notes:

- ❑ Due to the change in purpose of the `SAS$INIT` logical name between Release 5.18 and Release 6.09E, as well as many option changes, take special care in the use of the `SAS$INIT` logical name for Release 5.18. We advise that you do **not** define `SAS$INIT` as a system mode logical name in your `SYSTARTUP_V5.COM` any longer, but instead define it as a process mode logical name in the `SYS$MANAGER:SYLOGIN.COM` file, so that users can de-assign and reassign it as needed for the two releases. Alternatively, `SAS$INIT` can be defined as a user mode logical name in a command file that runs each release.
- ❑ In recent releases, some changes to file structure may be implemented that may cause incompatibilities with previous releases. Users should be aware that making changes to key definitions, screen size, or color options when using a new release of the SAS System may cause the user profile to be corrupted for access by earlier releases of the SAS System.
- ❑ If you plan on running multiple versions of the SAS System concurrently, please use caution with installing images in the known image table. The images `SASXKERN.EXE`, `SASAXDM.EXE`, `SASXKINI.EXE` and `SASDS.EXE` are common images between all releases of the SAS System. If you have installed these images for one release of the SAS System, you cannot install these images for another release of the SAS System. This is a limitation of the `INSTALL` utility under OpenVMS.

Non-Standard Licensing and Running ICP Tests

This section describes how to certify your SAS System if you do not want to use the information in the SETINIT file supplied on the installation tape. Do **not** use the SETINIT on the tape if:

- you are a VMScluster or Local Area VMScluster and your machine was added to the contract after the original installation tape was created. The SAS System distribution tape from which you are installing was originally generated for a cluster with a different configuration than currently exists.
- your SAS license has been renewed. You must apply the new license data to keep your SAS System running.
- the license information that was supplied on your SAS System distribution tape is incorrect. Call your SAS Contract Administrator to get the correct SETINIT information.

Note: Any change requests for your license parameters (other than those required because of a clerical error) must be submitted in writing on your company's official stationary to your Contract Administrator at SAS Institute. These requests include changing the serial number or CPU model specification when you upgrade your hardware.

Before You Apply the SETINIT

Do the following before attempting to apply a new SETINIT to your system:

- Make sure that you have `WRITE` access to `SAS$ROOT:[HELP]CORE.SASEB$CATALOG` and `SAS$ROOT:[TOOLS]SETINIT.SAS`.
- Make a backup copy of `SAS$ROOT:[HELP]CORE.SASEB$CATALOG`.
- Copy `SAS$ROOT:[TOOLS]SETINIT.SAS` to `SAS$ROOT:[TOOLS]ORIGINAL_SETINIT.SAS`.
- Make the required changes to `SAS$ROOT:[TOOLS]SETINIT.SAS` by using a standard OpenVMS editing tool.
- Type the information that is included in your `SETINIT.SAS` file **exactly** as it appears.

Steps to Apply the SETINIT

To apply the SETINIT information, you can do one of the following:

- Reinvoke the installation procedure and select Option 4, License the SAS System. After your SETINIT has been applied successfully, select Option 7, Run the Installation Certification Procedure.

or

- Set the default to the SAS\$ROOT:[TOOLS] directory. Make sure that the following steps have already been executed:
 1. Set up the SAS logical names by executing the SAS System startup file,
 - for a production system:
\$ @SASROOT:[TOOLS]SAS609E.COM
 2. Set up the SAS verb by doing either:
 - \$ SET COMMAND SAS\$ROOT:[IMAGE]SAS609E.CLD
 - Following the instructions on updating the system DCL command tables as documented in the section, "SAS Invocation via Command Language Definition File."
- Specify the following command from the VMS system prompt:

\$ SAS/SETINIT SETINIT.SAS
- Check the SETINIT.LOG for the following messages which indicate that your SETINIT was applied successfully:

NOTE: Siteinfo data have been updated.
NOTE: No update of secondary setinit since either the password was omitted or zero, or the SEC statement was omitted.

Troubleshooting SETINIT Problems

The following is a list of common error messages and solutions that can occur when attempting to update your SETINIT information.

ERROR:

```
ERROR: INCORRECT INFORMATION WAS ENTERED FOR THE PASSWORD xxxxxxxxx.
```

SOLUTION:

Check for typographical errors. The SETINIT information in the SETINIT.SAS file must be entered exactly as it appears on the paper SETINIT. If any text of the SETINIT does not match, the above error occurs.

ERROR:

```
ERROR: THE SAS SYSTEM IS EXECUTING ON A PROCESSOR (CPU) WHOSE MODEL  
NAME, MODEL NUMBER, AND SERIAL NUMBER ARE NOT INCLUDED IN THE  
SETINIT DATA USED TO INITIALIZE THE SAS SYSTEM LIBRARY IN USE.  
THIS IS PERMITTED IF THIS PROCESSOR IS A DESIGNATED BACKUP  
PROCESSOR FOR A LICENSED CPU. FOR THIS SITE, THE SAS SYSTEM IS  
LICENSED FOR THE FOLLOWING CPU SERIAL NUMBERS:
```

```
MODEL VAX xxxx-xxxx SERIAL NUMBER zzzzz
```

SOLUTION:

Verify that the SAS System is executing on the processor indicated in the SETINIT.SAS file. When the SETINIT is run on a processor that is not included in the SETINIT information, the above error is issued. If your model name, model number, or serial number has been updated, contact your SAS Institute Customer Service Representative for an updated SETINIT. Use SAS\$ROOT:[USAGE]SYSINFO.COM to obtain the correct information.

ERROR:

```
ERROR: THE SITE VALIDATION DATA CANNOT BE UPDATED. THIS IS MOST LIKELY  
DUE TO THE FACT THAT THE SASHELP CATALOG IS NOT AVAILABLE IN  
WRITE MODE, AND/OR THAT THE SETINIT OPTION HAS NOT BEEN SPECIFIED  
WHEN USING THE SAS COMMAND.
```

```
ERROR: DIFFICULTY READING THE SITE VALIDATION DATA.
```

SOLUTION:

Verify that you have WRITE access to the CORE.SASEB\$CATALOG file in SAS\$ROOT:[HELP]. Make sure that the option /SETINIT is included when running the SETINIT. If either of these conditions is not met, the above error is issued.

Notes referencing a secondary SETINIT should be ignored. The information is part of the SETINIT process, however it does not affect sites running in the VAX/OpenVMS environment.

Steps to Run ICP Tests

After the SETINIT has been updated, you have the option of running the ICP tests. By running the ICP tests, you will ensure that the SAS System installed on your system is running correctly.

To run the ICP tests, you have 2 options:

- ❑ Rerun the installation procedure and choose Option 7 from the Main Menu. After the ICP tests have completed, choose Option 8 from the Main Menu to exit from the installation procedure.

Run the ICP tests via `SAS$ROOT:[TOOLS]RUN_ICPTESTS.COM`.

1. Set up the SAS logical names by executing the SAS System startup file,
`SAS$ROOT:[TOOLS]SAS609E.COM`.
2. Set up the `SAS` verb by doing either:
 - ❑ `$ SET COMMAND SAS$ROOT:[IMAGE]SAS609E.CLD`
 - ❑ Following the instructions on updating the system DCL command tables as documented in the section, "SAS Invocation via Command Language Definition File."
3. `RUN_ICPTESTS.COM` runs all ICP tests found in `SAS$INSTALL:[ICP]` and notifies you of the results.

If an ICP test fails, check the differences file, `SAS$INSTALL:[ICP]TEST<product>.DIF` for differences between the result file, `SAS$INSTALL:[ICP]TEST<product>.RES` and the benchmark file, `SAS$INSTALL:[ICP]TEST<product>.BMK`. If you need further assistance in ascertaining the problem, contact the SAS Institute Technical Support Division.

Once you have finished installing the SAS System at your site, applying the license, and running the ICP tests, proceed to "Setting Up and Maintaining the SAS System" for information on how to configure the SAS System at your site.

The SAS NOTES and Utilities

The SAS Notes files are located in `SAS$ROOT:[USAGE]` and include:

- ❑ a Release 6.09E format SAS Usage Notes data set containing the list of the current SAS software problems for Release 6.09E, usage hints, and information about compatibility issues
- ❑ modified screens for browsing those data sets with `PROC FSBROWSE`
- ❑ SAS programs for processing the SAS Notes data sets

- the Support Application, for displaying the SAS Notes and Sample Library programs.

Once these files are installed, you may want to run one or both of the SAS programs, `SELECT` and `PRINT`.

Using the SAS Programs

The `SELECT.SAS` file creates a subset of the Usage Notes, based on your selection specified in the `PARMS.SAS` file.

The `PRINT.SAS` file prints out the Usage Notes. Change parameters in the `PARMS.SAS` file to customize the output from the `PRINT` program.

The `FIXREPT.SAS` file produces a report showing which outstanding problems in the Usage Notes have been fixed by maintenance. Change parameters in the `PARMS.SAS` file when using this program.

The `PARMS.SAS` file contains the parameters used by the `SELECT.SAS`, `PRINT.SAS`, and `FIXREPT.SAS` programs. Each parameter is preceded by a comment block that explains the parameter and describes the valid values.

The `READPRM.SAS` file reads and verifies values in the `PARMS.SAS` file. Do not modify this program.

Accessing the SAS Notes

The SAS Notes can be browsed on-line using either the `SUPPORT` facility, or the `FSBROWSE` procedure in SAS/FSP software. For more information on the `SUPPORT` facility, a windowing application for accessing the SAS Notes and Sample Library, see "The `SUPPORT` Application" below. Those sites that license SAS/FSP software may want to access the SAS Notes interactively with `PROC FSBROWSE`. To do this, use the following SAS statements for the SAS Notes:

```
LIBNAME LIBRARY 'SAS$ROOT:[USAGE]';
LIBNAME USAGE 'SAS$ROOT:[USAGE]';
PROC FSBROWSE DATA=USAGE.USAGE SCREEN=USAGE.SCREEN
RUN;
```

Note: The libref `LIBRARY` on the first `LIBNAME` statement must be issued to access application-specific formats.

The default search arguments are `MODULEN`, `PROD`, and `KEYS`. If you want to search other fields, first issue a `STRING` command. For more information on the `FSBROWSE` procedure, refer to *SAS/FSP Software: Usage and Reference, Version 6, First Edition*.

The Support Application

The SUPPORT Application is a menu-based SAS/AF application for accessing the SAS Notes and the Sample Library, which runs under Base SAS. The primary menu of the SUPPORT Application contains the following options:

```
[_] SAS NOTES
[_] SAMPLE LIBRARY
[_] MAINTENANCE
[_] OPTIONS
[_] HELP
```

The primary menu also gives you two choices for leaving the application, `EXIT` and `GOBACK`. Select `EXIT` to close the SUPPORT Application and exit SAS. Select `GOBACK` to close the SUPPORT Application, but not exit SAS.

An autoexec file, `SUPPORT.SAS`, with the SAS statements for invoking the SUPPORT Application is included under `SAS$ROOT:[USAGE]`. A DCL system file, `SUPPORT.COM` is also included. You may need to move this file to the appropriate location on your system for global access by users at your site. You may need to make some modifications to the file for the SUPPORT Application to execute properly, since a default name is supplied for the command used to invoke the SAS System and the default autoexec file name is `SUPPORT.SAS`. This file includes references to the SAS data library containing the SAS Notes data set and the catalog containing the entries for the SUPPORT Application, and to the library containing the formats for the SAS Notes data sets (these two libraries may be the same).

To start the SUPPORT Application from outside a SAS session, execute the `SUPPORT.COM` program file.

To start the SUPPORT Application from inside a SAS session, include the `SUPPORT.SAS` file into your Display Manager Editor window and submit.

SAS Notes

To view or print the SAS Notes, select `SAS NOTES` from the primary menu of the SUPPORT Application. The SAS Notes menu is displayed with the following options:

```
[_] FSBROWSE
```

allows you to browse the SAS Notes using `PROC FSBROWSE` if you have SAS/FSP software licensed. The default search arguments are `MODULEN`, `PROD`, and `KEYS`. If you want to search other fields, first issue a `STRING` command. For more information on the `FSBROWSE` procedure, refer to *SAS/FSP Software: Usage and Reference*.

[_] VIEW (AF)

allows you to view the SAS Notes using windows available in Base SAS software. If you choose this method, you are prompted to enter keywords by which to subset the SAS Notes. A list of SAS Notes titles is displayed based on the keywords entered. You can select a note from this list to display by clicking on the title.

To help locate relevant SAS Notes, you can enter up to two individual keywords, one `PRODUCT` name, and/or one `MODULEN` field key. You can also enter a `?` in either of the last two fields to display appropriate selection lists. The three "filtering" pushbuttons can also be used to refine your search.

When you have defined your search criteria, press the `RUN SEARCH` pushbutton to display a scrollable list of SAS Notes titles. You can view a SAS Note by clicking on its title or `MODULEN` field.

[_] PRINT

allows you to print a subset of the SAS Notes. You can create the subset by `MODULEN` or `PRODUCT`. Select `OUTPUT` to view or clear the Output window or send its contents to a printer.

Sample Library

The SUPPORT Application also allows you to access the programs from the SAS Sample Library. The SAS Sample Library is a diverse collection of SAS programs that illustrate the specific applications of SAS software and demonstrate different approaches to programming problems. Also included in the Sample Library are many of the examples that appear in SAS documentation.

To access the SAS Sample Library from the SUPPORT Application, select `SAMPLE LIBRARY` from the primary menu, then select the SAS product in which you are interested to get the Sample Library main menu. From this menu you can choose any of the following options:

[_] INDEX

creates an index of the sample programs. The index is saved in a catalog in your `SASUSER` library as an entry called `INDEX` with a type of `OUTPUT`. The `INDEX.OUTPUT` entry can be viewed or printed through the `SAVED` and `OUTPUT` options on the Sample Library main menu, or outside the application. Note that once the Sample Program index has been created, you do not need to generate it again, since it will be stored permanently in your `SASUSER` library.

[_] PROGRAMS

allows you to browse, edit, run or print individual sample programs. Programs are selected by a keyword value. To select programs by keyword, push the `SELECT KEYWORD` button. A keyword list will be shown from which to select. Choose one and a program selection list is displayed. Choice of a program pops up an action window with the choices of browse, edit, run, or print. You can save an edited program in your `SASUSER.PROFILE` catalog. See the `SAVED` option for more information about saved programs.

[_] SAVED

allows you to access catalog entries of types `SOURCE` and `OUTPUT` that have been saved in your `SASUSER.PROFILE` catalog. You can choose to edit, browse, print, delete, file or rename `SOURCE` or `OUTPUT` type members, or you can execute `SOURCE` members.

[_] OUTPUT

allows you to manipulate information directed to the Output window. To print the contents of the Output window, select `PRINT`. To clear the contents of the Output window, select `CLEAR`. To view the contents of the Output window, select `VIEW`.

Maintenance

If maintenance is supported for a release, the maintenance releases are identified by unique TS level numbers. The Maintenance menu displays the different TS levels found in the installed SAS Notes, and allows TS level subsetting of the SAS Notes.

To help locate relevant SAS Notes, you can enter up to two individual keywords, one `PRODUCT` name, or one `MODULEN` field key. You can also enter a `?` in either of the last two fields to display the appropriate selection lists. The three "filtering" pushbuttons can also be used to refine your search.

When you have defined your search criteria, press the `RUN SEARCH` pushbutton to display a scrollable list of SAS Notes titles. You can view a SAS Note by clicking on either its title or `MODULEN` field.

Options

The Options menu allows you to set and save certain useful `SUPPORT` options. To change the color scheme of the block menus, select `MENU COLORS`. To set printing parameters, select `PRINT PARMS`. To set a particular folder for the Sample Library, select `SAMPLE DIRNAME`. To save these options you have set in your `SASUSER.PROFILE` catalog, select `SAVE OPTIONS`.

Troubleshooting

If errors are encountered during execution of the application, the following message is displayed:

```
WARNING: Program Halted. See MSG or LOG for messages.
```

To view the errors, type `LOG` on the command line to access the LOG window. (If it is necessary to call SAS Institute Technical Support, please have this information available.) The application can be resumed by typing `AF` on the command line of the LOG window.

Modifying the Support File at Your Site

An autoexec file is included that provides the SAS statements necessary to invoke the SUPPORT application. An appropriate system file is also included. You may need to move this file to the appropriate location on your system for global access by users at your site. You may need to make some modifications to the file for the SUPPORT application to execute properly. Default names are supplied for the following:

- the command used to invoke the SAS System at your site
- the name of the autoexec file that includes the SAS statements necessary to invoke the application. The autoexec file includes references to the SAS data library containing the SAS Notes database and the catalog containing the entries for the SUPPORT application, and to the library containing the formats for the SAS Notes databases (these two libraries may be the same).

These names may need modifications based on your naming conventions at installation time.

Special Considerations for OpenVMS

OpenVMS Version Dependency for Specific SAS Products

- SAS/ACCESS Interface to INGRES:
 - OpenVMS Version 5.5-2 or higher
 - INGRES Version 6.3, INGRES Version 1.1/04 or higher.
- SAS/ACCESS Interface to ORACLE:
 - OpenVMS Version 5.5-2 or higher
 - ORACLE Version 6.0, ORACLE Version 7.0 or higher
 - ORACLE VMS Mailbox drive Version 1.2.6, 1.2.8 or higher.
- SAS/ACCESS Interface to Rdb:
 - OpenVMS Version 5.5-2 or higher
 - Rdb Version 4.0 or higher.

- SAS/ACCESS Interface to SYBASE:
 - OpenVMS Version 5.5-2 or higher
 - SYBASE Version 4.2, SYBASE Version 10.0 or higher.
- SAS/CONNECT Software:
 - DECnet must be installed.

Note: See Appendix F, "Storing and Locating SAS/CONNECT Script Files" for more information.
- SAS/SHARE Software:
 - DECnet must be installed.
 - TCP/IP Services or compatible services availability
 - GBL Access Method availability.

OpenVMS Version Dependency for VMS-Specific Product Extensions

- ALL-IN-1 Integration of Release 6.09E of the SAS System:
 - OpenVMS Version 5.5-2 or higher
 - ALL-IN-1 Version 2.4 or higher.

Note: See Appendix C, "Post-installation setup for the ALL-IN-1 Integration of Release 6.09E of the SAS System under VMS," for more information.
- CDA Support:
 - OpenVMS Version 5.5-2 or higher.
- CDD Engine:
 - OpenVMS Version 5.5-2 or higher
 - CDD/PLUS Version 4.1 or higher.
- Running SAS under DECwindows Motif:
 - Requires OpenVMS Version 5.5-2 or higher
 - DECwindows Motif Version 1.0 or higher.
- Vector Processing:
 - OpenVMS Version 5.5-2 with at least one vector processor.

Note: See Appendix M, "Using the Vector Processing Option," for more information.

Privileged Image Unloading

The SAS System includes a "user-written" system service that must be installed as a protected image on an OpenVMS 5.x (or later) system. The privileged unloading feature is dependent upon access to internal routines and data structures in the user's process control region. Although the SAS System service was available in Release 6.06 of the SAS System, it has become much more important in later releases of the SAS System. The number of images has increased, and the architecture of the system is based on their interactions. If the following apply to your installation, you should use privileged unloading:

- you frequently run out of memory with your SAS jobs.
- your large production jobs involve many procedures.

Alternatively, if your large production jobs involve a few procedures that are used over and over again, privileged unloading should not be used.

The `UNLOAD` option allows a site to control the use of the SAS system service. This option is documented in the *SAS Companion for the OpenVMS Environment, Version 6*. To enable privileged image unloading in Release 6.09E, the system service `SAS_USS_PRIV.EXE` must be installed as a protected and shared image, and a logical name for the image must be supplied to all SAS users. It must be manually installed. All source for the SAS system service, and command procedures for relinking, installing, and testing the system service, are found in `SAS$ROOT:[TOOLS]`.

`SAS$ROOT:[TOOLS]PRIV_UNLOADER.COM` compiles and links the SAS system service, while `SAS$ROOT:[TOOLS]INSTALL_UNLOADER.COM` installs the system service with the use of the logical name `SAS_USS_PRIV`. The system service is linked under OpenVMS 5.5-2. In a later release, it may be necessary to relink the system service in the following manner:

```
$ @SAS$ROOT:[TOOLS]PRIV_UNLOADER.COM
$ SET PROCESS/PRIVILEGE=CMKRNL
$ @SAS$ROOT:[TOOLS]INSTALL_UNLOADER.COM
```

SAS Institute recommends that you install this image by using the command:

```
$ @SAS$ROOT:[TOOLS]INSTALL_UNLOADER.COM
```

in the OpenVMS system startup file, `SYS$MANAGER:SYSTARTUP_V5.COM` or `SYS$MANAGER:SYSTARTUP_VMS.COM`.

For more information on enabling or disabling privileged unloading, contact SAS Institute Technical Support and request the TS Note for privileged unloading under OpenVMS systems.

CLEANUP Command

The ZCLEANUP command file used to clean up Version 5 and Version 6 work directories left around after an abend, system crash, etc. has been replaced with an executable image, SAS\$ROOT:[TOOLS]CLEANUP.EXE. CLEANUP runs faster than ZCLEANUP and allows you to change the mode of its operation using qualifiers.

To access the cleanup tool, choose a verb to assign to the cleanup function. In this example, the verb is CLEANUP. Create a DCL foreign symbol that points to the utility image. No SET COMMAND operation required.

```
$ CLEANUP == "$SAS$ROOT:[TOOLS]CLEANUP.EXE"
```

This lets you issue commands to cleanup directories similar to the old ZCLEANUP command procedure.

```
$ CLEANUP          ! Cleans current directory of work files
$ CLEANUP [ .TEMP ] ! Cleans work files from [ .TEMP ]
$ CLEANUP [ . . . ] ! Cleans work files from entire tree
```

The command accepts the following qualifiers:

```
/LOG                (default is /LOG)
/NOLOG
```

This causes the command to issue a message showing each file as it is deleted, and show the total number of directories deleted. If omitted, the command runs "silently" unless an error is encountered trying to delete one or more files.

Example:

```
$ CLEANUP [SMITH...]/NOLOG
```

```
/CONFIRM            (default is /CONFIRM)
/NOCONFIRM
```

This causes the CLEANUP command to prompt you for each directory to be deleted. The default is Y for "yes" if you press return, as in ZCLEANUP. If you do not wish to be prompted, or the command is being run in a batch job where no prompting can be done, then use the /NOCONFIRM qualifier.

Example:

```
$ CLEANUP [ .SCRATCH ]/NOCONFIRM
```

```
/V5                (default is /V5)
/NOV5
```

Controls the clean up of version 5 SAS work directories (i.e. those of the form Z%%%%%%%%%). The default is to clean up version 5 work directories. If you do not want to clean up version 5 work directories use the /NOV5 qualifier.

Example:

```
$ CLEANUP/NOV5 [ .SCRATCH]

/V6                (default is /V6)
/NOV6
```

Controls the clean up of version 6 SAS work directories (i.e. those of the form SAS\$WORK%%%%%%%%%). The default is to clean up version 6 work directories. If you do not want to clean up version 6 work directories use the /NOV6 qualifier.

Example:

```
$ CLEANUP/NOV6 [ .SCRATCH]
```

Requirements for Running SAS Software Under the Display Manager

In Release 6.09E of the SAS System under OpenVMS, TMPMBX privilege is required by any user wanting to run the SAS System under Display Manager. The TMPMBX privilege is also needed to run all full-screen products. To determine if a particular user has TMPMBX privilege, run the following commands to check the user's current AUTHORIZE quotas:

```
$ SET DEFAULT SYS$SYSTEM
$ SET PROC/PRIV=(SYSPRV)! Ensure access to SYSUAF.DAT file
$ RUN AUTHORIZE
```

```
UAF> SHOW user
```

```
---- "user" attributes and quotas displayed ----
```

If TMPMBX does not appear in the list of "Default Privileges," use the following commands (while still in AUTHORIZE) to add TMPMBX privilege to the "user" account:

```
UAF> MODIFY/DEFPRIVILEGES=(TMPMBX) user
UAF> SHOW user
```

```
---- "user" attributes and quotas displayed ----
```

```
UAF> EXIT
```

TMPMBX privilege will be available the next time "user" logs in.

Note: NETMBX should also be added if you plan to do any type of DECnet or network access.

Part II, Optimizing System Performance

This chapter discusses how to maximize the performance of the SAS System. First the SAS System minimum requirements under OpenVMS are described, followed by a discussion of how to collect and interpret statistics. These statistics will help you determine your current job efficiency.

Topics covered in this section are :

- collecting and interpreting performance statistics
- optimizing performance
 - techniques to optimize I/O
 - techniques to optimize memory usage
 - techniques for optimizing CPU performance.
- system performance and configuration.
 - minimum and recommended `SYSGEN` parameters
 - minimum and recommended `AUTHORIZE` quotas
 - optimizing performance in a local area VAXcluster environment.

Collecting and Interpreting Performance Statistics

Two system options, `FULLSTIMER` and `STIMER`, control printing performance statistics on the SAS log. At initialization, they are off by default but can be turned on by specifying `STIMER` or `FULLSTIMER` on the SAS command line, on the `OPTIONS` statement, or in a configuration file.

The statistics reported by the `FULLSTIMER` option are buffered I/O, direct I/O, page faults, elapsed time, and CPU time. `FULLSTIMER` results are displayed as follows:

```
NOTE: DATA STATEMENT USED THE FOLLOWING COMPUTER RESOURCES:
      Buffered IO:   29   Elapsed time:   0 00:00:08.57
      Direct IO:    66   CPU time:       0 00:00:06.79
      Page faults: 1241
```

The `STIMER` option reports a subset of the `FULLSTIMER` statistics, page faults and CPU time:

```
NOTE: DATA STATEMENT USED THE FOLLOWING COMPUTER RESOURCES:
      Page faults: 779   CPU time:       0 00:00:06.79
```

The statistics report the number of buffered I/O operations, direct I/O operations, page faults, the amount of CPU time required, and the total elapsed time that it took to execute the previous step. Version 6 statistics account for more of the actual work required by the step than in previous releases of the SAS System. For example, all file opens, closes, and image loads required to execute a step were accounted to the SAS supervisor in previous releases of the SAS System and did not show up in any step statistics. In Version 6, the step timer statistics reflect all resources used by these operations.

Although there are several types of resource usage statistics reported by the `STIMER` and `FULLSTIMER` options, the statistic that users are most interested in is elapsed time. Elapsed time represents the actual wall clock time it took to execute a job or step. Unfortunately, elapsed time is heavily dependent on the current load and the capacity of the system. The more users sharing a particular resource, the less that resource is available. If you have to wait longer to access a resource, your overall elapsed time will be longer.

Note: As a general rule, it is not a good idea to use elapsed time as a metric for the efficiency of your program.

Any computer system has three critical resources that are utilized by any application: I/O, memory, and the CPU. Under almost all circumstances, reduction in the use of any of these three resources results in better throughput of a particular job, and, in general, in a reduction in the elapsed time.

In discussions of improving performance, the following sections will concentrate on these three critical resources. Your goal should be to use the suggested performance improvement techniques and see how their use is reflected in a particular step or job. For purposes of performance improvement, your results will be reflected by the following statistics:

Improvement Technique	Timer Statistic
I/O techniques	Direct IO Page Faults CPU time
Memory-Usage techniques	Page faults CPU time
CPU techniques	CPU time

You will notice that CPU time is referenced multiple times. This is because certain techniques affect multiple resources. For example, if you can reduce the number of I/Os to disk, this will be reflected by a reduction in direct I/Os. Since the processor does not have to execute the code to prepare for direct I/Os as many times, there is a reduction in CPU time as well.

Optimizing Performance

Techniques to Optimize I/O

The single biggest area in which to concentrate efforts to improve performance of SAS jobs is in the I/O optimization area. The SAS System is a highly I/O intensive application. Most SAS jobs consist of repeated cycles through a particular set of data in order to perform a variety of data analyses and manipulation techniques. The vast majority of I/O for a SAS job is done to a disk (or tape) device. So, simply stated, in order to improve the performance of a SAS job, you need to reduce the number of times you have to go to the device to access the data.

This can be done in one of two ways. You can either alter your SAS code to reduce the number of times you have to process the data, and/or you can reduce the number of data accesses by processing more data each time the disk is accessed.

Reducing the number of times you process the data

WHERE clause processing

In many instances, you can use the `WHERE` clause to group data as if it were sorted, without having to presort the data. You can also use the `WHERE` statement in a procedure to subset data instead of executing a data step with a subsetting `IF` statement. By taking advantage of this, you eliminate extra data processing to perform certain analyses. For example, notice the timer results in the following `PROC PRINT` compared to the timer statistics needed to perform the same job without `WHERE` clause processing.

```
1? proc print data=orange.survey;
2? where type="navel";
3? run;
```

The SAS System 13:24 Monday, October 23, 1989

1

<u>OBS</u>	<u>TYPE</u>	<u>TEXTURE</u>	<u>FLAVOR</u>	<u>TASTE</u>
1	navel	9	9	9
2	navel	8	5	7
3	navel	8	9	5
4	navel	8	8	8
5	navel	9	9	9

Note: PROCEDURE PRINT used the following computer resources:

Buffered IO: 23	Elapsed time: 0 00:00:00.52
Direct IO: 2	CPU time: 0 00:00:00.27
Page Faults: 9	

```

4? data subset;
5? set orange.survey;
6? if type = "navel";
7? run;

```

Note: The data set WORK.SUBSET has 5 observations and 4 variables.

Note: DATA statement used the following computer resources:

```

Buffered IO: 21    Elapsed time:          0 00:00:02.50
Direct IO:  15    CPU time:              0 00:00:00.61
Page Faults: 456

```

```
8? proc print; run;
```

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2

OBS	TYPE	TEXTUR E	FLAVOR	TASTE
1	navel	9	9	9
2	navel	8	5	7
3	navel	8	9	5
4	navel	8	8	8
5	navel	9	9	9

Note: PROCEDURE PRINT used the following computer resources:

```

Buffered IO: 14    Elapsed time:          0 00:00:00.48
Direct IO:   2    CPU time:              0 00:00:00.26
Page Faults 276

```

From the example, you can see that the `WHERE` clause can indeed save resources by eliminating the number of times you process your data. Refer to *SAS Language: Reference* for more information on `WHERE` clause processing.

Indexing to prevent repeated execution of PROC SORT

An index is an auxiliary data structure used in conjunction with `WHERE` clause or `BY` group processing to assist in the location and selection of records specified by the value of the indexed variable. When an index is in place, the record can be accessed by reading the desired record directly. Without the index, the SAS System must start at the top of the data set and read each record sequentially to the end of the data set and apply the `WHERE` clause or `BY` statement to each value individually. Indexing may or may not improve performance of an application. If you are continuously rewriting a data set, it is not a good candidate for indexing since the index must be recreated each time the data set is rewritten. Refer to *SAS Language: Reference* for more information on creating and using SAS indexes.

Storing your data in a format that is accessible via an engine

Another way to eliminate some of the data processing overhead is to store your data in a format that is directly accessible by an engine. More specifically, if you do not have to process the data to make it available to SAS, you reduce the number of steps and therefore the resources required to perform the task. Refer to *SAS Companion for the OpenVMS Environment, Version 6, Second Edition*; Technical Report P-220, *Changes and Enhancements for the SAS System under VMS, Release 6.07*; Technical Report P-242, *SAS Software: Changes and Enhancements, Release 6.08*, and *SAS Companion for the OpenVMS Environment, Version 6, Second Edition* for more information on engines.

Using PROC SQL to define views of data

By setting up views of your data, you have the capabilities of the SQL language available to process the data via the SQL procedure. Using this procedure to do data subsetting and grouping can eliminate the need for extra passes through the data to preprocess or preformat the data. Refer to *SAS Procedures Guide, Version 6* for more information on the SQL procedure.

Note: You can also use the data step to create views of data. Refer to *Changes and Enhancements to Base SAS Software, Release 6.07* for more information on data step views.

Specifying the engine associated with a SAS data library

If you select an engine by implicit specification (i.e., you do not specify an engine on a LIBNAME statement), it requires extra processing for the SAS System to determine which engine to associate with the data library. The SAS System must look at the extensions of all files in the directory until it has enough information to determine which engine to use, as in the following example:

```
* specify the engine;
```

```
LIBNAME FRUITS V609 '$1$DUA52:[FRUITS]'
```

```
Note: Libref FRUITS was successfully assigned as follows:  
Engine: V609  
Physical Name: $1$DUA52:[FRUITS]
```

```
* No engine specified; the SAS System must determine engine type by  
implicit assignment;
```

```
LIBNAME FRUITS '$1$DUA52:[FRUITS];
```

```
Note: Directory for library FRUITS contains files of mixed engine types.  
Note: Libref FRUITS was successfully assigned as follows:  
Engine: V609  
Physical Name: $1$DUA52:[FRUITS]
```

Reducing the number of times you do I/O

Regardless of how completely you optimize your program and reduce the number of iterations of data processing, you will eventually access your data. In order to further improve performance of a SAS job, you can reduce the number of I/Os you perform in accessing your data. Most of the following discussion uses access to disk data in examples. However, most of these concepts apply as well to tape access.

Note: For further information on the options that are discussed below, refer to the *SAS Companion for the OpenVMS Environment, Version 6, Second Edition*; Technical Report P-220, *Changes and Enhancements for the SAS System under OpenVMS Release 6.07*; and Technical Report P-242, *SAS Software: Changes and Enhancements, Release 6.08*.

Performance Considerations for Version 6 SAS files

BASE engine

When you create or add to a SAS data set using the base engine, you can use the allocation quantity (`ALQ=`) and default file extension quantity (`DEQ=`) data set options to optimize the usage of disk space. If the file is large, you should specify a large initial allocation so that the file is contiguous. This will improve record access time. If the file already exists, and you are adding to it, the `DEQ=` option may help. If you know that you will be adding a lot of records, this option gives the same improvements as the `ALQ=` option by making the file extents more contiguous.

Both of these options correspond to the `RMS` options of the same name. Another way to utilize them is by using the DCL command, `SET RMS_DEFAULT`. By default, when these options are not set in your SAS program, the process default is used. Because the `SET RMS_DEFAULT` command changes your process defaults, you can use this command to achieve the same results.

The `BUFSIZE=` option is used when a data set is created with the base engine. It determines the page size of the file and becomes a permanent attribute of the file. When a page size is chosen by default, it is chosen to hold the maximum number of observations with minimal wasted space. One full page is always written, regardless of how full or empty the page is. If you know that the total data in the file is going to be small, you can enforce a small page size by using the `BUFSIZE=` option, so that the total file size remains small. In contrast, if you know that you are going to have many observations in a data set, you should optimize the `BUFSIZE` so that as little overhead as possible is needed.

The `CACHESIZ=` option specifies an internal memory cache or buffer size. It is not a permanent attribute of a file. For optimum efficiency, the `CACHESIZ=` value should be a multiple of the page size. `CACHESIZ` determines how much memory is allocated for a single read or write operation. For example, assume that the page size is 4096. By using a cache size of 32768, you access 8 pages worth of data with each access to disk. When a file is accessed sequentially, the number of actual disk accesses needed to process the entire file is reduced.

Using a larger `CACHESIZ` does require more memory since `CACHESIZ` bytes are allocated from your virtual address space for each open file. For example:

```
libname test v609 'disk:[directory]';
data subset ( keep = name age brthdate );
set test.large ( cachesiz = 32768 );
.
data statements
.
.
run;
```

This data step allows you to read in 32768 bytes of data with one disk access each time you read the data set `test.large`.

One further technique that can reduce I/O processing is to store your data in compressed data sets. Storing your data this way requires more CPU utilization to decompress the records as they are made available to the SAS System. However, if your bottleneck is I/O and not CPU usage, this may improve the performance of your application.

CONCURRENCY engine

When you create or add to a SAS data set created by the concurrency engine, you can use the `ALQ=` and `DEQ=` data set options to optimize the usage of disk space. If the file is large, you should specify a large initial allocation so that the file is contiguous. This will improve record access time. If the file already exists, and you are adding to it, the `DEQ=` option may help. If you know that you will be adding a lot of records, this option gives the same improvements as the `ALQ=` option by making the file extents more contiguous.

The multi-buffer count data set option `MBF=` may be used to specify the number of buffers allocated for I/O. If you are accessing the file for input or output, a multi-buffer count (`MBF`) of 1 is used by default. However, for files opened for update, a default of 2 is used with the assumption that you will probably be accessing this file randomly. When you are accessing your data randomly, a larger multi-buffer count may improve performance. This is especially true if you are accessing the same records over and over, but they are not sequentially located in the file. Increasing the number of buffers uses space in your process working set. Therefore, be sure that you do not use so much memory for your buffers that you begin page faulting at a high rate.

The bucket size data set option (`BKS=`) is used to specify the number of blocks in each bucket of the file. You can improve performance by using a large bucket size for files that are primarily accessed sequentially, a small bucket size for files that are primarily accessed randomly, and a medium bucket size for files that are accessed in both ways. The bucket size is a permanent attribute of the file. Therefore, it must be set up at data set creation time.

All of these options correspond to the `RMS` options of the same name. Another way to utilize them is by using the `DCL` command, `SET RMS_DEFAULT`. By default, when these options are not set in your SAS program, the process default is used. The `SET RMS_DEFAULT` command changes your process defaults. Therefore, you can use this command to achieve the same results.

V5 engine

Much like the `CACHESIZ` option on the `BASE` engine and the `BKS` option on the `CONCURRENCY` engine, the `V5` engine allows you to specify the amount of memory that will be available for I/O operations to data sets. This option for the `V5` engine is called `BUFSIZE` for compatibility with Version 5 of the SAS System. The `BUFSIZE` option used with the `V5` engine specifies the number of bytes that you can allocate for the buffer on a per data set basis.

Engine accesses

One final way to reduce the amount of data accessed and therefore reduce the number of I/Os needed to complete the job is to use the `DROP`, `KEEP`, and `LENGTH` statements to reduce the size of any given observation, and to use the `OBS` and `FIRSTOBS` options to reduce the number of observations processed. When you are creating and using temporary data sets, it is less resource intensive to only include the variables and observations required for the task. By reducing the number and size of observations in temporary data sets, you can reduce the number of I/Os required to process that data.

External I/O

The multi-block count external I/O option (`MBC`) controls how much memory is reserved to perform file access. Specifically, it determines the size (in terms of 512-byte increments) of the buffers allocated to perform a particular file access. The cost of using a large buffer size in the `MBC=` option is increased memory usage. You can specify `MBC=` on a per file basis, giving you the ability to optimize memory utilization versus extra I/O processing. By using the options `MBC=` and `MBF=`, you can optimize the performance of processing your external files. For most applications, the `MBC=` option will probably make the single, biggest improvement. The more data you can keep in memory, the fewer disk accesses are necessary and the better performance will be.

If you are accessing the file sequentially, a multi-buffer count (`MBF`) of 2 is used by default because the SAS System sets the read-ahead and write-behind flags. If you are accessing your data randomly, a larger multi-buffer count may improve performance. This is especially true if you are accessing the same records over and over, but they are not sequentially located in the file. Increasing the number of buffers uses space in your process working set. Therefore, be sure that you do not use so much memory for your buffers that you begin thrashing; reading such large amounts of data causes unprocessed data that is in your address space to be page faulted out of memory.

For example, if you know you have a large external file that you are going to read sequentially, you might want to increase the `MBC=` value to read more data in with each I/O. Make sure that the `MBF=` count is 2 in order to take advantage of read-ahead, write-behind processing:

```
filename input 'disk:[directory]large.file' MBF=2 MBC=64;
data get;
infile input;
.
.
data statements
.
.
run;
```

When you create or add to an external file, you can use the `ALQ=` and `DEQ=` options to optimize the usage of disk space. If the file is large, you should specify a large initial allocation so that the file is contiguous. This improves record access time. If the file already exists and you are appending to it, the `DEQ=` option may help. If you know that you will be adding a lot of records, this option gives the same improvement as the `ALQ=` option by making the file extents more contiguous.

All of these options correspond to the `RMS` options of the same name. Another way to utilize them is by using the DCL command, `SET RMS_DEFAULT`. By default, when these options are not set in your SAS program, the process default is used. The `SET RMS_DEFAULT` command changes your process defaults. Therefore, you can use this command to achieve the same results.

Techniques for Optimizing Memory Usage

With ample memory, you can make tradeoffs between utilization of memory versus increased reliance on other resources. This is covered in the previous section, "Techniques to Optimize I/O." In order to make the most of the I/O subsystem, many larger buffers are required. These buffers are allocated out of your available virtual address space and must share your physical address space (i.e., your working set) with the other memory demands of your SAS session.

Therefore, optimization of other resources is often at the expense of using more and more memory. In the event that memory is your critical resource, there are several things that can be done to reduce the dependence on increased memory. However, for most of these techniques, it will be at the expense of increased I/O processing or CPU utilization.

Increasing external I/O `MBC` and `MBF` options, the BASE engine `CACHESIZ` option, and the CONCURRENCY engine `BKS` option allows you to optimize the I/O subsystem by reducing the number of accesses necessary to reference data. However, this uses more memory. If you are operating in a memory-constrained environment, reduce these values in order to minimize memory usage.

The size of your I/O buffers is highly sensitive to the working set size. It is important not to continue to increase I/O buffers to the point that you exhaust your available working set. If you do this, you will notice an increase in the page fault rate for your job. See "Minimum and Recommended Authorize Quotas" for more information on working set size.

Using the LOADLIST option

Another way to optimize memory usage is to make sure that the images that are used most often are installed as shared images to the OpenVMS operating system. The `/LOADLIST=` command line option in the SAS System reports which images are used most often. If you install the most heavily used images as shared images, additional physical memory is not required when these images are used by multiple users. Memory can also be conserved by using the `/UNLOAD=` command line option. This option ensures that the most frequently used images do remain in memory. The `/UNLOAD` option is discussed in more detail in a later section.

Techniques for Optimizing CPU Performance

Usually, executing a single stream of code requires approximately the same amount of CPU usage each time the stream is executed. Optimizing CPU performance in these instances is usually a tradeoff; for example, you can optimize CPU performance at the cost of using more memory. Since the CPU performs all the processing needed to post an I/O, any option or technique that reduces the number of I/Os is going to have a positive effect on CPU utilization. Refer to the previous section on "Techniques to Optimize I/O" for information on how to reduce I/O processing.

Storing compiled code to compute intensive data steps

Another technique that can provide some improvement in CPU performance is to store data step code that is executed repeatedly as compiled code rather than SAS source code. This is especially true for data step jobs that are not I/O intensive. For more information on storing and using compiled code, Refer to *SAS Language: Reference*.

The UNLOAD Option

A final technique that can improve CPU usage is to make sure that you properly use the `UNLOAD` option. If you have specified the `UNLOAD` option, after each PROC and DATA step ends and each window is brought down in full screen mode, the SAS System purges the SAS images associated with the step that just ended from memory. Thus, memory is freed for use in the next step.

Specifying `NOUNLOAD` keeps images in memory. This strategy is very effective for a job that runs the same small set of procedures again and again, and significantly improves SAS System performance. However, if a procedure is used only once, there is no performance gain made by specifying `NOUNLOAD`. Also, a job that uses many different procedures (or windows) can fill up even a large memory space, force excessive page faulting, and degrade performance. In certain kinds of jobs, alternating between `UNLOAD` and `NOUNLOAD` can increase performance, as in the following example:

```

OPTIONS UNLOAD=MESSAGE; /* several different procs */
PROC SORT;
PROC PRINT;
PROC FREQ;
PROC MEANS;
PROC ANOVA;
OPTIONS NOUNLOAD ; /* same procs over and over */
PROC SORT;
PROC PRINT;
PROC SORT;
PROC PRINT;
PROC SORT;
PROC PRINT;
OPTIONS UNLOAD=MESSAGE; /* several different procs */
PROC PRINTTO;
PROC TABULATE;
PROC ANOVA;

```

Using `NOUNLOAD` keeps `PROC SORT` and `PROC PRINT` in memory during the time span where they are used again and again. Once you are finished with these procedures, specify `UNLOAD` to clean up the memory for upcoming steps.

Note: Contact SAS Institute Technical Support for more information on the `UNLOAD` option.

System Performance and Configuration

The SAS System is a heavy user of system resources. This includes physical and virtual memory, and the I/O subsystem. Typical SAS sessions execute many distinct images and process large amounts of data. This requires ample physical memory and address space, and also requires heavy use of the I/O subsystem for spooling and SAS data set operations.

The next two sections will detail several areas in which you can make system changes to provide better performance or to ensure that larger SAS jobs will be able to successfully execute. Primarily, control over system resources is accomplished by means of altering `SYSGEN` (system generation) parameters that control resources affecting all users, and `AUTHORIZE` quotas that are established on a per user (or per process) basis.

A simple overview of what you need to accomplish includes:

- providing sufficient virtual address space to support the types of jobs you need to run
- providing sufficient physical memory to prevent excessive page faulting
- reducing I/O activity by optimizing placement of files.

The first two items will be controlled with `SYSGEN` parameters and `AUTHORIZE` quotas. In order to provide an optimal I/O environment for the SAS System, it is important to spread your disk accesses across different disks. It is a good idea to have the SAS System images on a separate disk from the SAS System data. If you can spread your applications and data across more disk drives, there will be less contention at the drive level.

Other system resource optimizations can be realized by making sure that applications make proper use of the `UNLOAD` option. This option provides control over when the SAS System frees resources to the operating system. This is primarily because of the dynamic image loading technique employed by the SAS System. Dynamic loading allows a module to be called that was not originally linked to the calling image. This enables an image to transfer control to another image without losing image context. Dynamic unloading refers to the disassociation of a called module from the calling image. Dynamic loading and unloading together allow a reduction in resources and modularization of the SAS System. Resources are reduced since resources are only allocated when they are going to be used. Modularization aids in development and maintenance of the software, while minimization of resources enhances operating system efficiency.

VMS does not provide for a supported method of completely unloading a dynamically loaded image before image rundown. The SAS System in Releases 6.06, 6.07, 6.08, and 6.09E provides a mechanism to support complete image rundown. This method is called "privileged unloading" because it requires privileged code to modify a data structure in the process control region (process `P1` space). More information is available from the SAS Institute Technical Support Division.

Images that are used by multiple users should be installed with the option `/SHARED` to reduce the amount of image loading overhead needed to activate the image. Use of the OpenVMS `INSTALL` utility to make an image available in this fashion is documented in the OpenVMS Operating System documentation. For more information on which images to install, see the discussion of the `LOADLIST` option in the previous section.

Classifying SAS Job Size

Even though the size and type of SAS jobs vary from site to site, you can use the following set of guidelines to determine settings for `SYSGEN` parameters and `AUTHORIZE` quotas for small, medium, and large SAS jobs.

The amount of address space consumed and how much memory your job needs are the most important things to consider when quantifying small, medium, and large SAS jobs. Address space is required for both code and data space. Therefore, if you have a lot of observations, you are going to need more data space and your job will be considered larger. More important, however, are the number of procedures and the types of applications you run. Executing a large number of procedures over a small data set also produces a large job. For example, running

SAS/ASSIST is considered to be a medium to large job, regardless of the amount of data, because the product is large.

Other factors to consider include having image unloading enabled, and where you set buffer sizes. For more information on enabling the unloading of images and setting buffer sizes, refer to the *SAS Companion for the OpenVMS Environment, Version 6, Second Edition*; Technical Report P-220, *Changes and Enhancements for the SAS System under VMS, Release 6.07*; and Technical Report P-242, *SAS Software: Changes and Enhancements, Release 6.08*,

Large jobs can include the following:

- a lot of data
- a lot of code running over a little data
- a little data run over a lot of procedures without unloading
- running large applications such as SAS/ASSIST.

Small jobs can include the following:

- a few thousand observations being run by a couple of procedures
- data entry jobs.

The following are estimates for quantifying small, medium and large jobs by observation size:

- SMALL under 5,000 observations
- MEDIUM under 50,000 observations
- LARGE over 50,000 observations.

If you are familiar with your data, the type of application you are running, the number of procedures your job uses, buffer size settings, and checking if unloading of images has been enabled will help you better gauge the size of your SAS jobs. Once this type of information has been determined, it will be easier to set the recommended `SYSGEN` parameters and `AUTHORIZE` quotas to the appropriate values.

Minimum and Recommended SYSGEN Parameters

For the most part, modifying `SYSGEN` parameters will not actually have any impact on SAS System performance. Where this is not the case, it is explicitly noted. `SYSGEN` parameters will, instead, determine the size of the jobs that may be run. `SYSGEN` parameters impose a limit on the amount of particular resources that a process can use. When a process has exhausted the resource allotted by the operating system, the SAS System has to either attempt to free up resources of a like nature that are not in use, or, in the event that the SAS System cannot free up sufficient resource, your SAS session will abort. Making proper use of the `UNLOAD` option and the image unloading system service will insure that the SAS System frees up whatever resources it can.

Three SAS jobs were used to assist in deriving the following parameters. The job used to determine the minimum values consisted of a dataset with 100 observations each with 2 numeric variables and 1 10-byte character variable, one invocation of PROC PRINT, PROC SORT, and an FSEDIT session.

```

/* This will be a small job used to evaluate the minimal configuration
*/
/* requirements for running SAS. */

data a; do i=1 to 100; name="Text Field"; x=i*50; output; end; run;
proc print; run;
proc sort; by descending x; run;
proc fsedit; run;
endsas;

```

There were 2 jobs used to determine the recommended values. One job consisted of a single invocation of every SAS procedure with multiple invocations of procedures like PRINT and SORT. The other was a resource-intensive job that ran over a large amount of data. The job created a 50,000 observation data set with 20 numeric variables and 14 character variables most of length 8. Several procedures were run over the data, including CONTENTS, PRINT, MEANS, SORT (SAS and OpenVMS), SQL, GPLOT, GLM, REG, and COMPARE. Full screen procedures included FSVIEW, FSEDIT, CALC, ASSIST, and the EIS tutorial run in the MOTIF window environment.

Any parameters not mentioned below are assumed to be set at their default values. Unless specifically mentioned, the parameters in these examples assume no privileged unloading of images.

PROCSECTCNT parameter

Minimum - 128

Recommended - 300

PROCSECTCNT controls the amount of process header memory used in the loading and running of images. Each image loaded uses one or more process sections. If you run out of process sections, you receive the following OpenVMS system message:

```
%SYSTEM-F-SECTTBLFUL, section table (process/global) is full
```

For PROCSECTCNT, the size of a SAS program is determined by the number of procedures, formats, informats, and functions used by the program.

CTLPAGES and CTLIMGLIM parameters

CTLPAGES and CTLIMGLIM specify the number of pages in the process dynamic memory pool. OpenVMS uses the process pool to store image control structures, process logical names, and other data structures. CTLPAGES determines the size of the pool and CTLIMGLIM limits the amount of the pool that can be used for the image control structures. If you run out of space for image control structures, you receive the following OpenVMS system message:

```
%SYSTEM-F-INSFMEM, insufficient dynamic memory
```

You should then raise `CTLPAGES` and `CTLIMGLIM` by equal amounts. If you run out of space for logical names, first try increasing the `AUTHORIZE` quota, `JTQUOTA`. If that doesn't work, raise `CTLPAGES`.

For `CTLPAGES` and `CTLIMGLIM`, the size of the SAS program is determined by the number of steps, procedures, formats, informats, functions, and device drivers used by the program. The following values for `CTLPAGES` and `CTLIMGLIM` are recommended, based on the size of your SAS job.

- `CTLPAGES=100 CTLIMGLIM=35` for small to large jobs.

Note: Always maintain or increase the difference of 15 between `CTLPAGES` and `CTLIMGLIM`.

- `CTLPAGES=100 CTLIMGLIM=60` is sufficient for the largest possible SAS program.

VIRTUALPAGECNT parameter (pages)

Minimum - 25000

Recommended - 64000

`VIRTUALPAGECNT` specifies the maximum amount of virtual memory any process on the system can use. Every 128 virtual pages adds four bytes of memory to the system page table. If you raise the value for `VIRTUALPAGECNT`, you may also need to raise the `AUTHORIZE` quota `PGFLQUOTA` to allow processes to take advantage of the extra virtual memory. You may also need to increase the size of the system page and swap files. If you run out of virtual memory, you receive the following OpenVMS system message:

```
%SYSTEM-F-INSVIRMEM, Insufficient virtual memory
```

For `VIRTUALPAGECNT`, the size of a SAS program depends on the amount of memory required by the different program steps. The value for `VIRTUALPAGECNT` can be higher than the suggested high value for exceptional memory needs.

CHANNELCNT parameter (channels)

Minimum - 150

Recommended - 300

Note: Certain applications may require the minimum value to be higher.

`CHANNELCNT` controls the number of I/O channels a process is able to have open at once. This value should be at least 50 larger than the largest value of the process quota `FILLM` (see "Minimum and Recommended Authorize Quotas" later in this chapter). If you run out of channels, you receive the following system message:

```
%SYSTEM-F-NOIOCHAN, no I/O channel available
```

For `CHANNELCNT`, the size of a SAS program depends on the number of files opened, the number of steps, procedures, formats, informats, functions, and device drivers used, and the number of full screen operations used by the program.

GBLSECTIONS and GBLPAGES parameters

GBLSECTIONS and GBLPAGES are used to make images known as shareable. The values given below specify the number of unused sections and pages that must be available to make SAS609E.EXE and SAS_USS_PRIV.EXE known images. If you currently have this many sections and pages free, you do not need to increase the value of GBLSECTIONS or GBLPAGES. The following list shows how many sections and pages must be free for the files SAS609E.EXE and SAS_USS_PRIV.EXE.

- GBLSECTIONS
 - 2 free sections for SAS609E.EXE
 - 2 free sections for SAS_USS_PRIV.EXE
 - 3 free sections for SASDS.EXE
 - 3 free sections for SASXKERN.EXE
 - 3 free sections for SASXKINI.EXE
 - 3 free sections for SASXDM.EXE

- GBLPAGES
 - 438 free pages for SAS609E.EXE
 - 2 free pages for SAS_USS_PRIV.EXE
 - 493 free pages for SASDS.EXE
 - 643 free pages for SASXKERN.EXE
 - 71 free pages for SASXKINI.EXE
 - 164 free pages for SASXDM.EXE

WSMAX parameter

This parameter limits the maximum amount of physical memory that any one process can allocate. In order to minimize page faulting, you need to be sure that a process can allocate as much memory as possible without impacting other processes. Individual physical memory (working set) parameters are discussed in the next section. However, WSMAX sets an upper limit to the amount of memory that any one process can allocate, regardless of the individual process parameters:

- 3000 pages minimum
- 7500 pages recommended

Minimum and Recommended AUTHORIZE Quotas

This section describes minimum and recommended values for `AUTHORIZE` quotas. The parameters are configured to ensure that ample resources are available. Refer to *VMS AUTHORIZE Utility Manual* for more detailed information.

This is a portion of a listing of a typical user account. Note that some values are for administrative or accounting purposes and have little or no effect on the performance of the SAS System.

Maxjobs:	0	Fillm:	255	Bytlim:	35000
Maxacctjobs:	0	Shrfillm:	0	Pbytlim:	0
Maxdetach:	0	BIOl m:	200	JTquota:	3072
Prclm:	2	DIOl m:	200	WSdef:	500
Prio:	4	ASTl m:	400	WSquo:	4000
Queprio:	0	TQEl m:	10	WSextent:	6000
CPU:	(none)	Enql m:	40	Pgflquo:	64000

Below is a list of several `AUTHORIZE` quotas that should result in a good level of system performance for the user.

FILLM (files)

Minimum - 100

Recommended - 255

The maximum number of files a process can have open simultaneously is controlled by the `FILLM` quota. This should always be as large as possible, since, depending on the complexity of the job, the SAS System may open a very large number of files. Files are opened for input, output, and format; utility files are opened for various products; and dynamically loaded modules are opened. This quota should be set to at least 75 with the unloading option enabled. Without the unloading option, it should be set to the maximum. Setting this value to the maximum does not consume any system resources unless the added files are being referenced. It permits the user to open a large number of files, and consumes resources only when a particular file is open.

Note: The `SYSGEN` parameter, `CHANNELCNT`, also limits the number of open files. See the previous section on "Minimum and Recommended `SYSGEN` Parameters."

BYTLM (bytes)

Minimum - 15000

Recommended - 35000

The amount of system memory that can be consumed by a process for I/O related overhead is controlled by the `BYTLM` quota. The file system (RMS) consumes this quota for some data structures associated with open files. We recommend that you set this value reasonably high. If necessary, you may have to increase the `SYSGEN` parameter `NPAGEDYN` to accommodate extra paged system memory.

JTQUOTA (bytes)**Minimum - 1024****Recommended - 3072**

The JTQUOTA quota affects the size of the job-wide logical name table. The number of SYSTEM, PROCESS, GROUP, and JOB level logical names that you define on your system affects this quota.

PGFLQUOTA (pages)**Minimum - 15000****Recommended - 64000**

This quota, in conjunction with the SYSGEN parameter VIRTUALPAGECNT, controls virtual memory allocation. This value can be several thousand pages less than VIRTUALPAGECNT, because it only affects modified pages. Be sure there is adequate space in your page file(s) to contain PGFLQUOTA pages for all active processes. A site may consider creating alternate page files on a separate disk from the system disk for better paging performance.

WSDEFAULT (pages)**Minimum - 500****Recommended - 500**

This quota specifies the default working set size for the process and represents the initial number of physical pages that are available to a process. Since all SAS sessions are going to consume several hundred pages of physical memory in initializing the SAS System, ample physical pages should be made available.

WSQUOTA (pages)**Minimum - 2000****Recommended - 4000**

This quota specifies the limit on physical pages available to a process when OpenVMS is operating within normal memory limitations. More memory is available when OpenVMS has excess pages on the free page list, but these pages can be taken back if OpenVMS has a need for them. A process is always guaranteed that WSQUOTA pages will be allocated on its behalf and that ample physical memory for code, data, and scratch space are available. The system configuration must be able to provide page file space for each working set. If working sets of active processes are larger than the physical memory available, the system will swap or page excessively.

WSEXTENT (pages)

Minimum - 3000

Recommended - 6000

This quota denotes the absolute maximum amount of physical memory a process is allowed to access. It applies even though the operating system may have excess pages on the free page list. Pages above `WSQUOTA` and less than `WSEXTENT` may be retaken by OpenVMS if the need arises. A large `WSEXTENT` provides increased space for SAS session code, and, if there is sufficient memory available to the system, data and scratch space. Larger SAS sessions that may require repeating procedures or buffering large amounts of data can benefit from still larger working set sizes. This is, in part, due to the large size of the SAS System and its attempts to use memory in place of scratch disk space for more efficient data processing operations.

Optimizing Performance in a Local Area VMScLuster Environment (LAVC)

Most of the guidelines that have been presented are equally applicable to executing the SAS System on a local area VMScLuster satellite node. There are, however, additional considerations for optimizing performance in this environment.

The most important additional aspect is to make as much of the disk access as possible take place on the local node. One of the primary bottlenecks in a LAVC environment is the time required to move large amounts of code and data across the ethernet. In general, ethernet access is slower than local disk access. Therefore, to maximize performance, you should minimize the amount of ethernet activity.

This can be done in two ways. You can ensure that your data files and application source files are resident on the local node disk drives whenever possible. In addition, you can maximize your use of the `LOADLIST` option, which indicates the SAS System images that are executed most frequently during the course of a particular application. Copying and accessing these files from the local node disk drive prevents you from having to access them across the ethernet. If the executables are not located in the current directory of the local disk, the `SAS$LIBRARY` logical must be modified to include the new location.

Part III, Appendices

Appendix A,	Post-Installation Setup for SAS/ACCESS Software
Appendix B,	Post-Installation Setup for the ALL-IN-1 Integration of Release 6.09 Enhanced of the SAS System under OpenVMS
Appendix C,	Post-Installation Setup for SAS/ASSIST Software
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Appendix A, Post-Installation Setup for SAS/ACCESS[®] Software

SAS/ACCESS Interface to ORACLE Software

In order to use the SAS/ACCESS Interface to ORACLE, you must link the interface with your version of the ORACLE RDBMS. If you did not complete the linking during the installation procedure or if you must relink the SAS/ACCESS Interface to ORACLE, you need to run the installation post-processing file `SAS$ROOT:[TOOLS]POST_ACCORL.COM`. This installation post-processing command file links the SAS/ACCESS Interface to ORACLE with your current ORACLE configuration. You might need to relink the interface if you installed additional ORACLE products, or additional ORACLE SQL*Net device drivers, or if you install a new version of the ORACLE RDBMS.

The command procedure links the SAS/ACCESS Interface to ORACLE as a two-task application by using the VMS Mailbox driver or a SQL*Net device driver. The VMS Mailbox Driver and SQL*Net device driver are two-task drivers.

To do this, verify that you chose `[Y]` for the VMS Mailbox Driver during the Network Configuration Options menu of your ORACLE installation. Be careful not to change the other drivers you had in the initial ORACLE installation. The ORACLE RDBMS must be linked as a shared image using the default value of `S`. Refer to *ORACLE for DEC VAX/VMS Installation and User's Guide* for more information about installing the ORACLE RDBMS and the ORACLE two-task architecture.

You must execute the command file that defines SAS logical names before executing the post-processing files. Execute `SASdisk:[SASroot.TOOLS]SAS609E.COM` where `SASdisk` and `SASroot` are the disk and root directory of the SAS Release 6.09E installation.

SAS/ACCESS Interface to ORACLE Version 6 Software

In order to use the SAS/ACCESS Interface to ORACLE with an ORACLE Version 6 database system, you must create the `SASORA_V6.EXE` image. You must execute the `ORA_UTIL:ORAUSER.COM` file associated with your ORACLE Version 6.0 installation. In addition, the `ORA_ROOT` logical must point to your root level ORACLE Version 6 directory.

To link the `SASORA_V6` image, invoke the following post-processing command procedure:

```
$ @SAS$ROOT:[TOOLS]POST_ACCORL.COM V6
```

where `V6` is a parameter that is passed to the command procedure indicating that you want to link to ORACLE Version 6.

You must define the logical, `SASORA`, to point to a specific `SASORA` image. This image depends upon the version of ORACLE you want to use. For example, if you want to use ORACLE Version 6, issue the following command:

```
$ DEFINE SASORA SAS$LIBRARY:SASORA_V6.EXE
```

If you are using the SAS/ACCESS Interface to ORACLE to only access an ORACLE Version 6 database system, insert the `DEFINE` command for the logical name, `SASORA`, into the SAS System startup file:

```
SAS$ROOT:[TOOLS]SAS609E.COM
```

If you plan to use multiple releases of the ORACLE database, issue the appropriate `DEFINE` command before invoking the SAS System.

SAS/ACCESS Interface to ORACLE Version 7 Software

In order to use the SAS/ACCESS Interface to ORACLE with an ORACLE Version 7 database system, you must create the `SASORA_V7.EXE` image. You must execute the `ORA_UTIL:ORAUSER.COM` file associated with your ORACLE Version 7.0 installation. In addition, the `ORA_ROOT` logical must point to your root level ORACLE Version 7 directory.

To link the `SASORA_V7` image, invoke the following post-processing command procedure:

```
$ @SAS$ROOT:[TOOLS]POST_ACCORL.COM V7
```

where `V7` is a parameter that is passed to the command procedure indicating that you want to link to ORACLE Version 7.

You must define the logical, `SASORA`, to point to a specific `SASORA` image. This image depends upon the version of ORACLE you want to use. For example, if you want to use ORACLE Version 7, issue the following command:

```
$ DEFINE SASORA SAS$LIBRARY:SASORA_V7.EXE
```

If you are using the SAS/ACCESS Interface to ORACLE to only access an ORACLE Version 7 database system, insert the `DEFINE` command for the logical name, `SASORA`, into the SAS System startup file:

```
SAS$ROOT:[TOOLS]SAS609E.COM
```

If you plan on switching between releases of the ORACLE database, issue the appropriate `DEFINE` command before invoking the SAS System.

If your site uses SAS/ACCESS Interface to ORACLE and you are running ORACLE Version 7, you may need to increase the byte count quota (`BYTLM`) on your OpenVMS user account. This depends on the size of the SGA pad of the ORACLE Version 7 database at your site, the number of files your application is trying to open, and the amount of SQL*Net driver activity within your application.

SAS/ACCESS Interface to INGRES Software

In order to use the SAS/ACCESS Interface to INGRES, you must link the interface with your version of the INGRES RDBMS. If you did not complete the linking during the installation procedure, or if you must relink the SAS/ACCESS Interface to INGRES, run the installation post-processing file: `SAS$ROOT:[TOOLS]POST_ACCING.COM`. You might also need to relink if you install a new version of the INGRES RDBMS.

In order to link the SAS/ACCESS Interface to INGRES, you must have defined the INGRES logical names. Specifically, the logical name, `II_SYSTEM`, should be defined to the disk containing your INGRES installation.

You should execute the command file that defines SAS logical names before running the installation post-processing command file. Execute the following:

```
SASdisk:[SASroot.TOOLS]SAS609E.COM
```

where `SASdisk` and `SASroot` are the disk and root directory of the SAS System Release 6.09E installation.

To link the SAS/ACCESS Interface to INGRES, execute the installation post-processing file,

```
$ @SAS$ROOT:[TOOLS]POST_ACCING.COM xx
```

where `xx` is a version designation that indicates the release of INGRES you are using. Use 64 as the value for `xx` if you are linking INGRES Version 6.4/xx, and 11 if you are linking INGRES Version 1.1/xx.

SAS/ACCESS Interface to SYBASE Software

To use the SAS/ACCESS Interface to SYBASE, you must link the interface with your version of SYBASE Open Client. If you did not complete the linking during the installation procedure, or if you must relink the SAS/ACCESS Interface to SYBASE, you need to run the installation post-processing file, `SAS$ROOT:[TOOLS]POST_ACCSYB.COM`. The installation post-processing command file links the SAS/ACCESS Interface to SYBASE to your current SYBASE configuration. You may have to relink SYBASE applications when you install a new version of SYBASE Open Client.

In order to link the SAS/ACCESS Interface to SYBASE, the SYBASE logical names must be defined. Specifically, the logical names `SYBDB_OPTIONS` (SYBASE, Release 4.x), or `SYB_DB_OPTIONS` (SYBASE System 10) must be defined to point to the SYBASE linker options file. For example:

```
SYBASE_SYSTEM:[SYBASE.LIB]SYBDB_OPTIONS.OPT
```

Additionally, `SYB_DBSHR` (for both Release 4.x and System 10) must be defined to point to the SYBASE shareable image, as shown in the following example:

```
SYBASE_SYSTEM:[SYBASE.LIB]SYB_DBSHR.EXE
```

Additionally, you must be sure that the SYBASE shareable image, SYBASE_SYSTEM:[SYBASE.LIB]SYB_DBSHR.EXE reflects your current version of the SYBASE Open Client installation. For SYBASE Release 4.x, this image should have been built when you installed SYBASE. However, if you did not complete the SYBASE installation, or you are unsure about the status of this shareable image, you can rebuild it **before** invoking the SAS/ACCESS Interface to SYBASE installation post-processing file by executing the following:

```
$ @SYBASE_SYSTEM:[SYBASE.INSTALL]MAKE_SYBDBSHR.COM
```

To link the SAS/ACCESS Interface to SYBASE, execute the installation post-processing file:

```
$ @SAS$ROOT:[TOOLS]POST_ACCSYB.COM xx
```

where `xx` is a version designation that indicates what release of SYBASE Open Client you are using. For example, 40 for SYBASE Open Client Release 4.0, 460 for SYBASE Open Client Release 4.60, 10 for any SYBASE System 10 Open Client, and so on.

For more information on the SYBASE logical names and on the SYBASE installation procedure, refer to the *SYBASE Installation Guide for VAX/VMS*.

You must execute the command file that defines SAS logical names before running the installation post-processing command file by issuing the following command:

```
$ @SASdisk:[SASroot.TOOLS]SAS609E.COM
```

where `SASdisk` and `SASroot` are the disk and root directory of the SAS System Release 6.09E installation.

Appendix B, Post-Installation Setup for the ALL-IN-1 Integration of Release 6.09 Enhanced of the SAS[®] System under OpenVMS

Overview

This appendix covers the following topics:

- ❑ additional SAS software requirements for integration options
- ❑ making the ALL-IN-1 Integration of Release 6.09E available on your system
- ❑ adding a SAS System menu application to the ALL-IN-1 Integration of Release 6.09E.

Additional SAS Software Requirements for Integration Options

- ❑ SAS/ASSIST software (optional)

In order to use the `AST` option to run SAS/ASSIST software from the *Run Release 6.09E of the SAS System Program Management* menu, SAS/ASSIST software must be installed on your system.

- ❑ SAS/GRAPH software (optional)

In order to use either the `REG` or `SIX` options from the *Additional Graph Options* menu, SAS/GRAPH software must be installed on your system. These options also have the following additional requirements:

- ❑ `REG` requires that you produce SAS/GRAPH graphics stream files with the LCP01 SAS/GRAPH graphics device driver in an ALL-IN-1 File Cabinet document.
- ❑ `SIX` requires that you have RETOS software installed on your system. RETOS is the ReGIS-to-sixel conversion software. It allows you to convert a SAS/GRAPH graphics stream file produced with the SAS/GRAPH LCP01 graphics device driver in sixel format.

If your system has these graphic capabilities and you also have DECpage installed (the `DP` option is available from the *ALL-IN-1 Word and Document Processing menu*), you can print graphics in a document that was created in WPS-PLUS format.

Making the ALL-IN-1 Integration of Release 6.09E Available on Your System

To make the ALL-IN-1 Integration of Release 6.09E available to your users, perform the following steps:

1. If you do not meet the graphic requirements previously described, you should modify the REG and SIX options (available in the GSAS (Additional Graph Options menu)) so the ALL-IN-1 users at your site will know that these options are not available. To do this, add the following commands to the top of the script files, SAS\$ROOT:[ALLIN1]SAS_REG.SCP, and SAS_SIX.SCP:

```
DISPLAY This option is currently unavailable . . .
FORCE
EXIT
```

2. If the SAS logical names on your system, which are described in "Setting Up and Maintaining the SAS System," are **not** defined in the SYSTEM logical name table, but are defined in the PROCESS logical name table, the following commands should be added to the 5 command procedures listed below to make the logicals available when running Release 6.09E of the SAS System from an ALL-IN-1 session:

```
$ DEFINE/TRANSLATION=(CONCEALED)/PROCESS SAS$ROOT -
  DISK:[SAS609E.]
$ @SAS$ROOT:[TOOLS]SAS609E.COM
```

where DISK:[SAS609E.] points to the root directory for Release 6.09E of the SAS System, and SAS\$ROOT:[TOOLS]SAS609E.COM points to the startup file for Release 6.09E of the SAS System.

Add these commands to the beginning of each of the following *.COM files:

```
SAS$ROOT:[ALLIN1]SAS_AST.COM
SAS$ROOT:[ALLIN1]SAS_INT.COM
SAS$ROOT:[ALLIN1]SAS_MEN.COM
SAS$ROOT:[ALLIN1]SAS_PRE.COM
```

Also add the above commands to SAS\$ROOT:[ALLIN1]SAS_BAT.COM. However, rather than adding the commands to the beginning of the file, add the commands to the part of the command procedure where SAS_BATCH.COM is created. Search for \$ RUN_SAS_PGM: to add the above commands. For example:

```
$ wr "$ RUN_SAS_PGM:"
$ wr "$ define/translation=(concealed)/process sas$root -"
$ wr "    disk:[sas609E.]"
$ wr "$ @sas$root:[tools]sas609e.com"
$ wr "$ sas/cc=cr-"
$ wr "    /lis='sas_lis'-"
$ wr "    /log='sas_log'-"
$ wr "    'sas_options' -"
$ wr "    'sas_pgm'"
$
```

By adding the commands in this section, the logical names for the SAS System will be available to the batch job, `SAS_BATCH.COM`, when it is running in a batch queue.

Note: The verb name, `SAS`, is specified in the above `*.COM` files. If the verb name used to invoke Release 6.09E of the SAS System at your site is not `SAS`, you also need to change the `SAS` verb name in these `*.COM` files to the verb name used at your site. To do this, search for the string, `SAS/` in each of the `*.COM` files listed above and change `SAS` to the verb name used at your site. For example, if your site uses the verb name, `SAS609E`, change all occurrences of `SAS/` to `SAS609E/` in these command procedures.

3. The job-level logical name, `SAS$ALLIN1`, must be defined on your system in order to run the ALL-IN-1 integration of the SAS System, Release 6.09E by issuing a `DEFINE` command as in the following example:

```
$ DEFINE/JOB/NOLOG SAS$ALLIN1 SAS$ROOT:[ALLIN1]
```

This logical name points to the area where all the files for the ALL-IN-1 integration of Release 6.09E of the SAS System reside.

- If all users on your system will use the ALL-IN-1 integration of Release 6.09E of the SAS System, add the `DEFINE` command to the system login file, `SYS$MANAGER:SYLOGIN.COM`. This defines the logical name for each user at log in time.
- If only a few users are using the integration, you can either insert this command in a group `LOGIN.COM` or in each user's `LOGIN.COM`.

Note: If `SAS$ROOT` is **not** defined as a system-level logical name, you must specify the full pathname for the directory that contains the files for the ALL-IN-1 integration, as in the following example:

```
$ DEFINE/JOB/NOLOG SAS$ALLIN1 DISK:[SAS609E.ALLIN1]
```

4. Your ALL-IN-1 manager or ALL-IN-1 administrator must add the following to the `FORM LIBR:` field in each ALL-IN-1 user's profile:

```
Form libr: SAS$ALLIN1:SAS.FLB
```

5. A `BA` (Business Applications) form exists in the forms library, `SAS$ALLIN1:SAS.FLB`. If you currently do not have any other business applications available via this form at your site, you do not have to make any modifications. However, if you already have other business applications listed in your site's `BA` form, you should delete the `BA` form from `SAS.FLB` and update your existing `BA` form so you can invoke this integration from the `BA` form or any other ALL-IN-1 menu. Add the following line to the `BA` form:

```
S609E Invoke Release 6.09E of the SAS System
```

When you do so, the ALL-IN-1 Integration of the SAS System becomes available to your users by typing `S609E` as the choice from this menu or any other ALL-IN-1 menu.

Also, edit the named data for the BA form and add it to the list of available options so it can be invoked from hardcopy mode, as in the following example:

Named Data

```

1      Name .TYPE
MENU/USER=USER/TITLE=TITLE/DATE=DATE/MAIL=MAIL/CHOICE=CHOICE/CLEAR

2      Name .TYPE
/GET=DAY,OA$DAY/HARD=OA$_BA_BUS_APP_TITLE

3      Name CHOICE
/HARD="Options: S609E"

```

6. After making sure that you have met all of the minimum requirements outlined in this document, refer to the Technical Support Note #268, for information on how to invoke the SAS Program Management menu once the integration is installed on your system.

How to Add a SAS Menu Application to the ALL-IN-1 Integration of the SAS System, Release 6.09E

If you have a SAS menu application available on your system, you can make it available to ALL-IN-1 users via the MEN (Invoke a SAS menu application) option in the Run Release 6.09E of the SAS System menu by following the steps below:

1. Edit SAS\$ALLIN1:SAS_MEN.COM and search for the following lines:

```

$
$! If no SAS menu application exists, display a message:
$ write oamailbox "oa displayNo SAS menu applications are
$ write oamailbox "oa currently available . . .\force "
$ @dclmailbox:
$ wait 00:00:03
$ goto PREM_EXIT
$
$! If you have a SAS menu application, put the location of the startup file
$! in the place of 'DISK:[DIRECTORY]MENU_APP.SAS' below:
$!
$! sas/cc=cr'sas_options' DISK:[DIRECTORY]MENU_APP.SAS
$
$

```

2. Comment out the following lines:

```

$! If no SAS menu application exists, display a message:
$! write oamailbox "oa display No SAS menu applications are"
$! write oamailbox "oa display currently available at this site . . .\force "
$! @dclmailbox:
$! wait 00:00:03
$! goto PREM_EXIT

```

3. Uncomment the last line of this command procedure, and replace `DISK:[DIRECTORY]MENU_APP.SAS` in the command below with the name of the startup file for your menu application.

For example, if you have a SAS menu application, `SAS$ROOT:[MENU]ACCOUNT.SAS`, change the command to resemble the following:

```
$ sas/cc=cr'sas_options' SAS$ROOT:[MENU]ACCOUNT.SAS
```


Appendix C, Post-Installation Setup for SAS/ASSIST[®] Software

An `AUTOEXEC` file that can be used to invoke SAS/ASSIST software has been provided with your customer tape. This `AUTOEXEC` file automatically brings up the "Primary Menu" for SAS/ASSIST software upon invocation of Release 6.09E of the SAS System.

The `AUTOEXEC` file is located in:

```
SAS$ROOT:[TOOLS]ASSIST_AUTO.SAS
```

To make this `AUTOEXEC` file available to your users, set up the following OpenVMS symbol:

```
$ ASSIST ::= SAS/AUTOEXEC=SAS$ROOT:[TOOLS]ASSIST_AUTO.SAS
```

When the OpenVMS symbol is in place, users will only have to type `ASSIST` at the DCL prompt (\$) to access SAS/ASSIST software.

Note: We recommend that you include this symbol definition in your system login command file, `SYS$MANAGER:SYLOGIN.COM`, so the symbol will be available for all users upon logging into the system.

The following section describes profile enhancements and migration. The remaining sections describe how to add an optional master profile and optional group profile(s) to SAS/ASSIST software. A master profile can be used to override the default settings as sent by SAS Institute. This allows you to provide a customized setup for SAS/ASSIST software. With the master profile you can control the profile options of all SAS/ASSIST users from one central place. For information on the profile options, see Chapter 8, "Setting Up and Customizing Master, Group, and User Profiles" in *SAS/ASSIST Software: Changes and Enhancements, Version 6*.

Profile Changes and Enhancements

To enhance the profile feature for Query and Reporting, some changes have been made to the profile structure. A new profile option, `Query exit`, has been added to the user profile in `Type:Query`. Another new profile option, `Additional Information`, has been added to `Type:Query Manager`. This enables users who are running queries against SAS data to obtain customized information about the data they are accessing.

Converting User Profiles From a Previous Release

There are many ways to convert your user profile. One is to simply note any changes you have made to your user profile, exit SAS/ASSIST software, delete the profile, `SASUSER.PROFILE.PASSIST.SLIST`, and reinvoke SAS/ASSIST software. A profile with the new format will be created. You can now update your new profile with the option values you noted in your original profile.

Another way you can convert your user profile is to use a conversion program which is provided with this release. In the Program Editor window type and submit the following to convert to the new structure:

```
proc display cat=sashelp.qassist.profconv.scl; run;
```

The SAS Administrator may want to ensure that all users of SAS/ASSIST software convert their user profiles soon after the new release is installed. This can be done using the Master Profile (see the section, "Adding a Master profile" for information on creating a master profile). You will take advantage of the SAS/ASSIST start program, a profile option which runs a program when SAS/ASSIST software is invoked. The program must be a SOURCE entry, therefore you must save the code in a source entry in a library that is accessible by all users such as SASHELP.

In this example, the source is saved in SASHELP.QASSIST.PROFCONV.SOURCE. If you currently have a SAS/ASSIST start program that is used globally you can add the code in that program. If individual users have their own SAS/ASSIST start programs, it may be best to have them simply type and submit the code in the Program Editor. Complete the following steps:

1. Type the following in the Program Editor window :

```
proc display cat=sashelp.qassist.profconv.scl; run;
```

2. Select Save As...Write to Object from the File pmenu.

3. Enter the following destination object name:

```
SASHELP.QASSIST.PROFCONV.SOURCE
```

4. Select OK.

5. After the Master Profile has been created, open it and select Type: General

6. Specify the following: (The R status forces the user's profile to be updated)

<i>Cmd Option</i>	<i>Value</i>	<i>Status</i>
<i>SAS/ASSIST start program</i>	<i>SASHELP.QASSIST.P ROFCONV. SOURCE</i>	<i>R</i>
<i>Type of start program</i>	<i>Catalog</i>	<i>R</i>

Note: Once the conversion program has run, it can run again and again without effect. The administrator will have to leave these values in place until he feels confident that all users have used SAS/ASSIST software. The users will see a pop-up window indicating the above profile value change when they first access SAS/ASSIST software after the new release is installed and this technique is implemented. You may want to let them know to expect it. The user must accept this change.

When the administrator is confident that all users have invoked SAS/ASSIST software in the new release, he should clear the value specified for the SAS/ASSIST start program and make it available to the user. Specify the following:

<i>Cmd Option</i>	<i>Value</i>	<i>Status</i>
<i>SAS/ASSIST start program</i>		<i>U</i>
<i>Type of start program</i>	<i>Catalog</i>	<i>U</i>

The U status enables users to enter their own values for these options.

A pop-up window indicating these profile changes may be displayed. You can choose to accept the changes and update your profile.

Note: If you currently have a SAS/ASSIST start program that is used globally, you can add the above code to that program. If individual users have their own SAS/ASSIST start programs, it may be best to have them type and submit the code in the Program Editor.

Adding a Master Profile

A master profile can be used to override the default settings as sent by SAS Institute. This allows you to provide a customized setup for SAS/ASSIST software. With the master profile you can control the profile options of all SAS/ASSIST users from one central place. For information on the profile options, see Chapter 8, "Setting Up and Customizing Master, Group, and User Profiles," in *SAS/ASSIST Software: Changes and Enhancements, Version 6*.

Complete the following steps to add a master profile to SAS/ASSIST software:

1. Specify the location of the master profile by creating a new directory which will contain the master profile as shown in the following example:

```
DISK:[Directory]
```

All users with write-access to this directory will automatically also have write-access to the master profile in SAS/ASSIST software. Select a name which conforms to the naming conventions at your installation. All users must have read-access to this library.

- Invoke the SAS System.
- On line 1 of the Program Editor type the physical pathname to be used as the SAS library to store the master profile. Select Save As...Write to Object from the File pmenu.

```
00001 disk:[directory]
00002
```

- Enter the following destination object name and then select **OK**:

SASHELP.QASSIST.PARMS.SOURCE

Note: The entry must be saved with the name
SASHELP.QASSIST.PARMS.SOURCE.

The location of the master profile is now known by SAS/ASSIST software.

2. Create the master profile.

The first time SAS/ASSIST software is started a master profile is created if the SASHELP.QASSIST.PARMS.SOURCE contains the name of an existing library, and the person who starts SAS/ASSIST software has write-access to this library.

3. Customize the master profile by starting SAS/ASSIST and selecting
SETUP ... Master/group...

If you have write-access to the SAS library containing the master profile you can specify default values for your installation. These values will be used by new users as they start SAS/ASSIST software.

Note: If you restrict values by typing **R** in *Status*, users will not be allowed to change the values you define.

SAS/ASSIST contains a command bar and a saving facility. Depending on the style you want to run, you must specify the following options in the master profile:

Run old style:

Save selections on end:	No
Confirm Changes:	No
Menu Style:	Old

Run new style:

Save selections on end:	Yes
Confirm Changes:	No
Menu Style:	New

For more information, see Chapter 8 in *SAS/ASSIST Software: Changes and Enhancements*.

4. Create Group profiles.

From the master profile it is possible to create group profiles if you want to divide the users into several groups with different profiles. The master profile controls group and user profiles whereas the group profiles only controls the user profiles. You may want to set up group profiles as part of your post-installation tasks, or do it at a later time.

Select `Create Group Profile` from the `Locals` menu. Specify a name, description, and location for the group profile. Edit the profile option values as desired. To add users to a group profile, select `Update User Group` from the `Locals` menu to enter the userids interactively. You can also use a SAS program to update the group. To specify the name of the variable which contains the userid to be used in SAS/ASSIST, open the master profile, change the type to `System Administration` and enter the variable name for the `userid` option. By default the userid is found in the macro variable `&SYSJOBID`. This value is set in the option `userid` in the master profile (option type `System Administration`). Change the value if your site uses another variable to keep the userid. If the value name starts with `&`, it is a macro variable; otherwise it is an environment variable, which is defined before starting the SAS System.

Appendix D, Post-Installation Setup for SAS/TUTOR[®] Courses

After installing the SAS/TUTOR courses, follow these steps to set up and initialize the SAS/TUTOR system.

Set up an OpenVMS Symbol to Access SAS/TUTOR Courses

To facilitate user access to the SAS/TUTOR courses, define an OpenVMS symbol. To do so, perform the following steps:

1. Confirm the installation of the course command file.

The DCL command procedure, `SAS$CBT:[CBTMGR]SASTUTOR.COM`, should be used when accessing any SAS/TUTOR course. The command file brings up a menu screen that displays the list of courses that can be run on your system via an autoexec file, `SAS$CBT:[CBTMGR]CBTAUTO.SAS`.

Make sure that these files have been loaded onto your system. The autoexec file assigns librefs to the data libraries and other files used by the courses. The autoexec file also defines the functions of certain keys and sets SAS system options to be used when the courses are running.

2. Define an OpenVMS symbol, `SASTUTOR`, to invoke the command procedure, `SAS$CBT:[CBTMGR]SASTUTOR.COM`:

```
$ SASTUTOR ::= @SAS$CBT:[CBTMGR]SASTUTOR.COM
```

This command should be added to the system-wide login command procedure, `SYS$MANAGER:SYLOGIN.COM` so the symbol is available to all users when they log on.

3. Set the ownership of the SAS/TUTOR files to your UIC (user identification code). For example, if your UIC is `[100,200]`, use the following command to set the ownership of the SAS/TUTOR courses to your UIC:

```
$ SET FILE/OWNER_UIC=[100,200] SAS$CBT:[000000...]*.*;*
```

For more information on setting owner UICs, refer to *VMS DCL Concepts Manual*.

Initializing the SAS/TUTOR System

1. Once proper authorization has been assigned, initialize the SAS/TUTOR system by issuing the `SASTUTOR` command at the DCL prompt.
2. On the Course Management System initialization screen, enter the following password:

```
SAS$INIT
```

If prompted, enter or verify the location of the control library.

Note: During this step, your user ID is stored in the SAS/TUTOR system on the course administrator list, you are the only person with access to alter the Course Management System.

3. Select the option `Initialize a Course` from the Course Management System Main Menu.
4. Enter the ID of each course you installed.

```
Valid course IDs are:  CBT101  
                      CBT102  
                      CBT103  
                      CBT104  
                      CBT105  
                      CBT106
```

If prompted, specify where the course files were installed.

Verifying Installation and Initialization of SAS/TUTOR Courses

1. At the DCL prompt, issue the following command:

```
SASTUTOR
```
2. After issuing the `SASTUTOR` command, you are prompted to enter a valid full-screen device name (for example: `TEK4105`, `TEK4205`).

If the SAS/TUTOR system is properly installed and initialized, you should be taken to the Course Management System Main Menu because you are listed as a Course Administrator.

3. Select the option `Take a Course`. If courses are properly initialized, a menu of installed courses is displayed.

Adding a Course Administrator to the SAS/TUTOR System

1. From the DCL prompt, issue the `SASTUTOR` command.
2. From the Course Management System Main Menu, select `Update the Course Administrator List`.
3. Enter the user ID of additional course administrator(s). Up to eight user IDs can be entered.

Note: Once a user ID is listed on the course administrator list, that individual is automatically taken to the Course Management System Main Menu each time he or she issues the `SASTUTOR` command.

Each course administrator has authority to:

- add or remove a course from the SAS/TUTOR Course Selection Menu
- activate, modify, and use the student tracking system
- add or remove any user ID from the course administrator list.

Instructions for Deleting SAS/TUTOR Courses

A command procedure or "delete program" that allows you to delete SAS/TUTOR courses from your system has been supplied on your customer tape. The delete program should **only** be used by the Course Administrator or the Systems Manager.

To use the delete program, `SAS$CBT:[CBTMGR]CBT_DELETE.COM`, execute the steps below:

1. Log on to a privileged account. Since you will be deleting files from the SAS System directory tree, you need to have privilege to delete files from that directory tree. The original protection setting on all SAS System directories is:

```
S:RWED,O:RWED,G:RE,W:RE
```

Therefore, you need to be running from an account that has privilege to re-set the protection on the SAS/TUTOR courses that you want to delete via the delete program.

2. Make sure that SAS logical names are defined. The delete program uses the logical name, `SAS$CBT`, and will not work unless it is defined.

Note: If `SAS$CBT` is not set up on your system, run the SAS System startup command file, `SASdisk:[SASroot.TOOLS]SAS609E.COM`, to set up SAS System logical names, where `SASdisk` refers to the disk where the SAS System is installed and `SASroot` points to the root directory for Release 6.09E of the SAS System.

See the section, "The SAS System Startup Command File" in Part I, "Setting Up and Maintaining the SAS System" for more information about the SAS System startup command file.

3. Invoke the delete program:

```
$ @SAS$CBT:[CBTMGR]CBT_DELETE.COM
```

The delete program looks for SAS/TUTOR courses that have been installed on your system. One course at a time, you are asked if you want to delete an installed SAS/TUTOR course, as in the following example:

```
* Do you want to delete course files from SAS$CBT:[CBT101]? [N]
```

4. If you want to delete the course files, answer **Y**. You receive informational messages as the files are deleted:

```
Deleting files from SAS$CBT:[CBT101]...  
Deleting SAS$CBT:[000000]CBT101.DIR...
```

If you do not want to delete the course files, press RETURN. Once the delete program has finished prompting you about deleting installed SAS/TUTOR courses, you will receive the message:

```
SAS$CBT:[CBTMGR]CBT_DELETE.COM has finished executing...
```

Restoring Tracking Data from Release 6.08 to Release 6.09E (optional)

You can use your 6.08 tracking data by following these steps at any time after installing and initializing the SAS/TUTOR system.

1. Access SAS Release 6.09E.
2. Assign librefs to the SAS/TUTOR control libraries for both Release 6.08 and Release 6.09E as follows:

```
libname OLD (subdirectory for CBTCNTL - Release 6.08);  
libname NEW (subdirectory for CBTCNTL - Release 6.09E);
```

3. Submit the following SAS program to append Release 6.08 tracking data to the Release 6.09E tracking data set:

```
proc append base=NEW.TRACK data=OLD.TRACK;  
proc sort data=NEW.TRACK noduplicates;  
by TRKVAR;  
run;
```

Appendix E, Post-Installation Setup for SAS/CONNECT® Software

The first section in this appendix, "Storing and Locating SAS/CONNECT Script Files", describes the use of the sample script files shipped with the product. The remaining sections in this appendix list supported software for access methods available on OpenVMS and outline configuration procedures for those access methods that require additional configuration.

The access methods supported for OpenVMS are: DECNET, TELNET, and TCP/IP, and are described in the order listed. Refer to the section for the access method(s) that you will be using at your site for requirement information. Remote capability for the ASYNC access method supported in previous releases is available in this release, as well. There is no change in the requirements for this access method and, therefore, there will be no discussion of it in this appendix. Refer to *SAS/CONNECT Software: Usage and Reference, Version 6, Second Edition* for complete details on the access methods supported by other systems.

Storing and Locating SAS/CONNECT Script Files

Several sample script files are shipped with SAS/CONNECT software. SAS/CONNECT software uses these script files to establish a connection to a remote SAS session. A new SAS System option, `SASSCRIPT`, points to the location of the SAS/CONNECT script files. The `SASSCRIPT` option is used by SAS/ASSIST and could be used by user-written SCL applications.

The logical name, `SAS$CNTMISC`, contains the location of the script files. This value should be assigned to `SASSCRIPT` during the customization process for `CONFIG.SAS` by adding the following line to the `CONFIG.SAS` file:

```
/SASSCRIPT=SAS$CNTMISC
```

The value of the `SASSCRIPT` option can be a logical name or one or more concatenated directory names. The `SAS$CNTMISC` logical name points to `SAS$ROOT:[TOOLS]` by default, but the Systems Administrator may override this if desired. Therefore, by default, the sample script files are stored in `SAS$ROOT:[TOOLS]`. Putting the following line in `CONFIG.SAS` produces the same result as the previous example:

```
/SASSCRIPT=SAS$ROOT:[TOOLS]
```

If you would like to move these script files to another location, you must edit the SAS System startup file, `SAS$ROOT:[TOOLS]SAS609E.COM`, and change the location where you want the logical name, `SAS$CNTMISC`, to point. For example, if you want to create a search path for the sample script files that searches a work area first, then the default area, you can change the define command for `SAS$CNTMISC` in the SAS System startup file to:

```
$ DEFINE/SYSTEM/NOLOG SAS$CNTMISC -  
  DISK:[SCRIPT_FILES],-  
  SAS$MAINT,-  
  SAS$ROOT:[TOOLS]
```

where `DISK:[SCRIPT_FILES]` is your work area, `SAS$MAINT` points to the area where source maintenance files are stored, and `SAS$ROOT:[TOOLS]` points to the area where the original sample script files are stored. To do so, insert the following line in the `CONFIG.SAS` file:

```
/SASSCRIPT=SAS$CNTMISC
```

System Configuration for the DECnet Access Method (required to use DECnet)

SAS/CONNECT software provides a DECnet access method for use with OpenVMS. Any user that will use the DECnet access method must have `TMPMBX` and `NETMBX` privileges which should be standard user privileges. Proxy access to OpenVMS nodes is also supported.

DECnet has the ability to automatically create its remote partner. In DECnet terms, this process is called *connecting to an object*. When using SAS/CONNECT software, the local SAS session requests DECnet to connect the `SAS$CONN` object. This causes DECnet on the specified remote host to create a process on the remote host using proxy access or the user name and password supplied as the access control information. DECnet then finds and executes the command file associated with the object name, `SAS$CONN`. This command file contains DCL commands, one of which invokes the remote SAS session. A default `SAS$CONN.COM` file is provided for you in the `SAS$ROOT:[TOOLS]` directory.

For OpenVMS, you may do one of two things to cause DECnet to associate a command file with the `SAS$CONN` object name. One way is to have a command file whose name is `SAS$CONN.COM` in the user's default login directory.

A sample command file (`SAS$CONN.COM`) for OpenVMS follows:

```
$ set def disk:[user.directory]  
$ sas/dmr/comamid=decnet
```

The first line sets the default directory to the directory in which you want to run SAS, and the second line invokes the remote SAS session with the options necessary for SAS/CONNECT software.

An alternate way that you can have DECnet associate a command file with the `SAS$CONN` object name is to use the Network Control Program (NCP) to tell DECnet where the command file is located. To define the `SAS$CONN` object, the systems administrator will need `SYSPRV` and `OPER` privileges.

System Configuration for the TELNET and TCP Access Method (required to use TELNET or TCP/IP)

Using the TELNET or TCP access method, a user on OpenVMS can connect to any supported platform that is on the TCP/IP network, is running a SAS Release that has the corresponding access method support, and has SAS/CONNECT licensed. With the TCP access method, one of the supported TCP/IP products must be installed on any node, local or remote, that you want to use with SAS/CONNECT. For the TELNET access method, a supported TCP/IP package must be installed on the local node. The remote node does not have to run a supported TCP/IP product, but must run some TCP/IP product to make the node accessible via telnet.

The following TCP/IP products are supported for Release 6.09E:

- V1.3a+ of VMS/ULTRIX Connection with the latest patch kit from Digital Equipment Corporation's Customer Support Center
- DEC TCP/IP Services for OpenVMS, Version 2.0 (newer version of the DEC ULTRIX package listed above)
- TGV's MultiNet Software with UCX compatibility
- Wollongong's PathWay Runtime with UCX compatibility
- Process Software's TCPware for OpenVMS with UCX compatibility
- The TCP access method should run with any package that provides an interface compatible with DEC TCP/IP Services for OpenVMS.

Appendix F, Post-Installation Setup for SAS/SHARE[®] Software

To use SAS/SHARE software, you must complete system configuration for the access methods used for communication between servers and users.

Selecting Which Communications Access Methods to Use

You must perform the steps provided in this section. To select an access method, complete the following steps:

1. Determine which access methods to use.

An OpenVMS SAS/SHARE server and user can communicate using either or both of the following access methods:

- DECnet access method
- TCP/IP access method.

2. Set the SAS system option to specify selected access method.

The SAS system option `COMAMID=` specifies which access method SAS/SHARE software should use for communication. Specify `COMAMID=DECNET` to use the DECnet access method, or `COMAMID=TCP` to use the TCP/IP access method.

Your site's default value for this option should be specified in a SAS System configuration file by the SAS/SHARE Software Consultant. If you choose to use both access methods at your site, specify the one that will be used more often via the `COMAMID=` option. A user who needs to use the other access method can override the default by specifying the `COMAMID=` option in his own configuration file or in an options statement in his SAS program.

Note that the `COMAMID=` option is also used by SAS/CONNECT software. A user may use different access methods for communicating with a SAS/SHARE server and with a SAS/CONNECT remote session, and would have to specify different values for the `COMAMID=` option prior to establishing each connection. You should take into account the access method used by SAS/CONNECT software at your site when choosing your default value for the `COMAMID=` option.

The SAS System option `COMAUX1` cannot be specified on the VMS command line due to limitations with VMS command line parsing. While the command line parser will accept `/COMAUX1`, it will only take one of the two values specified by `/COMAMID` and `/COMAUX1`.

The `COMAUX1` option must be specified on a SAS `OPTIONS` statement before starting or referencing a SAS/SHARE server.

For example:

`SAS/COMAMID=TCP/COMAUX1=DECNET`

Only the DECnet access method will be started.

`SAS/COMAUX1=DECNET/COMAMID=TCP`

Only the TCP access method will be started.

`OPTIONS COMAMID=TCP COMAUX1=DECNET ;`

Both access methods will be started.

System Configuration for the DECnet Access Method

Complete the following steps:

1. Establish necessary privileges (**required**).

Each server or user process must have `TMPMBX` and `NETMBX` privileges; these should be standard user privileges. Additionally, each server process must have the `SYSNAM` privilege.

For more information, refer to Chapter 2, "Creating a SAS Server" in SAS Technical Report P-265, *SAS/SHARE Software for the OpenVMS Environment, Release 6.08 and 6.09*.

System Configuration for the TCP/IP Access Method

The following TCP/IP products are supported for Release 6.09E:

- DEC TCP/IP Services for OpenVMS, Version 2.0
- Digital's VMS/ULTRIX Connection, Version 1.3a with the latest patch kit or a higher version
- The Wollongong Group's PathWay Runtime, Release 1.1
- TGV's MultiNet Software with UCX compatibility
- any TCP/IP software that provides an interface compatible with DEC TCP/IP Services for OpenVMS, Version 2.0 or VMS/ULTRIX Connection.

To configure your installation for the TCP/IP access method, specify server names and port assignments. The server names and port assignments for the TCP/IP access method are defined in a services file. A server name must be 1 to 8 characters in length. The first character must be a letter or underscore. The remaining seven characters can include letters, digits, underscores,

the dollar sign (\$) or the at sign (@). To define server names and port assignments for the PathWay Runtime software, refer to the PathWay Runtime documentation.

Other TCP/IP products may not directly support a services file. The file `SAS$ROOT:[TOOLS]SERVICES.` is supplied for defining server names. It is located by the logical name `SASUCXETC_SERVICES`, which is defined by the file `SAS$ROOT:[TOOLS]SAS609E.COM`. This file contains ten default server definitions, `SHR`, `SHR1`, ..., `SHR9`. You may add, delete, or change any of the server names or port assignments. On a busy system, you may want your TCP/IP network administrator to change the port assignments to larger port numbers to avoid a SAS/SHARE port being dynamically allocated by other TCP/IP applications.

If you are in a cluster environment and have other TCP/IP products installed on other nodes in the cluster, you can use an existing services file, provided it conforms to the standard format of `/etc/services` files used by TCP/IP software on other systems. To use another services file, define the `SASUCXETC_SERVICES` logical name to the file you want to use and add your SAS/SHARE server definitions to this file.

Appendix G, Applying Patches and Installing SAS[®] Notes

This section describes the tools used to install SAS Notes, load source maintenance files, and apply patches to the SAS System under OpenVMS. Patches, source maintenance files, and SAS Notes are included on the installation tape and on a monthly SAS Notes tape. Patches are also available upon request from the Technical Support Division of SAS Institute Inc. at (919)677-8008. If you are a non-U.S./non-Canadian site, contact your SAS Representative for the SAS Institute office nearest you.

Installation Tape

The installation tape contains the SAS Notes, source maintenance files, and all of the `REQUIRED`, `HIGHLY RECOMMENDED`, `RECOMMENDED`, and `SPECIAL CONSIDERATION` category patches available when the tape is created. The patches are placed in the directory, `SAS$ROOT:[USAGE.PATCH]` by the installation procedure. You can install the SAS Notes and source maintenance files and/or apply these patches during the product installation. If you choose not to install the SAS Notes and source maintenance files and/or apply the patches, you can install them later by:

1. Rerunning the product installation.
2. Selecting Option 3, `Install SAS Notes and Load Patches`, from the Main Menu, to load SAS Notes, source maintenance files, and patches.
3. Selecting Option 6, `Apply Patches`, from the Main Menu.
4. Indicating that you want to install the SAS Notes, load patches and the source maintenance files, and/or apply the patches.

You can also apply the patches individually. See "Applying Single Patches" for more information.

Monthly SAS Notes Tape

The SAS Notes contain hints for using SAS software, discuss compatibility and documentation issues, and provide information about known problems with the SAS System. This appendix contains instructions for installing the monthly SAS Notes tape. The most recent tape is available upon request from the SAS Institute Distribution Department. Each new SAS Notes tape supercedes the previous tape. For more information on accessing the SAS Notes, see "SAS Notes and Utilities."

If you have already applied any of the patches contained on a SAS Notes tape, such as the patches on the installation tape, the "Apply Patches" portion of the installation procedure omits those patches and applies only those that have not already been applied. Patches for products you have not licensed are ignored.

Patch Notes

Patch Notes are included on the SAS Notes tape and are located in `SAS$ROOT:[USAGE.PATCH]UN609E.PATCH_NOTES`. The Patch Notes list all files that will be added to `SAS$ROOT:[USAGE.PATCH]` and briefly describe the patches contained on the tape. Instructions for reviewing the Patch Notes are included in the installation procedure. Please review the Patch Notes before installing the SAS Notes and patches.

Patches

The patches included on the SAS Notes tape fall into one of the four categories:

- `REQUIRED` patches fix problems that may result in incorrect statistical output or data integrity problems.
- `HIGHLY RECOMMENDED` patches fix problems that are serious but do not result in incorrect output or data integrity problems.
- `RECOMMENDED` patches fix less serious problems that may affect output and formatting.
- `SPECIAL CONSIDERATION` patches are not required and should not be applied until the corresponding Usage Note is read. These patches are to be applied manually.

If you choose to apply any patches, the first two categories are applied. The `RECOMMENDED` patches are applied only if requested. A file is created that lists the patches that have been applied. This file is named `SAS$ROOT:[USAGE.PATCH]APPLIED_PATCHES.TXT`.

Overview of the Installation Procedure

The monthly SAS Notes tape uses the same installation procedure as the SAS product tape. To install the monthly SAS Notes tape, initiate the installation procedure as described in Section I of the installation instructions.

When the Main Menu is displayed, you can select Option 3, Install SAS Notes and Load Patches; Option 2, Install Source Maintenance Files; or Option 6, Apply Patches. The patch files must be loaded onto your system before they can be applied. Therefore, you must select Option 3 before selecting Option 6. Options 2, 3, and 6 on the Main Menu are described in detail in Section I, Part II of this document. Refer to these sections during installation of the monthly SAS Notes tape.

Minimum Requirements for Installation

The SAS Notes installation procedure uses space on both the system disk and the disk on which the SAS System is installed. Peak and final disk usage depend on the options specified during the installation.

Note: The size of the SAS Notes and patch files may change as more SAS Notes, source maintenance files, and patches are added to each new monthly SAS Notes tape. Review the Patch Notes to see the sizes of the files on the current tape before continuing with the installation.

System Disk

The system disk needs 5000 blocks for the installation tools and a minimum of 15,000 blocks for patch processing. This space is only temporary and is released after the installation.

SAS System Disk

The disk where the SAS System is installed requires approximately 2,500 to 20,000 free blocks for SAS Notes and Patches, depending upon which installation options are specified. The source maintenance files space requirements are subject to vary over the life of a release. Check the tape for current space requirements.

How To Determine Which Patches Have Been Applied

There are 3 different ways to determine which patches have been applied:

- Examine the file `SAS$ROOT:[USAGE.PATCH]APPLIED_PATCHES.TXT`.

This may not be accurate if the previous environment was restored from a backup and the file `APPLIED_PATCHES.TXT` was not updated.

- Use the `PATSHOW` utility provided on the SAS Notes tape.

The `PATSHOW` utility may be used to determine which patches have been applied to an executable image. Provided in the `SAS$ROOT:[USAGE.PATCH]` directory is the utility `PATSHOW.EXE`, and its `CLD` file `PATSHOW.CLD`. To use the utility, the command verb must be defined.

It is not necessary to permanently define `PATSHOW` to the system since it will only be used periodically. The following command can be used to temporarily define the `PATSHOW` command verb within the context of the current process:

```
$ SET COMMAND SAS$ROOT:[USAGE.PATCH]PATSHOW.CLD
```

The `PATSHOW` command requires one parameter, the name of an image to analyze. An output listing is produced containing the name of the image, the date when the last patch was applied, and a list of patches identified by their ECO (engineering change order) number. This is illustrated by the following example (image names and patches used in these examples are fictitious):

```
$ PATSHOW SAS$ROOT:[PROCS]SASWHAT.EXE
Image: SAS$ROOT:[PROCS]SASWHAT.EXE;3
Last Patch: 2-JUN-1992 09:40:28.29
Patch: UNKNOWN      ECO: 07F
Patch: UNKNOWN      ECO: 080
```

Due to limitations in the information stored in image headers, each patch is identified as `UNKNOWN` in the `PATSHOW` listing. Each patch supplied by SAS Institute has an ECO number unique to the image to which it is applied. DEC reserves the numbers ranging from `001-060` in hex. SAS Institute uses numbers in a descending range from `080-061` in hex.

In order to make use of this information, you must determine what patches you have that are designated for the image you want to analyze, and from that you need to find out what ECO number is assigned to each patch. The OpenVMS Search utility provides a good method for determining this information. For example, if you want to determine which patches have been applied to the `SASWHAT.EXE` image, the following command will provide you with a list of patches available for the image:

```
$ SEARCH SAS$ROOT:[USAGE.PATCH]*.PAT SASWHAT
```

With that list of patches on hand, you can search each patch (`.PAT`) file for word `ECO`. For example, if you found that patch `Z6099876.PAT` was appropriate for the `SASWHAT.EXE` image, the following command could be used to get the ECO number for the patch:

```
$ SEARCH SAS$ROOT:[USAGE.PATCH]Z6099876.PAT ECO
```

The `SEARCH` command would produce output similar to the following:

```
SET ECO ^X07F
```

so the patch `Z6099876` sets the ECO number to `^X07F` (a hex `7F` or decimal `127`). If an ECO value of `07F` is displayed in the `PATSHOW` listing for the `SASWHAT.EXE` image, the `Z6099876` patch has been applied.

- Analyze the image with `ANALYZE/IMAGE`. Look for the section entitled "Patch Information." If no patches have been applied, this section says "There are no patches at this time." Otherwise, you should see the label "user eco levels 97-128:" followed by a hexadecimal number. This "user eco levels" number is useful for diagnosing problems when you call the SAS Institute Technical Support Division.

Applying Single Patches

A command procedure has been included that can be used to apply patches that were not applied when the installation tape or SAS Notes tape was installed, or patches that were obtained directly from the SAS Institute Technical Support Division. The command file is:

```
SAS$ROOT:[USAGE.PATCH]APPLY_PATCH.COM.
```

To apply patches using `APPLY_PATCH.COM`, do the following:

1. Determine which patches you want to apply. Each patch file contains a short description of the problem it fixes. The Usage Note corresponding to the patch gives more information about the problem.
2. Set your default directory to `SAS$ROOT:[USAGE.PATCH]`. If you set your default directory to another location, you must also copy the patch files for the patches you want to apply from the directory `SAS$ROOT:[USAGE.PATCH]` to your default directory.
3. Make sure the SAS logical name `SAS$ROOT` is defined. The command procedure uses this logical name to locate images to be patched. Also, make sure that you have `SYSPRV` privilege. This ensures that the command procedure does not fail due to privilege violations and that file ownership for the patched images remains unchanged.
4. Invoke `SAS$ROOT:[USAGE.PATCH]APPLY_PATCH.COM` by issuing one of the following two commands:

```
 @APPLY_PATCH.COM
```

The command procedure then prompts you for the name of the patch to apply, and whether to save a copy of the prepatched image, or to replace the original image.

or

```
 @APPLY_PATCH.COM Z609xxxx SAVE|NOSAVE TEST|NOTEST
```

Where `Z609xxxx` is the patch name, and `xxxx` is the Usage Note number corresponding to the patch. The `SAVE` or `NOSAVE` command can be specified on the command line to indicate whether the command procedure should save a copy of the unpatched image. The `TEST` or `NOTEST` option can be specified to indicate whether you want to test the patch off-line before replacing the image. These options are useful for running `APPLY_PATCH.COM` from your own command procedure.

The command procedure copies the target image to your default directory and patches the image. Then it either copies the image back to its original location or exits to allow you to test the patched image.

The `SAVE` option allows you to save a copy of the image before the patch is applied. Saving the unpatched image can save time if the newly applied patch has to be backed off for any reason. If you supply the `SAVE` option, the command procedure stores the unpatched image in the directory `SAS$ROOT:[UNPATCHED_IMAGES]`. If the directory does not exist, `APPLY_PATCH.COM` creates it.

The `TEST` option is included for users who want to test a patched image before replacing the image in the SAS System. This option causes the command procedure to apply the patch but leaves the patched image in your default directory. You can then test the patched image with a SAS program to see if the patch fixes a particular problem.

After testing, you must copy the patched image to its original location so that all SAS users will have access to it. Then you must edit the file:

```
SAS$ROOT:[USAGE.PATCH]APPLIED_PATCHES.TXT
```

and add a line for the patch that was just applied.

Errors

If the command procedure does not apply the patch successfully, look for error messages printed during the procedure. Also, check the journal file for the patch operation. The journal file is in your default directory and has the same name as the image with an extension of `.JNL`.

If you need more information, contact the Technical Support Division of SAS Institute Inc. at (919)677-8008. If you are a non-U.S./non-Canadian site, contact your SAS Representative for the SAS Institute office nearest you.

Manual Installation

`APPLY_PATCH.COM` expects the images to be located in the standard directories used by the installation procedure. If the image files are placed in non-standard locations, you may have to apply the patches manually by performing the following steps.

1. Type the patch file including header information. The header of the patch file gives a brief explanation of the purpose of the patch, instructions for applying the patch, and the name of the image to be patched.
2. Locate the image name in the patch header. It is in the record containing the label `IMAGE:`.
3. Copy the image file and the patch file to a work directory.
4. Apply the patch according to the instructions found in the patch header. Ignore the message:

```
%PATCH-I-NOGBL, some or all global symbols not accessible
```

The `PATCH` utility displays the changes being made to the image file. When the patch is finished, you receive the message:

```
%PATCH-I-WRTFIL, updating image file 'imagefile'
```

where `'imagefile'` is the name of the image being patched.

When this has completed, a new copy of the image file is contained in the work directory with the patch applied. If you do not see the `'%PATCH-I-WRTFIL'` message, the patch was not applied due to an error. The only exception is the message `ECO level already set`, which means that this patch has already been applied.

5. When the patch has been applied successfully, test the image to see if the patch fixes the particular problem.
6. Copy the image to its original location, as given in the header of the patch file.
7. If the image has been installed as a known image with the OpenVMS `INSTALL` utility, use the `INSTALL REPLACE` command to reinstall the patched version as a known image. To check if an image is installed as a known image, enter the following:

```
$ INSTALL LIST SAS$LIBRARY:imagenamename.exe
```

where `imagenamename.exe` is the image to which the patch is applied.

8. Edit the file:

```
SAS$ROOT:[USAGE.PATCH]APPLIED_PATCHES.TXT
```

and add a line for the patch that was just applied.

Appendix H, SAS Logical Names

Many logical names are created by the SAS System. Some are extremely important to the system, while others are used only for special processing. The following is a list of these logical names and a brief description of what they do.

SASTAPE	Tape device associated with SAS processes.
SAS\$ROOT	Root directory for the SAS System. Sub directories beneath this directory contain all the pieces of the SAS System.
SAS\$CBT	Root directory for SAS/TUTOR courses.
SAS\$EXTENSION	Root directory for user-written extensions.
SAS\$INSTALL	Root directory for installation procedure files.
SAS\$SAMPLES	Root directory for sample programs.
SAS\$LIBRARY	Search path for executable images.
SAS\$IMAGE	Base SAS image.
SASSHR	Image used for linking shareable images. This image provides a bridge for access between SAS images.
SASMSG	Image used to invoke SAS messages.
SASING	Allows use of the SAS/ACCESS interface to INGRES image.
SASORA	Allows use of SAS/ACCESS Interface to ORACLE image. Refer to Appendix A: "Post-Installation Setup for SAS/ACCESS Software" for more information about this logical name.
SASRDB	Allows use of SAS/ACCESS Interface to Rdb image.
SASSYB	Allows use of SAS/ACCESS Interface to SYBASE image.

SAS\$UCX\$ETC_SERVICES	Services definition file for SAS/CONNECT and SAS/SHARE.
SASWXFR	Allows use of the WIN/TCP shareable image.
SAS_USS_PRIV	Privileged unloader image. This is a user written system service used by the UNLOAD option.
SASAUTOS	AUTOCALL library. If a SAS MACRO is used, but not defined in the current SAS System session, the SASAUTOS directory is searched for a SAS program by the same name to resolve the MACRO expansion.
SAS\$HELP	Location for SAS System help and maintenance catalogs.
SASAPPL	Location of indexed SAS data sets used by SAS/ASSIST.
SAS\$FNT	Location for SAS/GRAPH fonts catalog.
SAS\$NEWS	The SAS\$NEWS logical name provides the SAS System Administrator a way of broadcasting information to all SAS users when they startup the SAS System. The contents of a file defined by this logical name are displayed as a header when the SAS System starts up. The appropriate place to define this logical is in the SAS609E.COM file, which defines all other logicals used by the SAS System. Not defining SAS\$NEWS has no effect on processing.
SAS\$CNTMISC	Location of the script files used by SAS/CONNECT
SAS\$MAPS	Location for SAS/GRAPH map data sets.
SAS\$MSG	Location for SAS System message files.
SAS\$SITEINFO	Site-specific information file. See "Appendix K, The SITEINFO File" for additional information.
SAS\$ALLIN1	Location of files used by the ALL-IN-1 Integration of Release 6.09E of the SAS System.
SAS\$TERMINAL	Default terminal device.

SAS\$LSEENV	Location of the SAS environment file when using <code>VAXLSE</code> with the SAS System.
SAS\$GDEVICE	Default graphics terminal.
SAS\$TPUDIR	Default location for TPU editor interface.
SAS\$SECTION	Default location for TPU section file.
SAS\$WORKROOT	Default location for SAS work library.
SAS\$WORKLIB	Location of the currently executing SAS work library
SAS\$XDEFAULTS	Default location for X resource files.
SAS\$USER	Default location for user profile.

These logicals are used by the sample programs:

SAMPSIO	Location of sample program data sets and catalogs.
MAPS	Location of SAS/GRAPH map data sets.

For more information on SAS system-wide and user-specified logical names, refer to *SAS Companion for the OpenVMS Environment, Version 6, Second Edition*.

Appendix I, Customizing Site Forms

As the SAS consultant for your site, you have the ability to customize the forms displayed for your operating system. The printer selection list can be customized to display only those printers available for your site. To find out more about customizing the printer selection list, issue the following command from the Display Manager:

```
AF C=SASHELP.BASE.PDEVICE.CBT
```

The OpenVMS Print File Parameters program can be customized for your site if you have SAS/AF software installed. To find out more about customizing the OpenVMS Print File Parameters program, issue the following command from the Display Manager:

```
AF C=SASHELP.BASE.FORMSCPH.CBT
```

If you have SAS/AF software, you can print these CBTs can be printed. To do this, issue the following program statements:

```
PROC BUILD C=SASHELP.BASE BATCH;  
PRINT DISPLAY SELECT=PDEVICE.CBT;  
RUN;  
PROC BUILD C=SASHELP.BASE BATCH;  
PRINT DISPLAY SELECT=FORMSCPH.CBT;  
RUN;
```

or

```
PROC BUILD C=SASHELP.BASE BATCH;  
PRINT DISPLAY SELECT=(PDEVICE.CBT FORMSCPH.CBT);  
RUN;
```

To route the output to a file rather than a printer, issue these commands:

```
PROC BUILD C=SASHELP.BASE BATCH;  
PRINT DISPLAY SELECT=(PDEVICE.CBT FORMSCPH.CBT)  
PRTFILE='file name'; RUN;
```


Appendix J, The SITEINFO File

The `SITEINFO` file provides site-specific information in a form that is modifiable by the local SAS site. You can access this file in full-screen mode by typing `SITEINFO` at the Display Manager command prompt.

The `SITEINFO` file is defined either by using the `SITEINFO` command line option (or configuration file.), as follows:

```
$ SAS/SITEINFO=SAS$ROOT:[TOOLS]SITEINFO.TXT
```

or by using the `SAS$SITEINFO` logical name. If the logical name is defined, the associated file is used. The logical is defined in the SAS startup command file. By default, the definition points to a template found in the file:

```
SAS$ROOT:[TOOLS]SITEINFO.TXT
```

The SAS Site Representative should modify the contents of the file to include site-specific information. A copy of the template on which these changes should be made is shown in the following example:

```
* SAS Licensed Installation Information:
```

```
Site Number:  
Site Name:
```

```
Please provide the above information with all documentation sent to SAS  
Institute when reporting a suspected problem.
```

```
* Installation Name and Address:
```

```
Name:  
Address:
```

```
Telephone:
```

```
* SAS Software Representative (this is the person to whom SAS Institute  
directs all communication about products installed at this site):
```

```
Name:  
Telephone:
```

```
* Installation Consulting Group:
```

```
Name:  
Telephone:
```

```
Request for help with SAS programming problems should be directed to  
your installation's consulting group.
```

* Requests for information concerning SAS courses or other educational services should be directed to the following individual and/or group:

Name:
Telephone:

* Following is a list of SAS Institute software products installed at this site:

Institute Program Product	Name	Model Group	CPU Serial
Use this column to list SAS software installed at your site; include version numbers:	Use this column to list Model Name:	Use this column to list CPU Group:	Use this column to list serial numbers:

Appendix K, Creating Translate Tables with PROC TRANTAB

If you want to provide your own collating sequences or change a collating sequence provided for you, use the `TRANTAB` procedure to create or modify translate tables. For complete details on the `TRANTAB` procedure, refer to SAS Technical Report P-197, *The TRANTAB Procedure, Release 6.06*.

When you create or modify a translate table, the new table is stored in your `SASUSER.PROFILE` catalog. This new table will override any translate tables by the same name stored in the `SASHELP.HOST` catalog.

Note: System Managers can modify the `SASHELP.HOST` catalog by copying newly created tables from the `SASUSER.PROFILE` catalog to the `SASHELP.HOST` catalog. Then all users can access the new or modified translate table.

If you are using Display Manager and want to see the names of the collating sequences stored in the `SASHELP.HOST` catalog, issue the following command from any window:

```
CATALOG SASHELP.HOST
```

If you are not using Display Manager, issue the following statements to generate a list of the contents of the `SASHELP.HOST` catalog:

```
proc catalog catalog=sashelp.host;  
contents;  
run;
```

The collating sequence is evidenced by entries of type `TRANTAB`.

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 collating sequences are displayed in the SAS log.

Appendix L, Instructions for Graphics Devices on OpenVMS

Getting Help on Graphics Devices and Drivers

If you are using the SAS System interactively, you can also obtain details on using graphics devices by entering `HELP` on the command line of the program editor or log window under SAS Display Manager. When the main HELP menu is displayed, select `GRAPHICS` then select `GRAPHICS DEVICES AND DRIVERS` from the GRAPHICS HELP menu. These HELP screens contain information on configuring specific devices and the `GOPTIONS` required to send output to them.

Setting up and Modifying Device Catalogs

After installing SAS/GRAPH software, you may need to create or modify device catalog entries in order to customize device driver output to your site's needs. This section gives a brief explanation of device catalogs and explains how to handle catalog entries that may need to be modified. For complete details on managing device catalogs, refer to Chapter 25, "The GDEVICE Procedure," in the *SAS/GRAPH Software: Reference, Version 6 Edition* and pages 36-52 in SAS Technical Report P-215, *SAS/GRAPH Software: Changes and Enhancements, Release 6.07*.

How Device Catalogs are Used

In Version 6 SAS/GRAPH software, the name of a graphics device driver that you specify using the `DEVICE=` or `TARGET=` options corresponds to an entry in a device catalog. Device catalog entries contain default characteristics (such as graph size, picture orientation, and default colors) used by the driver. You can change the characteristics used by a driver by modifying its entry in the device catalog or by specifying `GOPTIONS` that override settings in the catalog entry. Some options can only be set in the driver entry. For more information, refer to Chapter 5, "Graphics Options and Device Parameters Dictionary" in the *SAS/GRAPH Software Reference, Version 6 Edition*.

For example, if you specify `DEVICE=HP7550`, the SAS/GRAPH procedure attempts to find an entry named `HP7550` in available device catalogs. The parameters found in the entry (such as the default graph size, graph orientation, or output destination) are used to generate the graph. If you want to change the way the driver produces output, use the `GDEVICE` procedure to modify parameters in the catalog entry, or override the parameters with a `GOPTIONS` statement.

If you want to change defaults for a single session or job, use a `GOPTIONS` statement. If you want to permanently change the default parameters used by a driver, create a new device entry or modify an existing one. When the installation procedure installs the SAS/GRAPH product, an Institute-supplied device catalog, `SASHELP.DEVICES` is made available. This catalog contains over 300 entries, covering each graphics device and model that SAS/GRAPH software supports. Individual users or groups can create their own device catalogs. Device catalogs that you create have logical names `GDEVICE0.DEVICES` through `GDEVICE9.DEVICES`. When a driver name is specified in a SAS program, the SAS System looks for the corresponding entry in `GDEVICE0.DEVICES`, `GDEVICE1.DEVICES`, etc. If it does not find the entry in any of the user catalogs (or the catalogs do not exist), it searches the Institute-supplied catalog, `SASHELP.DEVICES`.

How and When to Modify Catalog Entries

If you need to make changes to a device entry, consider whether the changes affect an individual user or multiple users at a site. If the change affects only one user, that user should create a device catalog (`GDEVICE0.DEVICES`), copy the device entry from `SASHELP.DEVICES`, and make the changes to the entry in `GDEVICE0.DEVICES`. Note that `GDEVICE0.DEVICES` is an individual user catalog and is usually a unique catalog for each user. If the modification affects a large number of users (or if SAS is being run on a single-user workstation), the SAS Installation Representative or SAS Software Representative can make modifications to an entry in `SASHELP.DEVICES`.

Examples

The following examples illustrate how to use device catalog parameters to spool output directly to a hard copy device. The examples first illustrate `GOPTIONS` and `FILENAME` or host statements that can be used to produce output. Then it is shown how equivalent parameters can be specified in device entries, eliminating the need for the statements in the end users programs.

Spooling Directly to a Printer Queue

Suppose you want to use the X2700 driver and send the output directly to a Xerox 2700 printer attached to an OpenVMS host. If the `queue` name for the printer is `XPRINT` use the following `GOPTIONS` and `FILENAME` statements to send graphics output to the Xerox 2700 printer:

```
/* define fileref and queue attributes for output */
filename gsasfile printer queue=xprint notify=yes;

/* specify device driver, fileref for GSF, */
/* mode, and record length */
goptions dev=x2700 gaccess=gsasfile gsfmode=replace gsflen=132;
```

You can achieve the same results by creating your own driver with the `GDEVICE` procedure and specifying host file options. The following display shows the Host File Options window for the modified device entry `MYX2700`. You can enter these values using `GDEVICE` windows or with line-mode `GDEVICE` statements.

```
+GDEVICE:  Host File Options-----
-+
|Command ==>
|
|          Catalog: GDEVICE0.DEVICES      Entry: MYX2700
|
|Gaccess:
|
|Gsfname:  _____      Gsfmode: REPLACE      Gsflen:   132
|
|Trantab:  _____      Devmap:  REPLACE      Devtype: PRINTER
|
|Gprotocol: _____
|
|Host file options:
|QUEUE=XPRINT NOTIFY=YES
|
|-----
|X Close file at end of driver or procedure termination
|_ Close file at end of each graph
|
+----- ZOOM -R-----
-+
```

The information on the Host File Options window causes SAS/GRAPH software to send the output to the queue specified on the `Host file options` field using parameters specified on that line. The file is released when the SAS/GRAPH procedure terminates.

Note: Because a temporary spool file is being dynamically created, you do not need to specify `GACCESS=GSASFILE`.

Creating a Graphics Stream File and Sending to an OpenVMS Printer Queue

Suppose in the previous example you want to create a graphics stream file and use the OpenVMS `PRINT/QUEUE` command to send the file to your printer. If the queue name for the printer is `XPRINT`, you can use the following program, which uses `GOPTIONS` and `FILENAME` statements to create the graphics stream file, and send the graphics output to the printer queue using the OpenVMS `PRINT/QUEUE` command.

```

/* define fileref for graphics stream file */
filename gsf 'my.gsf';

/* specify device driver, fileref for GSF, */
/* mode, and record length */
goptions dev=x2700 gaccess=gsfmode=replace gsflen=132;

/* send SAS/GRAPH procedure output to the graphics stream file */
proc gslide;
  title 'Example of creating a graphics stream file';
run;
quit;
filename gsf clear; /* to clear file reference */

/* to release the graphics stream file to the printer */
x print/nofeed/queue=xprint my.gsf;

```

You can achieve the same results by creating your own driver with the `GDEVICE` procedure and specifying the host file options and host commands. The next two displays show the Host File Options window and the Host Commands window, respectively, for the modified device entry `MYX2700`. You can enter these values using `GDEVICE` windows or with line-mode `GDEVICE` statements.

```

+GDEVICE: Host File Options-----
-+
| Command ===>
|
|           Catalog: GDEVICE0.DEVICES      Entry: MYX2700
|
| Gaccess: sasgastd>my.gsf
|
| Gsfname: _____      Gsfmode: REPLACE      Gsflen: 132
|
| Trantab: _____      Devmap: _____      Devtype: DISK
|
| Gprotocol: _____

```

```
Host file options:  
_____  
_____  
  
X Close file at end of driver or procedure termination  
_ Close file at end of each graph  
  
+----- ZOOM -R-----  
-+
```

```
+GDEVICE:  Host Commands-----
-+
| Command ==>
|
|           Catalog: GDEVICE0.DEVICES      Entry: MYX2700
|
| Driver Initialization:
|   1 _____
|   2 _____
|
| Pre-Graph commands:
|   1 _____
|   2 _____
|
| Post-Graph commands:
|   1 _____
|   2 _____
|
| Driver Termination:
|   1 PRINT/NOFEED/QUEUE=XPRINT MY.GSF
|   2 _____
|
+----- ZOOM -R-----
-+
```

The information in the Host File Options window causes the driver to send the output to the file MY.GSF, and the information in the Driver Termination field of the Host Commands window executes the PRINT/QUEUE command when the procedure terminates.

Use the following guidelines when creating or modifying device entries:

- Only the SAS Installation Representative or SAS Software Representative should add or modify entries in SASHELP.DEVICES. End users should not have update access to SASHELP.DEVICES, with the exception of users working on individual workstations. If individual users need to make modifications on a multi-user system, they should create their own GDEVICE0.DEVICES catalog.

- ❑ If a catalog entry needs to be modified, create a new entry (with a different name) and modify the new entry. Renaming modified entries ensures that the original entries supplied in the `SASHELP.DEVICES` catalog use default settings.
- ❑ If a parameter needs to be changed only for a single session, use a `GOPTIONS` statement to override equivalent parameters in a device catalog.

Installing the SAS/GRAPH Linkable Driver

Note: This task is optional. If your site does not have a device that uses vendor-supplied subroutines (and does not have a ready-to-use SAS/GRAPH driver), you can skip these instructions.

This section describes the steps necessary to install the Linkable driver. The Linkable driver makes calls to user-supplied "CalComp compatible" plotting subroutines. These subroutines are normally provided by the plotter vendor when the plotter is purchased. Other plotting subroutine libraries may be available from third party vendors. The subroutine library should contain routines named `PLOT`, `PLOTS`, `SYMBOL`, and `NEWPEN` (or `TONE`).

If you installed the linkable driver in Release 6.06, you must reinstall the driver for Release 6.09E. If you installed a driver in Release 6.07 (or later), you can copy your 6.07 (or later) device entry to your 6.09E devices catalog, and use your 6.07 (or later) executable.

Drivers for Versatec plotters using `VERSAPLOT`, `RANDOM`, `VGS`, or `GKS` software may require special instructions. If you are creating a driver for a Versatec plotter, contact SAS Institute Technical Support.

To install a Linkable driver, you must perform the following steps:

1. Create an executable driver image.
2. Create a device catalog entry containing the characteristics of the device.

The Installation Procedure

This section is divided into the following five topics:

- overview of the Linkable driver

This section describes how the Linkable driver operates and describes the calls that the driver makes to the plotting routines.

- generating an executable image

This section provides instructions for compiling an Institute-supplied FORTRAN program and linking it with a library of plotting routines. Before following the instructions in this section, you should read over the remaining sections to determine if you want to make modifications to the driver or your routines.

- customizing device characteristics

This section shows how to edit the device catalog entry to supply the specific characteristics of your device.

❑ testing the driver

This section illustrates a sample program that you can use to make sure that the driver and device are working correctly.

❑ other external drivers

This section provides information on other external drivers that can be created, including a driver that can be used with GKS subroutine libraries.

Overview of the linkable device driver

The Linkable device driver is a special driver supplied with SAS/GRAPH software that is incomplete until linked with user-supplied plotting routines. These routines are normally provided by the manufacturer when the plotter is purchased or can be obtained from a third party vendor.

How the driver works

When built, the driver consists of three parts: a device catalog entry that contains the characteristics of the device, an *internal* driver that writes a metafile when a SAS/GRAPH procedure is run, and an *external* driver that reads the metafile and calls Calcomp-style subroutines that generate the graph. The external driver is an executable image that is created by compiling an Institute-supplied FORTRAN program (`LINKAVAX.FOR`) and linking it with the plotting subroutines that are supplied with your device.

The Linkable driver uses the SAS Metagraphics Driver facility to produce its output. When a SAS/GRAPH procedure is executed to produce a graph, the following happens:

- ❑ The internal driver, using information on device characteristics from a device catalog entry, produces a metafile of graphics data.
- ❑ An "external driver" (the executable image that you create by compiling the `LINKAVAX.FOR` program and linking it with your vendor-supplied plotting routines) reads the metafile and makes calls to the plotting subroutines. The plotting subroutines actually produce the output. The external driver can be run from within the SAS/GRAPH program, or can be run as a separate application after the SAS program has completed.

Plotting routines used by the driver

The LINKAVAX.FOR program makes calls to four subroutines (PLOTS, PLOT, SYMBOL, and NEWPEN) that follow the CalComp standard format as documented below.

PLOTS(0,0,14)

The PLOTS subroutine is normally used to initialize the device,. The third parameter of 14 causes the driver to write output to the FORTRAN unit 14 (FOR014). To change the value of the first two parameters, you can modify the values of the PLOTS1 and PLOTS2 variables in the LINKAVAX.FOR program. To modify the FORTRAN output unit used by the driver, change the value of the variable OUT in the INIDVR subroutine of the LINKAVAX.FOR program.

PLOT(X,Y,Ipen)

PLOT indicates the direction of the pen and when to terminate the plotting. X and Y indicate the pen coordinates in inches. Ipen codes are used to move the pen up or down as well as coding the origin reset, and terminating the plot. The following are valid Ipen codes:

- Ipen=-3 move and reset origin
- Ipen=2 draw
- Ipen=3 move
- Ipen=999 move and terminate plot

NEWPEN(Ipen#)

The NEWPEN routine is used to select the current pen or color. By default, the Linkable device driver assumes there are four pens named BLACK, RED, GREEN, and BLUE associated with Ipen numbers 1, 2, 3, and 4 respectively. To change the number of pens or the default colors, refer to the section "Customizing Device Characteristics."

SYMBOL(X,Y,Height,String,Angle,Nchar)

The SYMBOL routine is used to write hardware text and symbols. The following arguments are passed:

- X and Y pen coordinates in inches
- Height= height of characters in inches
- String= string of characters
- Angle= angle in degrees (0.0 or -90.0)
- Nchar= number of characters in string.

Some subroutines have a `SYMBOL` routine that takes seven parameters, as follows:

```
SYMBOL(X,Y,Height,String,INTEQ,Angle,Nchar)
```

where `INTEQ` is a dummy argument. If your `SYMBOL` routine expects seven parameters, you will need to make modifications to the `LINKAVAX.FOR` program as described in "Generating an executable image."

The relevant routines in some plotter libraries may not be named as previously described, but contain the correct arguments. In this case, modify the `LINKAVAX.FOR` program as necessary. If the arguments do not agree in type, number, or meaning, you can write interface routines that pass the expected subroutines to the plotter.

In addition to calls to the preceding routines, calls can be made to a series of routines to customize the driver to suit the requirements of your site or nonstandard plotting libraries. These are described more fully in "Additional Routines" in the next section.

Generating an executable image

To generate an executable driver image, you must compile the `LINKAVAX.FOR` program (which can be found in the directory referenced by `SAS$EXTENSION:[GR.MISC]`) and linkedit the resulting object module with your plotting subroutines.

The `LINKAVAX.FOR` program passes six parameters when it makes calls to the `SYMBOL` routine. If your plotting library contains a `SYMBOL` routine that uses seven parameters (most routines written in FORTRAN 77 use seven parameters), you must modify the `LINKAVAX.FOR` program so that it will pass seven parameters. To do this, edit the program and find the `CALL SYMBOL` statement, which passes six parameters. Following this statement is a commented statement containing `CALL SYMBOL` with seven parameters. Remove the `C` in column 1 of the commented statement, and add a `C` to column 1 of the original `CALL SYMBOL` statement.

If the `SYMBOL` routine in your plotting library only uses six parameters, you should not have to make any modifications to the `LINKAVAX.FOR` program. After making any necessary changes to `LINKAVAX.FOR`, compile the program using the following command:

```
$ FORTRAN LINKAVAX.FOR
```

This command creates a file named `LINKABLE.OBJ`. `LINKAVAX.FOR` that should be compiled with the same compiler you used to compile your plotting subroutines. If your subroutines were not compiled with the FORTRAN 77 compiler, specify the `NOF77` option when you compile `LINKAVAX.FOR`.

If your plotting subroutines are in a single library, use the following command to link the driver and produce a file called `LINKAVAX.EXE`:

```
$ LINK LINKAVAX,plotting_lib_name/LIBRARY
```

Note: This example assumes that you have a copy of your plotting subroutines and `LINKABLE.OBJ` in your current directory.

If your plotting routines are not in a single library, list all the necessary object files on the `LINK` command:

```
$ LINK LINKAVAX,PLOTS,PLOT,SYMBOL,NEWPEN
```

The external driver can be called from within your SAS session, or it can be run as a separate program after your SAS session has completed. By default, the external driver is called from within your SAS program by invoking an executable named `LINKABLE`. If you change the value of the `PROCESS=` parameter in the device entry for your driver (see "Customizing Device Characteristics"), you should rename the executable image to match the command specified in the process field.

If the external driver is to be executed outside of your SAS session, you should run the `LINKAVAX.EXE` program after your SAS session has completed. See "Customizing Device Characteristics," for details on specifying whether the external driver is to be executed from within your SAS session or run as an external program.

Additional routines

In addition to calls to the `PLOTS`, `PLOT`, `SYMBOL` and `NEWPEN` routines, the `LINKAVAX.FOR` program makes calls to several "null" routines. As coded, these routines immediately return to the calling program. However, you can replace these routines in the `LINKAVAX.FOR` source with your own routines that can be used for pre-initialization, post-termination, and so forth. These routines are as follows:

<code>PLOTA1:</code>	called before <code>PLOTS(0,0,Iunit)</code>	Beginning of each PROC
<code>PLOTA2:</code>	called after <code>PLOTS(0,0,Iunit)</code>	Beginning of each PROC
<code>PLOTG1:</code>	called before <code>PLOT(x,0.0,-3)</code>	After <code>CALL PLOT(-x,.5,-3)</code>
<code>PLOTG2:</code>	called after <code>PLOT(x,0.0,-3)</code>	After <code>CALL PLOT(-x,.5,-3)</code>
<code>PLOTF1:</code>	called before <code>PLOT(x,-.5,-3)</code>	End of each plot
<code>PLOTF2:</code>	called after <code>PLOT(x,-.5,-3)</code>	End of each plot
<code>PLOTZ1:</code>	called before <code>PLOT(-x,.5,-3)</code>	Beginning of each plot
<code>PLOTZ2:</code>	called after <code>PLOT(-x,.5,-3)</code>	Beginning of each plot
<code>PLOTZ1:</code>	called before <code>PLOT(0.,0.,999)</code>	End of each PROC
<code>PLOTZ2:</code>	called after <code>PLOT(0.,0.,999)</code>	End of each PROC

To use these routines you must remove the comment on the call to the routine and add the routine itself. To add the subroutine you can code the subroutine at the bottom of the program starting in column 7, such as:

```
      SUBROUTINE PLOTF2  
      CALL PLOT (0,0,-999)  
      RETURN  
      END
```

Customizing device characteristics

In Version 6 of SAS/GRAPH software, the device characteristics (such as graph size, default colors, rows, and columns) used by each driver are stored in an entry in a device catalog. When you specify a device driver name in your SAS/GRAPH program (in the `DEVICE=` option or when prompted), the name refers to an entry in a device catalog. For example, if you specify `DEVICE=FRED`, the software locates an entry named `FRED` in available device catalogs and uses the information in that entry to determine such parameters as graph size, orientation, resolution, and so on.

The default device catalog, `SASHELP.DEVICES`, is supplied as part of SAS/GRAPH software. The `SASHELP.DEVICES` catalog has an entry named `LINKABLE`, which contains the default characteristics used by the Linkable driver. For many devices, you can use the default characteristics and create the driver entry for your device by simply copying the `LINKABLE` entry and renaming it. For devices that do not use the default characteristics, you can create a new entry and modify the default parameters.

To get a list of the default characteristics used by the Linkable driver, you can use the `GDEVICE` procedure to list the contents of the `LINKABLE` entry in `SASHELP.DEVICES`. To do this, submit the following SAS statements:

```
PROC GDEVICE NOFS C=SASHELP.DEVICES BROWSE;
LIST LINKABLE;
END;
```

Important parameters from the `LINKABLE` entry are below. Refer to *SAS/GRAPH Reference Guide, Version 6, First Edition* for additional details on the parameters.

```
 Lrows: 0           Hsize: 7.500 in
 Lcols: 0           Vsize:10.000 in
 Prows: 66          Xmax: 7.500 in
 Pcols: 75          Ymax:10.000 in
 Aspect:1.500       Rotate: PORTRAIT
 Xpixels: 1500      Paperfeed:8.500 in
 Ypixels: 2000      Fillinc: 3
 Background color: WHITE
 Color list: BLACK,RED,GREEN,BLUE
 Process: RUN LINKABLE
 Process input: FOR023
 Interactive: PROC
```

The `INTERACTIVE` field specifies whether the external driver (the executable image created in Section 2) is called from within the SAS program (a value of `GRAPH` or `PROC`), or is not called by the SAS program, (a value of `USER`) in which case it must be run as a separate step after the SAS program completes. A value of `GRAPH` means that the external driver is called at the end of each picture, while a value of `PROC` means that the driver is called at the end of each SAS/GRAPH procedure (which can produce multiple graphs).

If you specify `INTERACTIVE=GRAPH` or `INTERACTIVE=PROC`, you must use the `PROCESS=` parameter to give the name of the command that must be issued to run the external driver. The default value for the `PROCESS=` parameter is `RUN LINKABLE`, which corresponds to the name of the executable image you created. If the executable image is not in the directory from which you are running the SAS System, you must supply the full path name in the `PROCESS` value. Alternatively, the `PROCESS` value can be a symbol defined in a foreign command. If you specify `INTERACTIVE=USER`, you do not have to supply the `PROCESS=` parameter.

The `PROCESSINPUT=` parameter specifies the logical name associated with the metafile generated by the internal driver. The default value is `FOR023`. The `LINKAVAX.FOR` program uses the logical `FOR023` as an input file. If you change the value of the `PROCESSINPUT=` parameter, you must modify the `LINKAVAX.FOR` program to get its input from the logical you specify.

The default parameters in the `LINKABLE` entry assume that your device has a resolution of 200 pixels per inch. If your device has a different resolution, you must modify the `XPIXELS` and `YPIXELS` parameters in your device entry to reflect the resolution. (The `XPIXELS` and `YPIXELS` values are the dimensions of the image area in pixels per inch.) You must also modify the `LINKAVAX FORTRAN` program. To modify this program, change the value of `PIXELS` in the following line to reflect the resolution (pixels per inch) of your device:

```
PIXELS=200.
```

If the default parameters are correct for your device, you can create a new entry by making a copy of the `LINKABLE` entry. Assuming that you want to name the new driver `MYDRIVER`, you can do this with the following `PROC GDEVICE` statements:

```
PROC GDEVICE NOFS C=SASHELP.DEVICES;  
COPY LINKABLE NEWNAME=MYDRIVER;  
MOD MYDRIVER DES='COPIED LINKABLE DRIVER';  
END;
```

In many cases, you must modify some of the parameters in the `LINKABLE` entry to fit your particular device. For example, suppose you have an 8-pen plotter with the following colors: `BLACK, RED, GREEN, BLUE, ORANGE, BROWN, YELLOW, GOLD`. To create a modified device entry, use the following `PROC GDEVICE` statements:

```
PROC GDEVICE NOFS C=SASHELP.DEVICES;  
COPY LINKABLE NEWNAME=MYDRIVER;  
MOD MYDRIVER DES='MODIFIED LINKABLE DRIVER'  
MAXCOLORS=9 COLORS=(BLACK,RED,GREEN,BLUE,ORANGE,BROWN,YELLOW,GOLD);  
END;
```

Notice that the value of `MAXCOLORS` includes the background color, so it should be set to one more than the number of foreground colors. The maximum number of foreground colors supported by the Linkable driver is 255. This is an increase over the maximum of 16 in previous releases.

You can also use `PROC GDEVICE` in full screen mode to copy and modify device entries. If you use full screen mode, the `PROCESS` and `INTERACTIVE` parameters can be found on the `METAGRAPHICS` screen of the entry. Refer to the chapter "The GDEVICE Procedure" in the *SAS/GRAPH Reference Guide, Version 6, First Edition* for details on using `PROC GDEVICE` to modify device catalog entries.

Testing the driver

If the external driver is executed from your SAS session, you must issue OpenVMS `DEFINE` statements for any files required by the driver before running your SAS program.

By default the Linkable driver writes a metafile to the logical `FOR023`, so you must supply an OpenVMS `DEFINE` statement or a SAS filename statement that associates the logical `FOR023` with the metafile.

This example assumes your plotting routines write output to the logical `FOR014`. If your plotting software writes to or defines another location, or requires that additional logicals be assigned, add OpenVMS `ASSIGN` statements as necessary. If your external driver is run after your SAS session has completed, you must provide an `ASSIGN` statement for the metafile, but none is required for output files.

```
$ DEFINE FOR014 output.file
$ DEFINE FOR023 metafile.file
```

or,

```
ASSIGN output.file FOR014
ASSIGN metafile FOR023
```

To test the driver, use the following SAS program:

```
GOPTIONS DEVICE=drivername;
PROC GTESTIT;
RUN;
```

If the external driver program is executed from your SAS session, the command specified in the `PROCESS` parameter of the driver entry is executed. If the executable image is not in the directory from which you are running the SAS System, you must supply the full path name in the `PROCESS` value. Alternatively, the `PROCESS` value can be a symbol defined in a foreign command. If the external driver is executed after the SAS session has finished (if `INTERACTIVE=USER` is specified in the device entry), the test program produces only a metafile, and the external driver must be executed as a separate step.

Other external drivers

In addition to CalComp library support, there is an external driver for GKS FORTRAN plotting libraries. The driver is designed to support `ANSI GKS` routines. The installation procedure is basically the same as for the Linkable driver. FORTRAN source for the GKS external driver is `GXTSGKS.FOR` in the directory referenced by `SAS$EXTENSION:[GR.MISC]`.

Appendix M, Using the Vector Processing Option

Hardware and Software Requirements

The vector processing option requires a VAX system running OpenVMS 5.5-2 or later with a vector processor. All OpenVMS 5.5-2 or later systems have VAX Vector Instruction Emulation Facility (VVIEF) software, which can be loaded to develop and run vector applications. You can use the vector processing option with vector emulation software but it will run more slowly than using the non-vectorized version of the SAS System.

System Considerations

The SYSGEN parameter, `VECTOR_PROC`, controls whether or not vector support code is loaded at boot time. A value of 1 (one) or 2 (two) allows SAS software to load the vectorized routines when you use the `/VECTOR` command line option and your SAS program uses vector manipulation routines.

Note: The default value for `VECTOR_PROC` is 1.

See "Using SYSGEN" in Part I of the installation instructions for more information on how to update `SYSGEN` parameters.

Using the Vector Processing Option

When you run a SAS program that calls one of the procedures or functions that uses vector processing, use the `/VECTOR` qualifier on the SAS System command line. SAS software loads the vector processing image whenever a program requests a vector manipulation routine. For example:

```
$ SAS/VECTOR myprogram.sas
```

If your system has no vector processor and the VVIEF is not installed, you will see the following message on the terminal or in your OpenVMS batch log:

```
%SAS-I-NOVECTOR, Vector processor not available
```

Refer to *SAS Companion for the OpenVMS Environment, Version 6, Second Edition* for more information on vector processing support.

Appendix N, Accessing SAS Samples

Sample programs for SAS products are provided on the installation tape. A SAS Site Representative may choose not to load the sample program onto the system during the initial install. If they are needed later, they can be installed with the installation procedure. There are several logicals provided to access the data used in sample programs. Two of the logicals that are used as librefs in the sample SAS programs, are:

SAMPSIO This logical is used to access SAS data sets and catalogs needed for the samples.

MAPS Location of SAS/GRAPH map data sets.

For more information concerning the SAS samples, refer to *SAS Consultant's Guide: Supporting the SAS System*.

Appendix O, Adding SAS HELP to an OpenVMS Help Library

In order for users to get online help when invoking Release 6.09E of the SAS System under OpenVMS, the system manager may want to produce an OpenVMS help library containing information on the SAS System. The file `SAS$ROOT:[TOOLS]SAS.HLP`, which contains text in the correct format for creating an OpenVMS help library, is included on the installation tape. You may choose to create a separate library for SAS HELP, or you may want to insert this information into an existing help library at your site. Note that this OpenVMS help information does not replace or supersede the help available during a SAS session.

Creating a New OpenVMS Help Library

If you want to create a new OpenVMS help library that contains only the SAS System help information, you need to use the OpenVMS library facility to create the library, as shown in the following example:

```
$ LIBRARY/HELP/CREATE=(BLOCKS:140,MODULES:1) -  
SAS$ROOT:[TOOLS]SAS.HLB -  
SAS$ROOT:[TOOLS]SAS.HLP
```

You must also define a `HLP$LIBRARY` logical name to point to this help library. For example, to define this help library for all users, you should insert the following line into your system startup file, `SYS$MANAGER:SYSTARTUP_V5.COM`:

```
$ DEFINE/SYSTEM HLP$LIBRARY SAS$ROOT:[TOOLS]SAS.HLB
```

If you already have a `HLP$LIBRARY` logical name defined for some other help library, you may use `HLP$LIBRARY_1`, `HLP$LIBRARY_2`, and so on. Refer to the *VMS Librarian Utility Manual* for further information.

Adding to an Existing OpenVMS Help Library

If you want to add the SAS System help information to an existing help library, you need to use the OpenVMS library facility to insert the SAS help information into the existing library:

```
$ LIBRARY/HELP/INSERT 'existing_library_name'  
SAS$ROOT:[TOOLS]SAS.HLP
```

You should already have defined a corresponding `HLP$LIBRARY` logical name.

Appendix P, Directory Structure Information for SAS/TOOLKIT[®] Software

Root directory for SAS/TOOLKIT Software:

```
SAS$ROOT: [ TOOLKIT ]
```

Required Files and Global Examples:

```
SAS$ROOT: [ TOOLKIT . GLOBAL . GRM ]  
          . LOAD  
          . OBJ
```

C Component and Samples:

```
SAS$ROOT: [ TOOLKIT . C . CNTL ]  
          . LOAD  
          . MACLIB  
          . OBJ  
          . SRC
```

PL/I Component and Samples:

```
SAS$ROOT: [ TOOLKIT . PLI . CNTL ]  
          . LOAD  
          . MACLIB  
          . OBJ  
          . SRC
```

FORTRAN Component and Samples:

```
SAS$ROOT: [ TOOLKIT . FTN . CNTL ]  
          . LOAD  
          . MACLIB  
          . OBJ  
          . SRC
```


Appendix Q, Post-Installation Setup for National Language Support (NLS)

If you installed any National Language Support (NLS) save sets for production or maintenance, and executed post-processing part in the installation procedure, there are some post-installation setup tasks you need to perform to make NLS for a language available on your system. If you did not execute post-processing for NLS during the installation procedure, see "Running the Post-Processing Procedure Manually" later in this appendix.

The following assumptions are made in these instructions. Make sure these apply to your system before proceeding.

- ❑ The logical names for the default English version of the SAS System are defined on your system as either `PROCESS` or `SYSTEM` level logicals.
- ❑ The `SAS` command verb is available to all users either installed in `DCLTABLES` or via an earlier execution of the following command:

```
$ SET COMMAND SAS$ROOT:[IMAGE]SAS609E.CLD
```

You must merge the NLS language delta `CORE` catalog with the `CORE` catalog of the SAS System. To do this, run the following SAS program:

```
libname fullcat "SAS$HELP";
libname maintcat "SAS$ROOT:[<language>.HELP]";
libname savedcat "SAS$ROOT:[HELP.SAVED_CATALOGS]";
libname deltacat "SAS$ROOT:[<language>.HELP]";

x 'create/dir SAS$ROOT:[HELP.SAVED_CATALOGS]';
x 'copy/log SAS$ROOT:[<language>.HELP]CORE.SASEB$DELTACAT
   SAS$ROOT:[<language>.HELP]CORE.SASEB$CATALOG';

/* Copy the full catalog into a work area: */
proc copy in=fullcat out=savedcat memtype=catalog;
  select CORE;

/* Merge the delta catalog into the full catalog: */
proc catalog cat=deltacat.CORE;
  copy out=savedcat.CORE;
quit;

/* Now, move the merged catalog into the appropriate directory: */
proc copy in=savedcat out=maintcat memtype=catalog;
  select CORE;
run;
```

where `<language>` refers to one of the supported NLS languages.

Supporting NLS for One Language

During post-processing, the installation procedure creates the following command:

```
SAS$ROOT:[<language>.TOOLS]<language>_SAS609E.COM
```

This command defines all `USER` level search path logical names required to run NLS for a language on top of the default English version of the SAS System. To make NLS for a language available on your system, set up the global symbol in your system login file, `SYS$MANAGER:SYLOGIN.COM`.

Note: By default, `SAS` is the command verb specified in the NLS command procedure. If you invoke the SAS System with a different command verb, edit the NLS command procedure and change the command verb to the one used on your system.

For example, you could add the following command to your system start-up file to support Spanish NLS:

```
$ SPANISH_SAS609E == "@SAS$ROOT:[SPANISH.TOOLS]SPANISH_SAS609E.COM"
```

This example would enable you to access the Spanish NLS version of the SAS System by specifying `SPANISH_SAS609E` at the `$` prompt.

Supporting NLS for Multiple Languages

To support NLS for more than one language, follow the steps in the above section, "Supporting NLS for One Language," but create separate global symbols for each language supported on your system.

Running the Post-Processing Procedure for Languages Manually

If you did not run the post-processing procedure for NLS support from the installation procedure, or if errors occurred during post-processing, you can run the post-processing procedure manually to create the NLS command procedure that defines the necessary `USER-` level logical names for a particular language.

Execute the following steps to create the NLS command procedure:

- ❑ Make sure that the `SAS$ROOT` logical name is already defined on your system before running the post-processing procedure.
- ❑ Invoke the post-processing procedure to create the NLS command procedure that defines the necessary search path logical names required for NLS for a particular language.

For example, you could specify the following to create the command procedure for Spanish NLS:

```
$ @SAS$ROOT:[TOOLS]POST_SPANISH.COM "SPANISH"
```

where `SPANISH` is a `P1` parameter used by the post-processing procedure. As a result, the NLS command procedure creates the following command procedure:

```
SAS$ROOT:[SPANISH.TOOLS]SPANISH_SAS609E.COM
```

This example command procedure defines the necessary `USER-` level search path logical names required to run the Spanish NLS version of the SAS System.

After this file is created, set up the global symbols necessary for NLS support on your system as described in the previous sections of this appendix.

Government Notice

If you are a government site or a government contractor, a file that contains important information specific to your site is unloaded during the product loading phase of the installation procedure. The file is located in:

```
SAS$ROOT:[TOOLS]GOVERNMENT.NOTICE
```

Note: It is important that you read and make other users at your site aware of this file by using one of the three options listed below.

1. To add the government notice information to an existing SAS HELP library execute the following commands:

- Set default to SAS\$ROOT:[TOOLS] as follows:

```
$ SET DEFAULT SAS$ROOT:[TOOLS]
```

- Edit the government notice text file as follows:

```
SAS$ROOT:[TOOLS]GOVERNMENT.NOTICE
```

and add the following line at the top of the file:

```
1 GOVT
```

Make sure the 1 is in the first column of the first line in GOVERNMENT.NOTICE; follow it by 1 space, and then the help member name, GOVT.

- Insert the help member into the SAS HELP library by issuing the following command:

```
$ LIBRARY/INSERT/LOG SAS.HLB GOVERNMENT.NOTICE
```

2. To add the government notice information to an existing OpenVMS help library (see Appendix O, "Adding SAS Help to an OpenVMS Help Library"), follow the first two steps listed under option 1. Then add the HELP member to the existing help library by executing the following command:

```
$ LIBRARY/HELP/INSERT 'existing_library_name'-  
GOVERNMENT.NOTICE
```

3. To add the government notice information to SAS\$ROOT:[HELP]NEWS.DOC execute the following commands:

```
$ SET DEFAULT SAS$ROOT:[HELP]
$ CONVERT/APPEND SAS$ROOT:[TOOLS]GOVERNMENT.NOTICE -
  SAS$HELP:NEWS.DOC
```