Installation Instructions and System Manager's Guide for the SAS® System under MVS

Release 6.09 Enhanced TS475

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Installation Instructions and System Manager's Guide for the SAS® System under MVS, Release 6.09 Enhanced (TS475)

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Using this Book

Contents of this Document

This document is divided into two sections, each containing two parts, and a set of appendices. The following describes the contents of each section of this document.

Section I, *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, "Pre-Installation Checklist"

  Gives you an overview of installation requirements and defines the installation parameters you need to supply for the install process. It also describes the installation actions and options from which you can choose.

- ❑ Section I, Part 2, "Installing the SAS System"

  Describes the common installation process you use for all actions and identifies the steps that are necessary for you to complete the different post-installation processing for each action.

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 the SAS System"

  Describes how you can customize SAS System invocation at your site. It also addresses issues that pertain to running the SAS System effectively at any site. You should carefully review all of this information.

- ❑ Section II, Part 2, "Maintaining the SAS System"

  Describes how to process the SAS Notes libraries as well as how to delete SAS product libraries.

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

Terminology

Although several media types are used for distributing SAS software products, these instructions refer to all media as *tape*.

During the first step of the installation process, you are instructed to allocate a data set into which all SAS System installation jobs will be loaded. The name of this data set is completely arbitrary and is referred to throughout this document as the *CNTL data set*.

CAUTION! If the `CNTL` data set is deleted, you will have to restart the installation process from the beginning to recreate the data set. Therefore, keep this data set on disk.

Other installation libraries are referenced in this document using the names specified in the `LIBSEL` member of the `CNTL` data set.

References

The following SAS Institute manuals assist users with Version 6 of the SAS System and may provide helpful information for completing your system set up and product implementation:

- *SAS Companion for the MVS Environment, Version 6, First Edition*
- *SAS Companion for the MVS Environment, Version 6, Second Edition*
- Technical Report P-218, *Changes and Enhancements to the SAS System, Release 6.07 under MVS*
- Technical Report U-116, *A Guide to the SAS Notes, Sample Library, and Online Customer Support Facility*

Contacting SAS Institute

If you have questions about this document or any of the procedures described in it, contact the SAS Institute Technical Support Division at (919) 677-8008, between 9 a.m. and 8 p.m., Eastern Time.

Section I, Installation Instructions

Part 1, Pre-Installation Checklist

Part 2, Installing the SAS System

Part 3, Installing SAS System Maintenance

Part 1, Pre-Installation Checklist

Introduction

This section provides an overview of the complete installation process, which includes the following tasks:

- ❑ checking available disk space
- ❑ checking software and hardware requirements
- ❑ choosing installation options
- ❑ verifying SETINIT status
- ❑ determining installation parameters.

Review the task descriptions in this section before starting your installation. Familiarity with this information will help your installation proceed smoothly.

Checking Available Disk Space

The *System Requirements* document shipped as part of your installation package provides the disk space requirements for each SAS product. The "Space Requirements Information" section also details the additional space needed for the installation process itself. Before you proceed, insure that you have adequate space available on one disk volume.

If you are installing add-on products (the base SAS product is not on your tape), verify that your existing SAS System libraries contain enough additional space to accommodate each product on your installation tape.

Checking System Requirements

The system requirements information is shipped as part of your installation package. Refer to the System Requirements document for the software and hardware requirements for the base SAS System and any other products you intend to install.

Choosing Installation Options

Before you begin to install the SAS System, you should decide which Action and which mode you plan to use. The following sections describe the Action and mode choices. Be sure to read these sections **before** you start the installation process.

You will be asked to supply information about your site and characteristics of the desired system installation. This information will be used to generate customized installation jobs to perform the needed installation tasks. The generated jobs have various names, depending upon the task they perform. They are abbreviated in this document by `SASIxxxx`.

Note: See the section, "Generated SAS Installation Jobs" for a complete listing of generated SAS installation jobs and job names.

Choosing a Primary Installation Action

Choose one of three primary actions to process a SAS System installation tape:

- ❑ `INSTALL-NEW` (**Action A**): Installs a new SAS System
- ❑ `INSTALL-DIRECT` (**Action B**): Installs additional products or maintenance directly to existing SAS System libraries
- ❑ `INSTALL-TO-STAGE` (**Action C**): Installs additional products or maintenance to new or existing SAS System staging libraries.

Determining When to Use Action A

Select Action A, `INSTALL-NEW`, when you receive a tape with a new release of the SAS System, including the base product. This installation procedure allocates new SAS System libraries on disk for unloading the libraries on your tape.

Determining When to Use Action B

Select Action B, `INSTALL-DIRECT`, when you receive a tape with additional SAS products or maintenance files for the current release of the SAS System, and you want to install all or part of the files directly into your current SAS System libraries. Maintenance files can include updates to the base product.

If you select this option, be aware that current load modules may be overwritten. You will also need to insure that existing load libraries have adequate space and that they are not in use.

Determining When to Use Action C

Select Action C, `INSTALL-TO-STAGE`, when you receive a tape with additional SAS products or maintenance files for the current release of the SAS System, and you want to unload the new products and updates to separate staging libraries. This installation procedure optionally allocates new SAS System staging libraries on disk for unloading the libraries on your tape and concatenates the staging libraries ahead of your specified production SAS System libraries for executing the SAS System. After testing your staged products and updates, you may want to copy the staging libraries to your current SAS System production libraries (using Action D). When you have completed this task, delete the staging libraries (using Action E).

Note: The following products are not installed to the staging area by Action C. They are all installed to separate libraries in the production prefix for all primary Installation Actions.

- ❑ Usage Notes `&prefix.Usage`
- ❑ SAS/TUTOR `&prefix.CBT`
- ❑ SAS/CPE `&prefix.CPE`

Note: When installing SAS/CPE software or CPE maintenance using an Action C, the `&prefix.CPE.PGMLIB` and `&prefix.CPE.CPMISC` data sets will be allocated and maintenance applied at `"STAGED-LIBR-PFX."`

Using Maintenance Actions

You can choose other actions to regenerate and run the `SASIxxxx` installation job(s) to perform further operations on your installed SAS System. The following maintenance actions are available:

- ❑ `STAGE-TO-FINAL` (**Action D**): Copies staged SAS product libraries into your production SAS System libraries
- ❑ `DELETE-ENTIRE` (**Action E**): Deletes an entire set of installed SAS libraries
- ❑ `DELETE-SELECTED` (**Action F**): Deletes only those libraries you specify in the `LIBSEL` member of the `CNTL` data set
- ❑ `STANDALONE-RENEW` (**Action G**): Applies renewal SETINIT information to an existing SAS System.

Choosing Installation Modes

When you run the `SASIxxxx` installation job(s), you must choose one action and two of the four modes. You can choose one of default or selective mode, and one of checkout or edit-and-go mode.

Default Mode

all SAS installation libraries on your tape are unloaded into the specified SAS System libraries on disk. This is the recommended method of installing the SAS System. It is easier and faster to perform than the selective installation and requires minimal set-up time. Later, you can remove optional libraries that you do not use by deleting them as described in "Deleting SAS Product Libraries" in Section II, Part 2 of this document. You should always install maintenance tapes in default mode. If you have concerns about installing maintenance in default mode, call the Technical Support Division at SAS Institute.

Selective Mode

you specify which products or product libraries are unloaded from the tape. You may want to perform a selective install when disk space is insufficient for installing an entire tape. When performing a selective installation, you must indicate whether to select by product or by product library. If you choose to select by individual library rather than by product, carefully review the product library information in the `LIBSEL` member of the `CNTL` data set. You must install all libraries marked `REQUIRED` for a product in order to run that product at your site.

Checkout Mode

the installation process pauses to allow you to review the customized `SASIxxxx` job(s) before it runs. To run the install in checkout mode, you edit and run the job `SASINEW` (Action A) `or SASIHOLD` (other Actions) in the `CNTL` data set after specifying your installation parameters in `SASEDITP`. This job creates the installation job(s) `SASIxxxx` in the `CNTL` data set, which you can review or edit before submitting.

Note: You must run in checkout mode if your site does not allow running jobs to submit other jobs directly to the MVS internal reader.

Edit-and-Go Mode

the installation process continues without pausing when you finish editing the necessary files. To perform the installation in edit-and-go mode, edit and run the job `SASINSGO` in the `CNTL` data set after specifying your installation parameters in `SASEDITP`. This job generates and submits customized `SASIxxxx` job(s) that perform the action you select, and stores the job(s) in the `CNTL` data set. `SASINSGO` cannot be used for Action A.

Note: If `SASINEW` is used for an action other than Action A, or `SASIHOLD/SASINSGO` is used for Action A, the jobs will halt with a return code `12` and a Severe Error message in the `SYSTERM` data set. The `SASINEW job` will not be in your `CNTL` data set if Base SAS software is not on your tape.

Verifying SETINIT Status

In many cases, the installation tape that you receive includes pre-applied licensing, or SETINIT, information. If your tape does not include a valid SETINIT, you must enter the SAS SETINIT statements included with your installation package. Each SAS System product must be licensed for your site in order for you to run it.

If the Cover Letter included in your installation package states that you have received a tape with an expired SETINIT, you must enter your customized SETINIT statements into the `RENEWPRM` member of the `CNTL` data set after you unload the installation jobs but before you run any of them.

For more information about the SETINIT process, see Appendix X, "Licensing the SAS System (Action G)".

Determining Installation Parameters

As you install the SAS System, you are asked to supply various site parameters for the installation jobs. These parameters follow, listed in alphabetical order, and are described with reference to where they occur in the installation process. Review the parameters and determine which values to supply before you begin the installation.

Two types of parameters appear in this installation process: selectable and keyword=value. *Selectable* parameters help reduce the amount of data you need to type, thereby reducing the number of possible keying errors. Selectable parameters are activated by removing comment characters. If there is a selection that you want, make sure that you remove the comment symbol associated with the parameter. Likewise, if there is an alternate selection that you **do not** want, be sure that the parameter is commented out. With *keyword=value* parameters, you specify your site value after *keyword*=. Do not leave any spaces between the equal sign and your value.

The parameters that are defined in this section appear in the `SASEDITP` member of the `CNTL` data set, which is the member that you edit to supply site-specific parameters, and the `SASINEW/SASIHOLD/SASINSGO` job, which is the job you submit to create your `SASIxxxx` job(s) for the action you specify in `SASEDITP`.

If you choose to perform your installation in *selective* mode, you must also edit one or both of the `PRODSEL` and `LIBSEL` members of the `CNTL` data set. All parameters in these members are selectable parameters. Comments in each member explain the parameters.

Note: You will see that some of the following parameters are used in the `IEBUPDTE` portion of the install. The sample `IEBUPDTE` job does not specify these parameters by name, but you need to specify the corresponding value in the JCL.

- **`CLST-DSN-SFX=`** (used in `SASEDITP`) specifies the final qualifier of the data set name of the command procedure library into which command procedures (`CLIST`s) are copied. It is appended to the installation library prefix that you specify with the action you select in `SASEDITP`. If you do not want to use this name, you can comment-out this parameter, uncomment the `CLST-DSN` parameter, and specify the entire data set name. The default is `CLIST`. The `CLIST-DSN-SFX` and `CLST-DSN` parameters are used only when installing the SAS System using Action A.

- **`CNTLDSN=`** (used in `IEBUPDTE`, `SASEDITP`, and `SASINEW/SASIHOLD/SASINSGO`) specifies the data set name of the PDS where you unload the installation jobs in the initial `IEBUPDTE` job. This is the critical `CNTL` data set described in "Introduction." You should keep this data set after you complete the installation.

- **COPYMOD=** (used in SASEDITP) specifies the IEBCOPY control statement to use when unloading your SAS installation load libraries from tape. The COPYMOD statement causes the load libraries to be reblocked to the blocksize specified by the LOADBLK= parameter. The default is COPYMOD. If you do not use COPYMOD, your load library blocksize will be 6144.

- **CPBK=** (used in SASEDITP only if the CPE product is included on your tape) allows you to set a block size of 6144 if your DASD will not support the default CPE PDB data set block size of 23040.

- **DISKUNIT=** (used in SASEDITP) specifies the JCL unit name or unit address for the volume on which the SAS installation libraries reside. This parameter is used for installing libraries and for printing the installation instructions. The default is DISK.

- **ENTRY=** (used in SASEDITP) specifies the entry point for the SAS System that is used in in-stream procedures during installation, in the cataloged procedures, and in CLISTs. The default is SASHOST, which runs the unbundled version of the SAS System. The "System Manager's Guide" in Section II of this document contains information on different bundling configurations that you can use to customize Version 6 of the SAS System for your site.

- **EXPDATE=** (used in SASEDITP) specifies the expiration date value used in accessing the installation tape. The value may need to be changed to 98000 for sites using a tape library management system. This parameter is used for installing libraries and for printing the installation instructions. The default is 99365.

- **LOADBLK=** (used in SASEDITP when you use COPYMOD) specifies the blocksize that you want to use for your SAS load library. The default is 32760.

- ***PREFIX/*PFX=** (used in SASEDITP) specifies the high-level qualifiers for the SAS installation libraries that the SASIxxxx job(s) will use when performing an action. The exact name of the PREFIX parameters varies according to the action you specify. The SASEDITP member of the CNTL data set groups each action with the corresponding prefix parameters that you need to specify.

- **PROC-DSN-SFX=** (used in SASEDITP) specifies the final qualifier of the data set name of the cataloged procedure library into which cataloged procedures (PROCs) are copied. It is appended to the installation library prefix that you specify with the action you select in SASEDITP. If you do not want to use this name, you can comment-out this parameter, uncomment the PROC-DSN parameter, and specify the entire data set name. The default is PROCLIB. The PROC-DSN-SFX and PROC-DSN parameters are used only when installing the SAS System using Action A.

- **SASCNM=** (used in SASEDITP) specifies the name you want to use for the SAS command procedure (CLIST). The default is SAS609.

- **SASINST-ACTION** (used in SASEDITP) provides a "turned-on" (active) value for the action you want the installation job(s) to perform. A separate selectable parameter represents each possible action. Choose the action you want by commenting out the "*NO*" to the left of the action name. The installation job(s) do not permit more than one action to be active at a time. Possible actions are:

  - Action A, INSTALL-NEW
  - Action B, INSTALL-DIRECT
  - Action C, INSTALL-TO-STAGE
  - Action D, STAGE-TO-FINAL
  - Action E, DELETE-ENTIRE
  - Action F, DELETE-SELECTED
  - Action G, STANDALONE-RENEW.

  Refer to "Choosing Installation Options" earlier in this section for a description of each action. There is no default action.

- **SASPNM=** (used in SASEDITP) specifies the name you want to use for the SAS cataloged procedure. The default is SAS609.

- **SMS-ALLOC** (used in SASEDITP) specifies that you intend to use IBM's SMS to help manage your installation data set allocations. By default, this parameter is commented-out. If you want to use SMS, uncomment the parameter.

- **SYSOUT=** (used in IEBUPDTE, SASEDITP, SASINEW/SASIHOLD/SASINSGO) specifies the SYSOUT class you want to use for jobs. The default is *.

- **TAPEUNIT=** (used in SASEDITP) specifies the JCL unit name or unit address for the tape drive on which the installation tape is mounted. This parameter is used for unloading tape libraries and for printing the installation instructions. The default is TAPE.

- **TMPUNI=** (used in SASEDITP) specifies the value your site uses as the system-assigned name for temporary storage. The default is SYSDA, which is the standard IBM default value.

- **VOLDISK=** (used in SASEDITP) specifies the volume serial of the disk pack for installing SAS product libraries. This parameter is ignored if you specify the use of SMS.

- **WORKSPC=** (used in SASEDITP) specifies the size, in 6144-byte blocks, for the WORK allocation for CLISTs, cataloged procedures, and in-stream procedures used throughout installation. The first value is the primary allocation, followed by a comma, and the second value is the secondary allocation. The default is 500,200.

Part 2, Installing the SAS® System

Overview

When you process a SAS System installation tape under MVS, you choose one of the following primary installation actions:

- `INSTALL-NEW` (**Action A**)

  installs a new SAS System at your site.

- `INSTALL-DIRECT` (**Action B**)

  installs additional products or maintenance files into existing SAS System libraries at your site. Also use this action to install a tape containing only Usage Notes.

- `INSTALL-TO-STAGE` (**Action C**)

  installs additional products or maintenance files into new or existing SAS System staging libraries at your site.

See "Choosing a Primary Installation Action" in Part 1 for a more detailed description of each option.

All options require you to follow the same steps to unload the SAS product libraries into your installation libraries. After unloading the installation jobs into the `CNTL` data set using the initial `IEBUPDTE` job, you specify your site values for installation parameters in the `SASEDITP` member of the `CNTL` data set and, optionally, in the `PRODSEL`, `LIBSEL`, and `RENEWPRM` members. Then you must create customized `SASIxxxx` installation job(s) for your site. Create these using one of the following:

- `SASINEW` does not directly submit the generated `SASIxxxx` job(s). The job is "held" and you must submit it when you are ready. Use for Action A only.

- `SASIHOLD` does not directly submit the generated `SASIxxxx` job(s). The job is "held," and you must submit it when you are ready. Use for actions other than Action A.

- `SASINSGO` submits the generated `SASIxxxx` job(s) directly as soon as it is complete. Use for actions other than Action A.

Once the `SASIxxxx` job(s) complete, you may need to perform site-specific implementation for some products. The steps necessary here depend on the products on your tape, not on the installation action you select.

When the tape libraries are installed and the product-specific implementation is complete, you may need to perform further steps, depending on the action you selected and your site requirements. If you are installing the base SAS System, you may want to customize your SAS System configuration. If you are installing new products or maintenance files into SAS System staging libraries, you may later want to integrate them into your production SAS System.

Outlining the Installation Process

The outline contained in this section summarizes the installation process and the post-installation processing appropriate for each action. Following this summary, each process identified is discussed in greater detail.

Common Installation Process

1. Pick a name for a new `CNTL` data set.

2. Unload the installation jobs by running `IEBUPDTE`.

3. Check the `#CONTENT` file to verify that needed products and/or maintenance are on this tape.

4. Check the `##README` file for any special installation instructions for your tape.

5. Specify installation parameters.

   - ❑ Supply `SASEDITP` parameter values.
   - ❑ If you are using selective mode, specify products/product libraries in `PRODSEL/LIBSEL`.
   - ❑ If special SETINIT instructions are indicated in the Cover Letter or your SETINIT has expired, enter `RENEWPRM` data.

6. Unload the SAS product libraries.

   - ❑ Supply `SASINEW/SASIHOLD/SASINSGO` parameter values.
   - ❑ Run `SASINEW/SASIHOLD/SASINSGO`.
   - ❑ If you are using checkout mode, run the appropriate SAS install job.

7. Verify the system installation.

   - ❑ Verify successful completion of the SAS install job.
   - ❑ Run `*VALID` jobs for installed products.

8. Complete site-specific implementation as needed for installed products.

Post-Installation Processing

The post-installation steps that you must perform are determined by the Action you are using. The following sections provide an overview for each action.

Overview for Action A: INSTALL-NEW

1. Implement TSO support if you are running under TSO.

2. Complete base SAS System customization.

   - ❑ Review Section II, Part 1, "Setting up the SAS System."
   - ❑ Perform customizations as appropriate.

Overview for Action B: INSTALL-DIRECT

Apply site changes, if needed, to maintenance versions of customized files.

Overview for Action C: INSTALL-TO-STAGE

1. Apply site customizations, if needed, to installed staging CLIST and PROC.

2. Apply site changes, if needed, to maintenance versions of customized files.

3. Perform site testing as desired.

4. Copy contents of staging libraries to the production SAS System libraries, using Action D. This task is optional but strongly recommended. See Section II Part 2, "Maintaining the SAS System" for more information.

   - ❑ Supply `SASEDITP` parameter values.
   - ❑ Specify products/product libraries in `PRODSEL/LIBSEL` if you are using selective mode.
   - ❑ Supply `SASIHOLD/SASINSGO` parameter values.
   - ❑ Run `SASIHOLD/SASINSGO`.
   - ❑ Run the generated `SASIxxxx` job(s) if you are using checkout mode.
   - ❑ Perform site-specific post-implementation for the final libraries. See "Performing Site-Specific Product Implementation," later in this section.
   - ❑ Perform site testing as desired.

5. Delete staging libraries, using Action E. This task is optional. See Section II Part 2, "Maintaining the SAS System" for more information.

   - ❑ Supply `SASEDITP` parameter values.
   - ❑ Supply `SASIHOLD/SASINSGO` parameter values.
   - ❑ Run `SASIHOLD/SASINSGO`.
   - ❑ Run `SASIDSTG` if you are using checkout mode.

Overview for Installation with National Language Support (NLS)

Note: The presence of NLS installation considerations in your documentation does not imply the presence of NLS files on your tape. The `#CONTENT` member of the control data set from your tape indicates whether or not your tape contains NLS files.

Installation with NLS consists of the actions described above with certain additional `SASEDITP` parameters supplied, whose values vary depending on the nature of your installation. Nearly all of the information you supply for an NLS installation enables the Action A, B, or C as above. The additional information controls the manner in which NLS files are added to the main (English language) system. Each of the N actions employs an Action A, B, or C to complete it. These variations are briefly listed below. See Appendix Y, "Installing National Language Support (NLS)" for more information and instructions. Be sure to read and understand the sections, "Important Notes" and "General Information" in Appendix Y.

Most installations will use Actions NA, NC, or NM.

- ❑ **NA** installing a new SAS System with NLS, uses Action A
- ❑ **NC** installing new products and NLS to an existing SAS System, or installing new products to an existing SAS System with NLS, uses Action C
- ❑ **NM** installing maintenance and NLS to an existing SAS System, or installing NLS to an existing SAS System, or installing maintenance to an existing SAS System with NLS, uses Action C
- ❑ **NS** adding NLS to an existing staged install at TS475, no new products, uses Action C
- ❑ **NN** adding NLS to an existing staged install with new products at TS475, uses Action C
- ❑ **NP** adding NLS to an existing staged install at TS450, uses Action C
- ❑ **NB** adding NLS only directly to a SAS System at TS475, short install, uses Action B
- ❑ **NX** adding NLS and maintenance directly to a SAS System at TS450, short install, uses Action B
- ❑ **N2C** adding a second NLS to a staged install, uses Action C
- ❑ **N2B** adding a second NLS directly to final libraries, uses Action B
- ❑ Third and subsequent NLS installations
- ❑ Using an NLS media to perform a non-NLS installation.

The next section begins the step-by-step explanation of the installation process. You must follow the instructions regardless of the Action you choose.

Performing the Installation Process

This section details all of the steps required to process a SAS System installation tape, regardless of the primary action selected. You must complete these instructions in their entirety to insure a complete, working SAS System. Once you have completed the installation process, complete the post-installation steps as described in "Post-Installation Processing." For post-installation, remember to follow the steps for the action you selected.

Unloading the Installation Jobs — Run IEBUPDTE

Step 1: Determine a name for a new `CNTL` data set.

Pick a name to use in the `IEBUPDTE` utility to contain the installation program. This must be a new, unused data set. Each media set from SAS must have its own CNTL data set. Violating this rule often causes troubles that are difficult to debug. A suggested naming convention is:

```
&prefix.MMMDDYY.CNTL
```

where `&prefix` is the prefix you are installing to and `MMMDDYY` is the date of installation. For example, `SYS.SAS609.FEB1494.CNTL` follows this naming convention.

Step 2: Set up a job to allocate and load a `CNTL` data set.

The job you create unloads all product installation members from the tape. The newly allocated data set is referred to hereafter as the *CNTL data set*. Use the example `IEBUPDTE` job, which follows, to create your site-specific job.

Note: A new `CNTL` data set must be allocated. Do **not** use the same `CNTL` data set name used for previous installations of SAS products.

To modify the example script, change the italicized text in the example to reflect your site-specific information. Change the information as indicated below:

a. Modify the first lines of the `IEBUPDTE` job to contain jobcard information for your site.

b. Change *`your.cntl.dataset`* to specify the data set name for your `CNTL` data set. (This text appears twice in the example. Be sure to replace it both times.)

c. Replace *`disk`* with the unit type you are using for the `CNTL` data set.

d. Replace *dddddd* with the volume serial of the disk pack on which the CNTL data set will be created.

e. Replace *vvvvvv* with the volser of the first tape in the series of tapes that you are installing.

f. Replace *uuuu* with the unit type for a tape drive at your site.

The example IEBUPDTE job follows:

```
//IEBUPDTE JOB (account information),'programmer',
//          TIME=(m,s),MSGCLASS=a
//*
//ALLOC     EXEC PGM=IEFBR14
//OUTCNTL  DD DSN=your.cntl.dataset,DISP=(NEW,CATLG,DELETE),
//          UNIT=disk,VOL=SER=dddddd,
//          DCB=(BLKSIZE=6160,LRECL=80,
//          DSORG=PO,RECFM=FB),SPACE=(6160,(450,45,35))
//*
//UPDTE     EXEC PGM=IEBUPDTE,PARM='NEW'
//SYSIN     DD DSN=SAS.SASROOT,DISP=OLD,VOL=SER=vvvvvv,
//          LABEL=(1,SL),UNIT=uuuu
//SYSPRINT DD   SYSOUT=*
//SYSUT2    DD DSN=your.cntl.dataset,DISP=OLD
//*
```

Step 3: Execute the IEBUPDTE job that you just modified.

Step 4: Check the ##README file for any special installation instructions for your tape.

This member was unloaded into the CNTL data set by the IEBUPDTE job you just ran. It contains any special instructions you may need to follow to complete the installation of the tape you received.

Specifying Installation Parameters

The SASEDITP member of the CNTL data set contains parameters for which all users must specify installation-specific values.

Other members of the CNTL data set contain information that you need to edit only under the following circumstances:

❑ **PRODSEL** contains product selection parameters.

Edit only if you want to perform the installation in selective mode.

❑ **LIBSEL** contains product library selection parameters.

Edit only if you want to perform the installation in selective mode, and you want to select by individual product library.

❑ **RENEWPRM** contains SETINIT text.

Edit only if the Cover Letter included with your installation package instructs you to do so.

For your convenience, the CNTL data set contains backup copies of SASEDITP, PRODSEL, and LIBSEL, with the names @SASEDTP, @PRODSEL, and @LIBSEL. The backup copies contain the default parameter values as unloaded from the tape. They exist for you to use as reference, to help you recover from possible error situations, and to reinitialize SASEDITP, PRODSEL, and LIBSEL, if desired, for performing additional actions. The current values in each member are always used when creating customized SASIxxxx job(s).

Step 1: Supply SASEDITP parameter values.

Note: Although comments in this member use lower case for readability, all parameter values you enter should be in upper case. Set CAPS ON in your edit session before entering your values.

❑ Provide job header information:

Use **JOBCARD1=** through **JOBCARD5=** to create JOB statements for the generated SASIxxxx job(s). The default JOBCARD1 value contains a jobname value of SYSNAME, which resolves so that the jobname is the same as that of the member name that contains the JCL for the job. **Do not change the //%SYSNAME. symbol in the existing JOBCARD1 value**. Update the remainder of the JOBCARDx parameters with the appropriate values (/*JOBPARM, /*ROUTE, //*MAIN, or //*FORMAT statements) for your installation. You may, for example, want to add a /*JOBPARM FETCH statement for online retrieval of your jobs.

Note: Be sure to leave the JOB statement values enclosed in quotes ("). Do not increase the number of characters (50) contained between the quotes in JOBCARD1.

❑ Select National Language Support (NLS) Options:

See Appendix Y, "Installing National Language Support (NLS)" for information on the proper settings for these options. These values only appear in SASEDITP if your tape contains NLS files. If these values appear in your SASEDITP, do not attempt installation until you have read Appendix Y.

❑ SKIP-NLS= Blank out the *NO* on this line if so directed by Appendix Y.

- ❑ NLS-ONLY= Blank out the *NO* on this line if so directed by Appendix Y.

  Note: The presence of NLS installation considerations in this documentation does not imply the presence of NLS files on your tape. The #CONTENT member of the control data set from your tape indicates whether or not your tape contains NLS files, and for what products.

- ❑ Select a single SAS install action and supply the corresponding library prefix values. The maximum prefix length is 23 characters, or 20 if you are installing NLS files.

  Select the action you want (Action A, B, or C) by blanking out or deleting the *NO* that precedes the action name. Verify that you have only one action value active. If more than one action is selected, a return code of 12 is set, and error messages specifying the duplicate selections are posted to SYSPRINT and SYSTERM.

  Specify library prefixes as follows:

  - ❑ If you are using Action A: INSTALL-NEW

    Use NEW-SAS-PREFIX= to specify the high-level prefix that you want to use for the SAS product libraries created by SASINSTA. The default is SAS.SAS609.

  - ❑ If you are using Action B: INSTALL-DIRECT

    Use EXISTING-SAS-PFX= to specify the high-level prefix of the existing SAS System libraries at your site into which you want to unload the tape libraries. The default is SAS.SAS609.

    If you cannot use exclusive access to the existing SAS Libraries (DISP=OLD), blank out the *NO* before BUDSP=SHR.

  - ❑ If you are using Action C: INSTALL-TO-STAGE

    Use STAGED-LIBR-PFX= to specify the high-level prefix of the SAS System staging libraries into which you want to unload the tape libraries. The default is SAS.SAS609.NEW, and it creates these libraries as part of the SAS install process for this action.

    Use FINAL-SASLIB-PFX= to specify the high-level qualifiers of an existing set of complete SAS System libraries. These libraries **cannot** be staging libraries from a previous maintenance install. The CLIST and cataloged procedure unloaded from the tape with the INSTALL-TO-STAGE action

concatenate the staging libraries in front of the production libraries for executing the SAS System.

- ❑ `PROD-BATCH-CFG=` specifies the name of a production batch SAS CONFIG file.
- ❑ `PROD-TSO-CONFIG=` specifies the name of a production TSO SAS CONFIG file.

To concatenate your production CONFIG files into the generated staging PROC and CLIST, blank out the `*NO*` on these lines and provide fully qualified data set names.

Note: These parameters are found in the SAS install `ACTION C` grouping along with `STAGED-LIBR-PFX` and `FINAL-SASLIB-PFX`.

- ❑ Provide site-specific parameter values for the following:
  - ❑ **`CNTLDSN=`** specifies the `CNTL` data set you created by running the `IEBUPDTE` job.
  - ❑ **`TAPEUNIT=`** specifies the JCL unit name or unit address for the tape drive on which the installation tape is mounted.
  - ❑ **`EXPDATE=`** specifies the expiration date value used in accessing the installation tape. You may need to change the value to `98000` if your site uses a tape library management system.
  - ❑ **`DISKUNIT=`** specifies the JCL unit name or unit address for the volume for the SAS installation libraries.
  - ❑ **`WORKSPC=`** specifies the size, in 6144-byte blocks, for the SAS `WORK` library allocation for CLISTs, cataloged procedures, and in-stream procedures used throughout installation. The first value is the primary allocation, followed by a comma, and the second value is the secondary allocation.
  - ❑ **`INTREADR=`** specifies the syntax for program submission to the JES internal reader. Optionally disables use of the internal reader if not available or allowed at your site.

    To REVISE the syntax to invoke your internal reader, modify the data between the quotes as shown in the following example:

    ```
    INTREADR='DD ALTERNATE,SYNTAX'
    ```

    Do not remove the surrounding quotes. If your syntax contains single quotes, change the surrounding quotes to double quotes as shown in the following example:

```
INTREADR="DD 'ALTERNATE',SYNTAX"
```

IMPORTANT: If you modify INTREADR= and want to use SASINSGO, you must make a corresponding change to the SYSUT2 DD statement of the SUBKICKR step of SASINSGO.

To DISABLE use of the internal reader, remove the *NO* before the INTREADR= with the blank value. SASINSGO becomes unusable. To complete the install you must individually submit each generated job in sequence following the successful completion of the prior step. See the listings and discussions in the following section, "Generated SAS Installation Jobs," for job names, functions, and sequencing.

- **ENTRY=** specifies the entry point for the SAS System that is used in in-stream procedures during installation, in the cataloged procedures, and the CLISTs. The default is SASHOST, which runs the unbundled version of the SAS System. The "System Manager's Guide" in Section II of this document contains information on the different bundling configurations you can choose in customizing Version 6 of the SAS System for your site.

- **SYSOUT=** specifies the SYSOUT class you want to use for jobs.

- **TMPUNI=** specifies the value your site uses as the system-assigned name for temporary disk storage .

- **VOLDISK=** specifies the volume serial of the disk pack for installing SAS product libraries. This parameter is ignored if you specify the use of SMS.

- **SMS-ALLOC** specifies whether you intend to use IBM's SMS to help manage your installation data set allocations. By default, this parameter is commented out. If you do want to use SMS, delete the *NO* to invoke your site's installed SMS allocation features. VOLDISK will be ignored. Your site default SMS values will be used unless you delete the *NO* on each appropriate SMS parameter and supply the parameter combinations required by your installation. Consult your SMS documentation and system support personnel for further information and appropriate values.

  The following SMS parms are supported by the SAS System LIBNAME and FILENAME statements via SVC 99 calls:

  - SMS-STORCLAS SMS "STORCLAS=" value
  - SMS-MGMTCLAS SMS "MGMTCLAS=" value

- SMS-DATACLAS SMS "DATACLAS=" value

  Note: The SAS FILENAME statement supports the SMS DSNTYPE parameter, but the SAS LIBNAME statement does not support SMS DSNTYPE. The installation process sets a DSNTYPE=PDS override in any new allocation of a non-sequential data set in an SMS installation. This prevents a default DSNTYPE=LIBRARY in a customer SMS definition causing the installation to allocate PDSE data sets for SAS system content, resulting in installation failure.

- **JES3SYS=** Delete the *NO* on this line if you are running on a JES3 system. This will cause certain dynamic data set allocations for Actions B, C, or D to be performed in a separate job named SASIALOB, SASIALOC, or SASIALOD, respectively.

- **COPYMOD=** specifies the IEBCOPY command name to use when unloading your SAS installation load libraries from tape. Using the COPYMOD command causes the load libraries to be reblocked to the blocksize specified by the LOADBLK= parameter. The default is COPYMOD. If you use COPY, your load library blocksize will be 6144.

- **CPBK=** if SAS/CPE software is installed on your tape, CPE PDB data sets will normally be blocked to 23040. If you are using 3390 native mode DASD, delete the *NO* in front of CPBK=27648, and comment out CPBK=23040 by inserting *NO*.

- **LOADBLK=** when you use COPYMOD, specifies the blocksize you want to use for your SAS load library. The default is 32760. If you are performing an INSTALL-DIRECT, use this parameter when your target library blocksize is not 6144.

- **PROC-DSN-SFX=** specifies the final node of the data set name of the cataloged procedure library to which cataloged procedures (PROCs) are copied. It is appended to the installation library prefix that you specify with the action you select in SASEDITP. If you do not want to use this name, you can comment-out this parameter, uncomment the PROC-DSN parameter, and specify the entire data set name. The default is PROCLIB. The PROC-DSN-SFX and PROC-DSN parameters are used only when installing the SAS System with Action A.

- **SASPNM=** specifies the name you want to use for the SAS cataloged procedure. The default is SAS609.

- **CLST-DSN-SFX=** specifies the final node of the data set name of the command procedure library to which command procedures (CLISTs) are copied. It is appended to the installation library prefix that you specify. If you do not want to use this name, you can comment-out this parameter, uncomment the CLST-DSN parameter, and specify the entire data set name. The default is CLIST. The CLIST-DSN-SFX and CLIST-DSN parameters are used only when installing the SAS System with Action A.

- **SASCNM=** specifies the name you want to use for the SAS command procedure (CLIST). The default is SAS609.

Step 2: If you choose selective mode, specify products in PRODSEL or product libraries in LIBSEL.

Note: The recommended installation mode is the default mode. If you are installing in default mode, skip to Step 3.

If you choose to install in selective mode, you first choose whether to install by product or by individual product library.

If you want to install by product, edit the member PRODSEL of the CNTL data set. By default, all products on your tape are installed. If you do not want to install certain products, turn those products *off* by removing the asterisk from column one for those products in the PRODSEL member.

If you want to install by individual product library, you can choose between the following two methods:

- Specify (or deselect) the product libraries that you **do not** want to install. Use this method when you want to install everything except for a few product libraries.

  In LIBSEL, specify the libraries that you want to omit by removing the asterisk from column one of the ignore line for each unwanted product library.

- Select the product libraries that you do want to install. Use this method when you want to install only a few product libraries.

  In PRODSEL, remove the asterisk from the DEFLTSEL=%TURNDOFF statement. In LIBSEL, remove the asterisk from column one of the dotask line for the product libraries that you want to install.

Step 3: If a special SETINIT is indicated in the Cover Letter or your SETINIT has expired, enter `RENEWPRM` data.

If the Cover Letter in your installation package indicates that your tape contains an expired SETINIT, then your package should also include customized SETINIT data for you to enter at installation. If your SETINIT has expired since the tape was cut, contact SAS Institute for the current SETINIT data. Enter this data into the `RENEWPRM` member of the `CNTL` data set **exactly** as it appears on paper.

Unloading the SAS Product Libraries

`SASINEW`, `SASIHOLD`, and `SASINSGO` are jobs that use the installation parameter values you specified to create customized SAS installation jobs. To run in edit-and-go mode, use the `SASINSGO` job. To run in checkout mode, use the `SASINEW` or `SASIHOLD` job. For more information about these modes, see the section "Choosing Installation Modes" in Part 1, "Pre-Installation Checklist".

Note: If you are installing the SAS System for the first time, you cannot run `SASIHOLD`.

These jobs save the SAS install task programs they generate in specific members of the `CNTL` data set, listed in the table below. The jobnames for these tasks correspond to the `CNTL` data set member names.

Normally the jobs in each grouping will submit the next in turn until the task is done. It is important to verify that all the install jobs complete successfully before continuing to the post-installation tasks.

Generated SAS Installation Jobs

The table of names for SAS installation tasks can also be found in the SASEDITP member of the control data set. A brief description of each follows below.

Install Action	Description	Job Name and CNTLDSN Member Name
Action A	Main Install Job	SASINSTA
Follows SASINSTA	Utility & Lists Install	SASINSXA
Action A NLS	Install Language Support	SASINLSA
Action B JES3	JES3 Standalone Alloc	SASIALOB
Action B	Main Install Job	SASINSTB
Follows SASINSTB	Utility & Lists Install	SASINSXB
Action B NLS	Install Language Support	SASINLSB
Action C JES3	JES3 Standalone Alloc	SASIALOC
Action C	Main Install Job	SASINSTC
Follows SASINSTC	Utility & Lists Install	SASINSXC
Action C NLS	Install Language Support	SASINLSC
Action D JES3	JES3 Standalone Alloc	SASIALOD
Action D	Copy Stage to Final	SASISTFN
Action E	Delete Staged Libs	SASIDSTG
Action F	Delete Selected Libs	SASIDSEL
Action G	Renew License Job	SASIRENW

Action A Install a SAS System to a new, unused prefix:

Submit the generated SASINSTA job. This job does the bulk of a new installation, including all the maintenance up to the date of the media. It in turn submits the SASINSXA job that installs tests, utilities, and other installation data. **It is important to verify that the second job completes successfully. If it does not, it is usually due to an invalid jobcard. You need to fix the jobcard and manually submit the job**. If you are also installing National Language Support, this job submits SASINLSA, which installs language support.

Action B **Install new products or maintenance DIRECTLY to an existing SAS System:**

(If you are running `JES3`, submit the generated `SASIALOB JES3` conditional data set new allocation job. This submits the following job:)

Submit the generated `SASINSTB` job. This job does the bulk of new product and/or maintenance installation. It also submits the `SASINSXB` job that installs tests, utilities, and other installation data. **It is important to verify that the second job completes successfully. If it does not, it is usually due to an invalid jobcard. You need to fix the jobcard and manually submit the job**. If you are also installing National Language Support, this job submits `SASINLSB`, which installs or upgrades language support.

Action C **Install new products or maintenance to a test or STAGING prefix:**

(If you are running `JES3`, submit the generated `SASIALOC JES3` conditional data set new allocation job. This submits the following job:)

Submit the generated `SASINSTC` job. This job does the bulk of new product and/or maintenance installation. It also submits the `SASINSXC` job that installs tests, utilities, and other installation data. **It is important to verify that the second job completes successfully. If it does not, it is usually due to an invalid jobcard. You need to fix the jobcard and manually submit the job**. If you are also installing National Language Support, this job submits `SASINLSC`, which installs or upgrades language support.

Action D **Copy new products or maintenance from the test or STAGING prefix to production or final libraries:**

(If you are running `JES3`, submit the generated `SASIALOD JES3` conditional data set new allocation job. This submits the following job:)

Submit the generated `SASISTFN` job. This job performs all necessary copy actions.

Action E **Delete all SAS allocated data sets contained in a given prefix, usually the test or staging prefix:**

Submit the generated `SASIDSTG` job.

Action F **Delete selected SAS libraries from the SAS System in a given prefix:**

Submit the generated `SASIDSEL` job.

Action G **Renew or install the license information (SETINIT) to the SAS System at a given prefix:**

Submit the generated `SASIRENW` job.

IMPORTANT: If your site does not support or allow program controlled submission to the internal reader, see the discussion on the INTREADR= parm of the SASEDITP member of the CNTL data set. In this case, you will have to manually submit each job of a particular action after the prior job completes, in the same order as listed above.

Running SASINEW, SASIHOLD, or SASINSGO

Complete the following steps:

Step 1: Supply SASINEW, SASIHOLD, or SASINSGO parameter values.

- Edit the PROC parameters in the SASINEW, SASIHOLD, or SASINSGO member of the CNTL data set you choose, and modify the jobcard information to reflect the values needed at your site. For more information about these modes, see "Choosing Installation Modes," in Part 1, "Pre-Installation Checklist."

  Update the parameter values using the following parameter descriptions as guidelines:

  Note: If you are running SASINEW or SASIHOLD, you will need to add the following line anywhere in the SAS EDIPT member to insure that the latest maintenance is installed:

  ```
  INSTALL@TS475=X
  ```

IMPORTANT: SASIHOLD and SASINSGO have parameters to supply **both** at the beginning **and** the middle of the program. CNTLDSN= must be supplied twice. Be sure this specification is identical in both places. A dissimilar specification will usually cause SASIHOLD and SASINSGO to fail.

- **CNTLDSN=** specifies the name of the installation CNTL data set you allocated using the IEBUPDTE job in Step 1 of "Unloading the Installation Jobs."

- **SASEDTP=** specifies the name of the CNTL data set member that contains the SASEDITP user site parameter values you have entered to control SAS installation tasks. The default is SASEDITP.

- **PRODSEL=** specifies the name of the CNTL data set member that contains the product selection parameter values you want to use to control SAS installation tasks. The default is PRODSEL, and selects all products.

- **LIBSEL=** specifies the name of the CNTL data set member that contains the library selection parameter values you want to use to control SAS installation tasks. The default is LIBSEL, and selects all product libraries.

- **SYSOUT=** specifies the SYSOUT class you want to use for this job.
- **DISKUNI=** specifies the unit name at your site for temporary storage.

Step 2: Run the SASINEW, SASIHOLD, or SASINSGO job to generate the SASIxxxx job(s).

Note: The SASINEW, SASIHOLD, SASINSGO, and SASIxxxx jobs require exclusive access to the CNTL data set. Be sure to terminate your edit session or otherwise free the data set after submitting the job you choose.

- If you run the SASINSGO job, it also submits the install job string it creates.

  Verify that all jobs complete successfully. When it completes, your product libraries are installed, and you are ready to verify installation and proceed with site-specific product implementation.

IMPORTANT: If syntax '//DDNAME DD SYSOUT=(A,INTRDR)' is not correct to submit to the internal reader at your site, you cannot use SASINSGO. Use SASIHOLD and modify the INTREADR= parm in SASEDITP.

- If you choose checkout mode, verify and run the generated SASIxxxx job(s).

  The SASINEW or SASIHOLD job completes with the creation of the install job string. Review, and then submit the generated SASIxxxx job(s). If you use an edit session to review the install job string, be sure to terminate it or otherwise free the CNTL data set. Verify that the install job string completes successfully. When it completes, your product libraries are installed, and you are ready to verify installation and proceed with site-specific product implementation.

Verifying the System Installation

Step 1: Check the job log to verify successful completion of the SASIxxxx job(s).

You should not receive any error messages, and the job should finish with completion codes of zero.

Several steps of the jobs may produce the following messages:

- `+NO CONFIG File Available`
- `NOTE: Apparent keyword reference could not be resolved.`

These messages are purely informational and can be ignored.

Step 2: Submit the initial verification job.

The job `VALID` in the `CNTL` data set performs basic validation of your SAS System installation. Check the SAS log to verify execution. You should not receive any error messages, and the job should finish with a completion code of zero. The `VALID` job should be run only if Base SAS software is installed because it does not have a corresponding "valid" job to run against if Base SAS software is not on the tape.

Step 3: Submit product verification jobs.

Separate validation jobs are included for many of the SAS software products. Each provides a more in-depth validation test for the specified SAS software product. For some products, post-installation implementation must be completed in order to run the products at your site. For these products, details on running the validation jobs appear in the appendix for the individual product.

The `CNTL` data set contains jobs used to validate products. You can run the following jobs without performing any special implementation for the products. Submit the relevant jobs for the products on your installation tape. Check the SAS log to verify execution of each job.

The following jobs are contained in the `CNTL` data set and validate the products indicated:

- **`BAVALID`** verifies base SAS product installation.

  If you perform any of the customizations described in "Setting up the SAS System" in the "System Manager's Guide" in Section II, you may want to rerun `BAVALID` (after modifying it to execute your customized procedure) as a regression test.

- **`ETVALID`** verifies SAS/ETS product installation.

- **`GRVALID`** verifies SAS/GRAPH product installation.

- **`MLVALID`** verifies SAS/IML product installation.

- **`ORVALID`** verifies SAS/OR product installation.

- **`QCVALID`** verifies SAS/QC product installation.

- **`STVALID`** verifies SAS/STAT product installation.

Note: If you receive errors while executing any of the validation jobs and cannot determine their cause, contact the Technical Support Division at SAS Institute as described in the introduction to this document. Validation jobs that invoke experimental status procedures may issue warning messages to alert you to the experimental status of those components.

Performing Site-Specific Product Implementation

Most SAS software products require no special implementation procedures. Products that do have special requirements are listed in this section. Refer to the appropriate product appendix for any required product-specific processing and customization information. You cannot run these products at your site until you complete the implementation information described in the appropriate product appendix.

- ❑ SAS/ACCESS Interface to ADABAS Software
- ❑ SAS/ACCESS Interface to CA-DATACOM/DB Software
- ❑ SAS/ACCESS Interface to CA-IDMS Software
- ❑ SAS/ACCESS Interface to DB2 Software
- ❑ SAS/ACCESS Interface to IMS Software
- ❑ SAS System under MSP
- ❑ SAS/ACCESS Interface to ORACLE Software
- ❑ SAS/ACCESS Interface to SymfoWARE Software
- ❑ SAS/ACCESS for SYSTEM 2000 Software
- ❑ SAS/ASSIST Software
- ❑ SAS/CONNECT Software

  Note: In order to run SAS/CONNECT software, you need to complete system configuration for the access method appropriate for your site.

- ❑ SAS/CPE Software
- ❑ SAS/GRAPH Software
- ❑ SAS/SESSION for CICS Software
- ❑ SAS/SHARE Software
- ❑ SAS/TOOLKIT Software
- ❑ SAS/TUTOR Courses

Post-Installation Processing

Now, your tape libraries are installed, and the site-specific product implementation is complete. You may need to perform further steps, depending on the action you selected and your site requirements. The following lists some of the tasks you may need to perform:

- ❑ After you install the base SAS System, you can customize your SAS System configuration.
- ❑ After you install maintenance files, you may need to apply site changes to maintenance versions of customized files.
- ❑ After you install new products or maintenance files into SAS System staging libraries, you may want to integrate them into your production SAS System.

ATTENTION! The rest of this section is divided into three subsections. Be sure to follow the instructions provided for the Action that you are using.

Completing the Installation for Action A

Be sure to read all of the appropriate sections if you are installing using Action A.

Implementing SAS TSO Support

Note: This task is required if you are running under TSO.

If you plan to run the SAS System under TSO, you must install the SASCP TSO command processor as outlined in the following. Otherwise, you can run the SAS System in batch mode only. You must also use the CLIST supplied with this installation tape to run the Release 6.09 SAS System under TSO. Do not try to use a SAS CLIST from a previous release.

SAS TSO support includes two different facilities. The SAS TSO command processor allows you to invoke the SAS System from a TSO session. The SAS TSO command support feature provides a SAS statement for executing TSO commands from a SAS session and allows SAS Data Step programs to execute TSO commands conditionally.

The SAS System supports these features through installation-modifiable modules. These modules contain all of the TSO service routine dependent functions and make no reference to SAS service routines or data areas. These modules are:

`SASCP` the TSO command processor for invoking the SAS System.

Note: `SASCP` is backward compatible and replaces the modules from previous releases. You can continue to execute previous releases of the SAS System and `SASCP` with the Release 6.09 `SASCP` installed on your system.

SASTSO the TSO command executor for executing TSO commands.

SASCALL the TSO CALL command processor used by SASTSO.

SASTSMAC the macros necessary to assemble these modules.

These source modules are unloaded from the tape during installation into the &prefix.BAMISC library. The default load modules SASCP, SASTSO, and SASCALL are unloaded into your &prefix.LIBRARY. These modules work correctly under all levels of TSO.

Most sites will not need to modify the modules. If you do not need to customize the modules, proceed to Step 3. However, should your site have special needs, Steps 1 and 2 describe how to modify and reassemble these modules.

Step 1: Determine if the distributed TSO support modules require installation customization for your site. Perform customization if needed. (Optional)

If you customize SASCP or SASTSO, and if your site has TSO/E Version 1 or base TSO installed, you must also change the GBLC set symbol &TSOE from its default value of 2 to 1 in each module that you reassemble. You do not need to make this change if your site runs TSO/E Version 2 or later.

The Assembler source code for the SASCP, SASTSO, and SASCALL modules is available in your &prefix.BAMISC library for modification. Assembly requires that the SYSLIB concatenation contain the general use system macro library SYS1.MACLIB, the product-sensitive system macro library SYS1.AMODGEN or SYS1.MODGEN, and the BAMISC library. Examine the source code for the TSO support modules for further details. Sample JCL for assembling and linking these modules is included with the comments of the modules.

If your site has modified the source code and relinked the SASCP module, you can use the TSO TEST command to test SASCP directly from the SAS library by specifying the CP option of TEST. Create a test version of the SAS609 CLIST and insert the TEST command with the CP option immediately before the SASCP invocation at the end of the CLIST.

Step 2: Modify system tables as needed. (Optional)

This installation may also require that you modify certain system tables, such as the PCF and/or ISPF Command Authorization tables. These modifications may require the assistance of local systems or technical support personnel.

The TSO command executor, SASTSO, contains support for TSO command validation by both PCF and ACF2. The use of ACF2 command validation must be explicitly enabled either by modifying and reassembling SASTSO (following the instructions given in the program header), or by using the MVS service aid, AMASPZAP. Contact the

Technical Support division at SAS Institute if you have any questions concerning these procedures.

The functionality that will allow you to interface the SAS System with IBM's ISPF is included in this release in beta form. For this reason, you should examine the ISPF Command Table, ISPTCM. For more information about this functionality, refer to *Developing ISPF Applications with the SAS System, Preliminary Documentation*.

If the SAS command processor, `SASCP`, is defined within your installation's ISPTCM, the flag bit to allow a function pool to be created for the command must be on `x'40'`. If `SASCP` is not in your ISPTCM, then either the default flag value must include the preceding bit, or you should do one of the following:

- change the default flag value
- add `SASCP` to the table with the flag on.

Note that the bit is `ON` in the default flag value in the sample ISPTCM that is distributed by IBM.

Step 3: Copy the `SASCP` module to your TSO command load library.

Note: This step is required if you are running under TSO.

Installation of SAS TSO support requires that the module `SASCP` be copied from the `&prefix.LIBRARY` to a load library that contains TSO commands. This can be a `STEPLIB` library defined in a `LOGON` procedure, a system link list library, or a link pack area library. (The `SASTSO` and `SASCALL` modules should remain in `&prefix.LIBRARY`.)

Use job `BASASCP` in the `CNTL` data set to copy `SASCP` to your TSO command load library. The `CMDDSN`, `CMDUNIT`, and `CMDVOL` JCL procedure parameters specify the user command load library into which you copy the `SASCP` module. Modify these values to specify your TSO command library. If you have customized the `SASCP` module and are storing it in a library other than `&prefix.LIBRARY`, you also need to specify its new location in the `//SASLIB DD` statement.

Check the JCL and run the `BASASCP` job.

Completing Base SAS System Customization

Although no further implementation is required for you to run the base SAS product at your site, you should review the topics in Section II, Part 1 of this document. The information contained in "Setting up the SAS System" in the "System Manager's Guide" can help you customize the SAS System effectively for your users. In this discussion, you should select a bundled configuration and install the bundles in your Link Pack Area. This section also describes how you can customize your SAS invocation procedures and your default options settings. The other topics that address use of the SAS SVC and SMF Exit may be relevant for your site as well.

If you have a prior release of the SAS System installed, you may want to make the corresponding customizations in your newly installed release.

Completing the Installation for Action B

Apply site changes, if needed, to maintenance versions of customized files.

- ❑ If you have customized the default options table (`DFLTOPTS`):

  If your site has customized `DFLTOPTS` and your maintenance load library contains the module `SASHOST`, you need to reassemble `DFLTOPTS` and relink the appropriate modules after installing the SAS maintenance load library. See Step 3 in Section II, Part 1 of this document, "Customizing Default Options and System Configuration Files" for details on assembling and linking the `DFLTOPTS` table.

- ❑ If you install SAS System bundles in the Link Pack Area (LPA):

  If your site installs bundles in the LPA/ELPA, and your maintenance load library contains any of these bundles, you will need to install the new versions in the LPA. See Section II, Part 1 of this document, "Installing the SAS System into the LPA," for details on this process.

Completing the Installation for Action C

Step 1: Merge site customizations, if needed, with installed staging CLIST and PROC.

If your site has customized the default CLIST or PROC, you need to apply your site customizations to the installed staging CLIST and PROC under one of the following conditions:

- ❑ you need to test the staged system with the site customizations in place
- ❑ you intend to run the staged system in a production mode.

If your site customizations are small, you may simply want to add them to the install-created staging CLIST and PROC. **The `SASIxxxx` jobs copy the staging CLIST `BACLST01` and the staging PROC `BAPROC01` in the `CNTL` data set only**. Rename these and copy them to the appropriate PROCLIB and CLISTLIBS for your site.

If you made many site customizations, you may want to add the staging libraries to the appropriate DDname concatenations in your customized CLIST and PROC. Add the concatenations as follows:

IMPORTANT: The staging libraries do not contain everything required to run the SAS System. The concatenations shown below are required to correctly run SAS.

❑ **Cataloged procedure modifications**

To concatenate the load library data sets, locate the JCL statements in the PROC that look like the following:

```
//STEPLIB DD DISP=SHR,DSN=&LOAD
//        DD DISP=SHR,DSN=&final-saslib-pfx.LIBRARY
```

Change this DD statement as follows, providing the prefix values specified in SASEDITP:

```
//STEPLIB DD DISP=SHR,DSN=&LOAD
//        DD DISP=SHR,DSN=&staged-libr-pfx.LIBRARY
//        DD DISP=SHR,DSN=&final-saslib-pfx.LIBRARY
```

To concatenate the SASMSG library data sets, locate the JCL statements in the PROC that look like the following:

```
//SASMSG DD DSN=&final-saslib-pfx.SASMSG,DISP=SHR
```

Change this DD statement as follows, providing the prefix values specified in SASEDITP:

```
//SASMSG DD DSN=&staged-libr-pfx.SASMSG,DISP=SHR
//       DD DSN=&final-saslib-pfx.SASMSG,DISP=SHR
```

To concatenate the AUTOLIB library data sets, locate the JCL statements in the PROC that look like the following:

```
//SASAUTOS DD DSN=&final-saslib-pfx.AUTOLIB,DISP=SHR
```

Change this DD statement as follows, providing the prefix values specified in SASEDITP:

```
//SASAUTOS DD DISP=(SHR,PASS),DSN=&SASAUTO
//         DD DISP=SHR,DSN=&staged-libr-pfx.AUTOLIB
//         DD DISP=SHR,DSN=&final-saslib-pfx.AUTOLIB
```

Since you cannot concatenate SAS data libraries, you must run with the SASHELP library that was updated with your installation tape. The SASIxxxx jobs merge the contents of &staged-libr-pfx.SASHELP with your &final-saslib-pfx.SASHELP. The resulting, merged SAS data library is the &staged-libr-pfx.SASHELP data set.

Locate the JCL statement in the PROC that looks like the following:

```
//SASHELP DD DSN=&final-saslib-pfx.SASHELP,DISP=SHR
```

Change this `DD` statement as follows, providing the prefix values specified in `SASEDITP`:

```
//SASHELP DD DSN=&staged-libr-pfx.SASHELP,DISP=SHR
```

❑ **CLIST modifications**

To concatenate the load library data sets, locate the line in the CLIST that reads:

```
SASLOAD('''&final-saslib-pfx.LIBRARY''')
```

Change this statement as follows, providing the prefix values specified in `SASEDITP`:

```
SASLOAD('''&staged-libr-pfx.LIBRARY'' ''&final-saslib-pfx.LIBRARY''')
```

To concatenate the `SASMSG` library data sets, locate the following line in the CLIST:

```
SASMSG('''&final-saslib-pfx.SASMSG''')
```

Change this statement as follows, providing the prefix values specified in `SASEDITP`:

```
SASMSG('''&staged-libr-pfx.SASMSG'' ''&final-saslib-pfx.SASMSG''')
```

To allocate the appropriate `SASHELP` library data sets, locate the following line in the CLIST:

```
SASHELP('''&final-saslib-pfx.SASHELP''')
```

Change this statement as follows, providing the prefix values specified in `SASEDITP`:

```
SASHELP('''&staged-libr-pfx.SASHELP''')
```

To concatenate the `AUTOLIB` library data sets, locate the following line in the CLIST:

```
MAUTS('''&final-saslib-pfx.AUTOLIB''')
```

Change this statement as follows, providing the prefix values specified in SASEDITP:

```
MAUTS('''&staged-libr-pfx.AUTOLIB''')
       '''&final-saslib-pfx.AUTOLIB''')
```

Step 2: Apply site-specific changes, if needed, to maintenance versions of customized files.

- ❑ If you have customized the default options table (DFLTOPTS):

  If your site has customized the DFLTOPTS table, and your maintenance load library contains the module SASHOST, you should reassemble DFLTOPTS and relink the appropriate modules after installing the SAS maintenance load library. See Step 3 in Section II, Part 1 of this document, "Customizing Default Options and System Configuration Files" for details on assembling and linking the DFLTOPTS table.

- ❑ If you install SAS System bundles in the LPA:

  If your site installs bundles in the LPA/ELPA, and your maintenance load library contains any of these bundles, you should install the new versions in the LPA. See Section II, Part 1 of this document, "Installing the SAS System into the LPA," for details on this process.

Step 3: Perform site testing as desired.

Step 4: Copy contents of staging libraries to production SAS System libraries using Action D (optional).

See Section II, Part 2, "Maintaining the SAS System," for more information on this process.

Step 5: Delete staging libraries using Action E (optional).

See Section II, Part 2, "Maintaining the SAS System," for more information.

Step 6: Perform any required product-specific processing as described in the appendix addressing a particular product.

Part 3, Installing SAS® System Maintenance

This section contains instructions for installing SAS System maintenance files. Whether you are installing Release 6.09 Enhanced of the SAS System for the first time, adding an additional SAS System product, or specifically installing maintenance files, SAS Institute recommends that you utilize the information in this section to unload the most current maintenance and enhancements for Release 6.09 Enhanced of the SAS System.

Identifying the Contents of Your Media

Before you can proceed with the installation process, you must identify the contents of your media. Complete the following steps.

1. Unload the `CNTL` data set using the `IEBUPDTE` job as described on page 17 in "Unloading the Installation Jobs - Run IEBUPDTE," in Part 2, "Installing the SAS System".

2. Edit the `#CONTENT` member of the `CNTL` data set. This member contains information about your installation media, as well as instructions on unloading your software.

3. Find the following line in the `#CONTENT` member:

   ```
   This tape contains the following products and/or
   maintenance files:
   ```

   A list of products usually follows this line. However, if you see only:

   ```
   MAINTENANCE FILES: to upgrade your new or existing
   system to TS475
   ```

   then you have maintenance-only media. Skip to the section "Upgrading Your Currently Licensed Products to TS475 or Installing Supplemental Maintenance" later in this section. If you see this line *and* a list of products, continue to the next section.

Installing the SAS System, Release 6.09 Enhanced for the First Time at TS475 or Adding a New SAS System Product at TS475

Whether you are installing Release 6.09 Enhanced of the SAS System for the first time or adding a new SAS System product, you should add the following step to the installation process in Part 2, "Installing the SAS System" to upgrade your Release 6.09 Enhanced SAS System to TS475.

Follow the installation process until you get to page 18, "Specifying Installation Parameters". In this section, you are instructed to edit the `SASEDITP` member of your `CNTL` data set. While editing this member, specify the text string `INSTALL@TS475=X` (**in uppercase**) anywhere in `SASEDITP`. Although it can be specified anywhere in the member, it *must* be in uppercase. If you do not add this text string in `SASEDITP`, the SAS System will install at TS450.

Continue with the installation process as documented in Part 2, "Installing the SAS System".

Note: If you are adding a new SAS System product and your base SAS System is *already* upgraded to TS475, you do *not* have to add the `INSTALL@TS475=X` text string to `SASEDITP`. The installation process will detect a base SAS System currently running at TS475 and your new system will automatically install at the same TS level.

Note: If you are adding a new SAS System product and your base SAS System is currently at TS450 through TS470, you ***must*** add the INSTALL@TS475=X text string to `SASEDITP`. Failure to add this text string will generate a system running mismatched maintenance. This type of installation is not supported and will result in spurious abends, looping situations, and other unpredictable results.

Upgrading Your Currently Licensed Products to TS475 or Installing Supplemental Maintenance

If the media in your package contains only maintenance files and usage notes or you want to install supplemental maintenance, follow the steps below:

1. Unload the `CNTL` data set using the `IEBUPDTE` job as described on page 17 in "Unloading the Installation Jobs - Run IEBUPDTE," in Part 2, "Installing the SAS System".

2. Edit the `SASEDITP` member of the `CNTL` data set created in step 1 above.

   Follow the steps for editing instructions as documented on pages 18 through 24 in "Specifying Installation Parameters," in Part 2, "Installing the SAS System". It is recommended you perform an Action C installation process. See "Choosing a Primary Installation Action," in Part 1, "Pre-Installation Checklist" for a description of the actions. Once you have specified your installation parameters, proceed with the next step.

   Note: Only Action B or Action C is available.

3. Edit the `SPKEYLST` member of the `CNTL` data set. To upgrade your currently licensed products to TS475, add the keywords `475SUPLMAINT` and `USAGENOTES` (*both in uppercase*) to this data set following instructions in the `SPKEYLST` member.

   To install the SAS/C transient library, add the additional keyword `V7TRANSLIB`.

4. Edit the MAKESUPL job in the CNTL data set. Modify the job card per your site specifications ***and*** follow the editing instructions in the comments of the MAKESUPL member.

5. Run the MAKESUPL job.

   Note: The MAKESUPL job needs exclusive access to the CNTL data set. You should back out of the CNTL data set after submitting MAKESUPL.

6. Upon successful completion of the MAKESUPL job, a SASISUPL member is created in the CNTL data set. This job is customized by your editing parameters in SASEDITP and the execution of MAKESUPL. Submit the SASISUPL job to install TS475 maintenance to your system.

   Note: The SASISUPL job needs exclusive access to the CNTL data set. You should back out of the CNTL data set after submitting SASISUPL.

7. After SASISUPL completes, a new SAS clist and SAS procedure are created in the CNTL data set. The SAS clist is stored in member BACLST01. The SAS procedure is stored in BAPROC01. The new clist and procedure will execute the SAS System at TS475. Use these to test your upgraded system either in interactive or batch mode, respectively.

Post-Installation Step

If you are upgrading your SAS System installation from an earlier TS level to TS475 and you have set SAS System options by assembling the DEFAULT OPTIONS TABLE using the BAOPTS1 member of your original CNTL data set, you must re-assemble this table. Edit the BAOPTS1 member in your original CNTL data set. Change the SYSLMOD DD in all three LINK EDIT steps to point to the new HLQ.library (the TS475 version) and rerun BAOPTS1.

If you are running the SAS System out of the LPA with PGM=SASXAL, it is necessary to refresh the LPA after completing the installation of maintenance.

Copying Staged Libraries to Production

If you performed the recommended Action C above on your maintenance-only media, you will eventually want to move these staging libraries to production. After testing TS475, complete the following steps to move these libraries to production:

1. Edit the SASEDITP member of the CNTL data set. You should comment out Action C and activate Action D within SASEDITP following the instructions on in "Copying Staged Libraries (Action D)" Section II, Part 2, "Maintaining the SAS System". You only need to perform step 1 in "Copying Staged Libraries (Action D)".

2. Edit the MAKESUPL member of the CNTL data set and submit it. No editing should be required in MAKESUPL.

   Note: The MAKESUPL job needs exclusive access to the CNTL data set. You should back out of the CNTL data set after submitting MAKESUPL.

3. After MAKESUPL completes successfully, edit the SASISPSF member of the CNTL data set. This job was customized for submission by your editing parameters in SASEDITP and the submission of MAKESUPL. Run SASISPSF to copy the staging libraries to production.

   After SASISPSF completes, your production libraries will be upgraded to run TS475.

For SAS/SHARE and SAS/CONNECT Software Customers Only

Support for IBM's TCP/IP, Version 3.2 is available on this media via a new SAS/C Transient Library. If your installation media only contains maintenance, you can unload the new SAS/C Transient Library using the V7TRANSLIB keyword as described in step 3 in "Upgrading Your Currently Licensed Products to TS475 or Installing Supplemental Maintenance" above.

If the installation media contains SAS System products, install the new SAS/C Transient Library by submitting the ULCTRANL job in the CNTL installation data set.

Section II, System Manager's Guide

Part 1, Setting Up the SAS® System

Part 2, Maintaining the SAS® System

Part 1, Setting Up the SAS® System

Part 1 describes how to tailor your SAS System installation to suit your particular site configuration. The following topics are discussed in this section:

- ❑ customizing default options and system configuration files (recommended)
- ❑ selecting a bundled configuration (recommended)
- ❑ installing the SAS System into the LPA (recommended)
- ❑ customizing your SAS CLIST and cataloged procedure (recommended)
- ❑ customizing your NEWS and SITEINFO files (recommended)
- ❑ installing the SAS SVC routine (optional)
- ❑ installing the SAS SMF exit. (optional)

Note: Some of the actions may require knowledge of MVS operating system principles.

Customizing Default Options and System Configuration Files

Note: You should complete this task.

In the process of installing Release 6.09 of the SAS System under MVS, you establish default SAS system options for all SAS invocations at your site. You can set these global defaults in any of the following places:

- ❑ Default Options Table
- ❑ System configuration file
- ❑ Restricted Options Table.

Two sample system configuration files are shipped with the SAS System. One has option settings set specifically for TSO (TSOXA in the `CNTL` data set). The other has settings for batch execution (BATCHXA). These files are discussed in more detail later in this section.

Users can also specify options in any of the following locations:

- ❑ in a user configuration file, which is specified using the `CONFIG` operand in the CLIST and the `CONFIG` parameter in the cataloged procedure
- ❑ on the command line when invoking the SAS System under TSO
- ❑ with the `OPTIONS` parameter in the cataloged procedure, if invoking it under batch
- ❑ from within a SAS session, either on an options statement or from the options window in DMS.

The following indicates the order in which the SAS System processes options from the various sources:

1. Options in the `DFLTOPTS` table (if one is linked in with `SASHOST` or the supervisor bundle that your `ENTRY=` option specifies)
2. Options in a system configuration file (if one is used)
3. Options in a user configuration file (if one is specified)
4. Options supplied on the command line in the invocation of the CLIST (TSO) or using the `OPTIONS` parameter in the cataloged procedure (batch)
5. Options in the restricted options table (if there is a `SASOP609` module in the linklist)
6. SAS session options. Since session options can be specified during a SAS session on an `OPTIONS` statement or in the Options window, their specification is not restricted.

Note that later specification of an option overrides an earlier specification. For example, options set in a user configuration file override options set in the system configuration file. Depending upon where you set them, you can streamline system startup or restrict use of options by users.

To streamline system startup for users under TSO, for example, you can add all option defaults needed for TSO at your site to the Default Options Table. Then, users need not allocate a system configuration file at startup time. You can remove its allocation from the CLIST to streamline system startup. Note that in this case, you still need a system configuration file for batch jobs to override the values tailored for TSO in the Default Options Table.

To restrict use of options by users, you can set them in the Restricted Options Table. Since this table is processed last after the Default Options Table, configuration files, and command line options, values set here override all earlier specifications. However, only the configuration options, which are specified at invocation, can be effectively restricted by specifying them in the Restricted Options Table.

Step 1: Determine default values for SAS system options at your site.

SAS system options that can be used in any operating system environment in which the SAS System resides are described as *portable* and discussed in *SAS Language: Reference, Version 6, First Edition*. Portable options new in Release 6.07 are discussed in Technical Report P-222, *Changes and Enhancements to Base SAS Software.* MVS-specific system options are discussed in the *SAS Companion for the MVS Environment, Version 6, First Edition*. MVS-specific SAS system options new in Release 6.07 are discussed in Technical Report P-218, *Changes and Enhancements to the SAS System, Release 6.07, for the MVS Environment*. The section "Summary of SAS System Options" in the MVS changes and enhancements document contains a table that lists all options available, both portable and MVS-specific. The options are listed in alphabetical order for easy reference.

This table shows the system default value for each option and includes a reference to the appropriate document for further details.

MVS-specific options that warrant special attention at installation time are discussed in the following. These options include the SMF- and SVC-related options, and the superblocking memory-use tuning options.

❑ **SMF and SVC Options**

The following options should be set in the Restricted Options Table with values that you choose at installation time. The settings on these options are unlikely to require change. Because of the measurements that these options govern, it is prudent to remove these option settings from general user access.

❑ **SMF**|**NOSMF** causes an SMF record to be written for every PROC or DATA step containing resource usage statistics for CPU time, storage, and `EXCP` count. `NOSMF` disables writing of utilization statistics by the SAS System. The default is `NOSMF`.

Note: The SAS system option `STIMER` must also be on for SMF records to be written.

❑ **SMFEXIT=*name*** identifies the user SMF recording exit load module. This load module is loaded and given control before SMF records are written. It allows the user to modify the contents of the record to be written or to disallow the writing of the record (if SMF option is in effect). There is no default.

For information on installing the SMF exit, see "Installing the SAS SMF Exit" later in this section.

❑ **SMFTYPE=*recnum*** identifies the SMF record type to record and specifies the default user type for the SAS System to place in the SMF records it generates when the SMF option is on. The value must be greater than 127 for the SAS SVC to write the SMF record. The default is `128`.

❑ **SVC0R15=*value*** specifies the value to be placed in Register 15 before invoking the SAS SVC. The default is `4`.

For information about installing the SAS SVC, see "Installing the SAS SVC Routine" later in this section.

❑ **SVC0SVC=*number*** specifies the SVC number invoked for functions requiring the SAS SVC. The default is `109`.

For information about installing the SAS SVC, see "Installing the SAS SVC Routine" later in this section.

❑ **Superblocking Memory-use Tuning Options**

To decrease memory fragmentation, the SAS System has the ability to obtain large blocks of memory from the operating system to satisfy multiple requests for smaller blocks of memory. This scheme, which is called *superblocking*, not only reduces fragmentation but also reduces the number of system `GETMAIN` calls that are issued. This facility is controlled by setting the superblocking options. When they are set to zero, no superblocking is performed. Refer to Chapter 12 in the *SAS Companion for the MVS Environment* for more background and additional details on superblocking.

The superblocking options warrant special attention at installation time because useful values can depend on the mode (batch or TSO) in which the SAS System runs. The default system configuration files unloaded from the tape contain the recommended defaults. These default values are based on early and fairly limited experience in running Release 6.08 of the SAS System. In most cases you should not need to alter these from their default values.

The SAS System issues superblock overflow warning messages if secondary (OSA) superblock memory is needed. These messages can help you to tune these values for your site.

The following options can be used at SAS invocation or in a configuration file to specify the size of the superblocks. The values may be specified in bytes or Kilobytes (K).

- ❑ **`PSUPISA=`*`value`*** specifies the size of the Initial Size Allocation (ISA) for the portable supervisor. The system default is `136K`. The installation configuration file `TSOXA` sets this option to `170K`.
- ❑ **`PSUPOSA=`*`value`*** specifies the size of the Overflow Size Allocation (OSA) for the portable supervisor. The system default is `4K`. The installation configuration file `TSOXA` sets this option to `20K`.
- ❑ **`VMCTLISA=`*`value`*** specifies the size of the ISA for SAS system memory management control blocks.
- ❑ **`VMTAISA=`*`value`*** specifies the size of the ISA for temporary memory above the 16MB line. Temporary memory is that memory which needs to be resident only while the task or procedure is active. This type of memory is highly transient so it is always cleaned up at the end of the task or procedure. In an MVS/XA or MVS/ESA environment, almost all PROC step memory, DATA step memory, and I/O buffers come from this class of memory. The value of this option is not used on an MVS/370 system.
- ❑ **`VMTAOSA=`*`value`*** specifies the size of the OSA for temporary memory above the 16MB line. The value of this option is not used on an MVS/370 system.

- **VMTBISA=*value*** specifies the size of the ISA for temporary memory below the 16MB line.

- **VMTBOSA=*value*** specifies the size of the OSA for temporary memory below the 16MB line.

- **VMNSISA=*value*** specifies the initial size allocation of NOSIG pools.

- **VMNSOSA=*value*** specifies the overflow size allocation of NOSIG pools.

- **VMPAISA=*value*** specifies the size of the ISA for permanent memory above the 16 MB line. Permanent memory is memory that is used past procedure or task termination, typically by the host and core supervisor. The system default is `0`. The installation configuration files `BATCHXA` and `TSOXA` set this option to `256K`.

- **VMPAOSA=*value*** specifies the size of the OSA for permanent memory above the 16 MB line. The system default is `0`. The installation configuration files `BATCHXA` and `TSOXA` set this option to `128K`.

- **VMPBISA=*value*** specifies the size of the ISA for permanent memory below the 16 MB line. The system default is `0`. The installation configuration files `BATCHXA` and `TSOXA` set this option to `256K`.

- **VMPBOSA=*value*** specifies the size of the OSA for permanent memory below the 16 MB line. The system default is `0`. The installation configuration files `BATCHXA` and `TSOXA` default this option value to `128K`.

Additional superblocking options specify ISA and OSA sizes for temporary memory. These options are rarely needed. Refer to Chapter 12 in the *SAS Companion for the MVS Environment* for more information.

- **The BNDLSUFX= Option**

The BNDLSUFX= option specifies a character that is to be appended to every bundle load module name before it is searched for or loaded. The character is appended to the name of every bundle load module (these modules have a prefix of SAB). If the name of the bundle is eight characters long already, the suffix character replaces the last character. The value for the BNDLSUFX= option can be enclosed in quotes, but does not have to be.

By using this option, the installation can cause those bundles that are installed in the Link Pack Area (LPA) and the Extended Link Pack Area (ELPA) to be renamed when they are copied to the installation's LPA library. Thus, the bundle modules can continue to exist in the SAS library with their original names, simplifying the application of maintenance and the concurrent running of different releases of the SAS System.

The suffix character is not used for the SASXAL, SASXAL2, or SAS370L modules. Your site may want to also rename these modules as well, using the suffix character for consistency. Note that the new names for the SASXAL and SASXAL2 modules must be the same except the SASXAL2 name has a 2 appended to it (or replacing the last character).

The BNDLSUFX= option is typically used only by system administrators, and not by the general user.

Step 2: Determine where to set your option defaults.

Review the procedures for setting default option values in the next three steps. Decide which options should be set in the Default Options Table, the system configuration files, and the Restricted Options Table. Save these lists for use in later steps.

Step 3: Customize the supplied `DFLTOPTS` table.

Customizing `DFLTOPTS` (Default Options Table) is optional. If you decide to customize it, edit the `DFLTOPTS` assembler source by adding the options to the table that you would like to include and removing those you do not want. For example, you can put options that have the same value in all execution modes in the Default Options Table.

The source for the `DFLTOPTS` table resides in the `&prefix.BAMISC` library member `DFLTOPTS`. This source represents the `DFLTOPTS` table that is linked into the SAS load modules on your installation tape. The JCL to assemble and link it is in member `BAOPTS1` in the `CNTL` data set. Run the job to assemble the `DFLTOPTS CSECT` and link it into `SASHOST` individually, and into the bundles of which `SASHOST` is a part. Be sure that if you run a bundled configuration, you relink the bundles that you use.

IMPORTANT: If you customize `DFLTOPTS`, you must reassemble it and relink the appropriate modules whenever you receive a SAS Maintenance load library that includes the `SASHOST` load module.

Since the `DFLTOPTS` table is linked with `SASHOST`, it does not have to be loaded to be read. If you can put all the default options that you need in the `DFLTOPTS` table, you do not have to use a system configuration file.

The `DFLTOPTS` table can contain as many option length/value pairs as needed. An option length/value pair consists of a half word length field, followed by a character string of the form `option`, `NOoption`, or `option=value`. The `OPT` macro in the assembler source calculates the length fields given the character strings. The table must be terminated by a pair with a length field of `0`.

Step 4: Customize the system configuration files.

Although a configuration file is not required for running Release 6.09 of the SAS System, a system configuration file provides an easy way to establish installation-wide default values for commonly used options. The default SAS CLIST and cataloged procedure installed from the tape always allocate a system configuration file and allow for specification of a user configuration file using the `CONFIG` operand and parameter.

Customizing your system configuration files involves customizing the following default system configuration files supplied with the installation:

- ❑ `TSOXA` running under TSO
- ❑ `BATCHXA` running in batch mode.

These default system configuration files are unloaded into the `CNTL` data set as samples for you to review. They contain some of the options for which you may want to establish installation-wide default values that would likely vary, depending on batch or interactive execution mode. However, not all of these attributes are required.

The `CNTL` data set, where the sample configuration files reside, is a blocked partitioned data set with fixed-length, 80-byte records. You can create a system or user configuration file as any sequential data set or member of a PDS, as long as the data set has fixed-length, 80-byte records.

The sample configuration files contain option settings separated into logical groups by comments. Records in a configuration file are either comment lines (indicated by an asterisk in column 1) or option lines. In the sample configuration files, options are listed one per line to make them easier to read and maintain. However, this is not required; more than one option can be included on a single line.

For options that require a value, the option must be specified as `option=value` with no blanks before or after the equal sign. Any SAS system option can be specified in the system configuration file. Those options include:

- ❑ options that must be specified only at invocation (sometimes referred to as configuration options). These options can be specified in a configuration file, on the CLIST command line, or in the batch `OPTIONS` parameter.

- ❑ options that can be specified any time (sometimes referred to as session options).

Once you have entered the options in the system configuration file, no further processing is necessary (unlike options specified in the Default Options Table or Restricted Options Table). However, if you move the configuration files from the installation `CNTL` data set, be sure to update

your CLIST and cataloged procedure accordingly to reference the new data set names.

Step 5: Create a Restricted Options Table (optional).

Since this is the last place from which invocation options are processed and a later specification of an option always overrides an earlier specification, an invocation option specified in the Restricted Options Table cannot be overridden by the user. (Note that session options can be overridden.) For options in the Restricted Options Table to be processed, the `SASOP609` module must come from a linklist library but does not have to be APF authorized.

The format of the Restricted Options Table is the same as that for the `DFLTOPTS` table, except that the option length/value pairs must be preceded by the header `***SASOPTRS***`. Like the Default Options Table, the Restricted Options Table is an assembler source module that must be assembled and linked.

The source for the sample Restricted Options Table is in the `&prefix.BAMISC` library member `SASOPTRS`. The JCL to assemble and link this table is in member `BAOPTS2` in the `CNTL` data set. The Restricted Options Table is optional. If you decide to install it, edit the `SASOPTRS` member containing the assembler source, adding the options to the table that you would like to include and removing those that you do not want to use. Run the `BAOPTS2` job to assemble the `SASOP609` module and link it into a linklist library.

Be sure that the `SYSLMOD DD` statement in the `BAOPTS2` job points to a linklist library since the `SASOP609` module must come from a linklist library in order to be processed.

Note: The sample table provided with this installation restricts the use of Display Manager and access to VSAM data sets. You should not run this sample "as is" unless you want to restrict the use of these features.

Step 6: Verify your default option settings.

After performing the various steps described in this section to set default option values for your site, you should run `PROC OPTIONS;` to verify that the desired defaults are in place. The MVS-specific SMF and SVC options are not normally displayed by `PROC OPTIONS`. Specify `PROC OPTIONS APF;` to review these options.

Selecting a Bundled Configuration

Note: You should complete this task.

Version 6 of the SAS System for MVS is distributed in two bundled configurations that are tailored for execution in the MVS/SP Version 2 or later (MVS/XA and MVS/ESA) environments, and one unbundled configuration. The two bundled configurations differ in that one is tailored for execution with some modules installed in the Link Pack Area (LPA), while the other is tailored for execution with no modules installed in the LPA. Note that the code is identical across the three versions; the only difference is in the packaging.

The `ENTRY` parameter of the JCL cataloged procedure or TSO CLIST determines which configuration is used. The default entry point name is `SASHOST`, which runs the unbundled configuration. If you want to run a bundled configuration, which is highly recommended, edit your installed SAS CLIST and cataloged procedure to specify the appropriate entry point name for your site as described in the following section.

MVS/XA or ESA Non-LPA (ENTRY=SASXA1)

The bundled components of the MVS/XA (or ESA) non-LPA configuration consist of the following modules located in your installed SAS LIBRARY data set: `SASXA1`, `SASXA2`, `SABXSPL`, `SABXINI`, `SABXTRM`, `SABXDM`, `SABDSC`, `SABDSX`, `SABZPLM`, `SABZPLC`, as well as others when other Institute Program Products (IPPs) are installed. `SABXINI` and `SABXTRM` are transient modules used during initialization and termination, respectively. `SABDSC` and `SABDSX` are the DATA step compilation and execution modules, respectively.

The `SASXA1` module resides below the 16 MB line, while all the other modules reside above it. `SASXA1` is the entry module. To execute the SAS System using this configuration, specify `ENTRY=SASXA1` in your `SASEDITP` member before you run the `SASIxxxx` job(s), or directly in your SAS CLIST and PROC.

MVS/XA or ESA LPA (ENTRY=SASXAL)

The bundled components of the MVS/XA (or ESA) LPA configuration consist of the following modules located in your installed SAS LIBRARY data set: `SASXAL`, `SASXAL2`, `SABXSPH`, `SABZPLH`, as well as others when other Institute Program Products (IPPs) are installed.

The `SASXAL` module resides below the 16 MB line, while all the other modules reside above it. `SASXAL` is the entry module. To execute the SAS System using this configuration, specify `ENTRY=SASXAL` in your `SASEDITP` member before you run `SASINST`, or directly in your SAS CLIST and PROC.

Installing the SAS System into the LPA

Note: You should complete this task.

You can install the bundled modules in the LPA/ELPA. If the bundled modules are not installed in the LPA/ELPA, they are loaded into the address space of each SAS System user. This can cause a significant increase in the working set size, placing a heavy burden on the paging subsystem. If you have many users of the SAS System, this may be an important consideration.

Step 1: Decide whether to install the SAS System in the LPA/ELPA.

Contact your systems programming staff to discuss the particular considerations involved at your site. You can install just the basic supervisor bundles, or the supervisor bundles and the other bundles listed below. The module sizes are as follows:

MVS/XA or MVS/ESA Configuration:

Bundled Module for LPA	**Size**	
SASXAL	202K	
Bundled Modules for ELPA	**Size**	
SASXAL2	604K	(recommended)
SABXSPH	1477K	(recommended)
SABDS	371K	(recommended; DATA step)
SABDPDL	453K	(optional; used by SAS/ASSIST, SAS/TUTOR)
SABSCLL	769K	(optional; used by SAS/ASSIST, SAS/TUTOR and SCL applications)
SABDBGL	127K	(optional; SCL debugger, SAS/TUTOR)
SABFSPL	351K	(optional; part of SAS/FSP)
SABZPLH	55K	(optional; printing routines)
SABXGPH	588K	(optional; part of SAS/GRAPH)
SABAFL	803K	(optional; part of SAS/AF)
Total for Configuration	5800K	

Step 2: Install the modules into the LPA/ELPA using the standard procedure at your site.

Step 3: Remove the bundled modules from the installed SAS LIBRARY data set or rename them. You can also rename the modules in the LPA/ELPA.

Note: Step 3 is necessary to prevent MVS from loading LPA/ELPA modules into the user's address space when a `JOBLIB` or `STEPLIB` DD statement (batch), or a `LOAD` or `SASLOAD` CLIST parameter (TSO) references the SAS System `LOAD LIBRARY`.

Some of the bundle names appear in internal tables; therefore, you cannot simply rename them without identifying them to the SAS System. To do this, you add a single character to the end of the bundle names, and identify that character to the SAS System using the BNDLSUFX= option. (Please note the exception for SASXAL2 given later in this discussion.) This approach allows you to apply maintenance directly to the SAS LIBRARY, as well as test it, and then move it into production by copying and renaming the affected bundles.

Note: If you use BNDLSUFX= for any of the bundled modules, you must rename them all, including those bundles which are added later. A mixture of bundles that have been renamed and those that have not will cause the system to fail.

For simplicity and consistency, you should use the last digit of the release number as your suffix character; for example, use 9 for Release 6.09. If you choose to rename the modules in the LPA/ELPA, follow these rules for MVS/XA (or ESA):

- Change the default for the ENTRY parameter of the JCL cataloged procedure and TSO CLIST to the new name for the SASXAL module that you renamed in the LPA.

- If you plan to make further CLIST or procedure customizations, edit the SASEDITP member of the CNTL data set to specify your name for the ENTRY= parameter.

- The new name for the module SASXAL2 must be the same as the new name for SASXAL with a 2 appended to it. If the new name for SASXAL is eight characters long, the 2 must replace the last letter. For example, if you choose the character 9 as your suffix character, rename the modules listed as follows:

Original Name	New Name	
SASXAL	SASXAL9	
SASXAL2	SASXAL92	<=== exception
SABXSPH	SABXSPH9	
SABDS	SABDS9	
SABDPDL	SABDPDL9	
SABSCLL	SABSCLL9	
SABDBGL	SABDBGL9	
SABFSPL	SABFSPL9	
SABZPLH	SABZPLH9	
SABXGPH	SABXGPH9	
SABAFL	SABAFL9	

  Note: Your list of modules may not include all those in this example. Your list will depend on the SAS System products that you have licensed.

  Note: If you specify the BNDLSUFX= option for running the SAS System, you must rename all the bundles as described, whether you install them in the LPA/ELPA or not.

Customizing Your SAS CLIST and Cataloged Procedure

Note: You should complete this task.

The SASIxxxx job(s) that you ran to complete the installation created tailored versions of the SAS609 CLIST and cataloged procedures.

You can further customize these tailored versions of the CLIST and cataloged procedure. For example, the CLIST includes statements that allocate a permanent SASUSER data library for each user. If no permanent SASUSER data library exists for the user, the CLIST creates one. If you do not want each user at your site to maintain an individual permanent SASUSER data library, you can remove these statements from the CLIST. You may also want to make changes as part of selecting a bundled configuration to run or as part of installing the SAS System in the LPA/ELPA, as previously described. Step 1 in this section describes some of the changes you may want to make.

If you want to make any of these or other modifications, modify your CLIST and PROC directly by using standard procedures for your site. The installed CLIST resides in the CNTL data set as BACLST01. The SASIxxxx jobs copied it to the command procedure library you specified in SASEDITP under the name you specified as SASCNM=. The installed cataloged procedure resides in the CNTL data set as BAPROC01. The SASIxxxx jobs copied it to the procedure library you specified in SASEDITP under the name you specified as SASPNM=. Determine the changes you want to make as described in Step 1 and apply the changes according to your standard procedures.

Note: Only Action A will move CLIST and catalogued procedure into a specified library. Actions B and C require that you manually copy and rename BAPROC01 and BACLST01 to the appropriate libraries.

Step 1: Determine the customizations you need.

Review the following information that discusses changes you may want to make. If you are installing any of the SAS/ACCESS products, you may want to review the appropriate appendices and incorporate those changes now. If you plan to run the BMDP interface, you may also want to customize BACLST02 and BAPROC02. There may be other site-specific issues for you to address.

❑ **SASUSER Considerations**

The Version 6 CLIST allocates a permanent SASUSER data library for each user the first time the user invokes the SAS System. When there is no SASUSER data library allocated to a session, the system by default assigns the SASUSER libref to the temporary WORK data library. In this case, data written to SASUSER disappears when the WORK data library is deleted.

The default CLISTs for prior versions of the SAS System have not allocated permanent data sets for individual users. Although individual SASUSER data libraries are not required, they allow users to take advantage of many new interactive features in the Version 6 SAS System. The SAS/ASSIST product uses the SASUSER library to store all SAS data sets created and to save all work (programs, output, and catalogs) from a SAS/ASSIST session. The SAS Display Manager uses this library for storing various types of information. Users can save profiles in their SASUSER data libraries to customize window sizes, function key settings, and other aspects of the SAS full-screen environment. You can use display manager SAVE and COPY commands to transfer data or program statements between Display Manager windows and catalogs in your SASUSER data library. The FORMS command stores forms entries used in printing from the display manager. Refer to Chapter 3 in the *SAS Companion for the MVS Environment, Version 6, First Edition* for details on commands and SASUSER profiles.

The default CLIST creates a permanent SASUSER data library for each user who invokes the SAS System using the CLIST statements, as shown in the following:

```
IF &SYSPREF EQ THEN +
     SET &USRPREF=&SYSUID
ELSE +
SET &USRPREF=SYSPREF

IF &STR(&SASUSER) EQ THEN +
     SET &SASUSER = &STR('&USRPREF..SAS609.SASUSER')
SET STATE = &SYSDSN(&SASUSER)
IF &STATE = OK  THEN +
     ALLOC F(&DDSASUSR) DA(&SASUSER) OLD &SU11
ELSE +
IF &STATE = DATASET NOT FOUND THEN DO
     WRITE Warning: SASUSER file does not exist, will be
     created.
     ALLOC F(&DDSASUSR) DA(&SASUSER) NEW CATALOG SP(30 5)
     ROUND +
          DSORG(PS) RECFM(F S) BLKSIZE(6144) &SU11
     END
ELSE IF &STATE NE OK THEN DO
     WRITE Warning: SASUSER file: &STATE
     WRITE          SASUSER file not allocated to this
     session
     END
```

Note: Using the &SYSDSN CLIST function as shown requires TSO/E Version 1, Release 3, or a subsequent release.

```
IF &SYSPREF EQ THEN +
     SET &USRPREF=&SYSUID
ELSE +
SET &USRPREF=SYSPREF
```

You may want to determine a different naming convention for SASUSER data libraries or alter the default space allocation.

❑ **Special Cataloged Procedure Parameters**

The default cataloged procedure includes two symbolic parameters that allow concatenation of user libraries before your SAS System installation libraries:

❑ **LOAD=**

The `LOAD=` parameter allows you to specify a user load library `DSN` to concatenate before the SAS load library data set.

❑ **SASAUTO=**

The `SASAUTO=` parameter allows you to specify a user autocall macro library `DSN` to concatenate before the system autocall macro library.

These parameters are intended to provide added flexibility for invoking the SAS System in batch mode. Please note that any existing JCL you use to invoke earlier releases of the SAS System may not work as expected with the new default PROC. If large volumes of production JCL at your site contain DD overrides for `//SASAUTOS` and `//STEPLIB`, you may want to customize the `SAS609 PROC` to change the concatenation order of the data sets for these DD statements.

❑ **Entry Name Considerations**

If you plan to run a bundled configuration from modules installed in your LPA/ELPA, change the default `ENTRY` name in your CLIST and cataloged procedure. Valid standard `ENTRY` names are as follows:

- ❑ `SASHOST` for MVS/XA (or ESA) non-bundled configuration
- ❑ `SASXA1` for MVS/XA (or ESA) non-LPA bundled configuration
- ❑ `SASXAL` for MVS/XA (or ESA) LPA bundled configuration

See the sections "Selecting a Bundled Configuration" and "Installing SAS on the LPA," earlier in this document for considerations relating to `ENTRY` name selection.

❑ **Running Versions 5 and 6 of the SAS System Concurrently**

If your users run both Versions 5 and 6 of the SAS System concurrently in the same TSO session, you may also want to customize the CLIST to avoid `DDname` conflicts.

To do so, determine a naming convention for the SAS file `DDnames` allocated, such as `WORK`, and specify your `DDnames` in the CLIST. The CLIST includes special `DDname` operands for you to use when specifying your SAS file `DDnames`. When you use these operands, the CLIST specifies the appropriate corresponding SAS system options for you. Specify alternate `DDnames` in this manner for any files that would cause conflicts at your site.

❑ **Further DDname Considerations**

Note that the Version 6 SAS System no longer uses the FORTRAN-style DDnames that were used in previous releases for the SAS log, print, and PARMS data sets. If you want to use the same DDnames in Version 6 as in earlier releases, you need to customize your CLIST, PROC, and system default options. Customize the CLIST and PROC by changing the DDnames as follows:

- ❑ change SASLOG to FT11F001
- ❑ change SASLIST to FT12F001
- ❑ change SASPARM to FT15F001.

Customize your default options by adding the following option values to your DFLTOPTS table or system configuration file.

```
LOG=FT11F001
PRINT=FT12F001
PARMCARDS=FT15F001
```

If you need more information about these options, the first section in "Setting Up the SAS System" contains details on customizing your DFLTOPTS table and system configuration file.

❑ **SORT Library Considerations**

If your users run PROC SORT and your site does not provide your system sort routine in a linklist library, set the SORTLINK CLIST operand to null and specify the load library that contains your system sort routine in the SORTLDSN operand. In the cataloged procedure, concatenate your system sort load library to the STEPLIB DD statement.

Step 2: Make the CLIST and PROC changes according to standard procedures at your site.

Customizing Your NEWS and SITEINFO Files

Note: You should complete this task.

The installation process unloads default NEWS and SITEINFO members into your NEWS partitioned data set. You can update these members with information appropriate for your site.

Information contained in the NEWS data set is displayed on the SAS log at invocation time when the NEWS= SAS system option is specified. The NEWS= option specifies either a logical or a physical name for the NEWS data set. The default system configuration files loaded into your CNTL data set at installation time contain the NEWS= system option specifying the physical name of the NEWS member in the NEWS data set allocated by the SASIxxxx jobs. You can modify the NEWS member to contain any information appropriate for your site, or, if you do not want to display standard information at invocation time, you can remove the NEWS= option from your system configuration files.

Information contained in the SITEINFO data set is displayed in the SETINIT SITEINFO window when the SITEINFO= SAS system option is specified. The SITEINFO= option specifies either a logical or a physical name for the SITEINFO data set. The default system configuration files loaded into your CNTL data set at installation time contain the SITEINFO= system option that specifies the physical name of the SITEINFO member in the NEWS data set allocated by the SASIxxxx jobs. The SITEINFO member provided with this installation includes a framework of information that you can specify and expand.

Installing the SAS SVC Routine

Note: This procedure is optional, but recommended.

Step 1: Decide whether to install the SAS SVC routine.

In most cases, where the function provided or supported by the SVC routine is not utilized or required, installation of the SVC routine is not absolutely necessary. However, you should complete the installation for the following reasons:

- ❑ You may decide at a later time to utilize the otherwise unavailable functions.
- ❑ If you later install a SAS Institute product that requires this SVC routine, the SVC is already installed, tested, and available.

Installation of the SAS SVC is **absolutely required** if:

- ❑ You are using the SAS SMF system option to write user SMF records
- ❑ Your site plans to install the Version 6 SAS/SHARE product.

The Release 6.09 SVC routine provides all the functions available with the Release 6.08, 6.07, 6.06, and Version 5 SVC routines. In addition, the 6.09 routine provides the third party RACF checking required by Release 6.09 of SAS/SHARE software. Therefore, if you intend to run Release 6.08 or previous releases of the SAS System on the same operating system as Release 6.09, you should replace the Release 6.08, 6.07, 6.06, or Version 5 SVC routine with the 6.09 SVC routine.

- ❑ **System Integrity Guidelines**

The SAS SVC Routine has been designed, written, and tested using IBM guidelines for system integrity. When it is properly installed, you cannot use the SAS SVC routine to violate system integrity as defined by IBM for the MVS/XA and MVS/ESA operating systems, or to obtain control in an authorized state, or to bypass system security or password protection.

Step 2: Select the ESR SVC routing code or SVC number for the SAS SVC routine.

You can install the SVC routine one of two ways:

- as a Type 4 Extended Support Router SVC (ESR SVC 109) entry
- as a standard "user" SVC (SVC routines 200-255) defined in member `IEASVCxx` of `SYS1.PARMLIB` or in `SYSGEN Stage I`.

You should install the SVC routine as a Type 4 ESR SVC (SVC 109). This technique has several advantages, one being that a user SVC reserved exclusively for the SAS SVC is not required. Additionally, if the Type 4 ESR SVC routing code you choose is selected for use by another software vendor, it is relatively easy for you to change the routing code used by the SAS SVC.

If you decide to install the SVC routine as a Type 4 ESR SVC entry, you must select a "routing code" that exclusively designates the SAS SVC routine. It is your responsibility to select the routing code to be used, to ensure that no other product or operating system component is using the routing code selected, and to maintain an awareness of the routing code selected so that no other product or operating system component that uses the same routing code is inadvertently installed. SMP/E could be used to accomplish this.

To choose the Type 4 ESR SVC (SVC 109) routing code to use, first determine which routing codes are already installed or in use by the operating system or other software products. To do this, list the names of members beginning with IGX00 in `SYS1.LPALIB` and all other libraries listed in the `LPALSTxx` member of `SYS1.PARMLIB`. You should also check the `IEALPAxx` member of `SYS1.PARMLIB` for `IGX00nnn` modules that may be placed in MLPA. The `nnn` suffix is the routing code (always in decimal) by which the ESR SVC routine is invoked. For example, the ESR SVC routine `IGX00019` would be invoked by loading register `15` with the decimal value `19` and then executing a SVC 109 instruction. Members beginning with `IGX` but not `IGX00` are subsequent loads of the routine named `IGX00nnn` and are not ESR entries.

IBM has reserved routing codes between 200-255 for customer use under MVS/ESA. Under MVS/XA, use a code between 0 and 36. SAS Institute recommends that you choose a routing code within these ranges. However, the default routing code is 4, for compatibility with previous releases of the SAS System. It is your responsibility to pick a routing code unused at your site and ensure its integrity.

If you decide to install the SVC routine as a "user" SVC routine, then you must ensure that the selected user SVC number is currently unused. For operating system releases later than MVS/SP 2.2.0, check the IEASVCxx member in SYS1.PARMLIB. For example, if you decide to install the SAS SVC as SVC 200, code the following SVCPARM statement in IEASVCxx:

```
SVCPARM 200,REPLACE,TYPE(4)
```

Note that the SAS SVC is installed as a Type 4, preemptive, unauthorized SVC with no locks held. For releases prior to MVS/SP 2.2.0, code the following SVCTABLE macro operand in the SYSGEN Stage I:

```
SVC-200-T4-FC00
```

The first "load" of a Type 4 SVC routine is named according to MVS convention, that is, IGC00nnc, where nnc is the zoned EBCDIC representation of the SVC routine's number resulting from the unpacking (using the UNPK instruction) of the positive, packed decimal value that is the SVC routine number. For example, the first load of a Type 4 SVC routine invoked using SVC 234 would be named IGC0023D, because X'234C', when unpacked, yields X'F2F3C4' or C'23D'.

In Step 3, you copy the load module of the SVC routine into SYS1.LPALIB or any other appropriate operating system library of your choice. You must name the copied load module appropriately. Therefore, in Step 3, you need to change the ### in IGC00#### on the IEBCOPY control statement to the unpacked, zoned EBCDIC form of the signed, packed decimal representation of the SVC number.

Step 3: Install the SVC routine into SYS1.LPALIB or a LNKLSTxx library, as appropriate.

You can install the SVC routine load module into the appropriate operating system library using IEBCOPY or any other utility that you desire. The sample JCL presented here uses IEBCOPY. We recommend that you install the SVC load module by the same mechanism that you use to install local operating system modifications or other software vendor products that require additions to system resident volume libraries.

You can install the SAS SVC into SYS1.LPALIB or any other LPA library pointed to by the LPALSTxx member of SYS1.PARMLIB. Optionally, you can install the SAS SVC into a LNKLSTxx library and bring it into the LPA at IPL time by a specification in the IEALPAxx member of SYS1.PARMLIB and an MLPA=xx specification in IEASYS00.

One load module (SVC0MVS) must be installed into SYS1.LPALIB (or other appropriate library) and given an appropriate name. If you have decided to install the SVC as a Type 4 ESR SVC entry, the following JCL can be used to copy SVC0MVS to SYS1.LPALIB and rename it:

```
//SVCESR   JOB (account information),'programmer',
//             MSGCLASS=A,MSGLEVEL=(1,1),TIME=(0,59)
//*
//*********************************************************
//*
//* INSTALL SAS SVC AS A TYPE 4 ESR SVC
//*
//*********************************************************
//*
//COPY     EXEC PGM=IEBCOPY
//SYSPRINT  DD  SYSOUT=A
//SYSUT3    DD  UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSUT4    DD  UNIT=SYSDA,SPACE=(CYL,(1,1))
//LPALIB    DD  DISP=OLD,DSN=SYS1.LPALIB
//SASLIB    DD  DISP=SHR,DSN=&prefix.LIBRARY <== your SAS LIBRARY
//SYSIN     DD  *
COPY INDD=SASLIB,OUTDD=LPALIB
S M=((SVC0MVS,IGX00###,R))    <== ### = SVC0R15= value
/*
//
```

If you have decided to install the SAS SVC as a Type 4 "user" SVC, then the following JCL can be used to copy SVC0MVS to SYS1.LPALIB and rename it:

```
//SVCUSER  JOB (account information),'programmer',
//             MSGCLASS=A,MSGLEVEL=(1,1),TIME=(0,59)
//*
//*********************************************************
//*
//* INSTALL SAS SVC AS A TYPE 4 USER SVC
//*
//*********************************************************
//*
//COPY     EXEC PGM=IEBCOPY
//SYSPRINT  DD  SYSOUT=A
//SYSUT3    DD  UNIT=SYSDA,SPACE=(CYL,(1,1))
//SYSUT4    DD  UNIT=SYSDA,SPACE=(CYL,(1,1))
//LPALIB    DD  DISP=OLD,DSN=SYS1.LPALIB
//SASLIB    DD  DISP=SHR,DSN=&prefix.LIBRARY <== your SAS LIBRARY
//SYSIN     DD  *
COPY INDD=SASLIB,OUTDD=LPALIB
S M=((SVC0MVS,IGC00###,R))    <== ### = SVC0SVC= UNPK
/*
//
```

You **must** IPL after the SVC routine is actually copied into SYS1.LPALIB (or another system library, such as SYS1.SVCLIB, SYS1.LINKLIB, or a LNKLSTxx system link list data set) and made resident in the link pack area using MLPA. You must IPL specifying the CLPA parameter (or an MLPA=xx parameter in conjunction with an IEALPAxx member of SYS1.PARMLIB) in response to the IEA101A message before you are able to use the SVC routine or continue with the next step of these installation instructions.

Step 4: Verify and, if needed, update the SVC SAS system options.

If you do not use the default values, you should set these options in the Restricted Options Table. See "Customizing Default Options and System Configuration Files" for details on creating a Restricted Options Table.

The following SAS system options are directly related to the SAS SVC routine and the manner in which it is installed. You **must** set these options as described in the following to invoke the SVC routine correctly.

- **SVC0SVC=**

  The default is `109` for `ESR SVC 109`. If not `109`, it should be within the range `200-255`, defining the user SVC number with which the SAS SVC routine has been installed into the operating system.

- **SVC0R15=**

  The default is `4` for compatibility with previous releases of the SAS System. Otherwise, it should specify the routing code that you use that is loaded into register `15` before invoking the SAS SVC routine using a SVC `109` instruction.

  If `SVC0SVC=109`, this value represents the suffix of `IGX00` used to determine the module invoked by the Type 4 extended SVC router (`SVC 109`). If `SVC0SVC` is other than `109`, then the value of `SVC0R15` is unused.

Installing the SAS SMF Exit

Note: This procedure is optional.

The `SMF` SAS system option controls whether SMF records formatted by the SAS System are written to the SMF file at the termination of every SAS Software step. If you intend to enable the SMF option in order to write SMF records, and if you would like to tailor the SMF records that the SAS System writes, you must install the SMF exit and set the `SMFEXIT=` system option.

Step 1: Decide whether you need to install the SMF exit.

You can use the SMF exit to examine the SMF record that the SAS System has formatted, modify fields within the record, write the record to a user file, and suppress the writing of the record by the SAS System.

Note: If SMF records are to be written to the SMF file, the SAS SVC must be installed. See "Installing the SAS SVC Routine " earlier in this document.

The use of the SMF exit is entirely optional. Even if it is not installed, records are written to the SMF file if the `SMF` and `STIMER` options are in effect and the SAS SVC is installed. If you install the SMF exit, you can still use the `SMFEXIT=` option to specify whether or not it is to be invoked. If you do not specify the `SMFEXIT=` option, the exit is not invoked. If the value specified is the name of a load module in the search paths, the exit is invoked.

Step 2: Tailor the SMF exit source to meet the requirements of your site.

The sample SMF exit is an assembler source module that must be modified to suit your needs. The source for the sample SMF exit is in the `BAMISC` library member `SMFEXIT`.

Note: In MVS/XA and ESA environments, the exit is entered in `AMODE 31`. If you are writing to a user file using an access method that requires you to be in `AMODE 24`, change `AMODE` for the access method calls, then return to `AMODE 31` before returning from the exit.

The exit is called at SAS System initialization, at SAS Software step termination, and at SAS System termination. At entry to the exit, `R15` contains the entry point address, `R14` contains the return address, `R13` points to a standard register save area, and `R1` contains the address of a fullword. If the fullword is `0`, the call is being made after the SAS System is initialized so that the exit can perform any initialization necessary. If your exit is writing records to a user file, you probably want to open the file on this call. If the fullword is `-1`, the call is being made before the SAS System is terminated so that the exit can perform any termination necessary. If your exit is writing records to a user file, you probably want to close the file on this call. If the fullword contains neither `0` nor `-1`, it is assumed to be the address of the SMF record to be written.

If the exit returns `0` in `R15`, the SAS System writes the SMF record pointed to by `R1`. If the exit returns a non-zero value in `R15`, the SAS System suppresses the writing of the SMF record. The following approaches may be taken in the exit:

- Zero R15 and return immediately to write the SMF record, as is.
- Return immediately leaving a non-zero value in `R15` to suppress the writing of the record.
- Modify the record pointed to by `R1`, as desired, including adding data in the user area provided, or perhaps changing the record type. Note, however, that record type must be greater than `127`. If it is not, the SAS SVC does not write the record to the SMF file. Note also that the record length in the standard header on input does not include the user area. If data is added in this area, the length field must be incrementally lengthened by the number of bytes added. Return a `0` in `R15` to cause the SAS System to write the modified SMF record.
- Modify the record pointed to by `R1`, as desired, and write the record to a user file. In this case, record-type checking is up to you. Return a non-zero value in `R15` to cause the SAS System to suppress writing of the SMF record.

The format of the record formatted by the SAS System is as follows:

Hex Offset	SMFREC	DSECT		
00	SMFRLEN	DS	BL2	Record length
02	SMFSEG	DS	BL2	Segment descriptor
04	SMFFLG	DS	BL1	Header flag
05	SMFRTYP	DS	BL1	Record type
06	SMFTIME	DS	BL4	Time given to smf
0A	SMFDATE	DS	PL4	Date given to smf
0E	SMFSID	DS	CL4	System id
12	SMFJOBN	DS	CL8	Jobname
1A	SMFRTME	DS	BL4	Reader time
1E	SMFRDTE	DS	PL4	Reader date
22	SMFSTEP	DS	XL1	Step number
23	SMFRSVD	DS	XL1	Reserved
24	SMFPROC	DS	CL8	PROC name
2C	SMFCPU	DS	F	PROC cpu time in timer units
30	SMFEXCP	DS	F	PROC excp count
34	SMFCORE	DS	F	PROC storage used
38	SMFVUSE	DS	F	Vector usage in .01 sec
3C	SMFVAFF	DS	F	Vector affinity time in .01 sec
40	SMFHSP	DS	F	RSM hiperspace time in .01 sec
44	SMFUSER	DS	XL64	User space (Not included in SMFLEN)

Step 3: Assemble and link the tailored source.

The JCL required to assemble and link the SMF exit is located in member BASMF in the CNTL data set. You can tailor the link step so that the name supplied on the ENTRY statement is the entry point that you want to use when invoking the exit. SMFEXIT1, which is the name on the ENTRY statement in the JCL, is the entry point in the sample SMF exit that simply zeroes R15 and returns, causing the SMF record to be written to the SMF file as formatted by the SAS System.

Step 4: If your site requirements dictate that SMF always be ON, and that the SMFEXIT= always be set, insure that SMF, SMFTYPE=, SMFEXIT=, SVC0SVC=, and SVC0R15= are set in the restricted options table.

See "Customizing Default Options and System Configuration Files" earlier in this document for more information.

Part 2, Maintaining the SAS® System

SAS Institute Inc. provides several services to assist you in maintaining and using your SAS software. These include the ability to easily renew your license onsite, to process the SAS Notes library that contains the SAS Usage Notes and the SAS Notes documentation, and to copy and delete SAS product libraries. Each of these procedures is discussed in this section.

Renewing Your License

If your SETINIT has expired, and you have received renewal SETINIT text, follow the instructions in Appendix X, "Licensing the SAS System (Action G)" to renew your SAS System license.

Installing Maintenance Modules

If you license a new product, or if you order Usage Notes, the installation tape you receive will contain the maintenance modules required to bring **all** of your SAS software products up to the current maintenance level. An Action B or Action C install will automatically update any installed product on your site to the most current maintenance level. A new product is automatically at current maintenance.

Note: Editing `PRODSEL` and `LIBSEL` has no effect on installation of maintenance. SAS Institute highly recommends that you always apply current maintenance. In the rare case that installing to the current maintenance level is inappropriate, contact Technical Support for alternative procedures.

Note: Since all maintenance is cumulative, each maintenance release contains all the modifications since the original production release. If you receive a second tape within the same maintenance period, maintenance is not duplicated. To ensure a correct install, products and maintenance should be applied to your system in the order in which they were received.

IMPORTANT: Each maintenance, Usage Notes, or multi tape set requires its own unused `CNTL` data set and `IEBUPDTE` unload utility. A suggested naming convention is `&prefix.MMMDDYY.CNTL`, where `&prefix` is the prefix you are installing to and `MMMDDYY` is the date of installation. The following example uses this naming convention: `SYS.SAS609.AUG1996.CNTL`.

Installing Supplementary Maintenance Material

Occasionally, supplemental modules, macros, and other materials are shipped with a SAS installation tape or Usage Notes tape. These are usually materials to deal with specialized situations. Normally you do not need to be concerned about them. You do not need to examine a list of them to see if they apply to you. If you do need to install one of them at your site, they are brought to your attention in an Alert Note, or in a Usage Note that you have already referenced for some reason, or by SAS Institute Technical Support.

Each of these special materials is given a keyword which is used by a MAKE program (member `MAKESUPL` in the control data set) to create a mini install to unload the material to your system (member `SASISUPL` in the control data set). The keyword is contained in the Alert or Usage Note, or given to you by someone from SAS Institute. Without the keyword, `MAKESUPL` will not generate the mini install. `MAKESUPL` looks for keywords in the `SPKEYLST` member of the control data set.

Complete the following steps to install supplemental material:

1. Edit the `SPKEYLST` member in the control data set. (A backup copy of this member is contained in the `@SPKYLST` member of the `&prefix.CNTL` data set).

2. Add the keyword(s) per the header instructions in the member.

3. Edit the `MAKESUPL` member of the control data set using the instructions for the SASIHOLD job in the installation instructions. Use the same values for `&CNTLDSN`, `&SASEDTP`, `&PRODSEL`, and `&LIBSEL` that you used for the standard installation.

4. Edit the `SASEDITP` member using the same values as SASEDITP member that you used for the standard installation. (If you are installing from a Usage Notes tape, it is recommended that you do so specifying Action C in SASEDITP, and supplying the requested staging library prefix. If you do decide to install supplemental material directly to your production system from a Usage Notes tape, choose Action B in SASEDITP.)

5. Submit the `MAKESUPL` job. It creates a member in the control data set called SASISUPL, which contains a job with the same name.

6. Submit the `SASISUPL` job. It unloads the supplementary material from tape and installs it to your system.

Processing SAS Notes Libraries

The SAS Notes library contains the SAS Usage Notes, the screens and formats necessary to access the Usage Notes, and the program entries necessary for the `SUPPORT` application. Complete the installation process before trying to process the SAS Notes libraries as described in this section.

Note: If you received a tape containing only Usage Notes, note that you must still allocate a new CNTL data set, and unload the SAS.SASROOT data set using the IEBUPDTE utility provided in "Unloading the Installation Jobs -- Run IEBUPDTE" in this document. Complete Action B to perform your install. The SASIxxxx job(s) generated by SASIHOLD/SASINSGO will allocate the necessary libraries, unload the notes libraries from tape, and tailor the provided Usage Notes jobs with the site parameters you provide in SASEDITP.

Usage Notes programs and CLISTs are loaded into &prefix.USAGE.PGMS, which is abbreviated as PGMS in the following discussion.

Running Batch Jobs to Execute SAS Notes Programs

Four programs, SELECT, PRINT, FIXREPT, and ZAPREPT, are distributed with SAS Notes. Four batch jobs USSELECT, USPRINT, USFIXRPT, and USZAPRPT are included to run the SAS Notes programs. The SAS Notes programs and batch jobs are installed into your PGMS library.

Before you run any of these programs, edit the PARMS member of the PGMS library. Change the parameters as described in the comment block preceding each parameter. The PARMS member is used by all three Version 6 SAS Notes programs. It is not necessary to edit any of the other members in the PGMS library.

To access the Version 6 SAS Notes, execute the following jobs:

- **USSELECT**

  (member USSELECT of the PGMS data set) executes the SAS Notes SELECT program. Because the distributed Usage Notes data set contains notes for all SAS products, the SELECT program allows you to keep only the Usage Notes for certain products and releases. The Usage Notes include descriptions of known problems, usage tips, and compatibility issues. The SELECT program also allows you to select or discard only the compatibility issues.

- **USPRINT**

  (member USPRINT of the PGMS data set) executes the SAS Notes PRINT program. The PRINT program is provided for those sites that do not license SAS/FSP software and for other sites that require a hard copy of the Usage Notes.

- **USFIXRPT**

  (member USFIXRPT of the PGMS data set) executes the SAS Notes FIXREPT program. The FIXREPT program produces a report, displayed by SAS product and TS level, of all the source code fixes available.

- **USZAPRPT**

  (member USZAPRPT of the PGMS data set) executes the SAS Notes ZAPREPT program. The ZAPREPT program produces a report of the zaps for a given release of one or more SAS products. The report organizes the zaps according to category and includes a listing of those zaps that have prerequisites.

Accessing SAS Notes Interactively

You can access the SAS Notes interactively by using either FSBROWSE or the SUPPORT application.

Accessing SAS Notes with FSBROWSE

Those sites that license SAS/FSP software may want to access the SAS Notes interactively with PROC FSBROWSE. Submit the following SAS statements after invoking the Version 6 SAS System:

```
LIBNAME LIBRARY '&prefix.USAGE.NOTES';
PROC FSBROWSE DATA=LIBRARY.USAGE SCREEN=LIBRARY.SCREEN;
RUN;
```

Accessing SAS Notes with the SUPPORT Application

The SUPPORT application, a full-screen SAS software application shipped as part of the SAS Notes, allows you to browse the usage notes and compatibility issues, generate an index listing of sample programs available for various products, and edit and execute these sample programs. The SUPPORT CLIST (located in the PGMS data set) invokes this application. The AUTOEXEC member, SPRTAUTO, provides the SUPPORT CLIST with the SAS statements necessary to invoke the SUPPORT application. Copy this CLIST to the standard location for CLISTs at your site.

Copying Staged Libraries (Action D)

This section describes how to copy staged SAS product libraries into your production SAS System libraries. Perform this step when the staged system (installed with Action C) is sufficiently tested and ready to be merged with the production SAS System.

Step 1: Supply SASEDITP parameter values.

- Blank out the *NO* that precedes the action name STAGE-TO-FINAL. Verify that you have only one action value active. If more than one action is selected, a return code of 12 is set, and error messages specifying the duplicated selections are posted to SYSPRINT and SYSTERM.

- Specify the prefix of the staged libraries as the STAGE-LIB-PREFIX and the prefix of the final libraries as the FINAL-SAS-PREFIX.

- ❑ If you cannot use exclusive access to the final libraries (`DISP=OLD`), blank out the `*NO*` before `DUDSP=SHR`.

Step 2: If you are using selective mode, specify products/product libraries in PRODSEL/LIBSEL.

If you choose to install in selective mode, you first choose whether to install by product or by individual product library.

If you want to install by product, edit the member `PRODSEL` of the `CNTL` data set. By default, all products on your tape are installed. If you do not want to install certain products, turn those products *off* by removing the asterisk from column one for those products in the `PRODSEL` member.

If you want to install by individual product library, you can choose between the following two methods:

- ❑ Specify (or deselect) the product libraries that you **do not** want to copy. Use this method when you want to copy everything except for a few product libraries.

  In `LIBSEL`, specify the libraries that you want to omit by removing the asterisk from column one of the `ignore` line for each unwanted product library.

- ❑ Select the product libraries that you **do** want to copy. Use this method when you want to copy only a few product libraries.

  In `PRODSEL`, remove the asterisk from the `DEFLTSEL=%TURNDOFF` statement. In `LIBSEL`, remove the asterisk from column one of the `DOTASK` line for the product libraries that you want to copy.

Step 3: Supply SASINSGO or SASIHOLD parameter values.

Step 4: Run SASINSGO or SASIHOLD (checkout mode).

Step 5: If you are using checkout mode (SASIHOLD), run the generated `SASISTFN` job (SASIALOD if JES3).

IMPORTANT: Be sure to perform site-specific post-implementation for the final libraries. See "Performing Site-Specific Product Implementation," in Section I, Part 2, "Installing the SAS System."

Deleting SAS Product Libraries

This section describes how to delete SAS product libraries. Although we recommend that you install all SAS product libraries when you receive an installation tape, you may decide at a later time that you no longer need certain product libraries. If you decide to delete any SAS product libraries, use the steps in this section to do so.

The SASIxxxx jobs provide you with two methods to delete SAS product libraries:

- DELETE-ENTIRE (Action E): deletes an entire set of SAS staging libraries.

  Action E is intended to be used to delete staged libraries after the STAGE-TO-FINAL (Action D) action has been executed. Please note that SAS/CPE software, SAS/TUTOR libraries, and Usage Notes libraries are not staged, and are likewise not deleted by this action.

- DELETE-SELECTED (Action F): deletes individual components related to the product library you selected from the SAS installation libraries.

Action E deletes entire data sets that have the prefix you specify, while Action F deletes product specific components from the SAS installation libraries. Action F does not delete an entire data set, so the number of data sets is the same when the action completes as it was before you ran this action.

Note: This section is **optional** and is included only to assist you in maintaining the SAS System in accordance with your installation needs. You might want to Use Action F to delete libraries if you originally installed several optional libraries that you only want to access for a limited time.

IMPORTANT: Refer to the LIBSEL member of the CNTL data set before selecting any SAS product libraries for deletion. Deleting any **required** libraries will produce unexpected results, and the product will not function correctly, if at all. If you inadvertently delete libraries you want to retain, you must reinstall them from your installation tape, or restore the entire system from backup.

Deleting a Set of SAS Installation Libraries (Action E)

To delete an entire set of SAS installation staging libraries, complete the following steps:

Step 1: Supply SASEDITP parameter values.

- Select DELETE-ENTIRE (Action E) by blanking out the *NO* before the action. Verify that you have only one action value active. If more than one action is selected, a return code of 12 is set, and error messages specifying the duplicate selections are posted to SYSPRINT and SYSTERM.

- Use the DEL-STAGELIB_PFX parameter to specify the prefix of the SAS libraries to be deleted.

Step 2: Edit and submit the SASINSGO or SASIHOLD job.

Step 3: If you are running in checkout mode, run SASIDSTG.

Step 4: Verify successful completion of SASIDSTG.

Deleting SAS System Libraries Components (Action F)

To delete SAS System library components for a SAS software product, complete the following steps:

IMPORTANT: Refer to the `LIBSEL` member of the `CNTL` data set before selecting any SAS product libraries for deletion. Deleting any **required** libraries will produce unexpected results, and the product will not function correctly, if at all. If you inadvertently delete libraries you want to retain, you must reinstall them from your installation tape.

Step 1: Supply `SASEDITP` parameter values.

- ❑ Select `DELETE-SELECTED` (Action F) by blanking out the `*NO*` before the action. Verify that you have only one action value active. If more than one action is selected, a return code of 12 is set, and error messages specifying the duplicate selections are posted to `SYSPRINT` and `SYSTERM`.

- ❑ Use the `DEL-LIBRARY-PFX` parameter to specify the prefix of the libraries with components to be deleted .

Step 2: Disable `PRODSEL`.

Note: You cannot use `PRODSEL` to select an entire product for deletion.

To disable `PRODSEL`, blank out the `*` before `DEFLTSEL=%TURNDOFF` to uncomment this parameter. Type an `*` in column one before the `DEFLTSEL=%TURNEDON` parameter.

Step 3: Supply `LIBSEL` parameter values.

To delete a product, select all the libraries associated with the product by uncommenting the line associated with the library specifying `%DOTASK`.

Step 4: Edit and submit the `SASINSGO` or `SASIHOLD` job.

Step 5: If you are running in checkout mode, run the SASIDSEL job to delete the libraries specified.

Step 6: Verify successful completion of SASIDSEL.

Appendix A, Unloading the Installation Instructions from Tape

These installation instructions for the SAS System are included on the installation tape in text-editor-readable form. A job is provided for you to offload them at your site. The text file containing these instructions does not reside in any of the SAS libraries unloaded from tape during installation. This job reads the instruction text file directly from tape, so a mount of the installation tape is required.

Obtaining the Instructions

Note: This task is optional.

Step 1: Examine the `ULINSDOC` member of the `CNTLDSN`.

You can specify a data set name other than the default, `&prefix.VIEW.INS.MAN`.

Step 2: Submit the `ULINSDOC` job to allocate the data set and read the documentation from the tape.

Step 3: Scan the documentation by using a text editor on the `SCANTEXT` member.

Note: Other members may have been included in the data set.

Appendix B, Customizing SAS® System Forms

As the SAS Consultant for your site, you have the ability to customize all SAS forms for your operating system. Associated with each form is a list of available printers. Review this information if users at your site require a site customized print form for use in DMS, SAS/AF®, SAS/FSP, SAS/CALC, SAS/ASSIST, or SAS/EIS Software.

Note: You must have SAS/AF Software licensed to modify the site form.

Customizing the Printer Selection List

Note: This task is optional.

Whenever you create a SAS System form, a list of printers is displayed. You can modify this list to reflect only those printers available for your site. Information on changing the printer selection list has been included in a CBT help file within the `SASHELP` library. To find out more about customizing this printer list, issue the following command from the Display Manager:

```
af c=sashelp.base.pdevice.cbt
```

Customizing the Print File Parameter Program

Note: This task is optional.

The MVS Print File program can be customized for your site if you have the SAS/AF software product installed. To view information about customizing the Print File Parameter program, issue the following command from the Display Manager:

```
af c=sashelp.base.formscph.cbt
```

Printing Help Files with Customizing Information

Note: This task is optional.

The `PDEVICE.CBT` help file, which describes how to customize the printer list, and the `FORMSCPH.CBT` help file, which describes how to customize the Print File Parameter program, can be printed if you have the SAS/AF software product installed at your site.

Issue the following program statements to print these CBT help files for review:

```
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;
```

or, to route the output to a file:

```
proc build c=sashelp.base batch;
   print display select=(pdevice.cbt formscph.cbt)prtfile='file
   name'
   run;
```

Appendix C, Installing the BMDP Interface

Introduction

The BMDP procedure (PROC BMDP) converts an input SAS data set into a BMDP save file and loads user-provided BMDP control statements for processing the file. It then calls a BMDP program (for example, BMDP1D) to execute the control statements. PROC BMDP then prints the output of the BMDP program, interspersing by-line information if a BY statement is given.

The SAS BMDP interface is not necessary if your site does not have BMDP, or if you are only accessing BMDP data through the BMDP engine (via the LIBNAME statement or PROC CONVERT). You may want to survey your SAS software users to determine if and how the BMDP interface will be used.

Installation of the BMDP Interface

Note: This task is optional.

If your users plan to run PROC BMDP, you need to customize the SASBMDP CLIST and cataloged procedure (PROC) and install them in the appropriate libraries for user access at your site.

Step 1: Edit the BMDPEDTP member of the CNTL data set to specify the desired values for the BMDP parameters.

The BMDP parameters are defined as follows:

- **BMDPPNM=** specifies the name of the PROC to execute the SAS BMDP interface at your site.
- **BMDPCNM=** specifies the name of the command procedure to invoke the SAS BMDP interface at your site.
- **BMDPLOD=** specifies the name of the load library that contains the BMDP programs. This item is **required**.
- **BMDPNWS=** specifies the BMDP news file name. This is **optional**, and displays as part of the BMDP program's output. Use NULLFILE if you do not want to view the BMDP news file name in your log.
- **BMDPMAC=** specifies the name of the BMDP macro file. This is only used by the BMDP program and is optional. Use NULLFILE if it is not wanted.

Step 2: Review and submit the BMDPPOST job in the CNTL data set.

Submit the BMDPPOST job to tailor the CLIST and PROC, as well as the BABMDP job.

Step 3: Review the SASBMDP CLIST and PROC located in your CNTL data set.

Member BACLST02 contains the CLIST. BAPROC02 contains the PROC. The cataloged procedure and CLIST contain file allocations for three sets of files. These files are required for the Version 6 SAS System, PROC BMDP, and the BMDP program.

If you have customized your SAS CLIST and cataloged procedure as described in the section "Customizing your SAS CLIST and Cataloged Procedure" of Part 1 of Section II, "System Manager's Guide," you may want to apply the same customizations here as well.

The files required for PROC BMDP are identified by the DDnames FT05F001, FT06F001, and FT03F001, which are defined as follows:

- **FT05F001** identifies the file into which PROC BMDP writes the BMDP control statements.
- **FT06F001** identifies the file into which PROC BMDP directs the BMDP program output listing for post-processing. This contrasts with the Version 5 SAS System, in which the BMDP program output listing was written directly to SYSOUT.
- **FT03F001** identifies the file into which PROC BMDP writes the converted BMDP save file. While the user can have PROC BMDP write to any unit number, FT03F001 is the default. The user must supply the additional JCL if another DDname is used.

Step 4: Review and then submit the BABMDP job in the CNTL data set that was tailored by the BMDPPOST job submitted in Step 2.

This job copies the tailored SASBMDP CLIST and PROC to the libraries that you specified earlier in SASEDITP and executes the TESTBMDP validation program to verify the installation of the BMDP interface.

Appendix D, Implementing the SAS/IML® Interface to the Engineering and Scientific Subroutine Library (ESSL) and the SAS/OR® Interface to the Optimization Subroutine Library (OSL)

Implementing the SAS/IML Interface to ESSL

Note: This task is optional.

If you license the IBM Engineering and Scientific Subroutine Library, you can implement an interface with `PROC IML` of the SAS/IML product by creating the SASESSL load module as described in member `ESSL` of `&prefix.BAMISC`.

Implementing the SAS/OR Interface to OSL

Note: This task is optional.

If you license the IBM Optimization Subroutine Library, you can implement an interface with `PROC NETFLOW` of the SAS/OR product by creating the SASOSL load module as described in member `OSL` of `&prefix.BAMISC`. To use this interface with `PROC NETFLOW`, specify the `USEOSL` procedure option when invoking `PROC NETFLOW`.

Appendix E, Using the IBM 3090 Vector Facility with the SAS® System

If you have an IBM 3090 with Vector Facility, the Vector Facility instructions are used by default by some SAS procedures, most noticeably `PROC GLM`. Specify the `NOVECTOR` SAS system option to disable use of the Vector Facility.

Appendix F, Implementing SAS/ACCESS® Interface to ADABAS Software

Customizing the SAS CLIST and Cataloged Procedure

Note: This task is required.

If the ADABAS interface is used extensively at your site, and if your ADABAS system load library is not a link list library, you may want to modify the SAS CLIST and cataloged procedure to allocate the necessary files by default. Alternatively, users must specify the `SASLOAD` operand shown below when invoking the CLIST and must override `STEPLIB` when running batch to concatenate the library that contains your site's Software AG load modules. In either case, they may also be required to allocate `DDCARD`, as appropriate.

Note: The concatenation order of the `SAS LOAD LIBRARY` and the load library for data base access may be interchanged. Generally, if more database access activities will occur in the SAS session or batch job, place the data base load library first in the concatenation (or ahead of the `SAS LOAD LIBRARY`). The opposite is true when SAS processing dominates the session or JOB.

- ❏ Make the following changes to the CLIST:
  - ❏ Replace the following line in the installation-supplied CLIST:

    ```
    SASLOAD ('''&prefix.LIBRARY''')
    ```

    with the line

    ```
    SASLOAD ('''your.ADABAS.loadlib'' ''&prefix.LIBRARY''')
    ```

  - ❏ Optionally, add an appropriate `ALLOCATE` statement for the fileref `DDCARD`, unless appropriate parameters are included in the `ADARUN` module.
- ❏ Make the following changes to the cataloged procedure:
  - ❏ Modify the `STEPLIB DD` statement to concatenate your Software AG load library as follows:

    ```
    //STEPLIB   DD DISP=SHR,DSN=&LOAD
    //          DD DISP=SHR,DSN=&prefix.LIBRARY
    //          DD DISP=SHR,DSN=your.ADABAS.loadlib
    ```

- Optionally, add an appropriate `DDCARD DD` statement, unless appropriate parameters are included in the `ADARUN` module. The following example illustrates the `DDCARD` parameters required by this interface:

```
ADARUN DATABASE=001 /*site-specific value*/
ADARUN DEVICE=3380  /*site-specific value*/
ADARUN MODE=MULTI   /*multi (default) or single*/
ADARUN SVC=253      /*site-specific value*/
ADARUN PROGRAM=USER /*required*/
```

Using the NATURAL Security Interface

Note: This task is optional.

The modules `NSCDDM` and `NSCDDM21` unloaded to your SAS LIBRARY data set are the NATURAL Security Interface modules supplied by Software AG. If you do not have the NATURAL Security Software, or do not want to use it, delete or rename the load module `NSCDDM`.

The module `NSCDDM` is support for NATURAL Release 2.2 or later. If you are using NATURAL Release 2.1 and you want to use the NATURAL Security Interface, delete or rename the existing `NSCDDM` module and then rename the module `NSCDDM21` to `NSCDDM`.

Using the Samples

Note: This task is optional.

Two samples for the ADABAS interface are unloaded into your `&prefix.SAMPLE` library at install time:

- `ADBDOC`, which is used to create sample data sets. These sample data sets are referenced in *SAS/ACCESS Interface to ADABAS Usage and Reference, Version 6, First Edition*.

- `ADBUTL` contains input to the ADABAS Utilities that are used to create the database referenced in *SAS/ACCESS Interface to ADABAS Usage and Reference, Version 6, First Edition*. ADBUTL creates a new ADABAS database with four files. You may want to create NATURAL DDMs to match these files using the NATURAL software.

SAS System Options for this Interface

Note: This task is optional.

Appendix 1 in the *SAS/ACCESS Interface to ADABAS Usage and Reference* manual lists the SAS system options for this interface. You may want to review these during installation. All options have defaults.

The options applicable to this interface are invocation options. That means you can change them when you invoke the SAS System but not during a SAS session. Some system options are also data set options; these can be changed during a SAS Procedure or DATA step.

You are allowed to restrict changes to invocation options by placing them in the Restricted Options Table, SASOPTRS. This process is described in "Customizing Default Options and System Configuration Files" in Section II, Part 1 of this document.

One option, ADBUPD=, is suggested as a restricted option. The ADBUPD= option determines whether the SAS/ACCESS for ADABAS engine can perform both read and update operations or is restricted to read only. The default option value, Y, specifies that both reads and updates are allowed. The option value, N, specifies that the engine can only read ADABAS data; any attempt to update an ADABAS file results in an error.

Note: The ABDUPD= option is the same as the ADBENGMD= option described in the user documentation for this interface.

Other options you may want to examine first are those listed in Appendix 1 of the *SAS/ACCESS Interface to ADABAS Usage and Reference, Version 6, First Edition* under the heading ADABAS System Options.

NATURAL Date and Time Support

The SAS/ACCESS Interface to ADABAS now supports NATURAL Date (D) and Time (T) datatypes. Such fields will have their data values translated into the equivalent SAS dates and times respectively.

When an access descriptor is created on a NATURAL or PREDICT DDM containing a date field, the default SAS format and informat is set to DATE7. As with other default formats and informats on the Access Descriptor Display window, this can be changed to another compatible SAS format/informat.

A NATURAL time field has a default SAS format and informat of TIME8. This can be changed to another SAS format/informat.

If the NATURAL time field is an extended time field, this can be interpreted as a SAS datetime value by specifying an E in the DB Content field. In this case, the default SAS format and informat is changed from TIME8. to DATETIME16. This can be changed to another compatible SAS format/informat.

While it is not possible to display these values as simple numeric values (date or time values), NATURAL date and time values are stored differently than SAS date and time values. Thus the values displayed in this manner will not be the same as if they had been displayed through a NATURAL application. It is not recommended that these values be used as other than their corresponding date or time values.

Appendix G, Implementing SAS/ACCESS® Interface to CA-DATACOM/DB Software

Customizing the SAS CLIST and Cataloged Procedure

Note: This task is required.

If the DATACOM/DB interface is used extensively at your site, and your DATACOM system load library is not a link list library, you may want to modify the SAS CLIST and cataloged procedure to allocate the necessary files by default. If you do not, users will be required to specify the `SASLOAD` operand shown below when invoking the CLIST, and to override `STEPLIB` when running batch to concatenate the library that contains your site's CA-provided load modules.

Note: The concatenation order of the `SAS LOAD LIBRARY` and the load library for data base access may be interchanged. Generally, if more database access activities will occur in the SAS session or batch job, place the data base load library first in the concatenation (or ahead of the `SAS LOAD LIBRARY`). The opposite is true when SAS processing dominates the session or JOB.

- ❑ Make the following change to the CLIST:
  - ❑ Replace the following line in the installation-supplied CLIST:

    ```
    SASLOAD ('''&prefix.LIBRARY''')
    ```

    with the line:

    ```
    SASLOAD ('''your.DATACOM.loadlib'' ''&prefix.LIBRARY''')
    ```

- ❑ Make the following change to the cataloged procedure:
  - ❑ Modify the `STEPLIB DD` statement to concatenate your CA-provided load module library as follows:

    ```
    //STEPLIB   DD DISP=SHR,DSN=&LOAD
    //          DD DISP=SHR,DSN=&prefix.LIBRARY
    //          DD DISP=SHR,DSN=your.DATACOM.loadlib
    ```

Using the Samples

Note: This task is optional.

Two samples for the DATACOM/DB interface are unloaded into your `&prefix.SAMPLE` library at install time:

- `DDBDOC` is used to create sample data sets referred to in *SAS/ACCESS Interface to CA-DATACOM/DB Usage and Reference Version 6, First Edition*.
- `DDBUTL` contains input to the CA-DATADICTIONARY Batch Utility that creates the database referred to in *SAS/ACCESS Interface to CA-DATACOM/DB Usage and Reference.* `DDBUTL` creates a new CA-DATACOM/DB database with four tables.

SAS System Options for this Interface

Note: This task is optional.

Appendix 1 in *SAS/ACCESS Interface to CA-DATACOM/DB Usage and Reference, Version 6, First Edition* lists the SAS system options for this interface. Chapter 4 in Technical Report P-221, *SAS/ACCESS Software Changes and Enhancements* describes how to set these option values to override the defaults. You may want to review this information during installation. All options have defaults.

The options applicable to this interface are invocation options. That means you can change them when you invoke the SAS System, but not during a SAS session. Some system options are also data set options; these can be changed during a SAS procedure or DATA Step. Refer to Appendix 2 in *SAS/ACCESS Interface Usage and Reference*, Version 6, First Edition for information on these data set options.

One invocation option, `DDBMISS=`, specifies a value to be used for representing null values when the SAS/ACCESS engine for CA-DATACOM/DB inserts or updates records in a database table. Valid values for the `DDBMISS=` option are blank (`0X40`) which is the default, and `0X00`.

You are allowed to restrict changes to invocation options by placing them in the Restricted Options Table, `SASOPTRS`. This process is described in "Customizing Default Options and System Configuration Files," in Section II, Part 1 of this document.

One option, `DDBUPD=`, is suggested as a restricted option. The `DDBUPD=` system option determines whether the SAS/ACCESS for CA-DATACOM/DB engine can perform both read and update operations, or is restricted to read only. The default option value, `Y`, specifies that both reads and updates are allowed. The option value, `N`, specifies that the engine can only read CA-DATACOM/DB tables; any attempt to update a CA-DATACOM/DB table results in an error.

Note: The `DDBUPD=` option is the same as the `DDBENGMD=` option described in the user documentation for this interface.

Appendix H, Implementing SAS/ACCESS® Interface to CA-IDMS Software

Customizing the SAS CLIST and Cataloged Procedure

Note: This task is required.

If the CA/IDMS interface is used extensively at your site, and your IDMS system load library is not a link list library, you may want to modify the SAS CLIST and cataloged procedure to allocate the necessary files by default. If you do not, you are required to specify the `SASLOAD` operand shown below when invoking the CLIST, and to override `STEPLIB` when running batch to concatenate the library that contains your site's CA-IDMS load modules. If you are accessing the IDMS databases using central version, you may also be required to load the `SYSCTL` file. If you are accessing the IDMS databases using local mode, you may also be required to allocate the database files.

- ❏ Make the following changes to the CLIST:
  - ❏ Replace the following line in the installation-supplied CLIST:

    ```
    SASLOAD ('''&prefix.LIBRARY''')
    ```

    with the line:

    ```
    SASLOAD ('''your.IDMS.loadlib'' ''&prefix.LIBRARY''')
    ```

  - ❏ Add an appropriate `ALLOCATE` statement for the fileref `SYSCTL`, if you are accessing your IDMS databases using central version.
  - ❏ Add the appropriate `ALLOCATE` statements for the IDMS databases you have authority to access, if you are accessing your IDMS databases using local mode.
- ❏ Make the following change to the cataloged procedure:
  - ❏ Modify the `STEPLIB DD` statement to concatenate your CA-provided load module library as follows:

    ```
    //STEPLIB   DD DISP=SHR,DSN=&LOAD DISP=(SHR,PASS)
    //          DD DISP=SHR,DSN=&prefix.LIBRARY
    //          DD DISP=SHR,DSN=your.IDMS.loadlib
    ```

  - ❏ Add the appropriate DD statements for the fileref SYSCTL, if you are accessing your IDMS databases using central version.

- ❑ Add the appropriate DD statements for the IDMS databases you have authority to access, if you are accessing your IDMS databases using local mode.

IDMWHST SAS System Options for this Interface

Note: This task is optional.

The `IDMWHST` option is a SAS System invocation option as well as a data set option. The default value for this option is `I`. You may want to change the default during the installation process. The default can be overwritten by supplying a different value for the `IDMWHST` option at SAS System invocation, or as a data set option.

The WHERE clause that is used on the IDMS view descriptor, the data step, or a procedure using an IDMS view descriptor, is handled differently according to the parameter.

Parameter	Action
`S`	The SAS System handles all of the WHERE clause processing.
`I*`	IDMS handles the WHERE clause processing. The engine will fail if it cannot handle any of the WHERE clause or if a WHERE clause is not entered. *This is the default.
`E`	Either the SAS System or IDMS handles the WHERE clause. IDMS builds the XDEs and makes a call to the database. If the call fails, the SAS System handles the WHERE clause.

SAS/ACCESS Data Step Interface Enhancement

A data step component to enhance the SAS/ACCESS Interface to CA-IDMS is available with this release. This component allows you to directly access network data using special SAS System extensions for the standard SAS INFILE statement, along with DATA step programming statements. The INFILE statement extensions, along with the DATA step programming statements, allow you to generate DML calls to the database.

Appendix I, Implementing SAS/ACCESS® Interface to DB2 Software

Defining the Interface to DB2 and DB2 Users

Note: This task is required.

The DB2 data base administrator at your site must perform the following steps.

If you installed and implemented the Release 6.06, 6.07, or 6.08 SAS/ACCESS Interface to DB2, and completed the `BIND` and `GRANT` steps at that time, you do not need to repeat them for Release 6.09.

Step 1: Bind the DBRMs into an application plan (required).

You can bind the application plan by using the `BIND` option from the DB2I panels under ISPF. Alternatively, you can issue the `BIND` command from TSO through the DSN command processor running in either foreground or background. A new plan will be created. If a plan with this name already exists on your system, it will be replaced.

The syntax of the `BIND` command is:

```
BIND PLAN(SASDB2E)
  MEMBER(SASDB2E,SASDB2L)
  LIBRARY('&prefix.DBRM') ISOLATION(CS)
```

If you plan to use DRDA support, you must regenerate plan SASDB2E to include:

1. bind packages for each server you plan to access
2. bind for the plan that must include all bind packages.

The syntax for binding packages and the plan is:

```
BIND PACKAGE(server1.userid) OWNER(userid) QUALIFIER(userid)
  MEMBER(SASDB2E) ACTION(REPLACE) ISOLATION(CS)
  LIBRARY('&prefix.DBRM')

BIND PACKAGE(server2.userid) OWNER(userid) QUALIFIER(userid)
  MEMBER(SASDB2E) ACTION(REPLACE) ISOLATION(CS)
  LIBRARY('&prefix.DBRM')

BIND PLAN(SASDB2E)
  PKLIST(server1.userid.SASDB2E,
         server2.userid.SASDB2E)
  ACTION(REPLACE) ISOLATION(CS)
```

Step 2: Grant EXECUTE authority to users (required).

Grant `EXECUTE` authority for the plan created by the `BIND` command to all users of the plan or to `PUBLIC` for general use. Issue the `GRANT` command as follows:

```
GRANT EXECUTE ON PLAN SASDB2E TO userid
```

Step 3: Set the `DB2SSID=` SAS system option to match a valid DB2 subsystem identifier at your site.

Contact a DBA at your site to obtain this default value.

Customizing the SAS CLIST and Cataloged Procedure

Note: This task is required.

If the DB2 interface is used extensively at your site, and if your DB2 system load library is not a link list library, you may want to modify the SAS CLIST and cataloged procedure to allocate your DB2 system load library by default. See Steps 1 and 2, which follow, for the changes to make.

If you do not make the changes described in Steps 1 and 2, users must specify the `LOAD` operand shown in the following example when invoking the CLIST. The user must also specify the `LOAD=` parameter when executing the cataloged procedure to concatenate your DB2 system load library.

Note: The concatenation order of the `SAS LOAD LIBRARY` and the load library for data base access may be interchanged. Generally, if more database access activities will occur in the SAS session or batch job, place the data base load library first in the concatenation (or ahead of the `SAS LOAD LIBRARY`). The opposite is true when SAS processing dominates the session or JOB.

- ❑ Enter the following command under TSO to start a SAS session in which you will execute the DB2 interface:

```
SASname LOAD('''your.db2.loadlib''')
```

where `your.db2.loadlib` is the DB2 system load library and `SASname` is the name of the CLIST you use to invoke the SAS System.

- ❑ To use the DB2 interface with the SAS cataloged procedure, use the `LOAD=` parameter of the PROC to specify your site's DB2 load library. For example, you can use the following code in your JCL:

```
//SASDB2     EXEC SASname,LOAD='your.DB2.loadlib'
```

Step 1: Update your SAS CLIST (optional).

If the DB2 interface is used extensively at your site, you may want to alter the CLIST so that your DB2 load library is allocated and concatenated before the SAS load library in the `TASKLIB` symbol. Replace the following line in the installation-supplied CLIST (where `SASLOAD` is a replacement parameter in the CLIST):

```
SASLOAD (''')&prefix.LIBRARY''')+
```

with this line:

```
SASLOAD (''')your.db2.loadlib''  ''&prefix.LIBRARY''') +
```

Step 2: Update your SAS cataloged procedure (optional).

If the DB2 interface is used extensively at your site with the SAS cataloged procedure, you may want to permanently change the `STEPLIB DD` statement in your cataloged procedure. To always execute the SAS System using the DB2 interface, modify the `STEPLIB DD` statement in your cataloged procedure to reflect the following lines.

```
//STEPLIB   DD DISP=SHR,DSN=&LOAD
//          DD DISP=SHR,DSN=&prefix.LIBRARY
//          DD DISP=SHR,DSN=your.db2.loadlib
```

where `&prefix.LIBRARY` is the SAS System load library and `your.db2.loadlib` is the DB2 System load library.

Verifying Installation of SAS/ACCESS Interface to DB2 Software

Note: This task is required.

Step 1: Set up JCL to invoke the cataloged procedure you updated as described in the preceding Step 2. Include a `SYSIN DD` statement like the following to run the installation verification program for this product:

```
//SYSIN  DD  DISP=SHR,DSN=&prefix.TESTS(TESTDB2)
```

Step 2: Submit the job and verify the results.

This job should complete with return code 0.

Creating and Loading the Sample Tables

Note: This task is optional.

Refer to *SAS/ACCESS Interface to DB2: Usage and Reference, Version 6, First Edition* for a number of coding examples based on sample DB2 tables that can be created at your site. Creating these tables will assist the users at your site in learning how to use the SAS/ACCESS Interface to DB2 product.

The program to create these sample tables is in the SAMPLE library member `DBLDB2`. To execute this program, use the JCL as previously described, with the `SYSIN DD` card referring to the `DBLDB2` member in the SAMPLE library as follows:

```
//SYSIN DD DISP=SHR,DSN=&prefix.SAMPLE(DBLDB2)
```

SAS System Options for this Interface

Note: This task is optional.

Refer to *SAS/ACCESS Interface to DB2: Usage and Reference* for a list of the SAS system options for this interface. You may want to review these during installation. All options have defaults.

The options applicable to this interface are invocation options. That means you can change them when you invoke the SAS System, but not during a SAS session. Some system options are also data set options; these can be changed during a SAS Procedure or DATA step.

You are allowed to restrict changes to invocation options by placing them in the Restricted Options Table, `SASOP609`. This process is described in "Customizing Default Options and System Configuration Files," in Section II, Part 1 of this document.

One option, `DB2UPD=`, is suggested as a restricted option. The `DB2UPD=` option determines whether the SAS/ACCESS for DB2 engine can perform both read and update operations, or is restricted to read only. The default option value, `Y`, specifies that both reads and updates are allowed. The option value, `N`, specifies that the engine can only read DB2 data; any attempt to update a DB2 file results in an error.

Another option that you may want to include is `DB2PKCHK`. If you set this option to yes, the interface checks the DB2 catalogs to see if any primary keys exist for a table. If a primary key is found, it is honored. The default option value is `N`. When no is specified for this option, the DB2 catalogs are not checked.

Appendix J, Implementing SAS/ACCESS® Interface to IMS Software

Customizing the SAS CLIST and Cataloged Procedure

Note: This task is required.

If the IMS interface is used extensively at your site, you may want to alter the CLIST and cataloged procedure so that your IMS libraries are allocated and concatenated.

Note: The concatenation order of the `SAS LOAD LIBRARY` and the load library for data base access may be interchanged. Generally, if more database access activities will occur in the SAS session or batch job, place the data base load library first in the concatenation (or ahead of the `SAS LOAD LIBRARY`). The opposite is true when SAS processing dominates the session or JOB.

Step 1: Determine the IMS library data set names and identify the IMS libraries you need to allocate at your site.

In order to access your IMS databases, you need to add allocations for the following IMS data sets to your SAS CLIST and cataloged procedure:

- ❑ `DFSRESLB`
- ❑ `DFSVSAMP` (only required for VSAM and OSAM access methods, as defined in the dbd)
- ❑ `IEFRDER`
- ❑ `IMS`
- ❑ `DD` statements for your IMS databases if using DLI or DBB region.

Depending on how your site runs IMS, you may also want to add allocations for these additional data sets:

- ❑ `IMSACB`
- ❑ `IMSERR`
- ❑ `RECON1`
- ❑ `RECON2`

Step 2: Add allocations to your SAS CLIST, specifying your IMS library data set names as determined in Step 1.

Replace the following line in the installation-supplied CLIST (where SASLOAD is a replacement parameter in the CLIST) so that your IMS `RESLIB` is concatenated before the SAS Load library in the `TASKLIB` symbol.

Replace the following:

```
SASLOAD ('''&prefix.LIBRARY''')
```

with the following:

```
SASLOAD ('''your.ims.reslib'' ''&prefix.LIBRARY''')
```

Add the following parameter at the top of the default CLIST to allow optional user input of the `IMS LOG IEFRDER` data set name:

```
/* --------Allow IMS LOG DSN input ---------------------- */ +
     IMSLOG(NULLFILE)    /* IMS LOG DSN                   */ +
```

Add lines like the following in the default SAS CLIST to allocate required IMS libraries:

```
ALLOC F(DFSRESLB) DA('your.ims.reslib') SHR &SU11
ALLOC F(IMS) DA('your.ims.psblib' 'your.ims.dbdlib') SHR &SU11
IF &STR(IMSLOG) NE THEN ALLOC F(IEFRDER) DA('&IMSLOG.') OLD
ALLOC F(DFSVSAMP) DA('your.parmlib(DFSVSAMP)') SHR &SU11
ALLOC F(database) DA('your.ims.database') OLD
```

Note: You only need to allocate your data base data sets with disposition `OLD` if you will be writing to them with the SAS/ACCESS software.

If needed, add lines like the following immediately after the statements you added for required IMS libraries:

```
ALLOC F(IMSACB) DA('your.ims.acblib') SHR &SU11
ALLOC F(RECON1) DA('your.recon1') SHR &SU11
ALLOC F(RECON2) DA('your.recon2') SHR &SU11
ALLOC F(IMSERR) DA('your.dump.data set') SHR &SU11
```

Step 3: Add allocations to your SAS cataloged procedure, specifying your IMS library data set names as determined in Step 1.

Concatenate your `IMS RESLIB` to your `STEPLIB` statement in your default SAS cataloged procedure as follows:

```
//STEPLIB DD DISP=SHR,DSN=&LOAD
//         DD  DISP=SHR,DSN=&prefix.LIBRARY
//         DD  DISP=SHR,DSN=your.ims.reslib
```

where `&prefix.LIBRARY` is the SAS System load library and `your.ims.reslib` is the IMS `RESLIB` library.

Add lines like the following in your default SAS cataloged procedure. If you want to use the IMS LOG facility, be sure to include appropriate `DD` specifications for your site in the `IEFRDER DD` statement.

```
//DFSRESLB DD  DISP=SHR,DSN=your.ims.reslib
//IMS      DD  DISP=SHR,DSN=your.ims.psblib
//         DD  DISP=SHR,DSN=your.ims.dbdlib
//IEFRDER  DD  DSN=NULLFILE,DISP=(,KEEP),
//              UNIT=(TAPE,,DEFER),VOLSER=xxxxxx,
//              DCB=(RECFM=VB,BLKSIZE=1920,LRECL=1916,
//              BUFNO=2)
//database DD  DISP=OLD,DSN=your.ims.database
```

Note: You only need to allocate your data base data sets with disposition `OLD` if you will be writing to them with the SAS/ACCESS software.

If needed at your site, also add lines like the following in your default SAS cataloged procedure:

```
//IMSACB DD  DISP=SHR,DSN=your.ims.acblib
//RECON1 DD  DISP=SHR,DSN=your.recon1
//RECON2 DD  DISP=SHR,DSN=your.recon2
//IMSERR DD  DISP=SHR,DSN=your.dump.dataset
```

Verifying Installation of SAS/ACCESS Interface to IMS Software

Note: This task is required.

Step 1: Set up JCL to invoke the cataloged procedure you updated as described in the preceding Step 3.

Include a `SYSIN DD` statement like the following to run the installation verification program for this product:

```
//SYSIN  DD  DISP=SHR,DSN=&prefix.TESTS(TESTIMS)
```

Step 2: Submit the job and verify the results.

This job should complete with return code `0`.

SAS System Options for this Interface

Note: This task is optional.

Refer to Appendix 1 in *SAS/ACCESS Interface to IMS-DL/1, Usage and Reference, Version 6, Second Edition* for a list of the SAS system options for this interface. You may want to review these during installation. All options have defaults.

The `BMPREAD=, DLIREAD=, IMSDLUPD=, IMSBPUPD=, IMSREGTP=, IMSID=, and IMSWHST=` options for this interface are invocation options. That means you can change them when you invoke the SAS System, but not during a SAS session. All other options are classified as session options.

You are allowed to restrict changes to invocation options by placing them in the Restricted Options Table, `SASOPTRS`. This process is described in "Customizing Default Options and System Configuration Files" in Section II, Part 1 of this document.

`IMSDLUPD=`, `BMPREAD=`, `DLIREAD=`, and `IMSBPUPD=` are suggested as restricted options. The `IMSDLUPD=` and `IMSBPUPD=` options determine whether the SAS/ACCESS for IMS engine can perform both read and update operations, or is restricted to read only. The default option value, `Y`, specifies that both reads and updates are allowed. The option value, `N`, specifies that the engine can only read IMS data; any attempt to update an IMS file results in an error. The `BMPREAD=` and `DLIREAD=` options determine whether the SAS/ACCESS Interface to IMS Data Step can perform both read and update operations, or is restricted to read only. The default value, `N`, allows update processing. The option value, `Y`, causes the SAS System to return a status code of `SE` and set `_ERROR_=1` if a DL/I update call is issued. For more information about these options, refer to *SAS/ACCESS Interface to IMS-DL/I, Usage and Reference, Version 6, Second Edition*.

Appendix K, Implementing SAS/ACCESS® Interface to ORACLE Software

Linking the ORACLE RDBMS Interface Subroutines

Note: This task is required.

The modules SASORA6 and SASORA7 are shipped with SAS/ACCESS Interface to ORACLE software to provide the ORACLE application interface support. The module SASORA6 is used to access ORACLE Version 6 systems, and SASORA7 is used to access ORACLE Version 7 systems. You will need to decide whether your site requires access to ORACLE Version 6, Version 7, or both.

Once you have linked these modules, you may need to relink them if you install additional ORACLE products, or if you install a new version of ORACLE.

Note: SAS/ACCESS to ORACLE software requires either the SASORAV6, or the SASORAV7 module. Do not change the name of these modules.

Step 1: Create the load module(s) (required).

The member `OCLPOST` of the `CNTL` data set contains JCL for linking the SASORA6 and SASORA7 load modules. If you want to link SASORAV6 for ORACLE Version 6, comment out the Version 7 lines and uncomment the Version 6. Alternatively, if you want to link SASORAV7 for ORACLE Version 7, comment out the Version 6 lines and uncomment the Version 7. Remove the appropriate step if you will not be using that version of ORACLE. Specify your site's data set name for the ORACLE SQLLIB as indicated.

Submit the job and verify successful completion.

Customizing the SAS CLIST and Cataloged Procedure (Required)

The SAS System option `ORAVER=` controls the version of ORACLE that you use in your SAS session. The default is `V7`, which means that the SAS session will expect to access ORACLE Version 7 libraries. If you want to use ORACLE Version 6, set the `ORAVER=` option to `V6`.

If the ORACLE interface is used extensively at your site, and if your ORACLE system load library is not a link list library, you may want to modify the SAS CLIST and cataloged procedure to allocate your ORACLE system load library by default. See Steps 1 and 2 below for the changes to make.

If you do not make the changes described in Steps 1 and 2, users must specify the LOAD operand shown below when invoking the CLIST and the LOAD= parameter when executing the cataloged procedure to concatenate your ORACLE system load library.

- Enter the following command under TSO to start a SAS session in which you will execute the ORACLE interface:

```
SASname LOAD('''your.oracle.cmdload''')
```

  where your.oracle.cmdload is the ORACLE system load library and SASname is the name of the CLIST you use to invoke the SAS System.

- To use the ORACLE interface with the SAS cataloged procedure, use the LOAD= parameter of the PROC to specify your site's load library. For example, you can use the following code in your JCL:

```
//SASORA EXEC SASname,LOAD='your.Oracle.cmdload'
```

Step 1: Update your SAS CLIST (Optional)

If the ORACLE interface is used extensively at your site, you may want to alter the CLIST so that your ORACLE load library is allocated and concatenated before the SAS load library in the TASKLIB symbol. Replace the following line in the installation-supplied CLIST (where SASLOAD is a replacement parameter in the CLIST):

```
SASLOAD('''prefix.LIBRARY''')+
```

with this line:

```
SASLOAD('''your.Oracle.cmdload'' ''prefix.LIBRARY''')+
```

Step 2: Update your SAS cataloged procedure (optional)

If the ORACLE interface is used extensively at your site with the SAS cataloged procedure, you may want to make the STEPLIB DD statement change permanent to your cataloged procedure. To always execute the SAS System using the ORACLE interface, modify the STEPLIB DD statement in your cataloged procedure to reflect the following lines.

```
//STEPLIB   DD DISP=SHR,DSN=&LOAD
//          DD DISP=SHR,DSN=prefix.LIBRARY
//          DD DISP=SHR,DSN=your.sas.loadlib
```

where prefix.Library is the SAS System load library and your.Oracle.cmdload is the ORACLE System load library.

Verifying Installation of SAS/ACCESS Interface to ORACLE Software (Required)

Step 1: **Set up JCL to invoke the cataloged procedure you updated as described in Step 2 above. Include a SYSIN DD statement like the following to run the installation verification program for this product:**

```
//SYSIN DD DISP=SHR,DSN=&prefix.TESTS(TESTORL)
```

Step 2: **Run the job and verify the results.**

This job should complete with return code 0.

Creating and Loading the Sample Tables (Optional)

Refer to *SAS/ACCESS Interface to ORACLE: Usage and Reference* for coding examples based on sample ORACLE tables that can be created at your site. Creating these tables will assist the users at your site in learning how to use the SAS/ACCESS Interface to ORACLE product.

The program to create these sample tables is in the SAMPLE library member DBLORA. To execute this program, use the JCL as previously described, with the SYSIN DD card referring to the DBLORA member in the SAMPLE library as follows:

```
//SYSIN DD DISP=SHR,DSN=&prefix.SAMPLE(DBLORA)
```

Appendix L, Implementing SAS/ACCESS® Interface to SYSTEM 2000® Software

Customizing the SASS2K CLIST and Cataloged Procedure

Note: This task is required.

Step 1: Edit the `S2EDITP` member of the `CNTL` data set and specify the parameter values as described in the following.

- ❑ **`S2KLOAD=`** your SYSTEM 2000 LOAD library where SYSTEM 2000 is installed
- ❑ **`S2KTEST=`** the name of the test library where SYSTEM 2000 is installed at your site
- ❑ **`S2KCNM=`** the name of the CLIST to be installed to invoke the SAS System and the SYSTEM 2000 Interface, referred to in this appendix as the `SASS2K` CLIST
- ❑ **`S2KPNM=`** the name of the cataloged procedure to be installed to invoke the SAS System and the SYSTEM 2000 Interface, referred to in this appendix as the `SASS2K` cataloged procedure
- ❑ **`TS2K=`** the name of the CLIST you previously installed with SYSTEM 2000 to invoke SYSTEM 2000
- ❑ **`TS2KFREE=`** the name of the CLIST previously installed with SYSTEM 2000 to free all SYSTEM 2000 files.

Step 2: Submit the `S2KPOST` job.

This job modifies the `SASS2K` CLIST and cataloged procedure with the `S2EDITP` parameter values, and copies them to `&prefix.CLIST` and `&prefix.PROCLIB`, respectively.

Executing the SASS2K CLIST to Access the SAS System

Note: This task is required.

Step 1: Verify the S2KLLIB parameter in the SASS2K CLIST.

The SASS2K CLIST is located in &prefix.CLIST under the name that you supplied in S2EDITP. The SASS2K CLIST has two functions. The first function is to allocate all the files that are necessary to access SYSTEM 2000 databases, while the second function is to execute the SAS System.

All the SYSTEM 2000 file allocations are isolated in a CLIST called S2K that is delivered with the base SYSTEM 2000 product. The SASS2K CLIST calls the S2K CLIST to allocate the files, but not to execute SYSTEM 2000. The SASS2K parameters that do not apply to the SAS System are there to pass options to the S2K CLIST. Refer to the SYSTEM 2000 installation instructions for an explanation of these parameters.

The S2KLLIB parameter is modified by the S2KPOST job to reflect the value you specified for the S2KLOAD= parameter in the S2EDITP member of the CNTL data set; however, you should verify that the S2KLLIB parameter in the SASS2K CLIST refers to your site's SYSTEM 2000 load library as follows:

```
S2KLLIB ('''your.S2K.loadlib''') +
```

Step 2: If you have not received the base SAS product on your installation tape, verify that the SASS2K CLIST's default values match those in your site's SAS and S2K CLISTs.

If you have received the base SAS product, these default values were already modified by S2KPOST job.

Move the SASS2K CLIST to the standard location for CLISTs at your site.

Step 3: Execute the SASS2K CLIST to access SYSTEM 2000 database via the SAS System.

Executing the Cataloged Procedure to Access the SAS System

Note: This task is required.

The `SASS2K` cataloged procedure performs the same function for the batch environment as the `SASS2K CLIST` provides for the TSO environment. The procedure allocates the necessary files to access SYSTEM 2000 databases and executes the SAS System.

Step 1: Verify that your site's SYSTEM 2000 libraries are allocated as desired.

Step 2: Run a batch job to invoke the cataloged procedure to access SYSTEM 2000.

Testing with Sample Data

Note: This task is optional.

Refer to *SAS/ACCESS Interface to SYSTEM 2000 Data Management Software: Usage and Reference, Version 6, First Edition* for coding examples based on the `EMPLOYEE` data base that is delivered with the SYSTEM 2000 product. These examples can help the users at your site learn how to use the SAS/ACCESS Interface to SYSTEM 2000 software. The SAS sample files contain SAS programs for creating additional files used in the documentation. The sample files also contain SAS programs, catalogs, and data files used in the document.

Step 1: Refer to the SYSTEM 2000 installation instructions for information on restoring the `EMPLOYEE` database.

Step 2: Refer to the (optional) `SAMPLE` library unloaded at installation time for the sample programs used as examples in the Usage and Reference guide and in the *SYSTEM 2000 Software Sampler, Version 6 Edition.*

Note: The (optional) `SAMPSIO` SAS data library for the SAS/ACCESS Interface to SYSTEM 2000 unloaded at installation time contains sample SAS data files, SAS/ACCESS views, and SAS catalogs that correspond to the examples found in the *SYSTEM 2000 Software Sampler, Version 6 Edition*.

Verifying Installation of SAS/ACCESS Interface to SYSTEM 2000 Software

Note: This task is required.

The job S2VALID included in the CNTL data set validates your SAS/ACCESS Interface to SYSTEM 2000 software installation. Run this job only after the SAS/ACCESS Interface to SYSTEM 2000 software has been installed.

Step 1: Submit the S2VALID job (member S2VALID of the CNTL data set).

This job verifies the correct installation and customization of the SAS/ACCESS Interface to SYSTEM 2000 software. Although the VALID job is run during installation of the SAS System, the S2VALID job provides a more in-depth validation test specifically written for the SAS/ACCESS Interface to SYSTEM 2000 software.

Step 2: Check the SAS log to verify that the S2VALID job has completed successfully.

You should not receive any errors, and the job should finish with a completion code of zero.

Note: If you receive errors while executing the S2VALID job, and you cannot determine their cause, contact the Technical Support Division at SAS Institute, using the method described in the introduction to this document.

Appendix M, Implementing the SAS System under MSP

Users of Fujitsu's MSP operating system should read these special considerations before proceeding with the installation.

Setting Up Entry Points

SAS module entry point names under MSP must be specified as follows:

- unbundled, non-LPA resident load module `SASHOSTF`
- bundled, non-LPA resident load module `SASXA1F`
- bundled, LPA resident load module `SASXALF`

The appropriate entry point must be declared in the `ENTRY=` parameter of `SASEDITP` in the section *Specifying Installation Parameters* of Part 2, "Installing the SAS System".

Implementing TSS Support

Step 3 of *Post-Installation Processing* (*Implementing SAS TSO Support*) requires users to copy module SASCP to a TSO command library. MSP TSS users must also copy alias `SASCPF` and this alias name must be the module name invoked from the SAS CLIST. A sample CLIST (`FUJICLST`) can be found within the `CNTL` data set created during the installation of this software. Please note that the entry point specified with the CLIST should be changed from `SASHOSTFF` to one of those specified above.

Configuration Options

MSP users must specify these configuration options:

Sorting	`SORTANOM=235` `DYNALLOC`
Fujitsu terminal users	`FSMODE=FACOM`

SMF Processing Zap

If SMF processing is required, the following zap must be applied to the distributed `SVC` module prior to its inclusion in your LPA library.

```
NAME        SVC0MVS

VER         0006        9113,3074
REP         0006        9112,3074
```

SAS/GRAPH Driver Customization

If installing the GSP SAS/GRAPH driver, edit and submit the following job.

```
//**********************Your Job Cards************************
//*
//LINKGSP   EXEC  PGM=JQAL, PARM='LIST,LET,CALL' ,REGION=1024K
//SYSPRINT  DD    SYSOUT=*
//SYSLIB    DD    DSN=SYS1.TGSLIB, DISP=SHR
//SYSLMOD   DD    DSN=SAS.SAS608.LIBRARY, DISP=SHR
//SYSUT1    DD    UNIT=SYSDA, SPACE=(1024, (200,20))
//SYSLIN    DD    *
      INCLUDE     SYSLMOD (SASGSPX)
      MODE        AMODE(31),RMODE (ANY)
      ENTRY       SASGSP
      NAME        SASGSP (R)
/*
```

Modify underlined data set names to your installation standards. Confirm the successful installation of the GSP interface driver by running a simple SAS/GRAPH test, such as the following (for 6683 terminal with graphics feature installed):

```
GOPTIONS DEV=GSP6683;
PROC GTESTIT PIC=1; RUN;
```

Ensure that the terminal is defined for GSP display (by running a non-SAS program invoking GSP display subroutines).

Special Considerations

While SAS Institute endeavors to provide as fully functional a release as possible to MSP users, there may be some functions described (for example, in the publication *SAS Companion for the MVS Environment, Version 6*) that prove to be inoperable under MSP. SAS Institute will investigate and remedy such deficiencies if possible.

Appendix N, Implementing SAS/ACCESS Interface to SymfoWARE Software

Customizing the SAS CLIST and Catalogued Procedure

Note: This task is required.

Invoking the SymfoWARE interface requires that several load library and database definitions be provided via your SAS CLIST and catalogued procedure. These definitions are the following.

- AIM load library, containing SymfoWARE system modules. This library may be concatenated ahead of or behind the SAS LOAD LIBRARY depending upon whether SAS processing or database activities dominate the SAS session or batch job.

  To invoke the AIM load library under TSS, either enter the following command:

  ```
  SASname LOAD('''your AIM loadlib''')
  ```

  where *SASname* is the name of your SAS CLIST and *your AIM loadlib* is your AIM system load library containing SymfoWARE system modules.

  or:

  Update your SAS CLIST to permanently invoke the AIM system load library. To do this, replace the following line in your installation supplied CLIST.

  ```
  SASLOAD('''&prefix.LIBRARY''')
  ```

  with:

  ```
  SASLOAD('''your AIM loadlib'' ''prefix.LIBRARY''')
  ```

  To invoke the AIM system load library in batch via your SAS catalogued procedure, you may either identify the AIM load library via the `LOAD=` parameter of the SAS PROC, for example:

  ```
  //SASSYM EXEC  SASname,LOAD='your AIM loadlib'
  ```

  where *SASname* is the name of your SAS catalogued procedure.

Or, alternatively, you may wish to permanently invoke the AIM system load library by changing the STEPLIB concatenation in your SAS catalogued procedure, for example:

```
//STEPLIB      DD    DISP=SHR,DSN=&LOAD
//             DD    DISP=SHR,DSN=your AIM loadlib
//             DD    DISP=SHR,DSN=&prefix.LIBRARY
```

- The name of the data set that comprises the database space for metadatabases and public databases. This data set is allocated during metadatabase definition, as performed by your database administrator according to the specifications outlined in the Fujitsu manual ***OSIV SymfoWARE Server RDB USER'S GUIDE***. An example of such a definition is contained within the sample files on the installation tape.

  The data set is defined via the filename/DDname SYSDBDCT. An example of a SAS CLIST definition would be the following.

  ```
  ALLOC    F(SYSDBDCT) DA('USERID.RDB.MD01') SHR
  ```

  A JCL definition within the SAS catalogued procedure might appear as the following.

  ```
  //SYSDBDCT     DD    DSN=USERID.RDB.MD01,DISP=SHR
  ```

- The names of the PED and APG definitions that apply to the metadatabases and public databases you wish to use. These definitions are made by your database administrator according to the specifications outlined in the Fujitsu manuals ***OSIV SymfoWARE Server RDB USER'S GUIDE*** and ***AIM ADL Reference Manual***. An example PED definition is included with the sample files on the installation tape.

  You invoke these definitions within your SAS CLIST via the AIMALLOC command, for example:

  ```
  AIMALLOC PED(PEDXXX) APG(APGYY)
  ```

  where PEDXXX and APGYY are names chosen by your database administrator according to site standards.

  To free the PED after use, include the command:

  ```
  AIMFREE  PED(PEDXXX)
  ```

  To invoke these definitions within your SAS catalogued procedure, code a JCL statement as follows:

  ```
  //AIMPED DD    SUBSYS=(AIM,PEDXXX,APGYY)
  ```

- The AIM system batch utility JYQDDUTY is supplied for database creation and deletion and for schema manipulation. The output data sets used by this utility are SYSPRINT and SYSULIST. These are sequential data sets with logical record size of 255 and VBA record format. It is preferable that database manipulation be conducted via JYQDDUTY, for example CREATE TABLE, DROP TABLE. However, SAS/ACCESS Interface to SymfoWARE software can be used to perform these functions via the EXECUTE interface. If the interface is invoked to perform these functions, the output data sets described above must be provided in the SAS CLIST and/or SAS catalogued procedure, for example:

```
ALLOC           F(SYSPRINT) SYSOUT(A)
ALLOC           F(SYSULIST) SYSOUT(A)
. . . . . .
FREE            F(SYSPRINT)
FREE            F(SYSULIST)

//SYSPRINT      DD          SYSOUT=*
//SYSULIST      DD          SYSOUT=*
```

Verifying Installation of SAS/ACCESS Interface to SymfoWARE Software

Note: This task is required.

Step 1: Unload the sample jobs and data from the tape labeled *SAS/ACCESS to SymfoWARE, Sample Jobs and Data*, which accompanies your SAS System, Release 6.09 maintenance tape. You can do this by submitting a job similar to the following:

```
//UNLOAD   EXEC  PGM=IEBCOPY
//SYSPRINT DD    SYSOUT=*
//SYSUT3   DD    UNIT=uuuu,SPACE=(CYL,(1,1))
//SYSUT4   DD    UNIT=uuuu,SPACE=(CYL,(1,1))
//CNTLIN   DD    DSN=SAS609.SYMFO.CNTL,UNIT=uuuu,
//               LABEL=(1,SL),VOL=SER=vvvvvv
//CNTLOUT  DD    DSN=your.cntl.dataset,DISP=OLD
//SYSIN          DD    *
           COPY INDD=CNTLIN,OUTDD=CNTLOUT
//*
```

This step will unload these members into your CNTL data set:

SYMINST	installation procedure and job
SYMCOPY	COPY statement for SYMINST job

Edit SYMINST to select site-specific parameters and submit for execution. This job will unload a verification job (TESTRD2), a sample database definition job (RD2EX), a SAS sample program (RD2SAMP) and two sequential data files (ORDERS and CUSTS).

Step 2: Set up JCL to invoke the catalogued SAS procedure you updated as described in the *Customizing the SAS CLIST and Catalogued Procedure* section. Include a `SYSIN` statement like the following to run the installation verification program for this product:

```
//SYSIN    DD    DISP=SHR,DSN=&prefix.SAMPSRC(TESTRD2)
```

where `&prefix.SAMPSRC` is the data set allocated and loaded in the `SYMINST` job.

Step 3: Submit the job and verify the results. This job should complete with return code 0.

Creating and Loading the Sample Tables

Note: This task is optional

After you have installed the `SAMPLE` library, you will find it contains two members. The first of these is member `RD2EX`, which consists of five sample jobs to define a metadatabase, public databases, tables, DSO and DSI definitions, initialize the DSIs, and load the tables from supplied data files. This member also contains a sample `PED` definition.

The second member is `RD2SAMP`, which contains a series of SAS `PROC SQL` statements to test various functions supported by SAS/ACCESS Interface to SymfoWARE software. Having performed the required definitions and data loads, you can invoke these SAS statements by executing your SAS catalogued procedure as previously described and referring to the `RD2SAMP` member in the `SAMPLE` library as follows:

```
//SYSIN     DD    DISP=SHR,DSN=&prefix.SAMPSRC(RD2SAMP)
```

SAS System Options for this Interface

There are two options that are relevant to SAS/ACCESS Interface to SymfoWARE software.

SAS System Option `DB2UPD=Y`

This option determines whether SAS/ACCESS to SymfoWARE software can perform both read and update operations or is restricted to read only operations. The default option value, `Y`, specifies that both read and updates are allowed. The option value, `N`, specifies that it can only read data. An attempt to update SymfoWARE data will result in an error.

Connection argument `DSO=Y`

This argument is optional and is specified to SAS/ACCESS to SymfoWARE software via the `CONNECTION` statement. For example:

```
Connect to Symfo (dso=y);
```

The default is `DSO=N`. If `DSO=Y` is specified, SAS/ACCESS to SymfoWARE software can perform certain functions against DSO type databases that are

normally performed by the utility program `JYQDDUTY`, e.g., `CREATE TABLE`, `INITIALIZE DSI`, etc.

Appendix O, 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 MVS and outline configuration procedures for those access methods that require additional configuration.

The access methods supported for MVS are TELNET, TCP/IP, and APPC. They are described in the order listed. Refer to the appropriate sections for the access methods that you will be using at your site for requirement information. Remote capability for the ASYNC, PC3270, PCLINK, and RSAS7171 access methods supported in previous releases is available in this release as well. There is no change in the requirements for these access methods, so they will not be discussed 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 value of the `SASSCRIPT` option can be a logical name or one or more concatenated PDS names. The install process places the script files into your `&prefix.CTMISC` data set.

The simplest way for you to give your users automatic access to the installed sample script files is to assign a physical name to the `SASSCRIPT` option in your system configuration file or `DFLTOPTS` table:

```
SASSCRIPT="&prefix.CTMISC"
```

where `&prefix.CTMISC` specifies your installation `CTMISC` data set name. See the "System Manager's Guide" in Section II of this document for details on updating the configuration files and `DFLTOPTS` table.

You can also specify other PDS names to concatenate behind your `&prefix.CTMISC` data set in the preceding example, or assign a logical name to the `SASSCRIPT` option. When you use a logical name, update your site's SAS CLIST to allocate the appropriate script data sets using the logical name specified as the DD name. For example, the following line could be added to your system configuration file or `DFLTOPTS` table:

```
SASSCRIPT=SASSCRIP
```

and the following statement could be added to your CLIST, following the `SAMPSIO` allocation:

```
/*
/* Allocate SASSCRIP for CONNECT scripts
/*
ALLOC F(SASSCRIP) DA('&prefix.CTMISC') SHR &SU11
```

System Configuration for the TELNET and TCP Access Methods

Using the TELNET or TCP access method, a user on MVS 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 software licensed. With the TCP/IP 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. Both the TCP/IP and TELNET access methods require line-mode TELNET on the remote host in order for a connection to be established through SAS/CONNECT software.

Software Requirements

SAS/CONNECT software requires SAS/C Transient Library Release 5.50 or later and one of the following levels of system software to support the TCP/IP access method:

- ❑ IBM TCP/IP Release 2.0 or later
- ❑ Interlink's SNSTCP, Version 2.0 or higher.

The SAS/C Transient Library has an open architecture that permits the use of TCP/IP products from different vendors. Vendors enable the transient library to utilize their communication software by providing a compatible SAS/C transient library module. The SAS/C transient library loads this module and directs communication to it. This requires that the module meet a defined interface for how it will be called by the SAS/C library. The IBM TCP/IP interface module is shipped by SAS Institute in the SAS/C transient library. If you have a product from another vendor, then you must obtain a module from them. Additional vendors will be added to the above list as they are verified.

Installing the SAS/C Transient Library

Note: This task is required in order to use the TELNET or TCP/IP access method.

The SAS TCP/IP access method for MVS uses routines in the SAS/C Transient Library for communication services. The library is included with both the SAS/CONNECT and SAS/SHARE products. If your site has installed release 5.50 of the SAS/C transient library you must either replace it with the included transient library (see installation below) or apply zap Z5500974 to your installed library. If your site does not have this library installed or if your site has an earlier version installed, you must install the included transient library as follows:

Step 1: Install the SAS/C Transient Library.

The `CNTL` data set member `ULCTRANL` contains JCL updated with job, `&_prefix` and allocation information you supplied in the `SASEDITP` member. If you run this job as supplied, it unloads the SAS/C Transient Library Version 5.50 or later from your install tape to a data set named `&prefix.SASC.TRANSLIB`.

If you want a different name for the library, modify the JCL in `ULCTRANL`. Change the `DSN=` on the `SASCTRAN` DD statement in the `IEFBR14` step and on the `DDOT0` DD statement in the `IEBCOPY` step.

Submit the job and verify successful completion.

Step 2: Allocate the SAS/C Transient Library for SAS execution.

Modify your SAS `CLIST` to add a `CTRANS` allocation as follows:

```
ALLOC F(CTRANS) DA('your.sasc.translib') SHR &SU11
```

Modify your SAS cataloged procedure to allocate the SAS/C Transient Library as follows:

```
//CTRANS          DD DSN=your.sasc.translib,
//                DISP=SHR
```

Note: If you choose to install your SAS/C Transient Library to a link list data set, you do not need to allocate it in your CLIST and cataloged procedure.

Network Configuration Data for TCP/IP

The operation of the TCP/IP access method depends on its ability to access the configuration information for a site. This section discusses the location of site configuration files and provides a detailed explanation of how the SAS/C transient library finds these files.

You should have already created the relevant files this section discusses when you installed your communications software, such as IBM TCP/IP.

IBM's TCP/IP

The SAS System uses IBM's TCPIP.DATA file or TCPPARMS file to determine resolver configuration and IBM defaults. By default, SAS will search the following to locate the configuration data set:

- TCPIP.TCPIP.DATA
- SYS1.TCPPARMS(TCPDATA)

If your configuration file is not in one of the default locations, the TCPIPPRF= SAS system option can be set to the TCP/IP prefix of your IBM files. For example, if your TCPIP.DATA file is installed in SYS2.VER2.TCP.TCPIP.DATA, the TCPIPPRF option should be set to SYS2.VER2.TCP.

If you do not use IBM defaults for resolver configuration, refer to the section, "Ensure TCP/IP Configuration Data is Accessible" below.

Interlink's SNS/TCP

Interlink provides an LSCNCOM interface to the SAS/C transient library. The LSCNCOM routine, and its alias L$CNCOM, should replace or be placed before the SAS-supplied module in the link-list search order. The routine is dynamically loaded on the first call to a SAS Socket Library function. The LSCNCOM interface will be searched for in the following locations:

- steplib(tasklib)
- lla(link list lookaside)
- lpa(link pack area)
- link list.

By default, SAS will use the Interlink name resolver. The SAS system option, ICSRSLV, can be used to specify the order in which the Interlink name resolver (DNR) and the SAS/C resolver are used. See the section, "Setting TCP/IP-Related SAS System Options" for more information.

If you do not use the Interlink name resolver (DNR), refer to the section "Ensure TCP/IP Configuration Data is Accessible" below.

For information on the LSCNCOM interface, refer to the Interlink documentation.

Ensure TCP/IP Configuration Data Is Accessible

Note: If you do not use IBM defaults for resolver configuration, or Interlink's name resolver (DNR), then this task is required in order to use the TELNET or TCP/IP access method.

The TCP/IP access method requires that certain data sets containing configuration data are available to the SAS System. The SAS System locates these data sets by their common DS name prefix. One of the methods below must be used to inform the SAS System of the DS name prefix of these data sets.

Most sites already have these data sets available for existing TCP/IP applications. Furthermore, if your site already has TCP/IP applications running under the SAS/C library, you have probably already completed this step.

Method 1: Use the default high-level qualifier `ETC`, or the default prefix `TCPIP`.

This is probably the most common and easiest way to configure your system; give the configuration data sets the `ETC` high-level qualifier, for example, `ETC.HOSTS` or `ETC.RESOLV.CONF`. If this convention is not possible at your site, and there are no conflicting DS names with the `ETC` high-level qualifier, you may utilize the default prefix to produce names like `TCPIP.ETC.HOSTS` or `TCPIP.ETC.RESOLV.CONF`.

For either style of default naming convention there are two restrictions. In each SAS session that acts as a local or remote execution, do not use the `TCPIPPRF=` option to override the default value of the TCP/IP prefix, `TCPIP`. Also do not apply the zap described in Method 2 to change the default value of the TCP/IP prefix in the transient library.

Method 2: Zap the default TCP/IP prefix to your prefix.

The default TCP/IP prefix is stored in a 26-character string array in `L$CNDBA` in the SAS/C transient library. You may change this value to suit your site's choice for configuration data set name prefix. For example, if names of the form `SYS.PROD.CONFIG.ETC.HOSTS` or `SYS.PROD.CONFIG.ETC.RESOLV.CONF` are desired, change the TCP/IP prefix to `SYS.PROD.CONFIG`. Apply zap number Z5504151 for this purpose.

Once the default TCP/IP prefix is changed, one restriction applies. In each SAS session that acts as a local or remote execution, do not use the `TCPIPPRF=` option to override the default value of the TCP/IP prefix.

Method 3: Use the `TCPIPPRF=` option to set your TCP/IP prefix.

The `TCPIPPRF=` SAS system option is an initialization time option that explicitly sets the TCP/IP prefix for that SAS session. Each local and/or remote SAS session that uses the TCP/IP access method must set this option to the site value at SAS invocation time. For example, if the names of your configuration data sets have the form `SYS2.VER2.TCP.ETC.HOSTS` or `SYS2.VER2.TCP.ETC.RESOLV.CONF`, set the option as follows:

```
TCPIPPRF=SYS2.VER2.TCP
```

This option is intended primarily for additional flexibility when more than one set of TCP/IP configuration data sets is available at a site.

Search Logic

The transient library uses the following methods to look for each of the configuration data sets where `dsname` is replaced by `ETC.RESOLV.CONF` or `ETC.HOSTS`.

- `<TSO prefix>.dsname` under TSO or `<userid>.dsname` under batch execution
- `dsname`, if the TCP/IP prefix has the default value, TCPIP.
- `<TCP/IP prefix>.dsname`, if <TCP/IP prefix> is not blank.

When the library finds a data set with one of the above names, the name is retained for the duration of the SAS execution. You may need to restart SAS to cause it to find a different filename.

Create an ETC.RESOLV.CONF File for Name Resolution

Note: This task is optional.

If you want to use the resolver for name server resolution, create a `<prefix.>ETC.RESOLV.CONF` file. IBM TCP/IP sites do not need this file. They can use the pre-existing `<prefix.>TCPIP.DATA` file to supply resolver configuration.

Finding Host Names and Addresses

Programs that need host names and addresses may use the `ETC.HOSTS` file, or they may call the resolver to contact the name server for the host name information.

If you are running a name server, the name server addresses are determined from the `ETC.RESOLV.CONF` file. If this file does not exist and you are using IBM's TCP/IP, the `TCPIP.DATA` file is used instead to determine resolver configuration and IBM defaults. The TCP/IP access method only recognizes the first three name servers specified in this file.

The transient library does not support the IBM TCPIP files, `HOSTS.LOCAL` and `HOSTS.SITEINFO`. The previous SAS TCP/IP access method used these files through Pascal transient library services. Sites that use these files must either switch to using name servers or create an equivalent `ETC.HOSTS` file.

The SAS/C transient library has default logic for finding host names and addresses. It uses this logic when interfacing to IBM TCP/IP. Other TCP/IP vendors may use this logic, augment it, or replace it. Refer to their documentation for details.

The default logic uses the following algorithm:

1. It looks for the `ETC.RESOLV.CONF` file, using steps 1, 2, and 3 of the search logic listed above. If it does not find this file, it goes to step 2. Otherwise, if the `nameserver` statement in this data set specifies the use of the resolver and name server, the library performs the specified queries. It returns any answer it receives. If attempts to connect to the nameservers are refused, it goes to step 3.

2. It looks for a data set in the format of the IBM TCP/IP file `TCPIP.DATA`, using steps 1 and 3 of the search logic listed above.

   If the `NSINTERADDR` statement in this data set specifies the use of the resolver and name server, the library performs the specified queries. It returns any answer it receives. If attempts to connect to the nameservers are refused, it goes to step 3.

3. It looks for an `ETC.HOSTS` file, using steps 1, 2, and 3 of the search logic listed above. If it finds an `ETC.HOSTS` file, it returns the result, including failure.

The determination of the domain name in name server queries follows the same logic as the `DOMAINORIGIN` statement of the `TCPIP.DATA` file.

Configuration Data Sets

On MVS, the following data sets usually contain site-dependent configuration information for TCP/IP:

- `ETC.HOSTS`
- `ETC.RESOLV.CONF`.

Note: There should be physical sequential (PS) files with any format such as FB or VB, and they should not contain line numbers.

The following is an example of the contents of an ETC.HOSTS file:

```
The form for each entry is:

<internet address> <official hostname> <aliases>

For example:

192.1.2.34 hpfcrm loghost

See the hosts(4) manual page for more information.
Note:  The entries cannot be preceded by a space.
The format described in this file is the correct format.
The original Berkeley manual page contains an error in the format
description.

127.0.0.1     localhost  loopback
151.174.130.8 bigserver.yourcompany.com bigserver
151.174.130.27 copland.yourcompany.com copland
151.174.130.28 ives.yourcompany.com ives
151.174.130.29 byrd.yourcompany.com byrd
```

The following is example contents of an ETC.RESOLV.CONF file:

```
domain yourcompany.com
nameserver 151.174.166.251
nameserver 151.174.52.151
nameserver 151.174.52.113
```

Setting TCP/IP-Related SAS System Options

The following SAS options are available as invocation options only.

```
sdssas s609...o('tcpipmch=name icrslv=<options>...
```

- ICSRSLV=ONLY | FIRST|LAST|NEVER

  This option is only useful to sites using Interlink's TCP/IP. The value of this option specifies the order in which the Interlink name revolver (DNR) and the SAS/C resolver are used. The value specified for the ICSRSLV option is stored in the SAS/C environment variable ICS_RESOLVER.

  - ONLY

    (default) call the Interlink name resolver only and return OK or error.

  - FIRST

    call the Interlink name resolver first and if there is an error, call the SAS/C resolver.

  - LAST

    call the SAS/C resolver first and if there is an error, call the Interlink name resolver.

- ❑ NEVER

  call the SAS/C resolver only and return OK or error.

- ❑ TCPIPMCH=name

  This option is useful to sites that run either multiple TCP/IP vendor packages or multiple instances of the same vendor's TCP/IP simultaneously. The TCPIPMCH option can be used to specify the name of the started task that is the instance of TCP/IP to be used.

  The value specified for the TCPIPMCH option is stored in the SAS/C environment variable TCPIP_MACH and defines the name of the address space running TCP/IP. The default value for the TCPIP_MACH environment variable for Interlink's TCP/IP is ACSS. For all other TCP/IP packages, the default is TCPIP.

Troubleshooting

Error messages that occur in SAS/C transient library routines that support the TCP/IP access method are written to the SASCTCPE DDname, if allocated, or to the terminal or JES2 log. The TCP/IP access method will write a message to the SAS log to reflect any situation described by a message generated by the transient library routines. The DDname of SASCTCPE has been reserved in order to redirect the error messages that may be generated by the SAS/C transient library routines. We recommend that you direct SASCTCPE to DUMMY to prevent error messages from being written to the terminal, including a message concerning the lack of a defined error message file. If you experience difficulty in establishing a TCP/IP connection, you may want to direct SASCTCPE to a SYSOUT data set or permanent file in the local and/or remote SAS execution to aid in problem determination.

References

For detailed information about the SAS/C Socket Library for TCP/IP refer to SAS Technical Report C-111, *SAS/C Socket Library for TCP/IP, Release 5.01*

System Configuration for the APPC Access Method

Note: This task is required in order to use the APPC access method.

Software Requirements

SAS/CONNECT software requires the following levels of system software to support the APPC access method:

- ❑ VTAM Version 3, Release 2 or later

- ❑ In order to support SAS/CONNECT access from another MVS, OS/2 (without a TSO logon), or VM/CMS environment, MVS/ESA Version 4, Release 2 or later with APPC/MVS configured is required.

Note: If you have an earlier release of MVS, an OS/2 SAS/CONNECT session can perform a scripted logon to a TSO userid in order to establish a connection from OS/2 to MVS.

- ❑ NCP Version 4 Release 3 or later for 3725 communications controllers, or Version 5 Release 2 or later for 3745 communications controllers, is recommended for peripheral node attachment.

System Configuration for APPC

System configuration tasks, in the form of resource definitions, must be performed prior to using the APPC access method with SAS/CONNECT software. The steps for defining SNA end nodes and their logical units for MVS environments are described in this section.

The following VTAM definitions are required to allow MVS to function as either a local or a remote host in a SAS/CONNECT conversation.

Step 1: Define application nodes.

Define local-domain VTAM application minor node identifiers for the collection of host logical units. This is done by VTAM systems personnel through the specification of APPL definition statements to define a pool of APPLs for SAS/CONNECT users. A sample APPL definition follows:

```
N02SVnnn  APPL APPC=YES,AUTOSES=1,MODETAB=modetab,
  DLOGMOD=modeent,DDRAINL=NALLOW,
  DMINWNL=16384,DMINWNR=0,DSESLIM=32767,
  DRESPL=NALLOW,EAS=3,SECACPT=CONV,
  VPACING=n
```

- ❑ `APPC=YES` allows the application to exploit the APPCCMD interface.
- ❑ `MODETAB=modetab` defines the session parameter mode table.
- ❑ `DLOGMOD=modeent` defines the default session parameter mode table entry.
- ❑ `DDRAINL=NALLOW` disallows conversation allocation quiescence during shutdown.
- ❑ `DMINWNL=16384` specifies the initial negotiation value for local contention manner sessions.
- ❑ `DMINWNR=0` specifies to use the remote partner's contention winner sessions request.
- ❑ `DSESLIM=32767` defines maximum session limits.
- ❑ `DRESPL=NALLOW` requires the remote partner to deactivate sessions.

- ❑ `EAS=3` specifies that a user has one session at a time.
- ❑ `SECACPT=CONV` indicates that FMH5 security subfield information is accepted.
- ❑ `VPACING=n` sets per site network requirements.

Refer to *VTAM Installation and Resource Definition* (SC23-0111) for further information.

Step 2: Define session mode entries.

Session mode entries, which defines protocol and performance parameters, are required to support session binding to a secondary logical unit residing within the local VTAM domain. Examples are provided below. Refer to the `BIND RU` description in Technical Reference 3, SNA Formats, and the `MODEENT` discussion in Technical Reference 5, VTAM Customization, for detailed descriptions.

Note that the `SNASVCMG` entry is required to support SNA services sessions initiated through a boundary NCP. The `MAPPCIND` entry specifies parallel session and CNOS support for independent LUs, while the `MAPPCDEP` entry, for dependent LUs, does not. Both examples specify access security field acceptance. The `RUSIZES` and `COS` settings are site specific.

```
SNASVCMG MODEENT LOGMODE=SNASVCMG,
                 FMPROF=X'13',
                 TSPROF=X'07',
                 PRIPROT=X'B0',
                 SECPROT=X'B0',
                 COMPROT=X'50B1',
                 RUSIZES=X'xxxx',
                 PSERVIC=X'060200000000000000000300',
                 TYPE=0

MAPPCIND MODEENT LOGMODE=MAPPCIND,
                 FMPROF=X'13',
                 TSPROF=X'07',
                 PRIPROT=X'B0',
                 SECPROT=X'B0',
                 COMPROT=X'50B1',
                 RUSIZES=X'xxxx',
                 PSERVIC=X'06020000000000000102F00',
                 COS=n,
                 TYPE=0

MAPPCDEP MODEENT LOGMODE=MAPPCDEP,
                 FMPROF=X'13',
                 TSPROF=X'07',
                 PRIPROT=X'B0',
                 SECPROT=X'B0',
                 COMPROT=X'50B1',
                 RUSIZES=X'xxxx',
                 PSERVIC=X'06020000000000000102C00',
                 COS=n,
                 TYPE=0
```

Setting APPC-Related SAS System Options

Note: This task is required.

The following SAS system options are required by SAS/CONNECT software for APPC access method support.

- `LUNAME=name`

  defines the explicit VTAM LU name (eight characters maximum) to use for the session. This name is used to define a user-dedicated LU rather than making use of pooled acquisition and can be used for both local and remote sessions on MVS.

- `APPCSEC=userid.password`

  specifies a userid.password string, _PROMPT_, or _NONE_. You can specify this as an option in an options statement, or in the configuration file on the local host. The default is _NONE_. Both the userid and password can contain alpha-numeric characters and the special characters @, #, $. If the remote host is case-sensitive for the userid and password, specify the value in the appropriate case and enclose it in quotation marks.

  Keep in mind that specifying this value in the configuration file undermines security by putting the userid and password as readable values in the SAS configuration file. If you specify _PROMPT_, the user is prompted for a userid and password for the remote host.

  You must specify either the userid.password string or _PROMPT_ to sign on to MVS, CMS, or VSE. The userid is optional and is usually omitted when both the MVS and CMS hosts have the same userid. In this case, the MVS session derives the userid from the appropriate Accessor Environment Element (ACEE).

  If you are connecting to an OS/2 session, you can omit this parameter (which causes the value to default to _NONE_) unless you have established a user profile on the OS/2 host with Communications Manager or with User Profile Management.

  Unlike most other SAS system options for APPC, this option will probably be specified by the end user.

You should include the following common options in a globally available system configuration file so that your end users do not need to be aware of them.

- `COMAMID=APPC`

  specifies that the APPC access method should be used for communication between SAS/CONNECT local and remote sessions.

- `LUPOOL=USER/ALL`

  specifies when a LU should be acquired from a pool. Setting this option to `USER` enables pool use for local MVS SAS sessions; this is the default value. Setting this option to `ALL` enables pool use for both local and remote MVS SAS sessions.

- `LU62MODE=name`

  specifies the communications mode to use. `SASAPPC` is the default mode name. The mode name, whether specified with the `LU62MODE` option or the default of `SASAPPC`, must be defined in both the local and the remote environments; for MVS, this is done with a `MODEENT` macro as shown previously.

The following options are used together to produce a LU name. The LU name is what you specify for the `REMOTE=` option prior to establishing a SAS/CONNECT conversation. The `LUPREFIX`, `LUFIRST`, and `LULAST` options describe the pool of LUs from which a LU is dynamically selected. These options are used only when pool use is enabled. (Setting `LUPOOL=USER` enables LU pool use only for local sessions on MVS; setting `LUPOOL=ALL` enables pool use for both local and remote sessions on MVS.) These options can be used to specify an actual LU name or an `ACBNAME` chosen by you to eliminate dependency between the SAS configuration and naming changes in your network.

- `LUFIRST=suffix`

  specifies the numeric LU (`ACBNAME`) suffix of the first LU in the pool.

- `LULAST=suffix`

  specifies the numeric LU (`ACBNAME`) suffix of the last LU in the pool. The size of a pool is determined as follows:

  ```
  pool-depth = LULAST - LUFIRST + 1
  ```

  If a LU is not acquired after cycling through the pool, the signon fails.

- `LUPREFIX=name`

  specifies the LU (`ACBNAME`) prefix to use to create a pool of LUs.

LUPREFIX=||suffix specifies the ACBNAME associated with this LU. The zero filling done to produce an ABCNAME (as defined in the user application pool) using the LUPREFIX system option is dynamic based on the magnitude of the LULAST value, rather than always filling to 8 bytes as was done in previous releases. For example, a 5-byte LUPREFIX value combined with LULAST=9 is not zero-filled to produce a 6-byte ABCNAME; combined with LULAST=99 is zero filled with a single zero to produce a 7-byte ABCNAME and so on. Sites that have defined 8-byte ABCNAMES in the user application pool should ensure that LUPREFIX and LULAST values are specified that generate 8-byte ABCNAMES (LUPREFIX=SASIUO LULAST=10 for example). Although this parameter is not required, it is recommended to insulate your SAS/SHARE configuration from changes in LU naming conventions and to allow the same configuration to be shared by more than one MVS system in the SNA network (since ACBNAMEs must be unique only within a single domain). The prefix used should be specified to the SAS System via the SAS system option LUPREFIX=. The lower and upper bounds of the suffix range used should be specified via the system options LUFIRST= and LULAST=, respectively. If the ACBNAME= parameter is omitted it defaults to lu-name, which should then be constructed as a name prefix and numeric suffix.

Note: LU Pool naming assumes a zero leading suffix; that is, if LUFIRST is 1, LULAST is 99, and LUPREFIX is N02SV, the first LU in the pool should be named N02SV01, not N02SV1.

Implementing SAS/CONNECT MVS/ESA APPC/MVS Subsystem Exploitation

Note: This task is optional.

You need to perform the additional steps described in this section to enable MVS to be a remote session of a SAS/CONNECT conversation initiated from another MVS, OS/2 (without a TSO logon), or CMS environment. These types of connections depend on SAS/CONNECT MVS/ESA APPC/MVS subsystem capabilities.

Refer to *MVS/ESA Planning: APPC Management* (GC28-1110) for a detailed discussion of these procedures.

Step 1: Define the VSAM transaction program profile data set to be run when an inbound connection is requested.

Run `IDCAMS` using the following example to create a KSDS VSAM cluster to contain the transaction program profile that defines the SAS/CONNECT transaction program.

```
DEFINE CLUSTER  ( NAME ( vsam.profile.dataset ) -
                VOLUME ( volser ) -
                KEYS ( 112 0 ) -
                RECORDSIZE ( 248 4000 ) -
                RECORDS ( 100 100 ) -
                SHAREOPTIONS ( 3 3 ) -
                INDEXED REUSE ) -
     DATA    ( NAME ( vsam.profile.data ) ) -
     INDEX   ( NAME ( vsam.profile.index ) )
```

The member `ATBTPVSM` in the `SYS1.SAMPLIB` data set contains other examples for creating this type of data set.

Step 2: Run the `ATBSDFMU` utility to define the transaction program profile.

Run the APPC/MVS administrative utility `ATBSDFMU` using the following example to define the transaction program profile.

```
//UPDTTPSI EXEC PGM=ATBSDFMU
//SYSPRINT DD SYSOUT=*
//SYSSDLIB DD DSN=vsam.profile.dataset,DISP=SHR
//SYSSDOUT DD SYSOUT=*
//SYSIN    DD DATA,DLM=$$
TPADD
    TPNAME(SASRMT)
    SYSTEM
    ACTIVE(YES)
    TPSCHED_DELIMITER(SCHEND)
    TAILOR_SYSOUT(YES)
    TAILOR_ACCOUNT(YES)
    CLASS(xxx)
    JCL_DELIMITER(JCLEND)
//SASRMT  JOB 'REMOTE SAS',MSGLEVEL=(1,1)
//   JCLLIB ORDER=(your.proc.library)
//   EXEC  copySAS
JCLEND
  KEEP_MESSAGE_LOG(ALWAYS)
SCHEND
$$
```

Note that the utility `SYSIN` input includes embedded JCL. The APPC/MVS transaction scheduler uses this JCL to invoke the transaction program `SASRMT`, which starts a remote SAS application on MVS by executing a SAS cataloged procedure. You need to specify the DSN of the cataloged procedure library where your SAS procedure resides in the `JCLLIB` statement of this JCL.

If users do not need to specify SAS system options for the remote SAS invocation, then you can specify your standard SAS cataloged procedure on the preceding EXEC statement in the SASRMT JCL. However, if users do need to customize option settings for the remote SAS invocation, then you need to set up a separate cataloged procedure like the following sample APPCSAS procedure. This procedure specifies a user-specific configuration file using the system symbolic parameter `&SYSUID`.

```
//APPCSAS  PROC USER=&SYSUID
//SAS   EXEC PGM=SASHOST,REGION=4096K
//STEPLIB  DD  DISP=SHR,DSN=prefix.LIBRARY
//CONFIG   DD  DISP=SHR,dsn=&USER..SASRMT.CONFIG
//         DD  DISP=SHR,DSN=prefix.CNTL(BATCH)
//SASHELP  DD  DISP=SHR,DSN=prefix.SASHELP
//SASMSG   DD  DISP=SHR,DSN=prefix.SASMSG
//WORK     DD  UNIT=3380,SPACE=(CYL,(1,1)),
//             DCB=(RECFM=FS,LRECL=6144,BLKSIZE=6144,DSORG=PS)
//SASLOG   DD  SYSOUT=A,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)
//SASLIST  DD  SYSOUT=A,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)
//SYSIN    DD  DUMMY
```

Step 3: Define and activate a target logical unit name.

Create an `APPCPMxx` member in `SYS1.PARMLIB`, where `xx` is a two-character identifier for distinguishing the member that defines the target LU name to service inbound remote session requests. This LU name is the value given to the `REMOTE=` option in both the local and remote SAS sessions. Use a statement like the following to specify the target LU name:

```
LUADD ACBNAME(N01APL00) TPDATA(vsam.profile.dataset)
    TPLEVEL(SYSTEM)
```

You also need to define a VTAM application node for this LU dedicated to APPC/MVS. This LU is in addition to the LU pool you defined in Step 1 of “System Configuration for APPC” previously. See Step 1 of "System Configuration for APPC" for a sample VTAM APPL definition. Then activate the logical unit to APPC/MVS through a `START` or `SET APPC` command, specifying the `xx` identifier.

References

Establishing communications within an SNA network, especially for a host subarea peripheral node, can be extremely trying until the configuration is properly specified. The APPC communications access method reflects failures as they are reported by the operating system components with which it interfaces. Often this information will be in the form of operation codes, return codes, and sense data. No attempt is made to interpret these failures. Rather, given the numerous possibilities for failure that are a function of your particular environment, it is expected that you will work with network systems and SAS support personnel at your site to attain resolution. Refer to the following IBM publications for additional information:

- *SNA Technical Overview* (GC30-3073)
- *SNA Formats* (GA27-3136)
- *VTAM Programming for LU6.2* (SC30-3400)
- *Extended Services for OS/2 Communications Manager User's Guide* (S04G-1015)
- *Extended Services for OS/2 Communications Manager Configuration Guide* (S04G-1002)
- *Extended Services for OS/2 Problem Determination Guide for the Service Coordinator* (S04G-1006)
- *Extended Services for OS/2 Programming Services and Advanced Problem Determination for Communications* (S04G-1007)
- *Extended Services for OS/2 Communications Manager System Management Programming Reference* (S04G-1116)
- *Extended Services for OS/2 APPC Programming Reference* (S04G-1025).

If you cannot resolve your connectivity problem, call SAS Institute Technical Support for assistance. You will likely be requested to generate traces to assist in documenting the problem, so ensure that you or your site support personnel are familiar with the tracing services available through VTAM and OS/2 Extended Services.

Appendix P, Implementing SAS/CPE® Software

Please refer to the guide *Installation Instructions for IT Service Vision Software* for information about implementing SAS/CPE Software.

Appendix Q, Implementing SAS/GRAPH® Software

Understanding How this Appendix Is Organized

This appendix is divided into four parts. Each part describes a part of the post-installation tasks that may be necessary to use SAS/GRAPH software at your site. The list is an overview of each part. Use this overview to help locate the information for which you are looking.

- Part 1, Accessing the SAS/GRAPH Maps Data Sets

  describes how to allocate the MAPS library in your installed CLIST or catalogued procedure. You must perform this task if users at your site need to access maps.

- Part 2, Customizing Devices

  provides the information necessary to customize device drivers for your graphic devices. The following is a list of the major tasks described in this part:

  - Setting up a Graphics Translate Table

    describes how to create SAS/GRAPH translation tables. These tables translate graphics commands from ASCII to EBCDIC and back to ASCII, so that you can print your graphics from ASCII terminals with plotters attached. You do not need to perform the task described in this section if all of your asynchronous devices are used with supported 3270- or 3287-type protocol converters.

  - Using SAS/GRAPH Software with ASCII Terminals and ASCII Terminal Emulators

    describes the interfaces to use with ASCII terminals and ASCII terminal emulators.

  - Using SAS/GRAPH software with ASCII printers or plotters

    describes the steps necessary to customize Institute-supplied drivers for use with ASCII printers or plotters. If you use Versatec or CalComp plotters (other than the 81 and 84 models), or any other ASCII device that does not have an Institute-supplied driver but uses CalComp-compatible plotting routines, see the section on "Installing the Linkable Driver."

- Installing the Linkable Driver

  describes how to create a driver that can be used with devices that come with a library of CalComp-compatible subroutines. Refer to this part only if you have such a subroutine library and no Institute-supplied driver is available for the device. Devices using the Linkable driver include those from such manufacturers as CalComp, Versatec, and, when used with EPIC or XPPI software, various Xerox printers. If you have a linkable driver from the 6.06 or 5.18 Release (but not 6.07 or 6.08), you must reinstall the driver for Release 6.09.

- Using SAS/GRAPH Software with IBM 3270-type Terminals and 3270 Emulators

  describes requirements for using Institute-supplied drivers for IBM 3270-type terminals (such as the IBM 3279 and the 3179 Model G) and 3270 emulation packages for personal computers, such as IRMA and Attachmate Extra. In addition to stand-alone drivers, the Institute supplies a set of drivers that interface with IBM's GDDM product to produce output on IBM 3270-type terminals. If you want to use these drivers, see the section "Using SAS/GRAPH Software with GDDM."

- Using SAS/GRAPH Software with IBM 3287, 3268, and 4224 Printers

  describes requirements for using Institute-supplied drivers for IBM 3287, 3268, and 4224 printers. In addition to stand-alone drivers, the Institute supplies a set of drivers that interface with IBM's GDDM product to produce output on these printers. If you want to use these drivers, see the section "Using SAS/GRAPH Software with GDDM".

- Using SAS/GRAPH Software with GDDM

  describes how to use the SAS/GRAPH device drivers that interface with IBM's GDDM base product to produce output on a variety of IBM devices, including 3270-type terminals, 3268, 3287, and 4224 printers, 3800 and 3820 printers, and IEEE-attached plotters.

- Part 3, Setting up and Modifying Device Catalogs

  describes how to create or modify device catalog entries in order to customize device driver output to the needs of your site.

- Part 4, Device Help Screens

  describes how to set up system parameters that are required to use certain drivers.

Part 1, Accessing the SAS/GRAPH Maps Data Sets

All installed SAS/GRAPH maps data sets are merged into the common MAPS library by the `SASIxxxx` jobs. To enable your users to access the maps data sets when operating under TSO, modify your installed SAS CLIST to include the following allocate statement for the MAPS library. Include it after the allocation of the `SAMPSIO` library.

```
ALLOC F(MAPS) DA('&prefix.MAPS') SHR REU
```

To access the maps data sets when running under MVS Batch, modify your installed SAS cataloged procedure to include the following DD statement to the JCL for the MAPS library.

```
//MAPS DD DSN=&prefix.MAPS,DISP=SHR
```

Part 2, Customizing Devices

Setting Up a SAS/GRAPH Translate Table

Note: A translate table is only needed if you are using ASCII terminals or attached plotters interactively on ASCII lines. (You do not have to complete this step if all of your asynchronous devices are used with 3270- or 3287-type protocol converters).

In order for SAS/GRAPH software to communicate with ASCII devices, you must translate graphics commands from ASCII to EBCDIC, and back to ASCII again. This requires both system and SAS/GRAPH translate tables. `GTABTCAM` and `SASGTAB0` are translate tables in the catalog `SASHELP.HOST` that are designed for use with TCAM and VTAM respectively. Generally, you should be able to use one of these tables along with your system tables to produce correct translation. However, if these tables are not able to perform all of the translation correctly, you may need to create your own SAS translate table. Refer to SAS Technical Report P-197, *The TRANTAB Procedure*, for details on creating your own translate table.

If you created your own translate table in Release 6.06, 6.07, or 6.08 you can use that translate table with Release 6.09. Copy your table from your Release 6.06, 6.07, or 6.08 `SASHELP.HOST` catalog to your Release 6.09 `SASHELP.HOST` catalog. In Version 5 SAS/GRAPH software, SAS/GRAPH translate tables were stored as load modules. In Version 6, the Institute-supplied tables are stored as members of the catalog `SASHELP.HOST`. If you created your own translate table in Version 5 of SAS/GRAPH software, you must convert the Version 5 module to a Version 6 catalog entry.

The TRANTAB= graphics option and the TRANTAB device parameter select a translate table for your system. The default TRANTAB value in Version 6 SAS/GRAPH software is SASGTAB0. If you have been using ASCII devices under Version 5 with TRANTAB=GTABVTAM, you do not need to change the default value. If you had to use the GTABTCAM table or a user-created table converted from Version 5, you should change the default TRANTAB option. The TRANTAB value can be specified either in a device entry or in a GOPTIONS statement. You can set a new default in either of the following two ways:

- Modify device catalog entries for all ASCII terminals and interactive plotters that you will be using at your site. To do this, use the following SAS statements:

```
PROC GDEVICE C=SASHELP.DEVICES NOFS;
MODIFY entryname
TRANTAB=tablename;
QUIT;
```

  Replace entryname with the name of the entry you want to modify, and tablename with the new TRANTAB value.

- Create a sequential file containing the following statement:

```
GOPTIONS TRANTAB=tablename;
```

  You can then concatenate this file ahead of the user AUTOEXEC file in your SAS CLIST and cataloged procedure.

  Note: This option may be more efficient if you have many types of ASCII terminals and plotters.

Using SAS/GRAPH Software with ASCII Terminals and ASCII Terminal Emulators

ASCII terminals and PCs running ASCII terminal emulation software are most commonly attached to MVS systems through a 3270-type protocol converter. When this is the case, it is necessary to provide both a device driver AND a GPROTOCOL value on your GOPTIONS statement. For terminals and PCs running ASCII emulation software, the DEVICE= parameter on the GOPTIONS statement will reflect the type of graphics terminal your software emulates. If your PC or terminal is connected directly or through a modem to a controller running ACF/NCP/NTO and is not attached to a 3270-type protocol converter, you only need to specify a device driver. Contact SAS Institute Technical Support if you have problems using this type of configuration.

The following is a list of ASCII terminal emulation products that should work with SAS/GRAPH attached to 3270-type protocol converters. However, SAS Institute does not assume liability regarding the functionality of any particular emulation product. For details on using a particular emulator with SAS/GRAPH, contact the SAS Technical Support Division.

Emulation product	Device Driver
Reflection 4	VT340
Reflection 7	HP2397
ZSTEM340	VT340
ZSTEM240	VT240
Smarterm340	VT340
Smarterm240	VT240
Kermit Version 2.3 and higher	TEK4014
TGRAF 4200 series	TEK4205
Emutek 4200 Plus	TEK4205
EM4105	TEK4105

Protocol converters can be used on IBM systems to allow asynchronous devices to communicate with the host computer on bisynchronous or SDLC lines. Protocol converters that perform IBM 3270 emulation make asynchronous terminals appear to the host as remote IBM 3278 or 3279 terminals. Some converters in this category appear to the host as 3274 cluster controllers and permit the attachment of asynchronous terminals (which appear to be 3278/79 terminals). When many types of these converters are used, SAS/GRAPH output is supported on both asynchronous graphics terminals and interactive plotters. Because these converters are used with Institute-supplied interactive drivers and I/O is performed by SAS/GRAPH software (rather than an external utility such as JES), a limited number of 3270-type protocol converters are supported by SAS/GRAPH software. The following is a list of supported protocol converters:

- PCI 1071 and 1076 (and compatible models)
- KMW 3270-FS
- DATASTREAM
- RENEX
- Commtex C-80
- Local Data DATALYNX
- Tektronix 4970
- IBM 7171
- HYDRA
- TEKTRONIX CX PROTOCOL.

Because new converter models are continually introduced by many manufacturers, consult the vendor to determine which specific models and configurations will work with SAS/GRAPH software. We strongly recommend that, before purchasing a converter, you arrange to obtain it on a trial basis to confirm that it will work.

To use SAS/GRAPH software with these converters, you must attach the asynchronous terminals directly to the converter. If you are using an interactive plotter, it should be in "eavesdrop" mode, between an asynchronous terminal and the protocol converter.

These converters are designed for interactive use. If you are using an ASCII hardcopy device in batch mode with a protocol converter (such as an AGILE 5287 or Local Data `INTERLYNX`), see the next section.

To obtain graphics output with the interactive converters listed previously, invoke SAS/GRAPH under TSO. If you are using a Local Data `DATALYNX`, specify:

```
GOPTIONS GPROTOCOL=SASGPSTE;
```

If you are using an IBM 7171 converter, specify the following:

```
GOPTIONS GPROTOCOL=SASGP71;
```

If you are using a HYDRA protocol converter, specify the following:

```
GOPTION GPROTOCOL=SASGPHYD;
```

For any of the other supported models, specify the following:

```
GOPTIONS GPROTOCOL=SASGPSTD;
```

Also specify the name of the graphics device you use in an `OPTIONS` or `GOPTIONS` statement. Then proceed to use SAS/GRAPH software as you normally would with an interactive device.

Note to Version 5 Users: `GPROTOCOL` values have changed between Version 5 and Version 6. However, you can still use the Version 5 equivalents (`GSASPSTE`, `GSAS7171`, and `GSASPSTD`) in Version 6.

The PCI 1067 protocol converter and the IBM 3708 converter (when used in protocol enveloping mode) make asynchronous terminals appear to IBM host computers as SDLC 3767 hardcopy terminals. These converters can be used with asynchronous graphics terminals and interactive plotters. **The 3708 is supported by SAS/GRAPH software only in protocol enveloping mode. It is not supported in protocol conversion mode.** If you are installing SAS/GRAPH for the first time and using either of these devices, contact Technical Support for details.

Using SAS/GRAPH Software with ASCII Printers or Plotters

When you use ASCII printers or plotters on an MVS system, the device must be connected to a 3287-type converter that is normally attached to a 3174 or 3274 control unit, and appear to the host as an IBM 3287 printer. You can attach various types of ASCII hardcopy devices to these converters and "spool" output to them.

To create output that can be sent to the device, specify the following GOPTIONS:

```
GOPTIONS DEVICE      = drivername
         GACCESS     = GSASFILE
         GSFMODE     = REPLACE
         GPROTOCOL   = protocolvalue
         HANDSHAKE   = XONXOFF
         GSFLEN      = logical record length divided by 2;
```

These options cause output to be written to the DDname GSASFILE, which can point to a file or directly to the device. When using SAS/GRAPH software with a 3287-type converter, be sure to use the proper driver for your graphics device (for example, a QMS printer or Hewlett-Packard plotter). You must also specify a value for the GPROTOCOL option. If the converter can send all characters in the data stream to the device, or if the data stream contains only printable characters, specify GPROTOCOL=' '. This value can also be used for most devices with a direct coaxial attachment, such as the Zeta 887 plotter, or Xerox printers with a coax interface.

To fully automate this process for the end user, the parameters in the preceding GOPTIONS statement can be incorporated into an Institute-supplied device driver entry. See Part 3, "Setting up and Modifying Device Catalogs" for details on using PROC GDEVICE to customize a device driver.

If the data stream for the device contains unprintable characters that the converter cannot process, you must specify an appropriate value for the GPROTOCOL option so that the data stream is modified to a format that will pass through the converter. GPROTOCOL= values for selected converters are:

SASGPAGL	Agile 5287 and 6287
SASGPISI	ISI 87
SASGPVAT	Avatar
SASGPIDX	IDEX
SASGPNET	NetCommander and I-Data
SASGPDCA	IRMAprint, IRMAprint2, TEK 4512, and QMS AFPlink
SASGPLCL	Local Data Interlynx, KMW 3287, Andrew (Newport, Malibu, Laguna)

The following new GPROTOCOL= values have been added with Release 6.09:

SASGPAXI	Axis
SASGPCAB	CableNet
SASGPCHK	Cherokee
SASGPIOC	I/O Corporation

Note to Version 5 users: GPROTOCOL= values have changed between Version 5 and Version 6. However, you can still use the Version 5 equivalents (GSASAGIL, GSASLDIL, and GSASISI) in Version 6.

If your converter is not in the preceding list, but can process your device's data stream without modification, try using GPROTOCOL=' '.

To send output to the device, you need system software that can direct output to a 3287-type printer. If you have software such as VPS or JES328X (Version 2), which can send output to a 3287 printer through JES, you can use a JCL statement or TSO ALLOCATE statement to direct output to the printer. For example:

```
//GSASFILE DD SYSOUT=class,DEST=destination
```

or

```
ALLOC FI(GSASFILE) SYSOUT(class) DEST(destination)
```

Another approach is to direct your output to a file and use a utility (such as DSPRINT or IEBGENER) to copy the file to the JES output queue.

SASWTR (the Institute-supplied writer) can only be used with IBM 3268 and 3287 printers. **Do not use it to send output to other devices.**

Make sure that your spooling software or subsystem is not inserting extra characters (line-feeds, page ejects, etc.) in the data stream. Version 1 of JES328X may insert extra characters and reblock data; therefore, it is not recommended for transmitting graphics data. Also make sure that your printer is not set to do automatic page ejects after a certain number of data lines. Finally, check to see that your printer has sufficient memory to process the graph you are sending to it. If any of the above conditions are true for your output device, you may receive distorted graphs, partial graphs, or graphs split between pages on a printer or plotter attached to a 3287-type protocol converter.

Installing the Linkable Driver

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 your site does not have a device that uses vendor-supplied subroutines, skip this section and refer to the instructions appropriate for your devices.

You can direct the output from the Linkable driver to a tape file for an off-line device, to a SYSOUT class for an online device (that appears to the system as a punch or a 3287 printer), or to a disk file for later spooling to the device.

To install a Linkable driver, you must perform the following two steps:

1. Create an executable driver module.

2. Create a device catalog entry containing characteristics of the device.

ATTENTION: Before you can use the Linkable driver, parts of it must be compiled and link-edited with your plotting subroutines.

If you built the Linkable driver in a previous release of SAS Software, locate and read the appropriate section:

- If you built a Linkable driver in Release 6.06, but not in Release 6.07 or 6.08,

  you must rebuild the driver for Release 6.09.

- If you built a Linkable driver in Release 6.07 or 6.08,

  you can copy your 6.07 or 6.08 device entry to your 6.09 device catalog, and your 6.07 or 6.08 executable module to your 6.09 load library (or modify your 6.09 SAS cataloged procedure or CLIST to use the load library where your 6.07 or 6.08 executable module is stored).

- If you built your last Linkable driver for use with Version 5 SAS/GRAPH software

  The Linkable driver has been redesigned for Version 6 and uses the Metagraphics Driver facility. The installation process for the driver has changed somewhat, but to the end user, use of the driver is the same as the Version 5 driver. For information on the new Linkable driver, read the next section.

Understanding the Linkable Driver Used in Version 6 of the SAS System

This section explains the changes and enhancements made to the Linkable driver for Version 6 of the SAS Software. This discussion is divided into the following eight topics:

- **Overview of the linkable driver**

  describes how the Linkable driver operates and provides a description of the calls made to the plotting routines by the driver.

- **Generating an executable module**

  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 whether you want to make any modifications to the driver or your routines.

- **Customizing device characteristics**

  The characteristics of the device (such as size of plotting area, default colors, rows and columns) are stored in a device catalog entry. This section shows how to edit the device catalog entry to supply the specific characteristics of your device.

- **Testing the driver**

  illustrates a sample program that you can use to make sure the driver and device are working correctly.

- **Special instructions for Versatec plotter users**

  If you are creating a driver for a Versatec monochrome or color plotter, refer to this section before attempting to build a driver. This section contains special instructions for creating a driver that calls the Versatec TONE routine (instead of NEWPEN) and invokes Versatec RANDOM or VGS routines.

- **Special instructions for Xerox EPIC or XPPI Version 1.0 users**

  If you are creating a driver with Xerox EPIC or XPPI 1.0 subroutines, refer to this section before attempting to build a driver. This section contains special instructions for creating a driver that calls the EPIC or XPPI routines.

- **Special instructions for Xerox XPPI Version 1.1 users**

  If you are creating a driver with Xerox XPPI 1.1 subroutines, refer to this section before attempting to build a driver. This section contains special instructions for creating a driver that calls the XPPI routines. If you are creating a driver with XEROX XPPI Version 2.0 or higher, contact the SAS Institute Technical Support Division.

- **Common problems and solutions**

  describes some of the most common problems encountered when trying to install and/or use the Linkable driver. If you have any problems, please consult this section before calling SAS Institute.

Overview of the Linkable Device Driver

The Linkable device driver is a special driver supplied with SAS/GRAPH software that is incomplete until link-edited with user-supplied plotting routines. These routines are normally provided by the manufacturer when the plotter is purchased or obtained from a third party vendor. Since these plotting routines perform all the driver output, this driver does not depend on ASCII translate tables.

How the Linkable Device Driver Works

The driver consists of two parts: a device catalog entry that contains the characteristics of the device and an executable module. The executable module is created by compiling an Institute-supplied FORTRAN program 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 (that produces a graph) is executed, the following happens:

1. An "internal" (Institute-supplied) driver module, using information on device characteristics from a device catalog entry, produces a metafile of graphics data.

2. An "external driver" (the executable module that you create by compiling the LINKAIBM FORTRAN 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.

Plotting Routines Used by the Linkable Device Driver

The LINKAIBM FORTRAN program is installed in `&prefix.GRMISC` as member LINKAIBM. This program makes calls to four subroutines (`PLOTS`, `PLOT`, `SYMBOL`, and `NEWPEN`) that must comply with the CalComp standard format as documented in the following list.

`PLOTS(0,0,14)`

The `PLOTS` subroutine is normally used to initialize the device, and the third parameter of 14 causes the driver to write output to the FORTRAN unit 14 (FT14F001). To change the value of the first two parameters, you can modify the values of the `PLOTS1` and `PLOTS2` variables in the LINKAIBM FORTRAN program.

To modify the FORTRAN output unit used by the driver, change the value of the variable `OUT` in the `INIDVR` subroutine of the LINKAIBM FORTRAN 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 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, see the section, "Customizing Device Characteristics."

SYMBOL(X,Y,Height,String,Angle,Nchar)

The SYMBOL routine writes 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

Subroutines written in FORTRAN 77 may 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 must modify the LINKAIBM program, as described in "Generating an executable module."

The relevant routines in some plotter libraries may not be named as shown in above but contain the correct arguments. In this case, the linkage editor can rename the routines to match the information in the previous example. In some cases, the arguments of a routine may not agree in type, number, or meaning with what is expected by the plotter. When the arguments do not agree, 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 Module

You may not need to read this section. Use the following list to determine which section is appropriate for your site:

- If you are creating a driver for a Versatec plotter, you should read "Special Instructions for Versatec Plotter Users" instead of this section.
- If you are creating a driver for a Xerox printer and using Xerox EPIC or XPPI 1.0 software routines, you should read "Special Instructions for Xerox EPIC or XPPI version 1.0 users" instead of this section.
- If you are creating a driver for a Xerox printer and using Xerox XPPI 1.1 software routines, you should read "Special Instructions for Xerox XPPI version 1.1 users" instead of this section. If you have XPPI Version 2.0 or above, contact Technical Support for details.

- ❑ If you do not fit into one of the three above categories, continue with this section.

To generate an executable driver module, compile the LINKAIBM and LINKEXT FORTRAN programs (found in `&prefix.GRMISC`) and link-edit the resulting object module with your plotting subroutines.

The LINKAIBM FORTRAN 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), then you must modify the LINKAIBM program so that it will pass seven parameters. To change the number of parameters passed, edit the program and find the `CALL SYMBOL` statement (which passes six parameters). A commented statement containing `CALL SYMBOL` with seven parameters follows this statement. 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 the preceding modifications to the LINKAIBM program.

Note: Compile the program with the same compiler you used to compile your plotting routines. If you do not, errors can occur when using the driver.

The following sample JCL compiles the LINKAIBM and LINKEXT programs and links them with the routines in your vendor-supplied plotting library. A sample program called LINKJCL is located in `&prefix.GRMISC` and can be used for this purpose. Data set names in lower case should be replaced with the appropriate data set names for your site. You can give the module any valid module name. However, this name must also be specified as the `PROCESS` parameter in the catalog entry for the driver (see "Customizing Device Characteristics").

The JCL may need to be modified, depending on the cataloged procedures used for the FORTRAN compiler and the linkage editor at your site.

```
//LINKABLE JOB 'your job information'
//      MSGCLASS=A,TIME=(,10),NOTIFY=yourname
//*JOBPARM FETCH
//your fortran exec
//SYSIN        DD DISP=SHR,DSN=linkaibm <=== linkable fortran program
//             DD DISP=SHR,DSN=linkext  <=== additional routine calls program
//*
//LKED  EXEC PGM=IEWL,PARM='MAP,LIST'
//SYSPRINT     DD SYSOUT=A
//SYSLIB       DD DISP=SHR,DSN=your.plotter.library
//             DD DISP=SHR,DSN=your.FORTRAN.library
//SYSLMOD      DD DISP=OLD,DSN=your.sas.library(mydriver),UNIT=DISK //OBJ
             DD DISP=(OLD,DELETE),DSN=&&LOADSET
//SYSLIN       DD *
  INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,NEWPEN) <= Versatec users see Sec 5
  REPLACE PLOTS,PLOT,SYMBOL,NEWPEN
  CHANGE MAIN(mydriver)
  INCLUDE OBJ
  ENTRY mydriver
  NAME mydriver(R)
//
```

Note: If you are using VS FORTRAN Version 2 Release 5, the `CHANGE MAIN(mydriver)` statement in the preceding example should be changed to `CHANGE MAIN#(mydriver)`.

In addition to calls to the PLOTS, PLOT, SYMBOL, and NEWPEN routines, a number of additional exits can be taken by the driver if they are supplied by the user. These may be used for pre-initialization, post-termination, and so forth. These additional routines follow:

PLOTA1:	called before PLOTS(0,0,Iunit)	Beginning of each PROC
PLOTA2:	called after PLOTS(0,0,Iunit)	Beginning of each PROC
PLOTC1:	called before PLOT(x,0.0,-3)	After CALL PLOT(-x,.5,-3)
PLOTC2:	called after PLOT(x,0.0,-3)	After CALL PLOT(-x,.5,-3)
PLOTF1:	called before PLOT(x,-.5,-3)	End of each plot
PLOTF2:	called after PLOT(x,-.5,-3)	End of each plot
PLOTG1:	called before PLOT(-x,.5,-3)	Beginning of each plot
PLOTG2:	called after PLOT(-x,.5,-3)	Beginning of each plot
PLOTZ1:	called before PLOT(0.,0.,999)	End of each PROC
PLOTZ2:	called after PLOT(0.,0.,999)	End of each PROC

Empty versions of the preceding subroutines are included in the LINKEXT program, which is located in &prefix.GRMISC. You can include your own versions of the subroutines by modifying the LINKEXT program and rerunning the JCL that you previously modified.

To avoid the minimal overhead of these empty function calls, you can modify the LINKAIBM source program by commenting out the CALL statements to these routines before compiling the driver.

Customizing Device Characteristics

ATTENTION: If you created a driver for your device in Release 6.06, you must rebuild the driver for Release 6.09 using the following instructions. If you created a driver in Release 6.07 or 6.08, you can copy that driver entry to your 6.09 device catalog.

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. In addition, the Metagraphics parameters, such as PROCESS and INTERACTIVE, must be modified to call the external process module that produces the output.

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;
LIST LINKABLE;
END;
```

Important parameters from the LINKABLE entry are listed below. Refer to *SAS/GRAPH Reference, Version 6 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
Maxcolors:  5       Devopts:     '2003800400000000'x
Background color:   WHITE
Color list:         BLACK,RED,GREEN,BLUE

METAGRAPHICS INFORMATION
Process:     XEQ:LINKABLE
Interactive: PROC
```

If the default parameters are correct for your device, create a new entry simply 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'
  PROCESS='XEQ:modulename';
  END;
```

The modulename in the PROCESS= parameter should be the name of the module that you created by compiling the LINKAIBM FORTRAN program and linking it with your vendor-supplied routines. (This task is described in Generating an executable module" earlier in this appendix.) You must have write access to the SASHELP.DEVICES catalog to run the program.

In many cases you will want or need to modify some of the parameters in the LINKABLE entry to fit your particular device. For example, if you have an 8-pen plotter with the following colors: BLACK, RED, GREEN, BLUE, ORANGE, BROWN, YELLOW, GOLD you will need to create a modified device entry.

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)
  PROCESS='XEQ:modulename';
  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 make the modifications described above in full-screen mode as well as line mode. Refer to "The GDEVICE Procedure" in *SAS/GRAPH Software: Reference, Version 6 Edition* for details on using PROC GDEVICE to modify device catalog entries.

Testing the Linkable Device Driver

To test the driver, use the following SAS program. This program assumes that the driver writes output to the fileref FT14F001. If your plotting software writes to another location or requires that additional files be allocated, add or change allocations as necessary. In addition, SAS dynamically allocates a temporary data set to the fileref FT23F001 to temporarily store the SAS metafile.

```
TSO ALLOC F(FT03F001) DA(myerror.file);
TSO ALLOC F(FT06F001) DA(myerror.file);
TSO ALLOC F(FT14F001) DA(myoutput.file);
GOPTIONS DEVICE=driver_name;
PROC GTESTIT; RUN;
```

Special Instructions for Versatec Plotter Users

The following sections describe modifications that must be made to the installation process if you are using a Versatec printer or plotter. If your printer or plotter uses RANDOM software, see the section "Generating graphics using RANDOM Software. " If your printer or plotter uses VGS software, see the section "Generating graphics using VGS Software."

Generating Graphics Using RANDOM Software

If you are creating a driver for Versatec plotters using RANDOM software, note the following changes to the instructions in "Generating an Executable Module," to account for the differences in the software interface:

1. Instead of compiling and using the LINKAIBM program with the LINKEXT program, you can replace the LINKEXT program with one especially designed for use with Versatec plotters using RANDOM or VGS software. The VERSAEXT program (located in &prefix.GRMISC) contains a subroutine PLOTA1 that makes calls to the VPOPT routine in RANDOM software to initialize parameters. You must modify the CALL VPOPT statement in the PLOTA1 routine and replace MODELNO with the actual model number of the plotter or printer used. For example, if you use a Versatec 2756 thermal printer, replace MODELNO with 2756 in the CALL VPOPT statement.

The calls to the VPOPT routines also cause the RANDOM routines to be executed at the end of each graph, eliminating the need to run RANDOM as a separate step. The VERSAEXT program also contains the subroutine PLOTF2, which calls the PLOT routine with a third parameter of -999 at the end of each graph. This eliminates potential problems with RANDOM software in which only one graph is generated if multiple graphs are requested in a procedure.

A special ROPEN routine is required from Versatec for Random software to allow for multiple graphs in a procedure. You should order this from your Versatec dealer. If there is still a problem, contact the SAS Institute Technical Support.

2. In the linkedit step, the statement:

```
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,NEWPEN)
```

has been replaced with the statement

```
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,TONE)
```

You can use the VERSAJCL member in &prefix.GRMISC for linking your routines, as shown in the following example:

```
//VERSATEC JOB 'your job information'
//       MSGCLASS=A,TIME=(,10),NOTIFY=yourname
/*JOBPARM FETCH
//your fortran exec
//SYSIN DD DISP=SHR,DSN=linkaibm
//             DD DISP=SHR,DSN=versaext
/*
//LKED   EXEC PGM=IEWL,PARM='MAP,LIST'
//SYSPRINT     DD SYSOUT=A
//SYSLIB       DD DISP=SHR,DSN=your.ropen.library
//             DD DISP=SHR,DSN=your.versatec.library
//             DD DISP=SHR,your.fortran.library
//SYSUT1       DD UNIT=SYSDA,SPACE=(1024,(200,20))
//SYSLMOD      DD DISP=OLD,DSN=your.driver.load(newname),UNIT=DISK
//OBJ          DD DISP=(OLD,DELETE),DSN=&&LOADSET
//SYSLIN       DD *
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,TONE)
REPLACE PLOTS,PLOT,SYMBOL,NEWPEN
CHANGE MAIN(newname)
INCLUDE OBJ
ENTRY newname
NAME newname(R)
//
```

Note: If you are using VS FORTRAN, Version 2, Release 5, you should change the preceding CHANGE MAIN(newname) statement to CHANGE MAIN#(newname).

The following example shows a typical SAS/GRAPH job using Versatec RANDOM software.

Note: If you created your driver using the LINKAIBM and VERSAEXT program, the RANDOM routines are called from within your SAS program and you do not have to run them as a separate step. The JCL to run SAS/GRAPH jobs with RANDOM software can be found in member `VERJCL` in `&prefix.GRMISC` on your installation tape.

```
//jobcard information
//*********************************************************************
//*                                                                   *
//*  This is a SAMPLE PROGRAM. Changes must be made to run on your    *
//*  system                                                           *
//*                                                                   *
//*********************************************************************
//VERSATEC OUTPUT
//*
//*********************************************************************
//*                                                                   *
//*  Numerous STEPLIB DD statements are used so SAS libraries are not *
//*  overwritten.                                                     *
//*                                                                   *
//*********************************************************************
//*
// EXEC SAS609,REGION=4096K
//STEPLIB      DD
//             DD
//             DD
//             DD
//             DD
//             DD
//             DD  DISP=SHR,DSN=your.ropen.load.library
//             DD  DISP=SHR,DSN=your.versatec.load.library
//*********************************************************************
//*                                                                   *
//*  PLOTPARM controls the following:                                 *
//*                                                                   *
//*  MODEL             -identifies the model of your printer          *
//*  XFACT and YFACT   -aspect ratio in x and y direction, set for    *
//*                     3 to 2 ratio to maintain round circles        *
//*  JWTH              -controls the width of each 'pen' selected     *
//*  JCLR              -controls the TONE color selected. See the     *
//*                     VERSATEC OPERATIONS GUIDE for details.        *
//*  Note that TONE starts with PEN 0 so JCLR 1 and 2 are repeated    *
//*                                                                   *
//*  Colors currently set are BLACK, RED, GREEN, BLUE, CYAN, MAGENTA, *
//*      YELLOW, ORANGE, BROWN, GRAY, LIME, VIOLET, ROSE, TAN, AQUA   *
//*                                                                   *
//*********************************************************************
//PLOTPARM  DD  *
&PLOT MODEL=model,XFACT=1.00,YFACT=0.66,VXMIN=0.45,WXMIN=0.45,
      JWTH(1)=2,JWTH(2)=2,JWTH(3)=2,JWTH(4)=2,JWTH(5)=2,
      JWTH(6)=2,JWTH(7)=2,JWTH(8)=2,
      JWTH(9)=2,JWTH(10)=2,JWTH(11)=2,JWTH(12)=2,JWTH(13)=2,
      JWTH(14)=2,JWTH(15)=2,JWTH(16)=2,
      JCLR(1)=8,JCLR(2)=8,JCLR(3)=6,JCLR(4)=7,JCLR(5)=5,
      JCLR(6)=2,JCLR(7)=3,JCLR(8)=4,
      JCLR(9)=146,JCLR(10)=142,JCLR(11)=10,JCLR(12)=114,JCLR(13)=218,
      JCLR(14)=164,JCLR(15)=139,JCLR(16)=69 &END
//*********************************************************************
//*                                                                   *
//*  PLOTLOG DD is the DDNAME where RANDOM log file is located        *
//*                                                                   *
//*********************************************************************
//PLOTLOG      DD DUMMY
//*********************************************************************
//*                                                                   *
//*  SASLIB DD statement points to the load library containing the    *
//*  linkedited driver module                                         *
//*                                                                   *
//*********************************************************************
//SASLIB DD DSN=your.versatec.driver.load,DISP=SHR
```

```
//VRFDATA  DD  DSN=&&CVRFDTA,UNIT=SYSDA,SPACE=(CYL,(10,2)),
//             DISP=(MOD,DELETE),
//             DCB=(RECFM=F,LRECL=4000,BLKSIZE=4000)
//VRFOUT   DD  SYSOUT=M,OUTPUT=(*.VERSATEC),
//             DCB=(LRECL=132,BLKSIZE=132,RECFM=FB)
//*********************************************************************
//*                                                                   *
//*  Replace 'member' with the DDNAME and member name for the DATPAT *
//*  file for your particular printer model.  For example, for a     *
//*  CE3200D printer, the DDNAME and member name should be CE3200D   *
//*                                                                   *
//*********************************************************************
//member  DD DISP=SHR,DSN=your.datpat.library(member)
//*********************************************************************
//*                                                                   *
//*  FT06F001 is the ERROR file                                       *
//*                                                                   *
//*********************************************************************
//FT06F001 DD SYSOUT=*
//SYSIN DD DSN=your.sas.program,DISP=SHR
//*
```

Note the following JCL that is specified in this SAS/GRAPH job:

- The `VRFOUT DD` statement contains output directed to the device.
- The `DATPAT` files contain information about the printer that RANDOM software requires. Not all of the `DATPAT` files are required. You need to supply only the one that refers to your printer or plotter.
- The `FT06F001 DD` statement points to where error messages and a log of the RANDOM routines will be written.
- The `SASLIB DD` statement points to where your driver module is stored. If your driver is a member in one of the SAS load libraries, this DD statement is not required.
- The `ROPEN` load library refers to the special load library that is ordered from Versatec.
- The `PLOTPARM DD` statement normally points to specific parameters in a file used by RANDOM software to enhance the output of your graphs. The model number should be specified in the `PLOT` statement. Other parameters, such as `XFACT`, `YFACT`, `JWTH`, and `JCLR` can be used to control the size of your graph, the width of the pens, and the colors used. Note that the first parameters, `JCLR(1)` and `JWTH(1)`, correspond to pen 0, which is not used by the SAS System. The second parameters, `(JCLR(2)` and `JWTH(2))`, correspond to pen 1, the third parameters correspond to pen 2, and so on. This means that the first and second parameter of `JCLR` and `JWTH` should be set to the same values.

The following is a list of some of the parameters that you can use:

Parameter	Description
JCLR	This assigns the color that the pen will use. You can match your pens to the color palette found in the back of your Versaplot Color Random Operations Guide. The colors used in this example are BLACK, RED, GREEN, BLUE, CYAN, MAGENTA, YELLOW, ORANGE, BROWN, GRAY, LIME, VIOLET, ROSE, TAN, AQUA. The first seven colors are produced directly, while the remaining colors are produced by dithering.
JWTH	This controls the width of the "pen" or nib on your device. This is commonly set to 2; however other settings can be used if a thicker line is desired (such as on 400 DPI electrostatic models).
MODEL	The model number of your printer or plotter.
XFACT	These are factors you can use to control the size of the plot.
YFACT	If your plot is smaller than the HSIZE and VSIZE specified in your SAS job, increasing the XFACT and YFACT values will increase the size of the plot. If your plot is larger than HSIZE and VSIZE, fractional values (between 0 and 1) can be used to decrease the size of the plot.

Generating Graphics Using VGS Software

If you are creating a driver for Versatec plotters using VGS software, note the following changes to the instructions presented in "Generating an Executable Module," to account for differences in the software interface:

1. Instead of compiling and using the LINKAIBM program with the LINKEXT program, you should replace the LINKEXT program with one especially designed for use with Versatec plotters using RANDOM or VGS software. The VERSAEXT program (located in &prefix.GRMISC) contains a subroutine PLOTA1, which makes calls to the VPOPT routine in VGS software to initialize parameters. You must modify the CALL VPOPT statement in the PLOTA1 routine and replace MODELNO with the actual model number of the plotter or printer being used. For example, if you are using a Versatec 2756 thermal printer, you should replace MODELNO with 2756 in the CALL VPOPT statement. If you were running Versatec RANDOM software previously, you should check the model numbers in your VGS manual as some of the models have changed.

The calls to the VPOPT routines also cause the VGS routines to be executed at the end of each graph, eliminating the need to run VGS as a separate step. The VERSAEXT program also contains the subroutine PLOTF2, which calls the PLOT routine with a third parameter of -999 at the end of each graph. This eliminates potential problems with VGS software in which only one graph is generated if multiple graphs are requested in a procedure.

2. In the linkedit step, the statement:

```
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,NEWPEN)
```

has been replaced with the statement

```
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,TONE)
```

You can use the following JCL for linking your routines. The VERSAJCL member in your GRMISC data set can be used to do this. Notice that the SYSLIB DD statement should point to the VGS library at your site.

```
//VERSATEC JOB 'your job information'
//      MSGCLASS=A,TIME=(,10),NOTIFY=yourname
/*JOBPARM FETCH
//your fortran exec
//SYSIN DD DISP=SHR,DSN=linkibm
//      DD DISP=SHR,DSN=versaext
/*
//LKED   EXEC PGM=IEWL,PARM='MAP,LIST'
//SYSPRINT DD SYSOUT=A
//SYSLIB   DD DISP=SHR,DSN=your.vgs.library
//         DD DISP=SHR,your.fortran.library
//SYSUT1   DD UNIT=SYSDA,SPACE=(1024,(200,20))
//SYSLMOD  DD DISP=OLD,DSN=your.driver.load(newname),UNIT=DISK
//OBJ      DD DISP=(OLD,DELETE),DSN=&&LOADSET
//SYSLIN   DD *
INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,TONE)
REPLACE PLOTS,PLOT,SYMBOL,NEWPEN
CHANGE MAIN(newname)
INCLUDE OBJ
ENTRY newname
NAME newname(R)
//
```

Note: If you are using VS FORTRAN, Version 2, Release 5, you should change the preceding CHANGE MAIN(newname) statement to CHANGE MAIN#(newname).

The following example shows a typical SAS/GRAPH job using Versatec VGS software. Note that if you created your driver using the VERSATEC member, the VGS routines are called from within your SAS program and you do not need to run them as a separate step. The JCL to run SAS/GRAPH jobs with VGS software can be found in member VGSJCL in &prefix.GRMISC that was unloaded from your installation tape.

```
//jobcard information
//*********************************************************************
//*                                                                   *
//*  This is a SAMPLE PROGRAM. Changes must be made to run on your *
//*  system                                                           *
//*                                                                   *
//*********************************************************************
//VERSATEC OUTPUT  FORMS=PLOT
//*
// EXEC SAS609,REGION=4096K
//STEPLIB      DD
//             DD  DISP=SHR,DSN=your.fortran.library
//             DD  DISP=SHR,DSN=VTECVGS.VTxxxxxx.LINKLIB
//             DD  DISP=SHR,DSN=VTECVGS.VTxxxxxx.IVPLIB
//PLOTLOG      DD  DUMMY
//SASLIB       DD  DISP=SHR,DSN=your.linked.library
//*********************************************************************
//*                                                                   *
//*  VGS PARAMETER FILE (VGSPARM DD).                                 *
//*                                                                   *
//*  THIS DATASET CONTROLS PEN SELECTIONS AND PENWIDTHS AND SHOULD *
//*  BE MODIFIED TO WORK WITH SAS GRAPH                               *
//*                                                                   *
//*********************************************************************
//VGSPARM  DD  DSN=yourid.VTECVGS.VTxxxxxx.DATALIB(VGSPARM),
//             DISP=SHR
//*********************************************************************
//*                                                                   *
//*  VGS CONFIGURATION FILES (VGSCFXX).                               *
//*                                                                   *
//* THE VGS INSTALLER SHOULD HAVE CUSTOMIZED THE DATA SETS BELOW TO*
//*  TEST THEM WITH THIS INSTALLATION VERIFICATION PROCEDURE (IVP).*
//*                                                                   *
//*  DEPENDING ON THE OUTPUT DRIVER USED IN THE VGS PARAMETER FILE *
//*   (VGSPARM DD), ONE OF THE VGS CONFIGURATION FILES WILL BE USED.*
//*                                                                   *
//*********************************************************************
//VGSCFRL  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(RLCNFG),DISP=SHR
//VGSCFRF  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(RFCNFG),DISP=SHR
//VGSCFBR  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(BRCNFG),DISP=SHR
//*********************************************************************
//*                                                                   *
//*  VGS FONTS FILE          (VGSFONT DD).                            *
//*  VGS PLOTTER MODEL FILE  (VGSMODL DD).                            *
//*  VGS OUTPUT DRIVER FILE  (VGSDRVR DD).                            *
//*                                                                   *
//*********************************************************************
//VGSFONT  DD  DSN=VTECVGS.VTxxxxxx.FONTDATA,DISP=SHR
//VGSMODL  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(VGSMODL),DISP=SHR
//VGSDRVR  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(VGSDRVR),DISP=SHR
//*********************************************************************
//*                                                                   *
//*  VGS COLOR DATA FILES (XXXXXXD).                                  *
//*                                                                   *
//*  DEPENDING ON THE PLOTTER MODEL USED IN THE VGS PARAMETER FILE *
//*   (VGSPARM DD), ONE OF THE VGS COLOR DATA FILES WILL BE USED.   *
//*                                                                   *
//*********************************************************************
//CE3200D  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(CE3200D),DISP=SHR
//CE3400D  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(CE3400D),DISP=SHR
//C2502D   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2502D),DISP=SHR
//C2508D   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2508D),DISP=SHR
//C2706AD  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2706AD),DISP=SHR
//C2706D   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2706D),DISP=SHR
//ECP42D   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(ECP42D),DISP=SHR
//M8800D   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(M8800D),DISP=SHR
//*********************************************************************
//*                                                                   *
//*  VGS PATTERN DATA FILES (XXXXXXP).                                *
//*                                                                   *
//*  DEPENDING ON THE PLOTTER MODEL USED IN THE VGS PARAMETER FILE *
//*   (VGSPARM DD), ONE OF THE VGS PATTERN DATA FILES WILL BE USED. *
//*                                                                   *
//*********************************************************************
//CE3200P  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(CE3200P),DISP=SHR
//CE3400P  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(CE3400P),DISP=SHR
//C2502P   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2502P),DISP=SHR
//C2508P   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2508P),DISP=SHR
//C2706P   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2706P),DISP=SHR
```

```
//C2706AP  DD  DSN=VTECVGS.VTxxxxxx.DATALIB(C2706AP),DISP=SHR
//ECP42P   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(ECP42P),DISP=SHR
//M8800P   DD  DSN=VTECVGS.VTxxxxxx.DATALIB(M8800P),DISP=SHR
//*****************************************************************
//*                                                               *
//*  VGS LOG FILE            (FT06F001 DD).                       *
//*  VGS GRAPHICS DATA FILE  (VGSPLOT  DD).                       *
//*  VGS INTERMEDIATE FILE   (VGSUT01  DD).                       *
//*                                                               *
//*  NOTES :                                                      *
//*                                                               *
//*  THE LISTING UNIT IN THE VGS PARAMETER FILE DETERMINES THE VGS *
//*  LOG FILE DDNAME (FTNNF001). FOR THIS VGSIVP PROCEDURE, USE THE*
//*  DEFAULT VALUE 6 FOR THE LISTING UNIT.                        *
//*                                                               *
//*  FOR THE VGS GRAPHICS DATA FILE, THE LRECL AND BLKSIZE MUST BE *
//*  EVEN-NUMBERED AND MUST BE WITHIN THE FOLLOWING RANGES:       *
//*                                                               *
//*      LRECL RANGE   :  00018 TO 32760                          *
//*      BLKSIZE RANGE :  00018 TO 32760                          *
//*                                                               *
//*  FOR CHANNEL-ATTACHED VERSATEC GRAPHICS CONTROLLERS AND INTER- *
//*  FACE BOXES, THE LRECL OF THE VGS GRAPHICS DATA FILE SHOULD BE *
//*  THE SAME AS THE LRECL OF THE GRAPHICS CONTROLLER OR INTERFACE *
//*  BOX.                                                         *
//*                                                               *
//*  CHECK WITH THE SYSTEM PROGRAMMER OF THE INSTALLATION SITE    *
//*  ABOUT THE PLOTTER/CONTROLLER LRECL AND SYSOUT CLASS.         *
//*                                                               *
//*  FOR A DESCRIPTION OF THE GRAPHICS DATA ATTRIBUTES AND HOW IT  *
//*  MAY BE ROUTED, SEE THE TOPIC, GRAPHICS DATA ATTRIBUTES, IN THE*
//*  IBM ENVIRONMENT CONSIDERATIONS SUBSECTION IN YOUR VGS MANUAL. *
//*  SYSOUT CLASS CHANGED TO M BY INSTALLER                       *
//*****************************************************************
//VGSPLOT  DD  SYSOUT=M,OUTPUT=(*.VERSATEC),
//             DCB=(LRECL=132,BLKSIZE=2640)
//VGSUT01  DD  UNIT=SYSDA,
//             SPACE=(TRK,(30,15)),
//             DISP=(MOD,PASS)
//FT06F001 DD SYSOUT=*
//SYSIN DD DSN=your.sas.program
//*
```

Note the following JCL specified in this SAS/GRAPH job:

- ❑ The `VGSPLOT DD` statement contains output directed to the device.
- ❑ The `VGSUT01 DD` statement contains an intermediate file used by Versatec. The `DISP=` parameter should be set to (`MOD,PASS`).
- ❑ The pattern, model, and color data files contain information that VGS software requires. Not all of the files listed in this sample job are required. You need only supply the ones needed for your printer or plotter.
- ❑ The `FT06F001 DD` statement points to where error messages and a log of the VGS routines will be written.
- ❑ The `SASLIB DD` statement points to where your driver module is stored. If your driver is a member in one of your SAS load libraries, this DD statement is not required.

- The VGSPARM DD statement points to a file that can control specific parameters to enhance the output of your graphs. The model of your printer or plotter number should be specified in the VGSPARM statement. A VGSPARM file is shown in the following example. Other parameters, such as PEN_COLOR and PEN_WIDTH can be used to control the colors and width of "pens" used on your graph. Note that PEN_COLOR 0 and PEN_WIDTH 0 are not used by the SAS System.

  The following is a list of some of the parameters you can use:

Parameter	Description
PEN_COLOR	This assigns the color that the pen will use. You can match your pens to colors found in the Versatec default color table found in the back of your VGS users guide. The colors used in this example are BLACK, RED, GREEN, BLUE, CYAN, MAGENTA, YELLOW, ORANGE, BROWN, GRAY, LIME, VIOLET, ROSE, LTBLUE, AQUA. The first seven colors are produced directly, while the remaining colors are produced by dithering.
PEN_WIDTH	This controls the width of the "pen" or nib on your device. This is commonly set to 2; however other settings can be used if a thicker line is desired, (such as on 400 DPI electrostatic models).
MODEL	The model number of your printer or plotter.
X_SCALE Y_SCALE	These are the scaling factors used to control plot size. If your plot is smaller than the HSIZE and VSIZE values specified in your SAS job, increasing the X_SCALE and Y_SCALE values will increase size of the plot. If your plot is larger than HSIZE and VSIZE, fractional values (between 0 and 1) can be used to decrease the size of the plot. Normally Y_SCALE is set to 0.66, but other values can be used.

The following is an example of a typical SAS/GRAPH VGSPARM data set:

```
* VGS parameter file.

* OUTPUT_DRIVER and MODEL are required entries

OUTPUT_DRIVER  RPM_VRF * RPM_VRF, RPM_VCGL, RASTER
MODEL          C2736          * See Appendix D
                              * of your VGS manual

* Optional entries are shown below, with acceptable values listed to
the right.

       * OPTIONAL ENTRIES     ASSIGNED VALUE     ACCEPTABLE VALUES
       * ================     ==============     =================

       * PAPER, VIEWPORT, and WINDOW defaults are based on a V80 model.

       * PAPER               0.0  10.555  0.0     * >= 0.0
                            10.555
       * VIEWPORT            0.0  10.555  0.0     * >= 0.0
                            10.555
       * WINDOW              0.0  10.555  0.0     * Any Real Numbers
                            10.555

       * COPIES              1                   * >= 1
       * DRAWING_MODE        TRANSPARENT         * TRANSPARENT, OPAQUE
       * END_JOB_CODE        999                 * Not -2,-3,-12,-
                                                  13,2,3,12,13
       * END_PLOT_CODE 1     999                 * Not -2,-3,-12,-
                                                  13,2,3,12,13
       * END_PLOT_CODE 2     -999                * Not -2,-3,-12,-
                                                  13,2,3,12,13
       * END_PLOT_CODE 3     23                  * Not -2,-3,-12,-
                                                  13,2,3,12,13
       * END_PLOT_CODE 4     -23                 * Not -2,-3,-12,-
                                                  13,2,3,12,13
       * FONT                0                   * >= 0
       * GRAY_SCALE_LINES    OFF                 * ON, OFF
       * INITIAL_PEN         1                   * 0 to 63
       * LISTING_UNIT        6                   * 0 to 99
       * OPTIONS_SUMMARY     ON                  * ON, OFF
       *PEN_COLOR 0          1                   * 1 to 4095
        PEN_COLOR 1          8                   * 1 to 4095
        PEN_COLOR 2          6                   * 1 to 4095
        PEN_COLOR 3          7                   * 1 to 4095
        PEN_COLOR 4          5                   * 1 to 4095
        PEN_COLOR 5          2                   * 1 to 4095
        PEN_COLOR 6          3                   * 1 to 4095
        PEN_COLOR 7          4                   * 1 to 4095
        PEN_COLOR 8          146                 * 1 to 4095
        PEN_COLOR 9          142                 * 1 to 4095
        PEN_COLOR 10         10                  * 1 to 4095
        PEN_COLOR 11         114                 * 1 to 4095
        PEN_COLOR 12         218                 * 1 to 4095
        PEN_COLOR 13         164                 * 1 to 4095
        PEN_COLOR 14         60                  * 1 to 4095
        PEN_COLOR 15         69                  * 1 to 4095
       *        *                                 *   .
       *        *                                 *   .
       *        *                                 *   .
       * PEN_COLOR 63        1                   * 1 to 4095
       * PEN_WIDTH 0         0                   * 1 to 31
         PEN_WIDTH 1         2                   * 1 to 31
         PEN_WIDTH 2         2                   * 1 to 31
         PEN_WIDTH 3         2                   * 1 to 31
         PEN_WIDTH 4         2                   * 1 to 31
         PEN_WIDTH 5         2                   * 1 to 31
         PEN_WIDTH 6         2                   * 1 to 31
         PEN_WIDTH 7         2                   * 1 to 31
         PEN_WIDTH 8         2                   * 1 to 31
         PEN_WIDTH 9         2                   * 1 to 31
         PEN_WIDTH 10        2                   * 1 to 31
         PEN_WIDTH 11        2                   * 1 to 31
```

```
  PEN_WIDTH 12        2                   * 1 to 31
  PEN_WIDTH 13        2                   * 1 to 31
  PEN_WIDTH 14        2                   * 1 to 31
  PEN_WIDTH 15        2                   * 1 to 31
*       *                                 *   .
*       *                                 *   .
*       *                                 *   .
* PEN_WIDTH 31        31                  * 1 to 31
* PEN_WIDTH 32        31                  * 1 to 31
*       *                                 *   .
*       *                                 *   .
*       *                                 *   .
* PEN_WIDTH 63        31                  * 1 to 31
* PLOT_IDENTIFIER     OFF                 * ON, OFF
* PLOT_STRIP          1                   * >= 1
* PLOT_SUMMARY        ON                  * ON, OFF
* RESERVED_UNITS      49  54              * 0 to 99
* ROTATE              OFF                 * ON, OFF
* SCALE               1.00                * > 0.0
* TEXT_PRECISION      STRING              * STROKE, CHAR,
                                          STRING
* TONE_COLOR          1                   * 1 to 4095
* TONE_FLAG           HATCH               * HATCH, TONE
* UNITS               1.0                 * > 0.0
* X_SCALE             1.0                 * > 0.0
  Y_SCALE             0.66                * > 0.0
* X_START             0.0                 * Any Real Number
* Y_START             0.0                 * Any Real Number
```

Special Instructions for Xerox EPIC or XPPI Version 1.0 Users

Modifications to the Installation Process

If you are creating a driver for Xerox printers using EPIC Version 3.1 or higher or XPPI Version 1.0 software, you must make the following changes to the instructions in "Generating an Executable Module" to account for the differences in the software interface:

1. Install EPIC in SINGLE PHASE. This allows SAS/GRAPH and EPIC to generate graphics in a single step. Release 3.1 is the earliest release of EPIC that will run with SAS Software.

2. Instead of compiling and using the LINKAIBM program with the LINKEXT program, you should replace the LINKEXT program with one especially designed for use with Xerox printers using the EPIC interface. Use the members `LINKAIBM` and `EPICEXT` (located in `&prefix.GRMISC`) in the `//FORT.SYSIN DD` statement. The EPICEXT program contains a subroutine `PLOTA1`, which makes calls to the `DJDE` files in the EPIC software to initialize parameters.

   The EPICEXT program also contains the subroutine `PLOTC1`, which calls the `PLOT` routine with a third parameter of -23 at the end of each graph. This eliminates potential problems with EPIC software in which only one graph is generated if multiple graphs are requested in a procedure.

The value for PIXELS in the LINKAIBM FORTRAN program should be changed from 200 to 300 dots per inch in subroutine INIDVR. You should increase the XPIXELS and YPIXELS values in your catalog driver entry using the GDEVICE procedure in order to create the correct sized graph. To calculate the number of pixels, use the following formula:

```
PIXELS = (XMAX or YMAX) x 300
```

You should also change the NEWPEN routine in the LINKAIBM FORTRAN program so that the NEWPEN routine remaps pen color 3 to pen color 4. This should be done because the width of pens 2 and 3 appear to be the same. This can be done by adding the following statement in the "SELECT COLOR" section of the LINKAIBM FORTRAN program just before the CALL NEWPEN(COLOR) statement.

```
IF (COLOR .EQ. 3) COLOR=4
```

3. The driver allows for three pen widths. You should set MAXCOLORS=4 and have three colors in your device driver entry. For example, if the colors list in the device entry has PEN1, PEN2, PEN3 for the colors specified, PEN1 is the thinnest pen and PEN3 is the thickest pen used.

   You can use the following EPICJCL member located in &prefix.GRMISC for linking your routines:

```
//NEWEPIC1 JOB 'your job information'
//      MSGCLASS=A,TIME=(,10),NOTIFY=yourname
/*JOBPARM FETCH
//your fortran exec
//SYSIN DD DISP=SHR,DSN=linkaibm
//      DD DISP=SHR,DSN=epicext
/*
//LKED   EXEC PGM=IEWL,PARM='MAP,LIST'
//SYSPRINT DD SYSOUT=A
//SYSLIB   DD DISP=SHR,DSN=your.epic.library
//         DD DISP=SHR,DSN=your.fortran.library
//SYSUT1   DD UNIT=SYSDA,SPACE=(1024,(200,20))
//SYSLMOD  DD DISP=OLD,DSN=your.driver.load(newname),UNIT=DISK
//OBJ      DD DISP=(OLD,DELETE),DSN=&&LOADSET
//SYSLIN   DD *
  INCLUDE SYSLIB(PLOTS,PLOT,SYMBOL,NEWPEN)
  REPLACE PLOTS,PLOT,SYMBOL,NEWPEN
  CHANGE MAIN(newname)
  INCLUDE OBJ
  ENTRY newname
  NAME newname(R)
//
```

   Note: If you are using VS FORTRAN Version 2 Release 5, the CHANGE MAIN(newname) statement above should be changed to CHANGE MAIN#(newname).

Generating Graphics Using EPIC or XPPI 1.0 Software

The following shows a typical SAS/GRAPH job using Xerox EPIC or XPPI 1.0 software. Note that if you created your driver using the LINKAIBM and EPICEXT FORTRAN programs, the EPIC routines are called from within your SAS program and you do not have to run them as a separate step. Source for the job can be found in member `EPICJCL` in `&prefix.GRMISC` on your installation tape.

The following is an example of a typical SAS/GRAPH job using EPIC or XPPI 1.0 software:

```
//jobcard information
//*******************************************************************
//*                                                                 *
//*  This is a SAMPLE PROGRAM. Changes must be made to run on your  *
//*  system                                                         *
//*                                                                 *
//*******************************************************************
//*
//SASSTEP EXEC SAS6,REGION=4096K
//STEPLIB      DD
//             DD  DISP=SHR,DSN=your.fortan.library
//             DD  DISP=SHR,DSN=your.EPIC.single.phase.library
//SASLIB       DD  DISP=SHR,DSN=your.linked.driver.library
//*******************************************************************
//*                                                                 *
//*  FT05F001 is the namelist file that controls EPIC parameters    *
//*                                                                 *
//*******************************************************************
//FT05F001 DD DSN=your.namelist.file,DISP=SHR
//*******************************************************************
//*                                                                 *
//*  FT06F001 is the EPIC log file                                  *
//*                                                                 *
//*******************************************************************
//FT06F001 DD SYSOUT=*
//*******************************************************************
//*                                                                 *
//*  EPICITMP and EPICVECT are intermediate scratch files that      *
//*  are used in the EPIC process                                   *
//*                                                                 *
//*******************************************************************
//EPICITMP DD DSN=&&IMAGE,SPACE=(6144,(10,5)),
//    DCB=(BLKSIZE=6144,RECFM=FB),
//    UNIT=SYSDA,DISP=(,DELETE)
//EPICVECT DD DSN=&&VECTORS,SPACE=(6144,(50,100)),
//    UNIT=SYSDA,DISP=(MOD,DELETE)
//*****************************************************************
//*                                                               *
//*  FT02F001 is the EPIC output file                             *
//*                                                               *
//*****************************************************************
//FT02F001 DD SYSOUT=*,DCB=RECFM=UA
//SYSIN DD DSN=your.sas.program,DISP=SHR
//*
```

Note the following JCL specified in this SAS/GRAPH job:

- ❑ The `FT02F001 DD` statement contains the transportable output file that is normally sent to the device.
- ❑ The `EPICVECT DD` statement contains an intermediate file used by EPIC. The `DISP=` parameter should be set to `(MOD,DELETE)`. This file normally will hold DJDE information and printer font text strings.

- The FT06F001 DD statement points to where error messages and a log from the EPIC routines will be written.
- The SASLIB DD statement points to where your SAS/GRAPH driver module is stored. If your driver module is a member in one of your SAS load libraries, this DD statement is not required.
- The FT07F001 DD statement normally points the FORTRAN logical unit IOMUN. It is only required if DJDE's or linemode data are read and merged between images on the transportable output file. It is rarely used with SAS/GRAPH output. Refer to your EPIC manual for details.
- The FT05F001 DD statement normally points to a file that can control specific parameters to enhance the output of your graphs. This is called the NAMELIST file. A sample file is listed below:

```
&EPIC IMGDSP=3,MSGLVD=1,IFNTXD=-
2,MGDJDE=0,DPRESO=300,
     DBRUSH=0.003333 &END
```

The following is a list of some of the parameters that you can use:

Parameter	Default	Description
DBRUSH	0.003333	Controls the width of the pen that will be used.
DPRESO	300	Controls the resolution in dots per inch on your device.
IMGDSP	1 The recommended value is 3.	Sets the characteristics of the transportable data set. Setting the value to 3 produces on-line I/O.
IFNTXD	-2	This controls the processing of printer fonts. Setting the value to -2 means the printer fonts are not used.
MSGLVD	1 Possible values for this parameter are:	This controls what is written to your FT06F001 file. The value supplied is the SUM of specific options requested; for example, a value of 5 causes the IMAGE SUMMARY and NAMELIST data to print. This can be useful in debugging problems in your graphics jobs.
	0	Print only error messages
	1	Print image summary information
	2	Print detailed information from XPPI
	4	Print NAMELIST parameter data
	8	List fonts definition file
	16	List clipped/undrawable vectors
	32	List user level calls

Special Instructions for Xerox XPPI Version 1.1 Users

Modifications to the Installation Process

If you are creating a driver for Xerox printers using XPPI Version 1.1 software, you must make the following changes to the instructions in "Generating an Executable Module" account for the following differences in the software interface:

Note: If you are running XPPI Version 2 or later, contact the SAS Technical Support Division for details.

1. You should install XPPI in SINGLE PHASE. This allows SAS/GRAPH and XPPI to generate graphics in a single step. Release 1.1 is the earliest release of XPPI that will run with SAS/GRAPH software and generate color scaling. If you are using Release 1.0, follow the instructions on building a Linkable driver with EPIC software. These instructions are given in the previous section.

2. Combine the members LINKAIBM and EPICEXT (found in `&prefix.GRMISC`), and name the combined program NEWXPPI1.

3. The EPICEXT program adds the following subroutines to the LINKAIBM FORTRAN program. The subroutine PLOTA1 is used to initialize the XPPI namelist parameter file and the DJDE file before each graphics procedure. The subroutine PLOTC1 is used to call the PLOT routine with a third parameter of -23 at the end of each graph. This eliminates potential problems with XPPI software in which only one graph is generated if multiple graphs are requested in a procedure.

4. Change the statement `PIXELS=200.` to read `PIXELS=300.` in the NEWXPPI1 program. This statement is in the section titled "`PREVIOUS USER 'ZAPPABLE' VALUES`." This change causes the driver to produce output at 300 dots per inch. You should also increase the `XPIXELS` and `YPIXELS` values in the device driver entry using the GDEVICE procedure in order to create correctly sized graphs. See "Customizing Device Characteristics" for more details.

5. Change the statement `CALL NEWPEN(COLOR)` to read `CALL COLPEN(COLOR)` in the NEWXPPI1 program. This statement is in the section titled "`SELECT COLOR`." This change causes the driver to make a call to the correct XPPI routine, which selects color or gray shades.

6. Xerox distributes the XPPI software in both source-code and object-code form. The XPPI object modules were created from assembly-language source code, using IBM assembler and VS FORTRAN 2.4. The optimize (OPT) in the compile step was set to 3 to improve execution time. It is recommended that you use VS FORTRAN level 2.3 (or higher) with XPPI. However, if you decide to use a different level of VS FORTRAN, you must recompile all of the XPPI source modules during the installation process (before linking). When recompiling, specify a language level (`LANGLVL`) of 77. You should compile the NEWXPPI1 FORTRAN program with the same compiler as the XPPI plotting routines. If you do not, errors may occur when using the driver. The NEWXPPI1 FORTRAN program was written using FORTRAN 66. When this is compiled using language level 77, you will receive the following warning messages during the compile step:

```
AN AMPERSAND IS AN INVALID CHARACTER FOR "LANGLVL 77."
THE AMPERSAND WILL BE PROCESSED AS AN ASTERISK.  SPECIFY
A VALID CHARACTER TO AVOID AN ERROR MESSAGE.
```

7. You can compile the NEWXPPI1 program with the following sample JCL:

```
//XPPIOBJ1 JOB 'your job information'
//      MSGCLASS=A,TIME=(,10),NOTIFY=yourname
/*JOBPARM FETCH
//your fortran exec
//FORT.SYSPUNCH DD DUMMY
//FORT.SYSLIN DD DSN=your.object.library(objectname),
//            DISP=(NEW,CATLG,DELETE),
//            SPACE=(TRK,5,2,5)),UNIT=SYSDA,
//            DCB=(RECFM=FB,LRECL=80,BLKSIZE=3120)
//FORT.SYSIN  DD DSN=your.newxppi.fortran.source(NEWXPPI1),
//            DISP=SHR
//*
```

   where `objectname` can be any name that you choose.

8. Linking the device driver requires that you perform the following two steps:

   a. First, create a Linkedit command program and store it in a member of a PDS data set with the following commands:

```
INCLUDE OBJECT(objectname)
INCLUDE SYSLIB(PLOTS)
INCLUDE SYSLIB(PLOT)
INCLUDE SYSLIB(SYMBOL)
INCLUDE SYSLIB(COLPEN)
INCLUDE SYSLIB(SETMSGPP)
INCLUDE SYSLIB(XENDIMPP)
INCLUDE SYSLIB(XHDRFLPP)
INCLUDE SYSLIB(XIOTPP)
INCLUDE SYSLIB(XOUTIMPP)
INCLUDE SYSLIB(XPTBITPP)
INCLUDE SYSLIB(XPTRAWPP)
INCLUDE SYSLIB(XWRSTRPP)
NAME yourdriver (R)
```

The objectname is the name of your object in the //FORT.SYSLIN DD statement of the compile job in the previous step. yourdriver is the name of the driver module you wish to create. This data set is used in the SYSLIN DD statement in the linkedit job in the next step.

b. Next, link the driver using the example JCL , which is an instream procedure. You can use the XPPIJCL member in the GRMISC data set to do this. Each statement of the job is explained briefly below:

LINKSD assigns specific names to the &dataset names in the instream proc. You may not need the HIGH= option and the &HIGH level qualifiers in your proc if you installed XPPI starting with XPPI as the first level name.

SYSLIB specifies where your FORTRAN libraries and XPPI libraries are included.

SYSLIN specifies the location of your linkedit command program containing the INCLUDE statements.

SYSLMOD specifies the location of your new driver load module. The member yourdriver should match the name used in the NAME statement in the linkedit program in the previous step.

OBJECT includes the OBJECT you created with the compile job in step 7 of this section.

The following is the example JCL you should use to complete this step:

```
//XPPILINK job card information
/*JOBPARM FETCH
//LINKSD PROC HIGH=highlevel,PROJ=XPPI,
//            VER=V1R1M02,DATA=linkeditmember
//LKED   EXEC PGM=IEWL,REGION=256K,
//            PARM='XREF,LIST,DCBS,AMODE=31,RMODE=24'
//SYSLIB   DD DISP=SHR,DSN=your.fortran.library
//         DD DISP=SHR,DSN=your.fortran.linklib
//         DD DISP=SHR,DSN=&HIGH..&PROJ..&VER..SLINKLIB
//SYSLIN   DD DISP=SHR,DSN=your.linkedit.command.data(&DATA)
//SYSLMOD  DD DISP=OLD,DSN=your.driver.load(newname),UNIT=DISK
//SYSPRINT DD SYSOUT=*
//SYSUT1   DD UNIT=VIO,SPACE=(CYL,(1,1))
//OBJECT   DD DISP=OLD,DSN=your.object.library
//        PEND
```

Generating Graphics Using XPPI Version 1.1 Software

The following examples show a typical SAS/GRAPH job using Xerox XPPI software. Note that if you created your driver using the NEWXPPI1 FORTRAN program, and you have a large centralized printer that is channel attached (such as a 9700 or HIGHLIGHT printer) the XPPI routines are called from within your SAS program and you do not have to run them as a separate step. If you have a decentralized printer that is defined to the host as a 3287 or 3780 remote (such as a 3700 or 4045 printer) you must run the COPYIMG program as a separate step. An explanation of the JCL follows the sample programs. Source for these jobs can be found in member XPPICENT (for centralized printers) or member XPPIDEC (for decentralized printers) in `&prefix.GRMISC` on your installation tape.

The following is an example of a typical SAS/GRAPH job using XPPI software for Centralized printers:

```
//jobcard information
//XPPISAS PROC HIGH=yourhighlevel,PROJ=XPPI,VER=V1R1M02,
//             NLIST=COLGFXW,NLDSN=NAMELIST,PCNTL=STD,
//             PALETTE=HILIGHT,FONT=A03,ENTRY=yourentry,
//             SAS=yoursasprogramname,
//             PRODFIX='your.sas.high.level',
//             CONFIG=NULLFILE,OPTIONS=,WORK='500,200'
//SAS608 EXEC  PGM=&ENTRY,PARM='&OPTIONS',REGION=4096K
//STEPLIB      DD  DISP=SHR,DSN=&PRODFIX..LIBRARY
//             DD  DISP=SHR,DSN=your.fortan.library
//             DD  DISP=SHR,DSN=your.fortan.load
//CONFIG       DD  DISP=SHR,DSN=&PRODFIX..CNTL(BATCHXA)
//             DD  DISP=SHR,DSN=&CONFIG
//WORK         DD  UNIT=SYSDA,SPACE=(6144,(&WORK),,,ROUND),
//                 DCB=(RECFM=FS,,DSORG=PS,LRECL=6144,BLKSIZE=6144)
//SASHELP      DD  DISP=SHR,DSN=&PRODFIX..SASHELP
//SASMSG       DD  DISP=SHR,DSN=&PRODFIX..SASMSG
//SASLOG       DD  SYSOUT=*
//SASLIST      DD  SYSOUT=*
//SASPARM      DD  UNIT=SYSDA,SPACE=(400,(100,300)),
//                 DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)
//SASLIB       DD  DISP=SHR,DSN=your.new.xppi.module.LOAD
//FT02F001     DD  SYSOUT=X,DCB=RECFM=UA
//FT04F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..FONTS(&FONT)
//FT05F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..&NLDSN(&NLIST)
//FT06F001     DD  SYSOUT=*
//FT07F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..PTRCNTL(&PCNTL)
//FT10F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..PALETTES(&PALETTE)
//MAPS         DD  DISP=SHR,DSN=&PRODFIX..MAPS
//XPPIVECT     DD  DSN=&&VECTORS,SPACE=(6144,(50,100)),
//                 UNIT=VIO,DISP=(MOD,DELETE)
//IMGTMP       DD  DSN=&&IMAGE,SPACE=(6144,(50,100)),
//                 DCB=(BLKSIZE=6144,RECFM=FB),
//                 UNIT=VIO,DISP=(,DELETE)
//SYSIN        DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..SASPGMS(&SAS)
//       PEND
//*
//STEP1 EXEC XPPISAS
```

The following is an example of a typical SAS/GRAPH job using XPPI software for Decentralized printers:

```
//jobcard information
//XPPISAS PROC HIGH=yourhighlevel,PROJ=XPPI,VER=V1R1M02,
//             NLIST=CI85X11T,NLDSN=NAMELIST,PCNTL=STD,
//             PALETTE=GRAY,FONT=A03,ENTRY=yourentry,
//             SAS=yoursasprogramname,
//             PRODFIX='your.sas.high.level',
//             CONFIG=NULLFILE,OPTIONS=,WORK='500,200',
//             CINLIST=SASIMG1
//SAS608 EXEC  PGM=&ENTRY,PARM='&OPTIONS',REGION=4096K
//STEPLIB      DD  DISP=SHR,DSN=&PRODFIX..LIBRARY
//             DD  DISP=SHR,DSN=your.fortan.library
//             DD  DISP=SHR,DSN=your.fortan.load
//CONFIG       DD  DISP=SHR,DSN=&PRODFIX..CNTL(BATCHXA)
//             DD  DISP=SHR,DSN=&CONFIG
//WORK         DD  UNIT=SYSDA,SPACE=(6144,(&WORK),,,ROUND),
//                 DCB=(RECFM=FS,,DSORG=PS,LRECL=6144,BLKSIZE=6144)
//SASHELP      DD  DISP=SHR,DSN=&PRODFIX..SASHELP
//SASMSG       DD  DISP=SHR,DSN=&PRODFIX..SASMSG
//SASLOG       DD  SYSOUT=*
//SASLIST      DD  SYSOUT=*
//SASPARM      DD  UNIT=SYSDA,SPACE=(400,(100,300)),
//                 DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)
//SASLIB       DD  DISP=SHR,DSN=your.new.xppi.module.LOAD
//FT02F001     DD  SYSOUT=X,DCB=RECFM=UA
//FT04F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..FONTS(&FONT)
//FT05F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..&NLDSN(&NLIST)
//FT06F001     DD  SYSOUT=*
//FT07F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..PTRCNTL(&PCNTL)
//FT10F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..PALETTES(&PALETTE)
//MAPS         DD  DISP=SHR,DSN=&PRODFIX..MAPS
//XPPIVECT     DD  DSN=&&VECTORS,SPACE=(6144,(50,100)),
//                 UNIT=VIO,DISP=(MOD,DELETE)
//IMGTMP       DD  DSN=&&IMAGE,SPACE=(6144,(10,5)),
//                 DCB=(BLKSIZE=6144,RECFM=FB),
//                 UNIT=VIO,DISP=(,DELETE)
//SYSIN        DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..SASPGMS(&SAS)
//IMGLIB       DD  DSN=&&TEMPILIB,SPACE=(6144,(30,10,10)),
//                 DCB=(BLKSIZE=6144,RECFM=FB,LRECL=64),
//                 UNIT=VIO,DISP=(NEW,PASS)
//COPYIMG EXEC PGM=COPYIMG,REGION=6000K
//STEPLIB      DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..LOAD
//INPDS        DD  DSN=&&TEMPILIB,DISP=(OLD,DELETE)
//FT02F001     DD  SYSOUT=A
//FT05F001     DD  DISP=SHR,DSN=&HIGH..&PROJ..&VER..COPIMG(&CINLIST)
//FT06F001     DD  SYSOUT=*
//        PEND
//STEP1 EXEC XPPISAS
```

The following is an explanation of the selected JCL. Refer to *SAS Companion for the MVS Environment, Version 6, First Edition* for more information on SAS related DDnames.

- ❑ `STEPLIB DD` refers to your production SAS libraries and FORTRAN libraries that are required to run XPPI.

- ❑ `CONFIG DD` points to the name of your instream SAS control library. The member is often called `BATCHXA` but can be other names.

- ❑ `WORK DD` specifies the amount of work space required by the SAS job. Often productions jobs can require larger amounts of workspace in order to finish running the job. You should customize this parameter depending on the amount of data and number of graphs you are generating on your system. For most operations, what is listed in the `WORK= PROC` parameter is sufficient.

- `SASHELP DD` points to your `SASHELP` data set, which contains the device catalog entry you created in, "Customizing Device Characteristics."
- `SASLOG DD` points to where the log of you SAS program is written.
- `SASLIST DD` points to where the non-graphics output (such as output from `PROC PRINT` or `TABULATE`) is written.
- `SASLIB DD` points to your driver load module (created from the previous step).
- `FT02F001 DD` points to the transportable output file that is normally sent to the device.
- `FT04F001 DD` points to the font list that is used for hardware character generation.
- `FT06F001 DD` points to where error messages and a log from the XPPI routines will be written.
- `FT07F001 DD` normally points to the FORTRAN logical unit where your printer DJDE control information is stored. You can use these parameters to merge text and graphics. Refer to your XPPI manual for more information on merging text and graphics.
- `FT10F001 DD` points to the color or gray scale palette file (members of the palette data set). You should use the `HILIGHT` member if you have a Xerox 4850 printer; otherwise, you should use the `GRAY` member.
- `MAPS DD` points to the SAS/GRAPH maps data set.
- `XPPIVECT DD` points to an intermediate file used by XPPI. The `DISP=` parameter should be set to `(MOD,DELETE)`. This file normally will hold DJDE information and printer font text strings.
- `IMGTMP DD` points to an intermediate image file used by XPPI. The `DISP=` parameter should be set to `(,DELETE)`.
- `SYSIN DD` points to the data set containing your SAS programs.
- `FT05F001 DD` normally points to your `NAMELIST` parameter file. This file contains specific parameters to enhance the output of your graphs. You should consult your XPPI manual under the section "Managing Your Resources with XPPI" for more details.

The following is a sample Centralized Printer NAMELIST parameter file:

```
&XPPI IMGDSP=3,MSGLVD=6,IFNTXD=-
   2,MGDJDE=2,IPCC=1,NTONER=2,
      IRESULT='BLACK',HILIGHT='GREEN' &END
```

The following is a sample Decentralized Printer NAMELIST parameter file:

```
&XPPI IMGDSP=6,MSGLVD=7,IFNTXD=-2,IOILFN(1)='TEMP',
      IOILFN(2)=0,IPCC=1,NTONER=1,PAGHGT=17.0,PAGWID=11.0 &END
```

The following is a list of some of the parameters that you can use:

Parameter	Default	Description
DBRUSH	0.003333	Controls the width of the pen that is used.
HILIGHT	RED	Controls the color to be used with HIGHLIGHT images. This can only be used with centralized printers. Other valid values are BLUE and GREEN.
IMGDSP	1 You should use 3 for centralized printers and 6 for decentralized printers.	Sets the characteristics of the transportable data set. Setting the value to 3 produces on-line I/O. A value of 6 means that no image files are included in the transportable output. Refer to your XPPI manual for more details on this parameter.
IFNTXD	-1 The recommended value is -2.	Controls the processing of printer fonts. Setting the value to -2 means the printer fonts are not used.
IOILFN		Controls the intermediate file name used with decentralized printers.
IPCC	0 The recommended value is 1.	Controls the vertical format control. A value of 1 selects a format statement that adds a plus character before each image record. Refer to your XPPI manual for more information.
MGDJDE	0 The possible values for this parameter are:	Tells XPPI what type of DJDE to generate and merge into the transportable image file.

		0	Generate and merge no DJDEs (if you set `MGDJDE=0`, you must set `MGTEXT=1`)
		1	Generate and merge batch-mode DJDEs
		2	Generate and merge page-interleaved DJDEs
`MSGLVD`	`0`		Controls what is written to your `FT06F001` file. The value supplied is the SUM of specific options requested. For example, a value of 5 causes the `IMAGE SUMMARY` and `NAMELIST` data to print. This can be useful in debugging problems in your graphics jobs.
	The possible values for this parameter are:		
		0	Print only error messages
		1	Print image summary information
		2	Print detailed information from XPPI
		4	Print `NAMELIST` parameter data
		8	List fonts definition file
		16	List clipped/undrawable vectors
		32	List user level calls
`NTONER`	1		Specifies the number of colors or toners available on your printer.
	Set to `1` for 1 toner and `2` for 2 toners or for color		
`XPOS and YPOS`	37		Specifies the image position in the X-axis or Y-axis direction in dots. Each dot is 1/300 of an inch and is similar in function to the `SAS GOPTIONS` of `HORIGIN` and `VORIGIN` respectively.

Decentralized printers also require a `COPYIMG` step, (see example after the centralized printer example) that takes the image file and converts it into `UDK` codes that the printer can understand. Note the extra `IMGLIB` statement and additional step. In the `COPYIMG` step there is an additional `FT05F001 DD` statement that has the same function as the `FT05F001 NAMELIST` function above. Changes to sizing, `XPOS`, and `YPOS` should be done here instead of in the previous `FT05F001 DD` statement.

Common Problems and Solutions

This section describes some problems you may encounter when installing or trying to use the Linkable driver. If you have any problems, please check the following list of problems and solutions before calling SAS Institute.

PROBLEM:

If the driver always produces an `ABEND` when executed, check the following possibilities:

SOLUTION:

First, look at the listing from the linkedit that created the driver. Make sure the `LET` option is not specified in the linkedit step. All external references must be resolved when the driver is linked. If the `LET` option appears, rerun the `LKED` step without specifying `LET` and make sure there were no unresolved references.

Make sure you have provided all the necessary allocations required by your plotting subroutines prior to execution of the driver. Generally, any file allocations required when you use these routines in a FORTRAN program would also be necessary when the LINKABLE driver is executed. This includes the driver output file (usually `FT14F001`) and a file for FORTRAN error messages (`FT03F001` or `FT06F001` depending on your FORTRAN installation). If the required logical names are not available, the driver will produce an `ABEND`.

PROBLEM:

`IEW0132` messages appear on the LINKEDIT step for `VFEIM#` and other VF modules when using VS FORTRAN.

SOLUTION:

Make sure that all of the FORTRAN libraries are available when linking the driver. VS FORTRAN has several libraries that can be concatenated in your `SYSLIB DD` statement in the linkedit step.

PROBLEM:

Portions of a graph are missing when the Linkable driver is used with a plotter with only one pen.

SOLUTION:

The Linkable driver assumes that there are four pens available. If the SAS/GRAPH System tries to use multiple colors and there is only one pen available, anything using a color other than the first default color may not be drawn. To circumvent this, use the `GDEVICE` procedure to change the `MAXCOLORS` value in the device entry to `2`.

PROBLEM:

Multiple graphics procedures are invoked, but only output from the first or last one comes out.

SOLUTION:

If output is written to a file, specify `DISP=MOD`. Even this may not suffice for some rare plotter control units that refuse to go past the first 999 record they encounter. Each graphics procedure causes another 999 record to be written as the procedure is terminating. If your plotter does not read past the 999 record for additional plots, you may be able to modify the plotter subroutines so that the 999 record is not written as a 999 record, but rather as a 3 record (see Ipen values for subroutine `PLOT`). You then invoke a special procedure at the end of your SAS step that would add a 999 record to the end of the plot file.

An alternative solution is to specify the `GOUT=` option on each procedure so that the output from each procedure is stored in a graphics catalog but not plotted. Then at the end of the job, use `PROC GREPLAY` to produce the plotting commands in one plot file. The call to `PLOT (0, 0, 999)` is only made when the procedure is terminated.

PROBLEM:

`IFYVLBCM` messages are received when using the driver if VS FORTRAN is used.

SOLUTION:

Some releases of FORTRAN require that the FORTRAN runtime library be available. This library should be added to your `STEPLIB` concatenation in your `LOGON PROC` or in your JCL.

PROBLEM:

`IEY0081 OR IGY0081 ALLOCATION` errors received when compiling the LINKAIBM FORTRAN program if using the FORTRAN G compiler.

SOLUTION:

Compile the program with a newer version of FORTRAN compiler. The FORTRAN G compiler cannot handle this type of logic.

PROBLEM:

`DEVICE INITIALIZATION FAILED` error messages are received when using the LINKABLE driver.

SOLUTION:

A device catalog entry has not been created as described in "Customizing Device Characteristics", or a `LIBNAME GDEVICE0` statement is needed if you created your own personal catalog.

Using SAS/GRAPH Software with IBM 3270-Type Terminals and 3270 Emulators

This section describes the steps necessary to use SAS/GRAPH software with IBM 3270-type graphics terminals and emulators.

Note: You do not need GDDM to use SAS/GRAPH software with IBM 3270-type graphics terminals. However, a GDDM device driver is required when using an IEEE-attached pen plotter or when creating GDF and ADMGDF files. For more information on the SAS/GRAPH interface to GDDM, see "Using SAS/GRAPH Software with GDDM" in this appendix.

The following sections discuss using SAS/GRAPH software with IBM 3270-type graphics terminals. This discussion is divided into the following six topics:

- **Specifying the correct device driver**

  describes the IBM 3270-type terminals that support graphics and the available SAS/GRAPH device drivers.

- **Customization of the control unit**

  describes the customization requirements for the IBM 3274 control unit to support "presentation graphics." Most IBM 3174 control units come standard with graphics support and require no extra customization.

- **Specifying VTAM node definitions and mode tables**

  contains sample VTAM node definitions and mode tables for IBM 3270-type terminals. These definitions and tables are valid for use with either the IBMxxxx or GDDMxxxx drivers. If your VTAM definitions are not correct, you may receive Screen Erasure messages, `PROGxxx` communication errors, or the message `Error: Your device does not support graphics` when you attempt to display graphics.

- **Requirements for 3270 emulators**

  explains the general requirements for displaying host graphics on a PC or PS/2 using 3270 emulation software. Also listed are several emulation packages and their appropriate device driver to use with SAS/GRAPH.

- **Support for Canadian-French keyboards**

  describes the steps necessary to add support for the IBM 327x Canadian-French keyboards. This step is optional.

- **Common installation problems and how to solve them**

  describes some of the most common problems encountered when trying to use the IBMxxxx device drivers. If you have any difficulties, please refer to this section before calling SAS Institute.

Specifying the Correct Device Driver

In Version 6, all SAS/GRAPH device drivers exist as entries in a SAS catalog. You can browse and manage device driver entries using `PROC GDEVICE`. The default device catalog is `SASHELP.DEVICES`. The following is a list of IBM 3270-type terminals that support graphics along with the appropriate device driver. The device driver can either be specified in the `DEVICE=` parameter of an options statement, a `GOPTIONS` statement, or when prompted.

Device	Driver
IBM 3179 G	IBM3179
IBM 3192 G	IBM3192
IBM 3472 GC	IBM3472
IBM 3270 PC/G	IBMPCG
IBM 3270 PC/GX	IBMPCGX
IBM 3278 (with PS)	IBM3278
IBM 3279 (with PS)	IBM3279
IBM 3270 PC (with PS)	IBM3270
IBM 3290	IBM3290
IBM PC or PS/2 running GDDM-OS/2 LINK	IBMOS2CM

IBM 3278 and 3279 terminals (as well as IBM 3270 PCs) must have a PS (Programmed Symbols) adapter installed before they are capable of displaying graphics. If you are using an emulator, specify the driver for the device being emulated. Version 6 supports the SAS/GRAPH graphics window. When running with the Display Manager system, the SAS/GRAPH graphics window is enabled by default. To disable it, specify:

```
OPTIONS NOGWINDOW;
```

If GWINDOW is in effect and you are using one of the devices previously listed (or one that emulates a previously listed device) within the Display Manager System (DMS), you do not have to specify a device driver. A default GWINDOW driver will be chosen for you. Note that in Version 6, most device drivers for IBM 3270-type terminals are interchangeable. You can use the IBM3179 driver on an IBM 3472 terminal and vice-versa.

Customizing of the IBM 3274 Control Unit

The IBM 3274 control unit to which your 3270-type terminal or PC is connected must be properly customized in order to use the terminal for "presentation graphics." Most IBM 3174 control units come standard with graphics support. The following items apply only to 3274 control units.

If the 3274 is pre-Configuration Support "D," the necessary customization questions and answers are as follows:

Question Number	Answer
161	1
162	1
163	same answer as question 112
164	1
165	1 if 3274 is a "C" model (remote), 0 otherwise

If the 3274 has Configuration Support "D" installed (for example, the newer 41 and 61 models), the questions and answers are as follows:

Question Number	Answer
160	1
161	1
165	1 if 3274 is a "C" model (remote), 0 otherwise

Note that attachment to IBM 3274-1B, 3274-21A, 3274-21B, 3274-21C, 3274-21D, or 3276 control units is not supported.

Specifying VTAM Node Definitions and Mode Tables

The following sample VTAM node definitions and mode tables are provided as an aid to setting up your IBM graphics terminal for use with TSO. There are three sets of node definitions: (1) local non-SNA, (2) remote BSC, and (3) SNA (local and remote). The relevant mode table entries to be used will depend upon whether you are SNA or non-SNA. These are examples of definitions currently in use at SAS Institute. Your own definitions and tables may vary slightly, depending on the types of terminals you use.

The following VTAM node definitions and mode tables are valid for both the IBMxxxx and GDDMxxx drivers. If you are using the GDDMxxx drivers, refer to *GDDM Installation and System Management* (SC33-0321-2) for additional details on node definitions and mode tables.

Failure to specify the proper information to VTAM when using IBM graphics terminals causes SCREEN ERASURE errors, `PROGxxx` communication errors, or the message `Error: Device does not support graphics`. Note that the standard IBM 3278 and 3279 terminals (as well as IBM 3270 PCs) do not support graphics, unless they have the PS (Programmed Symbols) option installed. With IBM 3179 and 3192 terminals, only those designated as Model G devices support graphics.

The following examples are sample VTAM node definitions:

```
*
* VTAM configuration statements for graphics devices attached
* to a local non-SNA control unit
*
IBM32793 LOCAL TERM=3277,CUADDR=521,ISTATUS=ACTIVE,                X
               FEATUR2=(MODEL2,EDATS),       <===  Color display   X
               MODETAB=M3274,DLOGMOD=L3279M3,                       X
               USSTAB=USSTAB00
IBM32784 LOCAL TERM=3277,CUADDR=53E,ISTATUS=ACTIVE,                X
               FEATUR2=(MODEL2,EDATS),       <===  EDS display     X
               MODETAB=M3274,DLOGMOD=L3278M4, <== 3278-4 graphics  X
               USSTAB=USSTAB00

*
* VTAM configuration statements for graphics devices attached
* to remote BSC control units
*

BSC79M3       TERMINAL TERM=3277, A 3277 terminal                  X
               ADDR=6060C1C1,     Installation specific to port #  X
               POLL=4040C1C1,                                      X
               FEATUR2=(MODEL2,EDATS), <== Color display           X
               USSTAB=USSTAB00,   USS table for VTAM               X
               MODETAB=MT3274,    EDS mode table                   X
               DLOGMOD=L3279M3    A model 3 3279
BSC78M4       TERMINAL TERM=3277, A 3277 terminal                  X
               ADDR=6060C2C2,     Installation specific to port #  X
               POLL=4040C2C42,                                     X
               FEATUR2=(MODEL2,EDATS),<== Graphics display         X
               USSTAB=USSTAB00,   USS table for VTAM  X
               MODETAB=MT3274,    EDS Mode table      X
               DLOGMOD=L3278M4    A 3278 Model 4
*
* VTAM configuration statements for graphics devices attached to
* SNA control units (A and C models)
*
IBM32793  LU  LOCADDR=4,                                           X
              ISTATUS=ACTIVE,                                      X
              MODETAB=M3274,      3274 mode table                  X
              DLOGMOD=S3279M3,    <<=== 3279 color graphics        X
              USSTAB=USSSNA00
IBM32784 LU   LOCADDR=5,                                           X
              STATUS=INACTIVE,                                     X
              MODETAB=M3274,      3274 mode table                  X
              DLOGMOD=S3278M4,    <<<=== 3278 EDS                  X
              USSTAB=USSSNA00
```

The following examples are sample VTAM mode tables:

```
MT3274   TITLE 'SAS LOGON MODE TABLE FOR USE WITH 3274 CONTROL UNITS'
MT3274   MODETAB
        TITLE 'SAS LOGON MODE TABLE FOR NON-SNA (D & C(BISYNC)) UNITS'
L3278M2  MODEENT LOGMODE=L3278M2,FMPROF=X'02',              X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000185018507F00'
L3278M3  MODEENT LOGMODE=L3278M3,FMPROF=X'02',              X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000185020507F00'
L3278M4  MODEENT LOGMODE=L3278M4,FMPROF=X'02',              X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000018502B507F00'
L3279M2  MODEENT LOGMODE=L3279M2,FMPROF=X'02',          3270/3279  X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000185018507F00'
L3279M3  MODEENT LOGMODE=L3279M3,FMPROF=X'02',          3270/3279  X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000185020507F00'
L3290Q   MODEENT LOGMODE=L3290Q,FMPROF=X'02',                     X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000185018507F00'
L3290V   MODEENT LOGMODE=L3290V,FMPROF=X'02',                     X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000018502B507F00'
L3290H   MODEENT LOGMODE=L3290H,FMPROF=X'02',                     X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000018501B847F00'
L3290B   MODEENT LOGMODE=L3290B,FMPROF=X'02',                     X
              TSPROF=X'02',PRIPROT=X'71',SECPROT=X'40',           X
              COMPROT=X'2000',                                    X
              PSERVIC=X'00C000000000018503EA07F00' .
        TITLE 'SAS LOGON MODE TABLE FOR SNA (A & C(SDLC)) UNITS'
S3278M2  MODEENT LOGMODE=S3278M2,FMPROF=X'03',              X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7',                    X
              PSERVIC=X'028000000000185018507F00'
S3278M3  MODEENT LOGMODE=S3278M3,FMPROF=X'03',              X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7',                    X
              PSERVIC=X'028000000000185020507F00'
S3278M4  MODEENT LOGMODE=S3278M4,FMPROF=X'03',              X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7'                     X
              PSERVIC=X'02800000000018502B507F00'
S3279M2  MODEENT LOGMODE=S3279M2,FMPROF=X'03',  3270/3279/8775     X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7',                    X
              PSERVIC=X'028000000000185018507F00'
S3279M3  MODEENT LOGMODE=S3279M3,FMPROF=X'03',  3270/3279/8775     X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7',                    X
              PSERVIC=X'028000000000185020507F00'
S3290Q   MODEENT LOGMODE=S3290Q,FMPROF=X'03',                     X
              TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',           X
              COMPROT=X'3080',RUSIZES=X'87C7',                    X
              PSERVIC=X'028000000000185018507F00'
```

```
S3290V   MODEENT LOGMODE=S3290V,FMPROF=X'03',                        X
               TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',             X
               COMPROT=X'3080',RUSIZES=X'87C7',              X
               PSERVIC=X'02800000000018502B507F00'
S3290H   MODEENT LOGMODE=S3290H,FMPROF=X'03',                        X
               TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',             X
               COMPROT=X'3080',RUSIZES=X'87C7',              X
               PSERVIC=X'02800000000018501B847F00'
S3290B   MODEENT LOGMODE=S3290B,FMPROF=X'03',                        X
               TSPROF=X'03',PRIPROT=X'B1',SECPROT=X'90',             X
               COMPROT=X'3080',RUSIZES=X'87C7',              X
               PSERVIC=X'02800000000018503EA07F00'
         MODEEND
         END
```

All of the preceding information can be found in the ACF/VTAM installation manual.

Requirements for 3270 Emulators

When attempting to display SAS/GRAPH output on PCs and PS/2s attached to an MVS system and running 3270 emulation software, it is important to remember that not all 3270 emulation packages support mainframe graphics. In order for most 3270 emulation packages to support mainframe graphics, an additional graphics "module" must also be installed and configured in order for that 3270-emulation package to support mainframe graphics. In addition, before mainframe graphics can be displayed on a PC or PS/2 emulating a 3270-type terminal, it must be defined to VTAM as a device that supports extended data streams. See "Specifying VTAM node definitions and mode tables" for more details on configuring your PC or PS/2 as a mainframe graphics device.

The following is a list of some emulation packages that can be used with SAS/GRAPH Software:

Base Emulation Product	Additional Graphics Product
Attachmate Extra Extended for DOS	Attachmate HGO (Host Graphics Option) for DOS
Attachmate Extra for Windows	Attachmate HGO for Windows
IBM OS/2 Communications Manager	IBM GDDM-OS/2 LINK product
IBM PC3270 for DOS	IBM GDDM-PCLK product
IRMA Workstation for DOS	IRMA Graphics for DOS
IRMA Workstation for Windows	IRMA Graphics for Windows
Novell NetWare 3270 MultiWorkstation	Novell NetWare 3270 Vector Graphics
3270 Passport	3270 Passport APA Graphics
RabbitGATE/RabbitSTATION	Rabbit Software Open Advantage Graphics
RUMBA for Windows	RUMBA Graphics for Windows

If your emulation package is configured for vector graphics, use the SAS/GRAPH device driver IBM3179 to display graphics on your PC or PS/2. GDDM-PCLK users should use the `GDDMPCG` driver. GDDM-OS/2 LINK users can use either the Institute-supplied driver `IBMOS2CM` or the `GDDMPCG` driver. If the IBM3179 driver is being used with any of the preceding emulation packages and the graphics being generated do not appear as expected, the `GDDMPCG` driver can be used as a substitute if the GDDM base product is installed on your system.

Support for Canadian-French Keyboards

Note: This task is optional.

Canadian-French keyboards have accent keys that result in composite characters when used with certain letters. These accent keys are considered "dead keys" unless used with a second valid character, and thus the EBCDIC code points that represent them cannot be used as a programmed symbol code point. To remove these five code points from use with the programmed symbols data stream, specify the `$FSOPT2` system option when invoking the SAS System, as follows:

```
SAS OPTIONS($FSOPT2)
```

Common Installation Problems and How to Solve Them

This section describes some of the most common problems encountered when installing or trying to run SAS/GRAPH software on IBM graphics terminals. If you have any problems, please consult the following list of problems and solutions before calling SAS Institute.

PROBLEM:

```
PROG 470 or PROG 471 error
```

SOLUTION:

If the terminal is an IBM 3278 or 3279, make sure it has a programmed symbols board installed. If you get this error on an IBM graphics terminal, do the following:

1. Press **RESET** and then **ALT/TEST**.

2. Type `/6` and press **ENTER**. This causes several lines to appear on the upper left part of the screen. The second of these lines will initially be 00.

3. Press **ENTER**. This causes the second line to change to 04. Keep pressing **ENTER** until the second line equals 14. If the terminal locks up after the second line is 0C, read the discussion below about proper customization of the 3274.

4. Several lines of hexadecimal code will appear under this line—get the first three halfwords of the bottom line and have them ready when you call SAS Institute to report the problem.

PROBLEM:

```
Error: Device does not support graphics
```

SOLUTION:

First, make sure that the device you are using is a graphics device. If you are using a PC with emulation software, be sure that the emulator is designed to support host graphics. Second, check to make sure that your VTAM node definitions are correct. Third, make sure that the control unit to which your device is attached supports graphics data streams.

PROBLEM:

Incomplete graphs with question marks or solid blocks at the bottom

SOLUTION:

This problem only occurs on devices that support programmed symbols (such as the IBM 3279, 3270 PC, and 3290) when you attempt to display a complex graph. The only way to correct this problem (other than upgrading the device itself to support additional programmed symbol sets) is to simplify the graph as much as possible.

PROBLEM:

```
PROG 401 or PROG 474 error
```

SOLUTION:

Make sure that items 161-165 on your 3274 control unit have been set correctly, particularly item 163, which should be set to the number of extended data stream terminals you have attached to the control unit.

PROBLEM:

```
PROG 450 error
```

SOLUTION:

This error usually occurs when an SNA terminal has a mode table entry defined for a non-SNA terminal.

PROBLEM:

Graphs on an IBM 3279 Model 2 do not fill the entire screen

SOLUTION:

This results from the fact that the Model 2 has only 24 lines. If the SAS/GRAPH System were to try to use the entire screen, there would be gaps in the graph; to avoid this problem, only about 2/3 of the screen is used.

Using SAS/GRAPH Software with IBM 3287, 3268, and 4224 Printers

This section describes the steps necessary for using SAS/GRAPH software with IBM 3287, 3268, and 4224 printers using stand-alone (non-GDDM) device drivers. As alternatives to the stand-alone device drivers, device drivers for IBM 3287, 3268, and 4224 printers are available that interface with IBM's GDDM (Graphical Data Display Manager) product. If you choose to use a GDDM device driver instead of a stand-alone device driver, see "Using SAS/GRAPH Software with GDDM" in this document.

As with other SAS/GRAPH device drivers, the IBM3287, IBM3268, and IBM4224 drivers exist as entries in the default device catalog, `SASHELP.DEVICES`. You can browse and manage device driver entries using `PROC GDEVICE`. The IBM3287, IBM3268, and IBM4224 drivers require an additional spooling utility that handles the 'transfer' of graphics data between the driver and the printer. The spooling utility provided on the SAS/GRAPH installation tape for 3287 and 3268 printers is the `SASWTR` external writer. The `SASWTR` external writer cannot be used with the IBM4224 printer.

This section is divided into the following five topics:

- **Using SAS/GRAPH software with IBM 3287 and 3268 printers**

  details the requirements for using SAS/GRAPH software with IBM 3287 and 3268 printers as well as the `GOPTIONS` statement you specify to generate graphics output.

- **Using SAS/GRAPH software with an IBM 4224 printer**

  details the requirements for using SAS/GRAPH software with an IBM 4224 printer, as well as the `GOPTIONS` statement you specify to generate graphics output.

- **The SASWTR external writer**

  describes how to use the `SASWTR` external writer program. You can only use `SASWTR` with graphics output from the IBM3287 and IBM3268 drivers. `SASWTR` only supports IBM 3287 and 3268 graphics printers (as well as 'clones' from vendors such as Memorex/Telex and Interface Systems Inc.). `SASWTR` does not support graphics output produced by the IBM4224 device driver.

- **Common installation problems and how to solve them**

  describes common installation problems and how to solve them. If you encounter problems, please consult this section before calling SAS Institute.

- **VTAM definitions for IBM 3287, 3268, and 4224 printers**

  describes the necessary VTAM definitions that are required when using SAS/GRAPH software with IBM 3287, 3268, and 4224 printers.

Using SAS/GRAPH Software with IBM 3287 and 3268 Printers

The IBM 3287 and 3268 printers are four-color dot matrix printers that are capable of producing graphics. These devices can be used only with an IBM 3274 or 3174 control unit capable of supporting graphics devices.

With the IBM 3287 and 3268, the printer itself must be capable of producing graphics and must have the Extended Character Set Adapter and PS (Programmed Symbols) installed. While SAS/GRAPH software will work with PS-2, PS-4, or PS-4A, SAS Institute recommends that you install PS-4A; otherwise, the quality of your graphics output may diminish. The IBM 3268 Model 2C printer has pre-installed programmed symbol sets that emulate either PS-4 (six sets) or PS-4A (four sets—one multicolor) based on the setting of the Language Select Switches (which the 3287 does not have). If you will be using SAS/GRAPH software with an IBM 3268 Model 2C printer, set the first switch of the Language Select Switches to `ON`.

GOPTIONS Statement for Use with IBM 3287 and 3268 Printers

The IBM3287 and IBM3268 device drivers work equally well from batch or interactive modes. To use SAS/GRAPH software with an IBM 3287 or IBM 3268 printer, specify the following:

```
GOPTIONS DEVICE  = IBM3287x  (or IBM3268x)
DEVADDR = (SAS,.,VTAM nodename);
```

Where the device driver suffix *x* should be `D`, `E`, or `F` (usually `F`). The suffix denotes the Programmed Symbol (PS) memory option on your printer. These are the suffixes that the drivers support:

PS-2	PS-4	PS-4A
D	E	F

For example, to use an IBM 3287 that has PS-4A (the most common configuration), set the `DEVICE=` parameter to IBM3287F. Note that the emulation of PS-4 or PS-4A on an IBM 3268 is controlled by the setting of the Language Select Switches. For PS-4A, the first switch of the Language Select Switches should be in the `ON` position.

For Release 6.08 of SAS/GRAPH software, the following device drivers have been added for paper size that is 8.5 inches vertically: IBM328SF, IBM328SD, IBM326SF, and IBM326SE.

Use of the IBM3287 or IBM3268 device driver also requires the `DEVADDR=` option. Specify the `DEVADDR=` parameter as follows:

```
GOPTIONS DEVADDR = (applname,applpw,nodename);
```

The following is an explanation of each parameter:

- applname is the ACF/VTAM application name defined on the APPL statements in the network definition. If the applname is SAS, the writer looks for application names on APPL statements of SASnnn, where nnn is 001, 002, 003, and so on. This allows the writer to choose one of many APPL statements, some of which may already be busy. If the applname is not SAS, the APPL statement must contain the same name as the DEVADDR operand.

- applpw is the password for the applname as defined in the ACF/VTAM network definition. If no password is defined (which is usually the case), enter the password as a single period:

```
GOPTIONS DEVADDR = (xxx,.,yyy);
```

- nodename is the ACF/VTAM-defined network name (LU name) of the IBM 3287 or 3268 printer where the output is to be routed. For example, GOPTIONS DEVADDR=(SAS,.,PRINTER1) tells the external writer to sign on to VTAM as SAS001 and send the graphics output to the printer with the VTAM nodename of PRINTER1.

Five GOPTIONS are available to control routing and characteristics of the output to SASWTR. The GWRITER= option specifies the external writer name to be used for IBM 3287 and 3268 graphics output (the default is SASWTR). The GCLASS=, GCOPIES=, and GFORMS= options specify the SYSOUT class, number of copies, and forms name for output. These default to G, 1, and STD, respectively. The GDEST= option sets the destination for the JES SYSOUT for the printer—this defaults to LOCAL

GDEST must specify a valid JES destination code. For example, to send graphics output to a SYSOUT class of A and to request three copies of each graph, specify:

```
GOPTIONS GCLASS=G GCOPIES=3;
```

JCL for Special SYSOUT Handling

The IBM3287 and IBM3268 drivers dynamically allocate a JES SYSOUT file with the external writer name of SASWTR. If you want to do some special SYSOUT handling and do not want to use the options discussed in the previous section, include a //SAS3287 DD statement in your SAS job, and the device driver will write the output to the SAS3287 file. For example, if you want to specify COPIES= in a batch job, specify:

```
//SAS3287 DD SYSOUT=(G,SASWTR),COPIES=nn
```

It is not possible to specify the SYSOUT writer name using the TSO ALLOC statement. If you run under TSO and are using SASWTR, use the GOPTIONS statement to control the SYSOUT parameters.

Using SAS/GRAPH Software with an IBM 4224 Printer

The IBM 4224 Model 2E2 is a monochrome graphics printer, and the IBM 4224 Model 2C2 is a color graphics printer. The 4224 Model 2C2 supports either four colors or eight colors (depending on the type of ribbon installed in the printer).

To use SAS/GRAPH software with an IBM 4224 graphics printer, specify the following:

```
GOPTIONS DEVICE  = IBM4224  (or IBM42241, or IBM42244)
         GACCESS = GSASFILE ;
```

For Release 6.08 of SAS/GRAPH software, the following device drivers have been added for paper size that is 8.5 inches vertically: IBM424S, IBM424S1, and IBM424S4.

The IBM4224 and IBM424S drivers support eight colors (blue, red, magenta, green, cyan, yellow, black, and brown). The IBM42241 and IBM424S1 drivers support one color (black). The IBM42244 and IBM454S4 drivers support four colors (blue, red, green, and black). The graphics file that the driver produces (in IPDS format) is sent to the destination pointed to by the DDname of `GSASFILE`. For example, to send graphics output to an IBM 4224 in batch, add the following statement to your JCL:

```
//GSASFILE DD SYSOUT=class,DEST=printer destination, DCB=(RECFM=vb, LRECL=506)
```

A spooling utility that can process native IPDS output, such as VPS, is required to spool the graphics output to the printer. `SASWTR` does not support graphics output created by the IBM4224 device drivers.

The SASWTR External Writer Program

Upon installation of the SAS/GRAPH product, `SASWTR` exists as a member in the SAS loadlib (`SASWTR` is actually an alias for `SGWTRO`). `SASWTR` is an external writer program that you use to spool graphics output from the IBM3287 and IBM3268 drivers to IBM 3287 or 3268 printers. `SASWTR` does not support output from the IBM4224 device driver or other drivers such as the HP7550 driver. If you are not using the IBM3287 or IBM3268 drivers or are using an alternative product such as VPS for spooling, skip this section.

If you plan to use `SASWTR`, the first step is to copy the `SASWTR` member (along with `SGWTRO`) from the SAS loadlib to an APF authorized library on your system (usually your system link list). You can use IBM's IEBGENER utility to perform the copy.

If you are using SASWTR for the first time, place the following JCL in a member called SASWTR in your system PROCLIB. Do not change the PARM= specification or the position of the IEFRDER DD statement (if you must add a DD statement, place it after the IEFRDER DD statement). If you are currently using the Version 5 SASWTR, you should install the Version 6 SASWTR . The program IASXWR00 is the IBM external writer. Specification of WRITER=SASWTR on the OS MODIFY ('F') command causes the SASWTR module to be loaded when output is presented by JES that has SASWTR in the SYSOUT writer name field.

```
//SASWTR PROC
//* Do not insert a DD card between the following two statements
//IEFPROC  EXEC PGM=IASXWR00,PARM='P',TIME=1440
//IEFRDER  DD   DUMMY,DCB=BLKSIZE=137
//* Do not insert a DD card between the preceding two statements
//SYSUDUMP DD   SYSOUT=%PRINT
```

Starting and Modifying the Writer

Only a few commands control the SASWTR external writer. However, these commands must all be entered from an operator's console. To start the writer, enter the following:

```
S SASWTR.name
```

where name is any name that you choose. All subsequent MODIFY statements that control the writer use this name. After the IEF176I WAITING FOR WORK message, enter the following:

```
F name,WRITER=SASWTR,C=G
```

This tells the writer to accept all work in SYSOUT class G with the writer name of SASWTR. If your output for SASWTR is not in SYSOUT class G, specify the appropriate class. The writer now runs until a STOP command is issued. To stop the writer, enter the following:

```
P name
```

It is **not** necessary to restart the writer each time the SAS/GRAPH System sends output to the 3287/3268. You need to start the writer only when you IPL the system and can leave the writer running continuously, using almost no CPU resources while waiting for input. When active, the writer will issue "IEF176I ... WAITING FOR WORK" messages — this is normal. The writer will normally issue the IEF302A and IEF383A operator action messages for the first job processed by the writer; both messages should be given the reply of "U" (Use).

You can have as many writers active concurrently as you want. However, each must have a different name so that commands can be directed to a particular external writer. The Version 6 SASWTR puts the name you assign in parentheses preceding each console message for easy identification of multiple SASWTRs. You may want to have as many writers active as there are 3287 and 3268 printers available for SAS/GRAPH output. All writers have access to all available printers; thus multiple writers enable you to use more than one printer at a time. Note, however, that more than one writer may attempt to direct output to the same printer. In this case, the second writer must wait until the first is finished before gaining access to the printer. This causes both writers to be tied up while the second printer is idle. The following example illustrates the use of multiple writers and how to segregate the processing for certain printers:

```
S SASWTR.PRT1                              Start
S SASWTR.PRT2                              Three
S SASWTR.PRT3                              SASWTR's
F PRT1,WRITER=SASWTR,CLASS=A,FORM=PRT1  DEST=LOCAL by default
F PRT2,WRITER=SASWTR,CLASS=G,DEST=RMT2  Get any FORM specified for R2
F PRT3,W=SASWTR,C=G,FORM=PRT3           DEST=LOCAL by default
```

Specify valid combinations of GWRITER, GCLASS, GFORMS, and GDEST in a SAS GOPTIONS statement to direct the output through the appropriate SASWTR for one or more printer groups.

Aborting the Writer

If necessary, SASWTR can be aborted during a VTAM session from a VTAM operator's console. You must first know either the VTAM APPL name (ACBNAME) of the active SASWTR session or the printer's VTAM network name (LU name). The SASWTR application name identifies the Primary Logical Unit (PLU) in the VTAM session, and the printer name represents the Secondary Logical Unit (SLU). To abort the SASWTR session, enter one of the following VTAM commands at the operator's console:

```
V NET,TERM,PLU=applname
V NET,TERM,SLU=luname
```

SASWTR should then issue message SASG035A to allow the operator to specify whether to purge or requeue the JES data set.

Alternative Routing for Operator's Messages

You may route messages to a log file, rather than the console, by supplying a WTRLOG DD statement in the SASWTR procedure in your PROCLIB. SASWTR automatically replies to messages that require a response. (The specific reply depends on the message; in general, if CANCEL or PURGE is a valid reply to a SASWTR message, one of these is used.) The WTRLOG DD statement can either be for a SYSOUT data set or for a disk data set; however, since DISP=MOD should be specified for a disk data set, a SYSOUT data set is recommended. The DCB attributes for the log data set must be LRECL=133, BLKSIZE=133, and RECFM=F. If the WTRLOG DD

statement is not present, all messages are displayed on the operator's console.

SASWTR Messages

The external writer may display the following messages on the operator's console or in the `WTRLOG` data set. Some messages may have alternate text appear after the semicolons in the messages. To help you identify which writer is issuing messages, the `S SASWTR.step` name appears in parentheses, preceding the message. Messages sent to the `WTRLOG DD` have a date/time stamp preceding the message text.

SASG000I `job_name (jesjobid) ON SASWTR VERSION v.rr; CLASS=c, FORMS=form, DEST=jes_dest`

Informational message that may appear at either the operator's console or on the printer when `SASWTR` starts processing output.

SASG001I `PURGING DATA SET FOR job_name (jesjobid)`

The JES data set currently being processed for the named job or TSO user is being purged either at the request of the operator or by automatic error recovery processing when the `WTRLOG` is used.

SASG002U `APPLID "vtamappl" IS NOT AUTHORIZED TO ACQUIRE NODES`

The ACF/VTAM APPL statement for the `"vtamappl"` name shown did not specify `AUTH=(ACQ)`. The application must be allowed to dynamically acquire nodes. Update the APPL statement and vary the application major node inactive, then active again. Then restart `SASWTR`.

SASG003A `PRINTER "vtamnode" NOT FOUND; REPLY WITH NEW-NAME/PURGE/REQUEUE`

The ACF/VTAM node name shown is not defined to VTAM or is in a major node that is not currently active. Reply with a new node name or `PURGE` or `REQUEUE` to purge or requeue the `SYSOUT` data set. You can check with ACF/VTAM by issuing the `D NET,E,ID=vtamnode` command to display the status of the node in question.

SASG004I `PRINTER "vtamnode" IN USE BY ANOTHER WRITER; THIS WRITER WILL WAIT`

The 3287 or 3268 printer with the VTAM node name shown is printing another job for another external writer. This writer is waiting for the other to finish so that it can acquire control of the printer.

SASG005W PRINTER "vtamnode" HAS PS-nn BUT USER SPECIFIED DEVICE DRIVER SUFFIX s

An incorrect device driver suffix was specified by the SAS user when the spool file for the printer named "vtamnode" was generated. See the SAS INTERFACE section and make sure that the correct device driver and suffix was specified. You may have specified a device driver suffix corresponding to a programmed symbols option not installed on the named printer.

SASG006A PRINTER "vtamnode" I/O ERROR: RC=rr FDBK=ff SENSE=ssssssss; REPLY PURGE/REQUEUE

This message is caused whenever an unknown I/O error is detected on the 3287 or 3268 printer. Reply to purge the current data set or requeue it. To force an abend, reply "A" and the writer will issue a SASG015U message and abend.

SASG007A PRINTER "vtamnode" LENGTH I/O ERROR; REPLY PURGE/REQUEUE

This message is caused only on local non-SNA-attached 3287 or 3268 printers. The problem is probably a known IBM hardware bug. Call SAS Institute Technical Support and request the IBM fix number for your CE.

SASG008A APPLID "vtamappl" PASSWORD INCORRECT; REPLY NEW-PASSWORD/PURGE/REQUEUE

SASWTR was given an incorrect password for the ACF/VTAM application shown. The VTAM APPL definition defines a different password for the application. Reply with the correct password or PURGE or REQUEUE to purge or requeue the current SYSOUT data set.

SASG009A APPLID "vtamappl" IS INVALID; REPLY NEW-APPLID/PURGE/REQUEUE

The application name shown is not defined to VTAM or is in an application major node that is not active. Enter the correct VTAM application name or PURGE or REQUEUE to purge or requeue the data set. You can check with ACF/VTAM by issuing the D NET,E,ID=vtamappl command to display the status of the APPL in question.

SASG010A APPLID "vtamappl" ALREADY IN SESSION; REPLY NEW-APPLID/PURGE/REQUEUE

The ACF/VTAM application name shown is already in session with VTAM. Reply with the correct VTAM application name or PURGE or REQUEUE to purge or requeue the current SYSOUT data set. You may check the APPL status by issuing the D NET,E,ID=vtamappl command to display the APPL in question.

SASG011A APPLID "vtamappl" REQUIRES PASSWORD; REPLY NEW-PASSWORD/PURGE/REQUEUE

The SAS programmer did not specify a password for the VTAM application name shown and the VTAM APPL statement has one defined. Reply with the correct password for the application or PURGE or REQUEUE to purge or requeue the current SYSOUT data set.

SASG012A ALL SAS VTAM ACB'S ARE IN USE; REPLY PURGE/REQUEUE/CONTINUE

All the SASnnn APPL statements are in use. The probable cause is that more external writers are started than are defined by ACF/VTAM APPL statements. A reply of CONTINUE will cause the writer to try again to sign-on, or you can reply PURGE or REQUEUE to purge or requeue the current data set. Make sure that you have at least as many SASnnn statements as you have writers started.

SASG013I "MODIFY writerid" COMMAND MUST BE RE-ENTERED TO RESTART SASWTR

An F writerid,W=SASWTR,... command must be entered at the console for this writer to restart. It will not resume printing until the command is entered. This message reminds you when another MODIFY command is required to restart the writer.

SASG014A EXCESSIVE WAIT TIME TO ACQUIRE PRINTER "vtamnode"; REPLY PURGE/REQUEUE

The writer has waited for an unacceptable length of time to acquire a printer; the printer may be "owned" by another application that will not release it, or ACF/VTAM may not know that the printer has been disconnected from the 3274 control unit. The appropriate reply either purges or requeues the current SYSOUT data set.

SASG015U TERMINATION ERROR Unnnn; RC=rr, FDBK=ff, SENSE=ssssssss

The writer has experienced an uncorrectable error. You can call SAS Institute with the Unnnn code and the information in this message, or you may be able to diagnose the problem yourself by checking the VTAM return, feedback, and sense codes. The return code and feedback codes can be found in *ACF/VTAM Programming Manual* (SC27-0449) in the appendix "Return Codes and Sense Fields."

SASG016U PRINTER "vtamnode" REJECTED VTAM BIND — CHECK LOGMODE ENTRY

The DLOGMOD operand on the LU or LOCAL VTAM definition statement for the named printer points to a LOGMODE table entry that is incorrect. Check that the proper BIND image is defined and then restart SASWTR.

SASG017U PRINTER "vtamnode" LOGMODE ENTRY INVALID; LUTYPE=xx FMPROF=yy

The LU type in the message in combination with the FMPROF in the message are invalid for an IBM 3287 or 3268 printer. The mode table entry specifies conflicting parameters. Correct the mode table and reassemble, linkedit, and restart VTAM to insure that the parameters are correct.

SASG018A PRINTER "vtamnode" REQUIRES INTERVENTION; REPLY CONTINUE/PURGE/REQUEUE

The named IBM 3287 or 3268 printer requires operator intervention. Reply CONTINUE to the message when the printer is ready and the writer continues, or PURGE or REQUEUE to purge or requeue the current SYSOUT data set.

SASG019U PRINTER "vtamnode" SENT INVALID AID BYTE FOR QUERY REPLY

The printer gave an invalid response to a Read Partition-Query (RPQ) command. This could be caused by a 3287 or 3268 printer that does not have the graphics features or by another hardware-related error.

SASG020A SASWTR HEADER RECORD NOT PRESENT; REPLY PURGE/REQUEUE/CONTINUE

The writer has started processing a SYSOUT data set that does not have a SASWTR header record at the beginning. This may be caused by the writer attempting to write a SYSOUT data set not created by SAS/GRAPH software. Check the job on the interface to see if it was created by SAS Software. If so, reply with CONTINUE and the writer will continue scanning to find the header record; if not, reply either PURGE or REQUEUE to purge or requeue the current SYSOUT data set.

SASG021A PRINTER "vtamnode" UNAVAILABLE; REPLY NEW-NAME/PURGE/REQUEUE

The VTAM node name shown is not available to the writer. Check the status of the node listed and reply with the correct node name or with the same node name after correcting the situation. Reply PURGE to purge the SYSOUT data set for the job requesting the unavailable node, or REQUEUE to requeue the SYSOUT data set.

SASG022U PRINTER "vtamnode" LOGMODE ENTRY INVALID: NAME NOT FOUND

The VTAM LOCAL or LU definition for the node shown contains a MODETAB entry that could not be found. Correct the LOCAL or LU definition, or insure that VTAM can find the mode table then restart SASWTR.

SASG023U PRINTER "vtamnode" LOGMODE ENTRY INVALID: NO FMHDR BIT IN COMPROT

The VTAM mode entry for the node shown is an SCS (LU type 1) bind and the bit that allows the application to use function management headers is not set in the COMPROT. Correct the mode entry and restart SASWTR.

SASG024U PRINTER "vtamnode" LOGMODE ENTRY INVALID: INCORRECT FMPROF=xx

The VTAM mode entry for the node shown contains an invalid function management profile value. The only valid values for FMPROF are x'02' or x'03'. Correct the mode table and restart SASWTR.

SASG025W PRINTER "vtamnode" HAS nn COLORS BUT USER SPECIFIED mm COLORS

The named printer does not have the number of colors available that the device driver expected it to have when the spool file was generated for the named printer. One of two things may have happened: either a monochrome ribbon has been installed on the 3287 or 3268 printer, or a different color map was supplied to the IBM3287/3268 device driver by the $DEVADDR routine (to support such color variance). The SYSOUT data set will still be printed, but the output may be distorted due to incorrect color attributes given in the data stream.

SASG026U TERMINATION ERROR U0098 DUE TO VTAM HALT OR VARY ACB INACTIVE COMMAND

The VTAM operator has issued either the HALT NET,QUICK command or a VARY NET,INACT,ID=vtamappl,I command for the SASWTR using ACBNAME "vtamappl." SASWTR will terminate with user error code U0098.

Note: The latter command is useful when SASWTR must be terminated but does not respond to the STOP SASWTR command. If the VARY INACT command is used to terminate SASWTR, and no system IPL occurs before restarting the SASWTR, issue the following two commands:

"VARY NET,INACT,ID=xxxxxxxx,F" and "VARY NET,ACT,ID=xxxxxxxx".

SASG027U PRINTER "vtamnode" SENT INVALID QUERY REPLY IDENTIFIER

The named printer has sent an invalid data stream in response to the Read Partition-Query (RPQ) command. This is a probable hardware error.

SASG028U TERMINATION ERROR U0097 DUE TO CLSDST IN LOSTERM EXIT

SASWTR has experienced an uncorrectable error for the CLSDST issued by the ACF/VTAM LOSTERM exit to terminate the ACB for the session.

SASG029I TERMINATION DUE TO LOSTERM EXIT NOTIFY

SASWTR has been notified by the ACF/VTAM LOSTERM exit that either the printer has been disconnected or the session has been terminated by the operator.

SASG030I PRINTER "vtamnode" OUTPUT ROUTED TO PRINTER "vtamnode"

This message will be issued when SASWTR switches from one printer to another, either when an operator replies to a message with a new printer name or when automatic switching is indicated in the WTROUCTL user control table (making no operator reply necessary).

SASG031W SASWTR/DEVICE DRIVER OUTPUT VERSION MISMATCH

SASWTR has detected that the SYSOUT data set being processed was not created by a compatible version of the IBM3287/3268 SAS/GRAPH device driver. Some inconsistencies in output processing may result.

SASG032I INPUT DATA SET TRUNCATED; PICTURE MAY BE INCOMPLETE

SASWTR has detected that the SYSOUT data set being processed was not complete; this may have been caused by the abnormal termination of the job or TSO session that created the SYSOUT data set.

SASG033U DEVICE "vtamnode" IS NOT A PRINTER

The device named "vtamnode" was specified by the programmer to receive the output of the IBM3287/3268 device driver, but SASWTR has determined that the named device is not a 3287 or 3268 printer. The SYSOUT data set being processed will be purged.

SASG034T SASWTR SENT OUTPUT TO PRINTER "vtamnode"

This message only appears at the terminal of a logged-on TSO user when the output generated by his or her TSO session has been processed by SASWTR. The request for the message attempt is controlled by an entry in the $DEVADDR "exit" for the IBM3287/3268 device driver.

SASG035A APPLID "vtamappl" & PRINTER "vtamnode" SESSION CANCELED; REPLY PURGE/REQUEUE

The VTAM session between the named application and printer has been terminated by the operator. Reply PURGE or REQUEUE for appropriate action on the SYSOUT data set. See the section entitled "Aborting the Writer" for information on session termination.

SASG036I APPLID "vtamappl" MUST BE RE-ACTIVATED BY ISSUING VTAM VARY ACB ACTIVE COMMAND

This message appears as a reminder that SASWTR is unable to use the named VTAM application until the VARY NET,ACT,ID=vtamappl command is issued. This message should only appear after session termination via the VARY NET,INACT,ID=vtamappl,I command.

SASG037A APPLID "vtamappl" IS INACTIVE; REPLY NEW-APPLID/PURGE/REQUEUE

The named VTAM application has been varied inactive by an operator or was never activated after starting VTAM. A new application name can be specified, or the PURGE or REQUEUE reply purges or requeues the SYSOUT data set being processed. The status of the application can be checked by issuing the VTAM command D NET,E,ID=vtamappl.

SASG038I VTAM IS INACTIVE; INPUT WILL BE REQUEUED

VTAM is inactive; SASWTR can not send the output in the SYSOUT data set to a 3287 or 3268 printer. The output is automatically requeued. When VTAM becomes active, processing can be restarted by issuing the command F writerid,W=SASWTR,... at the operator's console.

Common Installation Problems and How to Solve Them

This section describes some of the most common problems encountered when installing and using the IBM3287, IBM3268, and IBM4224 device drivers, and SASWTR. If you have any problems, please consult the following list of problems and solutions before calling SAS Institute.

PROBLEM:

SASGxxxx error message on the operator's console.

SOLUTION:

Before calling SAS Institute with the problem, please have the following information ready:

- Is your printer SNA or non-SNA?
- Is your printer local or remote?
- What is the type and model number of the control unit you are using?
- If your printer is an SNA printer, what is the LU Type?
- What is your release of ACF/VTAM?
- What version of SAS and SASWTR are you running?
- If SASG006A or SASG015U, also obtain:
  - RC
  - FDBK
  - SENSE
  - Abend code in IEF438I message (this is in hex but should be reported in its decimal equivalent if at all possible)

If the error message is SASG006A or SASG007A, reply with an A; if the error message is SASG003A or SASG021A, reply with ABEND. The A or ABEND reply will cause a SASG015U error. When you get this error, collect the information asked for in the preceding list before calling SAS Institute.

PROBLEM:

Rough boundaries between boundaries of filled areas on graphs—for example, diagonal lines on pie charts look like stairsteps.

SOLUTION:

This is a hardware limitation, resulting from having either PS-2 or PS-4 rather than PS-4A on your 3287. To determine which of these features you have installed, run Offline Diagnostic Test #5 in the *IBM 3287 Maintenance Information Manual*.

PROBLEM:

Distorted output on IBM 3287 when hardcopy key is hit on IBM 3279.

SOLUTION:

The hardcopy key on the 3279 cannot be used to produce graphics on the 3287. You must use the IBM3287 driver.

PROBLEM:

Message `ERROR: DYNAMIC ALLOCATION FOR SYSOUT DATA SET FAILED`.

SOLUTION:

`GOPTIONS GDEST=` destination specifies a destination unknown to JES.

PROBLEM:

`SASWTR` output gets printed on system printers in JES2/SP systems

SOLUTION:

Specify the Work Selection criteria parameter on the `PRINTERnn` definition in the JES2 initialization parameters to require a match for writer name. Example:
`PRINTER1 UNIT=00E,...,WS=(W,../..)`

VTAM Definitions for IBM 3287, 3268, and 4224 Printers

You can use the following sample `VTAM APPL` statements with `SASWTR`. Use these statements if the first parameter of the `DEVADDR=` graphics option in your SAS job is `SAS`.

```
*-------------------------------------------------------------------*
*                                                                   *
*      This is the definition of the ACF/VTAM R2 application
*      definitions supported by SAS Institute, Inc.

*      Use at least as many APPL statements as there are 3287
*      and 3268 printers.
*
*      Specify:  GOPTIONS DEVADDR=(SAS,.,printer nodename);

*      Format of labels on APPL statements:
*
*         SASDNNN -- Where "D" represents the domain/node of the
                     system and "NNN" is the same as that
                     specified on the ACBNAME=SASNNN.  SASNNN
                     ACBNAMES will be shared across domains.

*      Remove the "NVPACE" specification if SCS (LU Type 1)
*      printers are used.*
*                                              10/89
* *-------------------------------------------------------------------*
```

* System (Domain) 1 Definitions:

```
SAS1001  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS001
SAS1002  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS002 SAS1003  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS003 SAS1004  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS004 SAS1005  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS005 SAS1006  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS006 * System 2
Definitions (unless only one domain used): SAS2001  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS001 SAS2002  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS002 SAS2003  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS003 SAS2004  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS004 SAS2005  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS005 SAS2006  APPL
AUTH=(ACQ,NOPASS,NVPACE,NOTSO,NOPO),EAS=1,ACBNAME=SAS006
```

* Other systems should be defined in the same manner.

The following is sample VTAM node definitions that are currently in use at SAS Institute and can be used with IBM 3287, 3268, and 4224 printers. Parameters can vary from installation to installation.

```
*--------------------------------------------------------------------*
*     This is the definition of the ACF/VTAM R2 3287 printer
*     supported by SAS Institute Inc.                                *
*                                                    10/89
*--------------------------------------------------------------------*
*
*      The following definition is for a local non-SNA printer     *
*                                                                    *
*--------------------------------------------------------------------
* PRINTER1 LOCAL TERM=3286,                                          X
               CUADDR=33F,                                          X
               ISTATUS=ACTIVE,                                      X
               FEATUR2=(MODEL2,EDATS),        <===  Color Printer   X
               MODETAB=MT3270,                                      X
               DLOGMOD=L3287
*--------------------------------------------------------------------*
*     The following definition is for a SNA printer                  *
*                                                                    *
*--------------------------------------------------------------------
* PRINTER1 LU LOCADDR=32,                                            X
                    ISTATUS=ACTIVE,                                 X
                    MODETAB=MT3270,                                 X
                    DLOGMOD=S3287               <===  ColorPrinter
```

Use the following sample VTAM mode table as a guide when using IBM 3287, 3268, and 4224 printers. Specific parameters may vary from installation to installation.

Note: VTAM mode tables must be assembled and linkedited into your system VTAMLIB.

```
*-------------------------------------------------------------------*
*      This is the definition of the ACF/VTAM R2 3287 printer
       mode table supported by SAS Institute Inc.
                                                  10/89
* *-----------------------------------------------------------------
* MT3270   TITLE 'SAS LOGON MODE FOR 3287 PRINTERS'
* MT3270   MODETAB
*     SAS Logon Mode Table for use with a non-SNA 3287-type Printer*
L3287    MODEENT LOGMODE=L3287,                                    X
                 FMPROF=X'02',                                     X
                 TSPROF=X'02',                                     X
                 PRIPROT=X'71',                                    X
                 SECPROT=X'40',                                    X
                 COMPROT=X'2000',                                  X
                 PSERVIC=X'00800000000185020507F00'

*

*      SAS Logon Mode Table for use with a SNA 3287-type Printer in
•      LU Type-3 mode

* S3287   MODEENT LOGMODE=S3287,                                   X
                  FMPROF=X'03',                                    X
                  TSPROF=X'03',                                    X
                  PRIPROT=X'B1',                                   X
                  SECPROT=X'90',                                   X
                  COMPROT=X'3080',                                 X
                  RUSIZES=X'8787',                                 X
                  PSERVIC=X'03800000000018502B507F00'

*      SAS Logon Mode Table for use with a SNA 3287-type Printer in
       SCS LU Type-1 mode

* S3287SCS MODEENT LOGMODE=S3287SCS,                               X
                   FMPROF=X'03',                                   X
                   TSPROF=X'03',                                   X
                   PRIPROT=X'B1',                                  X
                   SECPROT=X'90',                                  X
                   COMPROT=X'7080',                                X
                   RUSIZES=X'8787',                                X
                   PSERVIC=X'01000001E100000000000000',            X
                   PSNDPAC=X'01',                                  X
                   SRCVPAC=X'01'
           MODEEND
           END
```

Using SAS/GRAPH Software with GDDM

SAS Institute provides a set of drivers that interface with IBM's GDDM base product and can be used to direct output to any device supported by GDDM. The set of GDDM drivers comes standard with SAS/GRAPH software. You do not need to do anything extra to install the GDDM device drivers. Some of the GDDM device drivers are provided as an alternative to the SAS/GRAPH device drivers. For example, both the GDDMPCG and IBM3179 drivers produce graphics on an IBM 3179 Model G graphics terminal. The advantages of one over the other vary and depend on a particular site's requirements. On the other hand, some graphics devices require the use of a GDDM driver. These devices include IEEE-attached plotters (IBM 7372, IBM 6180, etc.) and IBM 3800-type laser printers (IBM 3800, 3812, 3820, etc.).

To use any of the GDDM drivers, the GDDM base product (IBM Program Number 5748-XXH) must be installed on your system. The GDDM load library is commonly installed in a system link list so that the SAS/GRAPH GDDM drivers can load the module `ADMASPT`. `ADMASPT` is GDDM's System Programmer Interface routine. If the GDDM load library is not installed in a system link list, concatenate it to the `STEPLIB DD` statement (if MVS batch) or use the `LOAD` parameter in the SAS CLIST (if running interactively under TSO).

The information in this section is discussed in the following nine tasks:

- ❑ GDDM nicknames
- ❑ GDDM tokens
- ❑ GDDM drivers for graphics terminals
- ❑ GDDM drivers for IEEE-attached plotters
- ❑ GDDM drivers for IBM 3287, 3268, and 4224 printers
- ❑ GDDM drivers for the IBM 3812 Model 2 and IBM3816 printers (with IPDS)
- ❑ GDDM drivers for IBM 3800-type printers (3800, 3820, etc.)
- ❑ Creating GDF and ADMGDF files
- ❑ Using SAS/GRAPH software with GDDM/PCLK

GDDM Nicknames

GDDM nicknames are device definitions that tell GDDM what type of device you are using, what type of graphics output to generate, and where to send the graphics output. GDDM nicknames are normally placed in a source-format sequential file with an LRECL of 80 and a RECFM of FB. You can use a partitioned data set to store nicknames as long as you specify the member name when you allocate the data set. You can name the data set containing nicknames anything you choose. However, you must allocate it (whether in batch or TSO) with a DDname of `ADMDEFS`. For example, if your `GDDM ADMDEFS` nickname file has a name of `SYS1.ADMDEFS` and you are running interactively under TSO, allocate your `GDDM ADMDEFS` nickname file as follows:

```
ALLOC F(ADMDEFS) DA('SYS1.ADMDEFS') SHR
```

The information in the `ADMDEFS` nickname file should be in uppercase and begin in column 2. Column 1 should be blank (or an asterisk for a comment). Nickname definitions are not required for all GDDM drivers. The drivers that require nickname definitions are those drivers that support IEEE-attached plotters, IBM 3287, 3268, and 4224 printers (when writing `ADMPRINT` files directly to the JES output queue), IBM 3800-type printers, and `GDDM/PCLK`. See the individual device sections that follow for sample nicknames.

GDDM Tokens

GDDM tokens are default device definitions stored in load module format when GDDM is installed. For graphics terminals, IEEE-attached plotters, IBM 3287, 3268, and 4224 printers, and GDDM/PCLK, the default tokens are located in the `ADMLSYS1` member of your GDDM sample library. Tokens for IBM 3800-type printers are located in the `ADMLSYS4` member in your GDDM sample library.

Note that not all GDDM device drivers require the use of a device token. The only device driver that requires the use of a token is the GDDMFAM4 driver, which you use for IBM 3800-type printers. The token is passed to GDDM using either the `GDDMT=` (or `GDDMTOKEN=`) parameter in the `SAS GOPTIONS` statement or the `DEVTOK=` parameter in the device nickname. See the section on IBM 3800-type printers for a further discussion on device tokens.

GDDM Drivers for Graphics Terminals

If your graphics device supports APA (All-Points-Addressable) graphics and seven colors (such as the IBM 3179 Model G, 3192 Model G, the 3270 PC/G, or the 3472 Model GC), specify the following:

```
GOPTIONS DEVICE = GDDMPCG;
```

For the IBM 3270 PC/GX, which supports 15 colors, specify the following:

```
GOPTIONS DEVICE = GDDMPCGX;
```

For graphics devices that support PS (Programmed Symbols) graphics and seven colors, such as the IBM 3279 Model S3G and 3270 PC, specify the following:

```
GOPTIONS DEVICE = GDDM79;
```

For monochrome graphics devices that support PS (Programmed Symbols) graphics, such as the IBM 3278 Models 2 and 4 with Programmed Symbols, specify the following:

```
GOPTIONS DEVICE = GDDM78;
```

To display graphs on the screen of a graphics terminal, you must be running interactively under TSO. The drivers mentioned previously can be used in batch but only to create members of a graphics catalog or to create GDF or ADMGDF files. To terminate a graph that is displayed on the screen of a graphics terminal, press Enter, PF3, or PF15.

Note : The GDDM drivers do not support the Version 6 SAS/GRAPH Graphics Window.

GDDM Drivers for IEEE-attached Plotters

The GDDMPLT2, GDDMPLT6, and GDDMPLT8 drivers can be used to drive 2, 6, and 8-pen plotters attached to an IBM 3179 Model G, 3192 Model G, 3270 PC/G, or 3270 PC/GX via an IEEE interface. There are two methods for sending graphics output to an IEEE-attached plotter. The first method sends the graphics output directly to the plotter. With the second method, the graph is initially displayed on the screen of the terminal and then sent to the plotter by pressing PF4 or PF16. To send a graph directly to the plotter in an interactive session, use the following `GOPTIONS` statement:

```
GOPTIONS DEVICE = GDDMPLTx
         GDDMN = SASPLOT;
```

The driver suffix should match the number of pens in the plotter. The name you specify on the `GDDMN=` option should match a nickname (SASPLOT, in this case) that you define within your GDDM ADMDEFS nickname file (described earlier in this section). Define the nickname of `SASPLOT` in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=SASPLOT,
TOFAM=1,
TONAME=(*,ADMPLOT)
```

The keyword `NICKNAME` should begin in column 2 of the `ADMDEFS` file and the value for the `NAME=` parameter should match the name given in the `GDDMN=` option within the SAS job.

The second method for producing SAS/GRAPH output on an IEEE-attached plotter is to display a graph initially on the screen of the terminal and then send the graph to the plotter by pressing PF4 or PF16. For this method, specify the following:

```
GOPTIONS DEVICE = GDDMPCG
         GDDMN = *
       DEVADDR = (.,.,SASPLOT);
```

The nickname for the plotter is specified as the last parameter in the DEVADDR= option. In this example, the nickname of SASPLOT is the same nickname that you use when sending graphs directly to the plotter.

GDDM Drivers for the IBM 3287, 3268, and 4224 Printers

As alternatives to the IBM3287, IBM3268, and IBM4224 drivers (as well as SASWTR), GDDM drivers are available that produce graphics output on IBM 3287, 3268, and 4224 graphics printers. To use these drivers, specify the following:

```
GOPTIONS DEVICE = GDDM87 (or GDDM68, or GDDM4224)
         GDDMN = printer nodename or device nickname ;
```

For Release 6.08 of SAS/GRAPH software, the following device drivers have been added for paper size that is 8.5 inches vertically: GDDM87S, GDDM68S, and GDDM424S.

The GDDM87, GDDM87S, GDDM68, and GDDM68S drivers support four colors while the GDDM4224 and GDDM424S drivers support eight colors. The GDDMN= parameter is equivalent to specifying DEVADDR=(.,.,printer nodename or device nickname). The GDDMN= parameter can be used in one of two methods. With the first method, specify the VTAM nodename of the printer you want to use. Each printer that you are going to use with GDDM must be made known to GDDM by including the VTAM nodename of each printer in GDDM's system request queue data set.

Specifying the VTAM nodename of a printer in the GDDMN= graphics option causes an ADMPRINT file to be created (either on the TSO user's default disk pack or a public disk pack, if run in batch). In order to print the ADMPRINT file, start the GDDM utility ADMPRINT (either as a started task or as a batch job). Please note that with MVS batch jobs, GDDM no longer uses the TSO user's high-level qualifier when creating each ADMPRINT file.

As an alternative, you can specify GDDMN= device nickname. This method is most commonly used when writing ADMPRINT files directly to the JES output queue. Once on the JES output queue, the ADMPRINT file can be printed by either version 2.2 of JES328X or version 5 of VPS. To direct the ADMPRINT file to the JES output queue, specify the following:

```
GOPTIONS DEVICE = GDDM87 (or GDDM68, or GDDM4224)
         GDDMN = SPOOL;
```

Define the nickname of SPOOL in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=SPOOL,
         FAM=2,
         PROCOPT=((PRINTDST,sysout class,printer destination))
```

GDDM Drivers for the IBM 3812 Model 2 and IBM 3816 Printers (with IPDS)

The IBM 3812 Model 2 and IBM 3816 printers are available with the IPDS (Intelligent Printer Data Stream) feature. The IPDS feature allows these printers to support the same type of graphics that the IBM 4224 printer supports. To send SAS/GRAPH output to the IBM 3812 Model 2 or IBM 3816 printer with the IPDS feature, specify the following:

```
GOPTIONS DEVICE = GDDM381p (or GDDM381L)
          GDDMN = IBM3812;
```

The GDDM381P driver defaults to portrait mode while the GDDM381L driver defaults to landscape mode.

Define the nickname of IBM3812 in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=IBM3812,
          FAM=1,
        TOFAM=2,
       DEVTOK=S3812Q,
       TONAME=(VTAM nodename of your printer)
```

The token of S3812Q is for a 3812 printer attached to an SNA control unit. Check the `ADMLSYS1` member of the GDDM sample library for additional 3812 device tokens. To spool the graphics file directly to the JES output queue, replace the `TONAME=` parameter in the nickname with:

```
PROCOPT=((PRINTDST,sysout class,printer destination))
```

GDDM Drivers for IBM 3800-Type Printers

Use the GDDMFAM4 device driver to produce SAS/GRAPH output on high-resolution graphics printers such as the IBM 3800 and 3820 laser printers. The output produced by the GDDMFAM4 driver is a bit-image, device dependent file known as an `ADMIMAGE` file. This file can be sent directly to a high-resolution printer using a print utility such as IBM's Print Services Facility (PSF). By default, the IBM 3800 printer produces graphics output in landscape mode on paper that is 8.5 inches vertically and 11 inches horizontally. To produce SAS/GRAPH output on an IBM 3800 printer, specify the following:

```
GOPTIONS DEVICE = GDDMFAM4
          GDDMN = IBM3800
          GDDMT = IMG240X;
```

The token of IMG240X is a default token supplied by IBM for a 3800 laser printer. Other default tokens for 3800-type printers can be found in the `ADMLSYS4` member of the GDDM sample library.

Define the nickname of IBM3800 in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=IBM3800,
       TONAME=(*),
      PROCOPT=((CDPFTYPE,PRIM),
               (HRIFORMT,CDPF),
               (HRISPILL,NO),
               (HRISWATH,10),
               (HRIPSIZE,110,75,TENTHS))
```

Most other IBM 3800-type printers (such as the 3820) produce graphics output in portrait format on paper that is 11 inches vertically and 8.5 inches horizontally. To produce SAS/GRAPH output on a 3820-type printer, specify the following:

```
GOPTIONS DEVICE = GDDMFAM4
          GDDMN = IBM3820
          GDDMT = IMG240;
```

For Release 6.08 of SAS/GRAPH software, the following device drivers have been added for IBM3820-type printers: GDDM382P (defaults to portrait mode) and GDDM382L (defaults to landscape mode).

The token of IMG240 is a default token supplied by IBM for a 3820 laser printer. Define the nickname of IBM3820 in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=IBM3820,
       TONAME=(*),
      PROCOPT=((CDPFTYPE,PRIM),
               (HRIFORMT,CDPF),
               (HRISPILL,NO),
               (HRISWATH,10),
               (HRIPSIZE,80,105,TENTHS))
```

Setting the TONAME= parameter in the nickname to an asterisk (*) directs GDDM to write the ADMIMAGE graphics file to the DDname of ADMIMAGE. For example, use the following DD statement in a batch job to send output directly to a 3800-type printer:

```
//ADMIMAGE DD SYSOUT=A,DEST=printer destination,
//              DCB=(LRECL=8206,BLKSIZE=8210,RECFM=VBM)
```

Setting the CDPFTYPE parameter in the nickname to PRIM, which is the default, tells GDDM to write out an ADMIMAGE file as a primary page document. Primary page documents are normally printed by themselves, one to a page. To create a secondary page segment that can be included in a DCF or Script document, set the CDPFTYPE parameter in the nickname to SEC.

Setting the HRIFORMT parameter in the nickname to CDPF tells GDDM to create the ADMIMAGE file as a structured bit-map file, which most printers use. If you need an unformatted bit-map file, set the HRIFORMT parameter in the nickname to BITMAP.

Setting the HRISPILL parameter in the nickname to NO tells GDDM not to use an external spill file when building the ADMIMAGE bit-map in memory. If the HRISPILL parameter is set to YES, which is the default, graph procedures that normally produce multiple graphs produce only one graph.

The HRISWATH parameter in the nickname tells GDDM how many horizontal 'slices' to divide the picture into when building the bit-map in memory. Increasing this number will cause the job to use less memory but more CPU time. A good overall value is 10.

The HRIPSIZE parameter in the nickname determines the actual graph size. The first value is the width of the page (in tenths of inches). The second value is the depth of the page (in tenths of inches). Use the HRIPSIZE parameter to reduce the size of the graphics image (especially when creating secondary page segments). For example, use an HRIPSIZE setting of 50,40,TENTHS for a graph size of 5 inches horizontally and 4 inches vertically.

Creating GDF and ADMGDF Files

GDF (Graphics Data Format) and ADMGDF files are device-independent files containing general graphics orders and commands. You can create GDF and ADMGDF files with SAS/GRAPH software and GDDM but you cannot currently display or import GDF and ADMGDF files into the SAS System. To create a GDF file, use the following GOPTIONS statement:

```
GOPTIONS DEVICE    = GDDMPCG
         GSFNAME   = ADMPIF
         GSFMODE   = REPLACE
         GSFLEN    = 400
         CHARTYPE  = 2
         NODISPLAY;
```

Setting GSFNAME=ADMPIF causes the GDF file to be written to the file with a DDname of ADMPIF. This should be either a sequential file or a partitioned data set with a record format of fixed block and a record length of 400. If you use a PDS to store the GDF files, specify the desired member name when you allocate the DDname of ADMPIF.

ADMGDF files are similar to GDF files except that ADMGDF files contain header information in the first 16 bytes of each record. The first eight bytes of each record contain the PDS member name and the second eight bytes contain the keyword ADMGDF. To create an ADMGDF file, specify the following:

```
GOPTIONS DEVICE   = GDDMPCG
         GSFNAME  = GRAF
         GSFMODE  = REPLACE
         NODISPLAY
         ADMGDF;
```

Before running the job, allocate a partitioned data set with the DDname of ADMGDF. This partitioned data set must have a LRECL of 400. The members of the PDS are the actual ADMGDF files. The member name is automatically created by appending a sequence number to the end of the GSFNAME= option. For example, the preceding GOPTIONS statement, followed by a graphics procedure, creates a member with the name GRAF0000 in the partitioned data set that was allocated with the DDname of ADMGDF.

Using SAS/GRAPH Software with GDDM/PCLK

GDDM/PCLK is terminal emulation software for a PC or PS/2 that provides mainframe graphics support. GDDM/PCLK requires the following three parts:

- ❑ The GDDM base product (installed on the host)
- ❑ The GDDM PCLKF feature (installed on the host)
- ❑ The GDDM/PCLK product (installed on the PC or PS/2).

To display graphics on the monitor of a PC or PS/2 running GDDM/PCLK, specify the following:

```
GOPTIONS DEVICE = GDDMPCG; (or GDDMPCGX for 15 color support)
```

In the `GDDM ADMDEFS` nickname file, specify the following:

```
NICKNAME FAM=1,
     PROCOPT=((PCLK,YES))
```

To send SAS/GRAPH output to attached printers using GDDM/PCLK, specify the following:

```
GOPTIONS DEVICE = GDDMPCG
         GDDMN  = PCPRINT;
```

Define the nickname of `PCPRINT` in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=PCPRINT,
          FAM=0,
        TOFAM=1,
       DEVTOK=device token,
       TONAME=(*,ADMPCPRT),
      PROCOPT=((PCLK,YES))
```

To send SAS/GRAPH output to attached plotters using GDDM/PCLK, specify the following:

```
GOPTIONS DEVICE = GDDMPLT8
          GDDMN = PCPLOT;
```

Define the nickname of `PCPLOT` in the GDDM ADMDEFS nickname file as follows:

```
NICKNAME NAME=PCPLOT,
          FAM=0,
        TOFAM=1,
       DEVTOK=device token,
       TONAME=(*,ADMPLOT),
      PROCOPT=((PCLK,YES))
```

Consult the GDDM/PCLK documentation for a list of valid device tokens to specify in the `DEVTOK=` nickname parameter. Before displaying graphics with GDDM/PCLK, allocate the `DDname` of `ADMPC` to the GDDM sample library and the `DDname` of `ADMSYMBL` to the GDDM symbol library.

Consult the following manuals for further information about GDDM calls, nicknames, and tokens:

- *GDDM Base Programming Reference* (SC33-0332)
- *GDDM Installation and System Management* (SC33-0321)
- *GDDM Application Programming Guide* (SC33-0337).

Part 3, Setting Up and Modifying Device Catalogs

Note: The tasks described in this section are optional.

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 how to handle situations where catalog entries may need to be modified. For complete details on managing device catalogs, refer to Chapter 25, "The GDEVICE Procedure," in *SAS/GRAPH Software: Reference, Version 6 Edition* and 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, when you specify the name of a graphics device driver with the `DEVICE=` or `TARGET=` options, or when prompted, the name you specify corresponds to an entry in a device catalog. Device catalog entries contain default characteristics used by the driver. For example, the parameters can determine details such as graph size, picture orientation, default colors, and whether to send the graphics output directly to a device or store it in a file. A device catalog entry can also be set up to control the attributes of a graphics stream file or to execute the necessary host commands to send graphics output directly to the device. This feature enables you to develop applications that do not require the end user to specify special `GOPTIONS` or issue host commands to produce hardcopy output. You can change the characteristics used by a driver either by modifying its entry in the device catalog, or by specifying `GOPTIONS` that override settings in the catalog.

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 where output is sent) are used in generating the graph. If you want to change the way the driver produces output, you can use the `GDEVICE` procedure to modify parameters in the catalog entry, or you can override them with a `GOPTIONS` statement. In general, if you want to change defaults for a single session or job, you can use a `GOPTIONS` statement. If you want to permanently change the default parameters used by a driver, you can create a new device entry or modify an existing one.

An Institute-supplied device catalog, SASHELP.DEVICES, is installed and made available as part of the overall SAS/GRAPH installation process. This catalog contains over 300 entries, covering each graphics device and model that SAS/GRAPH software supports. Individual users or groups can also create their own device catalogs. These are given the names GDEVICE0.DEVICES, GDEVICE1.DEVICES and so on, 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 the entry is not found in any of the user catalogs (or the catalogs do not exist), the Institute-supplied catalog, SASHELP.DEVICES, is searched.

How and When to Modify Catalog Entries

If you need to make changes to a device entry, how you do so depends on whether the changes affect an individual user or most or all users at a site. If the change affects only one user, that user should create his or her own 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, being a "personal" catalog, is usually a different catalog for each user. If the modification affects a large number of users, the SAS Installation Representative or SAS Software Representative can make modifications to an entry in SASHELP.DEVICES.

The following guidelines should be used 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. If individual users need to make modifications, 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. By renaming modified entries, users are ensured that the original entries supplied in the SASHELP.DEVICES catalog use default settings.
- Any options specified in a GOPTIONS statement override equivalent parameters in device catalogs. If a parameter needs to be changed only for a single session, it is probably easier to use a GOPTIONS statement than to create a new device entry.

Examples

The following examples illustrate how to use device catalog parameters to create graphics stream files or to spool output directly to a hardcopy device. The examples first illustrate GOPTIONS and FILENAME or host statements that can be used to produce output, and then show how equivalent parameters can be specified in device entries, eliminating the need for the statements in the end users programs. 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*.

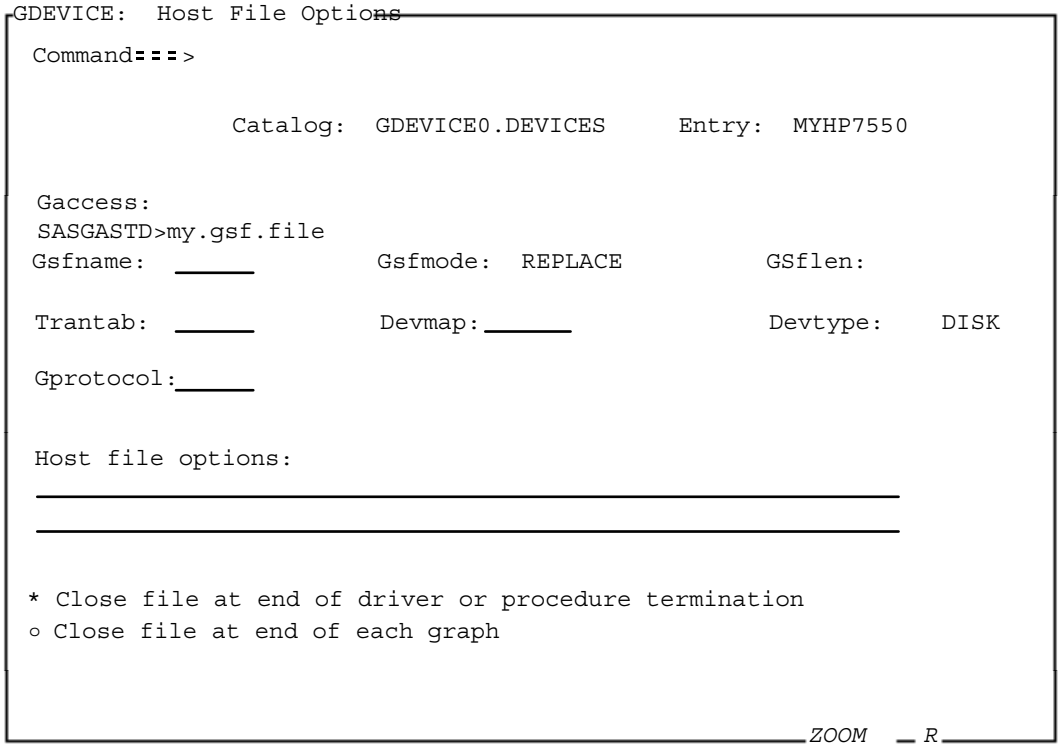
Creating a Graphics Stream File

Suppose you want to use the HP7550 driver to create a graphics stream file of HPGL commands to be transferred to another computer or application. To create the file using GOPTIONS and FILENAME statements, you can use the following statements:

```
/* define fileref for graphics stream file */
filename gsasfile 'my.gsf.file';

/* specify device driver, fileref, mode, and record length */
goptions dev=hp7550 gaccess=gsasfile gsfmode=replace gsflen=80;
```

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 MYHP7550. You can enter these values using GDEVICE windows or with line-mode GDEVICE statements.



Notice that the DEVTYPE field specifies DISK. This prevents the driver from sending output back to the terminal. In addition, notice that the GACCESS field contains the complete name of the external file (without surrounding quotes). If the file does not already exist, you can have the driver allocate it by specifying the DISP= and SPACE= parameters in the Host File Options field.

Spooling Directly to a Graphics Device

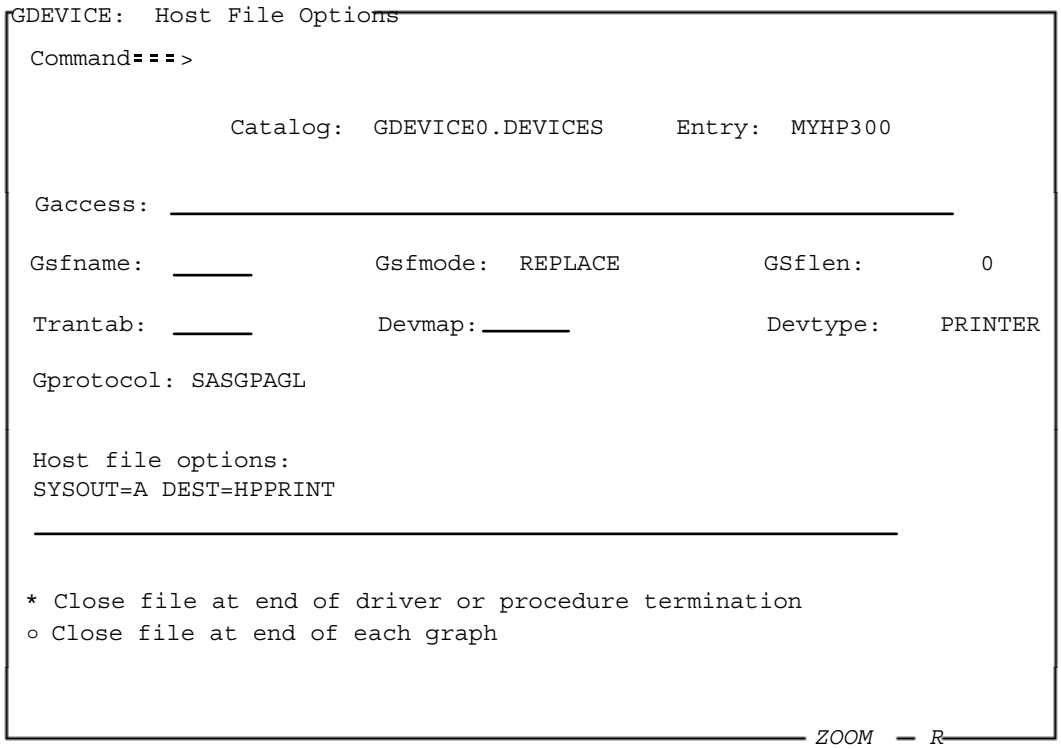
Suppose you want to use the HPLJ300 driver and send the output directly to a Hewlett-Packard LaserJet printer attached to an AGILE 6287 protocol converter. Your site has system software such as VPS that enables you to define the printer as a JES destination with a SYSOUT class of A, and a DEST of HPPRINT.

The following GOPTIONS and FILENAME statements are used to send graphics output to the LaserJet printer.

```
/* define fileref and JES parameters for graphics stream file */
filename gsasfile sysout=a dest=hpprint;

/* specify device driver, fileref for GSF,  */
/* protocol converter, and record length    */
goptions dev=hplj300 gaccess=gsasfile gprotocol=sasgpagl gsflen=128;
```

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 MYHP300. You can enter these values using GDEVICE windows or with line-mode GDEVICE statements.



When the preceding parameters are specified, SAS/GRAPH software dynamically allocates a SYSOUT file with a SYSOUT class of A and a destination of HPPRINT, and directs the driver output to that file.

Note: Because a temporary spool file is dynamically allocated, it is not necessary to specify GACCESS=GSASFILE.

Part 4, Device HELP Screens

These instructions contain information on setting up system parameters required to use certain drivers and how to build drivers where necessary. Additional information on configuring and using graphics devices is available in *SAS/GRAPH Software: Using Graphics Devices in the MVS Environment*.

If you are using the SAS System interactively on a full-screen terminal, you can also obtain details on using graphics devices by entering `HELP` on any Display Manager command line. When the main `HELP` menu is displayed, select `GRAPHICS`, and then select `GRAPHICS DEVICES AND DRIVERS` from the `GRAPHICS HELP` menu. These `HELP` screens contain information on configuring specific devices and `GOPTIONS` required to send output to them.

Appendix R, Implementing SAS/SESSION® for CICS Software

Introduction

SAS/SESSION software enables terminal users connected to the Customer Information Control System (CICS) to communicate with the SAS System in an MVS/ESA™ Version 4.2 environment. In reality, the user communicates with the SAS System running in an APPC/MVS initiator. The SAS System uses VTAM as the communication access method. Figure 1 illustrates the relationship among the various components.

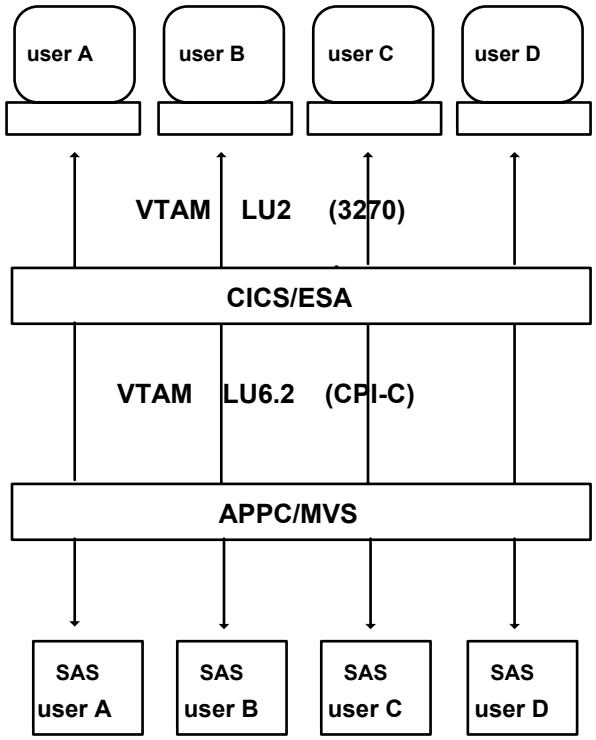


Figure 1

Installing the SAS/SESSION interface to the SAS System consists of the following:

- ❏ defining the interface to VTAM/ESA
- ❏ defining the interface to APPC/MVS
- ❏ defining the interface to CICS/ESA.

These topics are covered in the next three sections. The discussions assume that Base SAS software, CICS/ESA, and APPC/MVS have already been installed.

Program names and argument values shown throughout this document serve as examples only. You may modify them to fit your naming conventions.

For more information on defining the interface, consult the following manuals:

- *CICS/ESA Intercommunication Guide*
- *CICS/ESA Resource Definition (Online)*
- *MVS/ESA Planning: APPC Management.*

Defining SAS/SESSION to the VTAM System

To define SAS/SESSION to VTAM requires two steps:

- Define the two VTAM applications needed by the interface
- Define a LU Type 6.2 entry in the VTAM logon mode table.

Define the VTAM Applications

Two VTAM applications need to be defined (or modified):

- `SASSESS`, to access the SAS System through APPC/MVS
- `MVSCICS`, the CICS system application.

Note: The application names `SASSESS` and `MVSCICS` are examples for the purpose of discussion only. Contact your systems programmer to identify the correct names for your installation.

Use the VTAM APPL macro to define the applications. The VTAM application definition table contains an APPL macro expansion for each application to be used in a VTAM environment. You will need to add (or change) some parameters for the SASSESS and the MVSCICS applications:

```
SASSESS      APPL  APPC=YES,SRBEXIT=YES,SECACPT=ALREADYV,VERIFY=NONE,     *
                   DMINWNL=0,DMINWNR=10,DSESLIM=10

MVSCICS      APPL  AUTH=(ACQ),EAS=10,APPC=NO,PARSESS=YES,                 *
                   ACBNAME=MVSCICS
```

Examples of these `APPL` definitions are in member `SASSAPPL` of the `&prefix.SEMISC` data set.

Define the VTAM Logon Mode

The VTAM logon mode table contains various protocol definitions for use by applications within the VTAM system. SAS/SESSION uses an Advanced Program to Program Communication (APPC) logmode entry. If this type of entry already exists, the interface can use it.

Otherwise, use the following MODEENT macro. You can include the MODEENT macro in the existing VTAM logon mode table.

```
SASCLU62 MODEENT LOGMODE=SASCLU62,                              *
                    TYPE=X'00',                                 *
                   FMPROF=X'13',                                *
                   TSPROF=X'07',                                *
                  PRIPROT=X'B0',                                *
                  SECPROT=X'B0',                                *
                  COMPROT=X'50B1',                              *
                  PSERVIC=X'060200000000000000002C00'
```

A copy of this mode table entry is in the &prefix.SEMISC data set, member SESSMODE.

Note: The mode name must match the value specified for the Modename parameter in the CICS SESSION resource. See "Defining SAS/SESSION to CICS/ESA."

Defining SAS/SESSION to APPC/MVS

To define SAS/SESSION to the APPC/MVS system, you need to modify the 'SYS1.PARMLIB' members for APPC/MVS initialization. These members are APPCPMxx and ASCHPMxx, where the xx is the two-character suffix of the specific members used by your system. APPCPMxx defines the logical unit that corresponds to the VTAM application defined for APPC/MVS (SASSESS). The following example is in &prefix.SEMISC, member SESSAPPM:

```
LUADD
  ACBNAME(SASSESS)
  TPDATA(SYS1.APPCTP)
```

Member ASCHPMxx defines a class of initiators for executing the SAS System. The definition specifies the number of instances that are available, as in this example from &prefix.SEMISC, member SESSASPM:

```
CLASSADD CLASSNAME(SASSESS) MIN(1) MAX(10) RESPGOAL(1)
```

To invoke SAS in an initiator, add the following transaction program profile definition to 'SYS1.APPCTP'. The TPNAME parameter must correspond to the TPNAME specified in the CICS PARTNER resource. See "Defining SAS/SESSION to CICS/ESA." The CLASS parameter value (SASSESS) corresponds to that for the CLASSADD statement in the ASCHPMxx parmlib member.

```
  TPADD
     TPNAME(SAS_SESSION)
     TPSCHED_DELIMITER(DLM1)
     CLASS(SASSESS)
     KEEP_MESSAGE_LOG(ERROR)
     JCL_DELIMITER(DLM2)
//SASSESS   JOB (),'SAS/SESSION(TM)'
//CRTESUSR  EXEC PGM=IEFBR14
//SASUSER   DD  DISP=(MOD,CATLG),DSN=&SYSUID..SASSESS.SASUSER,
//              UNIT=DISK,SPACE=(CYL,(2,1))
//SASAUTOS  DD  DISP=(MOD,CATLG),DSN=&SYSUID..SASSESS.SASAUTOS,
//              UNIT=DISK,SPACE=(CYL,(2,1))
//CONFIG    DD  DISP=(MOD,CATLG),DSN=&SYSUID..SASSESS.CONFIG,
//              UNIT=DISK,SPACE=(TRK,(0,1)),
//               DCB=(DSORG=PS,RECFM=FB,LRECL=80,BLKSIZE=3120)
//SASEXEC   DD  DISP=(MOD,CATLG),DSN=&SYSUID..SASSESS.SASEXEC,
//              UNIT=DISK,SPACE=(TRK,(0,1)),
//               DCB=(DSORG=PS,RECFM=FB,LRECL=80,BLKSIZE=3120)
//SAS       EXEC PGM=SASXAL,PARM='SESSION'
//STEPLIB   DD  DISP=SHR,DSN=YOUR.SAS.LOAD
//CONFIG    DD  DISP=SHR,DSN=YOUR.SAS.CONFIG(TSO)
//          DD  DISP=SHR,DSN=&SYSUID..SASSESS.CONFIG
//SASAUTOS  DD  DISP=SHR,DSN=YOUR.SAS.SASAUTOS
//          DD  DISP=SHR,DSN=&SASUID..SASSESS.SASAUTOS
//SASHELP   DD  DISP=SHR,DSN=YOUR.SAS.SASHELP
//SASMSG    DD  DISP=SHR,DSN=YOUR.SAS.SASMSG
//SASPARM   DD  UNIT=SYSDA,SPACE=(400,(100,300)),
//               DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)
//WORK      DD  UNIT=SYSDA,SPACE=(6144,(500,200),,, ROUND),
//               DCB=(RECFM=FS,DSORG=PS,LRECL=6144,BLKSIZE=6144)
//SASUSER   DD  DISP=OLD,DSN=&SYSUID..SASSESS.SASUSER
//SASEXEC   DD  DISP=SHR,DSN=&SYSUID..SASSESS.SASEXEC
DLM2
DLM1
```

Note: Setting KEEP_MESSAGE_LOG(ERROR) generates a message data set when a non-zero return code is returned to CICS. Refer to *IBM MVS Planning : APPC Management* for more information on the MESSAGE_DATA_SET and the KEEP_MESSAGE_LOG parameters.

An example job to update your TP profile data set with this profile is in the &prefix.SEMISC data set, member SESSPROF.

Security Considerations

Since the SAS System executes in an APPC/MVS address space rather than under CICS, it acquires its own security environment. APPC/MVS defines this environment when CICS requests allocation of the transaction program. To create the environment, APPC/MVS uses the userid that CICS passes. By default, CICS passes no userid. Therefore, all input data sets used by APPC/MVS must have a universal access of read, and all output data sets must have a universal access of write.

In order for CICS to pass a userid to APPC/MVS, you must establish a conversation security level of *already verified*. You can specify this using the `SECACPT=ALREADYV` parameter of the VTAM APPL definition for the APPC/MVS logical unit (`SASSESS`). Alternatively, if you define RACF session security between the CICS and APPC/MVS logical units, you can specify `CONVSEC(ALREADYV)` on the RACF APPCLU definition for the APPC/MVS LU.

If the security level is already verified and users do not sign on to CICS using the CESN transaction, CICS passes its default user id on TP allocate requests. In this case, the SAS System running under APPC/MVS has the same security as the CICS system and can access the same data sets.

Defining the security level to *already verified* and having users sign on to CICS allows users to customize their SAS software environment. In order for users to use the CESN signon transaction, CICS external security must be active. The example TP profile defines four user-specific data sets: `SASUSER`, `SASAUTOS`, `CONFIG`, and `SASEXEC`. If you choose to retain these user-specific data sets in the TP profile, note that the `&SYSUID` system variable identifies them. This variable resolves to the user id that CICS passes when issuing a TP allocation request. Therefore, if users do not sign on, or several users sign on with the same id, the potential exists for multiple users to attempt to access the same data sets for update. This could result in lockouts of users or in corrupted data.

In order to allow some users to access the SAS System without first signing on to CICS (for example, those who do not desire any special customization), you can define a second TP profile with a key that specifies the CICS default user id. This profile would not specify any output data sets with the `&SYSUID` system variable. For example, if the default user for your CICS system is `CICS1`, specify the following key on the `TPADD`:

```
TPADD
  TPNAME(SAS_SESSION)
  USERID(CICS1)
  ...
```

Note that to support user id qualified TP profiles, the LU definition in your `APPCPMxx` member of `'SYS1.PARMLIB'` must specify a `TPLEVEL` of `USER`:

```
LUADD
  ACBNAME(SASSESS)
  TPDATA(SYS1.APPCTP)
  TPLEVEL(USER)
```

Defining SAS/SESSION to CICS/ESA

To enable communication with APPC/MVS, be sure `ISC=YES` is specified in the system initialization parameters. To define the CICS resources required for SAS/SESSION, use the CEDA transaction of the Resource Definition Online (RDO) facility of CICS. For details on any of the parameters used, refer to the following IBM manual: *CICS/ESA Resource Definition (Online).*

All of the resources for SAS/SESSION are contained in a single GROUP in the CICS System Definition (CSD) file. You can choose any name that is acceptable for groups (for example, SASSESS). The following are basic components of the SASSESS group.

Use the DEFINE function of the CEDA transaction for these definitions.

CONNECTION

defines the actual VTAM connection (SASC) between CICS and the APPC/MVS System. Note that the value of the Netname parameter (SASSESS) matches the ACBNAME for the SASSESS VTAM APPL definition.

Connection parameters required are as follows:

```
Connection      - SASC
Group           - SASSESS
Netname         - SASSESS
Accessmethod    - VTAM
Protocol        - APPC
Singlesess      - No
Datastream      - User
Recordformat    - U
Autoconnect     - All
Inservice       - Yes
Attachsec       - Local
```

SESSION

defines the session (SASSESS) on which the conversations will take place between CICS and the SAS System. Note that the value of the Connection parameter (SASC) matches the name of the Connection in the preceding list. The SASC connection supports multiple sessions. Session parameters required are as follows:

```
Session          - SASSESS
Group            - SASSESS
Connection       - SASC
Modename         - SASCLU62
Protocol         - APPC
Maximum          - 00010,00010
Receivecount     - No
Sendcount        - No
Sendsize         - 3840
Receivesize      - 3840
Autoconnect      - All
Buildchain       - Yes
Discreq          - Yes
```

The Modename SASCLU62 refers to the VTAM logon mode table entry name for APPC (LUTYPE6.2). You can specify an existing entry in the VTAM logon mode table here. See "Define the VTAM Logon Mode" for more information.

PROGRAM

defines the transaction program delivered with SAS/Session to CICS. The library that the program resides on must be concatenated with the CICS Relocatable Program Library (RPL), or the load member must be copied into the existing RPL. The required parameters for the SASSESS program are as follows:

```
Program         - SASSESS
Group           - SASSESS
Language        - ASSEMBLER
Reload          - No
Resident        - No
Status          - Enabled
DataLocation    - Any
```

TRANSACTION

defines the transaction (SASC), which invokes the program SASSESS, as indicated by the parameters. Note that the transaction name (SASC) matches the value of the Transaction parameter under the SESSION component. Transaction parameters required are as follows:

```
Transaction     - SASC
Group           - SASSESS
Program         - SASSESS
Profile         - SASSESS
Status          - Enabled
TaskDataLoc     - Any
```

PROFILE

defines the SASSESS profile. This profile makes the SASC transaction use the terminal's alternate display size (as the SAS System does) in all communications with the terminal. The profile also defines the modename used for APPC communication with the SAS System. Profile parameters required are as follows:

```
Profile         - SASSESS
Group           - SASSESS
Scrnsize        - ALTERNATE
Modename        - SASCLU62
```

If the user already has a profile defined that meets these requirements, that profile name can be used in the transaction component instead of SASSESS.

PARTNER

defines the SASCSESS partner. This partner defines the network LU name and the APPC/MVS transaction program name used to communicate with the SAS System. It also specifies a profile that defines the modename for APPC communication. Partner parameters required are as follows:

```
Partner         - SASCSESS
Group           - SASSESS
Netname         - SASSESS
Profile         - SASSESS
Tpname          - SAS_SESSION
```

The partner name must be the concatenation of the transaction name (SASC), and the suffix (SESS). This allows the installation to define different APPC/MVS transaction program profiles for different SAS System configurations.

Activating the Interface

To activate SAS/SESSION on APPC/MVS, complete the following steps:

1. Start APPC/MVS and its transaction scheduler under the control of the Master Scheduler, as shown in the following:

```
START APPC,APPC=xx,SUB=MSTR
START ASCH,ASCH=xx,SUB=MSTR
```

where xx is the suffix of your APPCPMxx and ASCHPMxx members in 'SYS1.PARMLIB'.

If APPC/MVS and its transaction scheduler are already started, activate your members using the SET command, as shown in the following:

```
SET APPC=xx
SET ASCH=xx
```

where xx is the suffix of your APPCPMxx and ASCHPMxx members in 'SYS1.PARMLIB'.

2. Verify that the SASSESS LU is active. You can display its status by issuing the following command:

```
DISPLAY APPC,LU,ALL,LLUN=SASSESS
```

After activating the CICS interface, the LU display should show the following:

```
PARTNERS=00001
```

3. After the CICS interface is active and users begin using SAS/SESSION, periodically display the status of the transaction programs. You can display its status by issuing the following command:

```
DISPLAY APPC,TP,ALL,LLUN=SASSESS
```

For more information on managing APPC/MVS resources, refer to *MVS/ESA Planning: APPC Management*.

To activate SAS/SESSION on CICS, complete the following steps:

1. Install the group `SASSESS` by issuing the `CEDA` command:

```
CEDA INSTALL GROUP(SASSESS)
```

A message on the CEDA output display should say `Install Successful`. If it does not, check the parameters you supplied to determine the problem and reissue the command.

2. Press PF15 to terminate CEDA processing.

Note: If the auto install list includes the group `SASSESS`, you do not need to issue the `CEDA` command.

3. Issue the following command to verify the connection to APPC/MVS:

```
CEMT I CONN
```

The status of the SASC connection appears on the screen. After the group `SASSESS` is installed, the status shown should be `Ins Acq` (inservice and acquired).

Once the connection has been acquired, the sessions associated with that connection are allocated automatically.

4. Press PF15 to terminate CEMT processing.

5. Clear the display.

Executing the SAS System

To execute the SAS System, first sign on to CICS to enter your userid and password if required by your SAS administrator:

```
CESN
```

Then, use the SASC transaction to execute the SAS System:

```
SASC <options>
```

where *options* are any valid SAS system options.

Note: SASC refers to the CICS transaction name as defined in the Transaction component. See "Defining SAS/SESSION to CICS/ESA" for more information.

The session proceeds as if you had entered the SAS command from a TSO terminal. Refer to Chapter 2, "Using the SAS System Under MVS," in the *SAS Companion for the MVS Operating System* for more information.

At the end of the session, the following message indicates that all resources associated with this transaction have been released in the CICS region:

```
SAS/SESSION complete, return code is 0
```

Refer to *MVS/ESA Application Development: Writing Transaction Programs for APPC/MVS* for information on other return codes.

Appendix S, Implementing SAS/SHARE® Software

Special Files for Use with SAS/SHARE Software

Customizing the Started Task JCL Procedure for a Server

Note: This task is required.

Step 1: Edit the `SHREDITP` member of the `CNTL` data set and specify the following parameter values.

- **`SASSNM=`** specifies the JCL procedure name and member name in the started task procedure library for the started task JCL
- **`SERVERID=`** specifies the default server id

Step 2: Edit and submit the `SHRPOST` job.

This job modifies the SAS/SHARE started task JCL procedure, member `SHPROC01` in the `CNTL` data set, with the `SHREDITP` parameter values and copies the procedure to the library specified with `PROCDSN`.

`PROCDSN=` specifies the data set name of the cataloged procedure library to which the started task procedure is copied. The default is the procedure library specified for the SAS System.

Step 3: Notify the server administrator that this file has been provided.

Configuration File for a Server

Member `SRVCNFG` of the `CNTL` data set is provided as a default configuration file for a server's SAS execution. This member contains recommended SAS system option settings and is included in the CONFIG concatenation in the started task JCL procedure customized according to the procedure described in the previous section.

Customizing the SAS/SHARE Autocall Macros

Note: This task is required.

The installed SASSAML data set is an APPLSYS macro library created when you run the SASIxxxx jobs and used by the SAS/SHARE autocall macros. This library contains the required members DEFAULTS and SERVERID. These members contain instructions with examples in comment headers for adding entries to the tables used by the macros. To use this library, you must specify its name in the SHRMACS autocall macro.

Step 1: Edit the SHRMACS autocall macro (required).

Member SHRMACS in the AUTOLIB data set must contain the correct data set reference for the APPLSYS macro library. Edit this member to change the name SAS.SASSAML to the correct installed &PREFIX.SASSAML data set name for your installation.

Step 2: Notify the server administrator that this file has been provided.

Installing the SAS SVC Routine

Note: This task is required.

Step 1: Install the SAS SVC routine (required).

If you have already installed the SAS SVC for Release 6.09 SAS software, it is not necessary to repeat that now. You can find the details on installing the SAS SVC in Section II, Part 1 of this document under the heading "Installing the SAS SVC."

Release 6.09 SAS SVC is backward compatible and replaces the SAS SVC routines from previous releases. You can continue to execute previous releases of the SAS System and SAS/SHARE software with the Release 6.09 SAS SVC installed on your system.

Step 2: Verify the SVC routine SAS system options.

Be sure the SVC routine SAS system options accurately reflect the way the SAS SVC is installed. The SAS system option SVC0SVC= should be set to the number at which the SAS SVC is installed (for example, 251 or 109). If the SAS SVC is installed at 109 as an ESR SVC, the SAS system option SVC0R15= should be set to the ESR code (for example, 4).

Step 3: Verify installation on all CPUs, as needed.

If you have more than one CPU, be certain that the SAS SVC is installed on the systems that will be executing SAS/SHARE software at your installation.

Selecting Communications Access Methods to Use

Note: This task is required.

Step 1: Determine the access method to use.

Communication between a SAS/SHARE server and user is handled by a part of SAS software called a communications access method. There are four communications access methods available for use with this release of SAS/SHARE software under MVS:

a. cross-memory services
b. VTAM LU 6.2
c. VTAM LU 0
d. TCP/IP.

To use the cross-memory services access method, a server and user must be running on the same MVS system.

You can choose to use one access method exclusively, or you can choose one as your primary access method and others as secondary access methods. If you choose to define primary and secondary access methods, SAS/SHARE software will attempt to establish a user-to-server connection using the primary access method first. If that attempt fails, SAS/SHARE software will then attempt to establish the connection using each of the secondary access methods in turn.

You should choose the access methods you will use based on your site's requirements and restrictions. The cross-memory access method is the default and is faster than the other access methods. However, the cross-memory access method can only be used for within-system communication and requires installation of a module in an authorized link list library and definition of an inactive MVS subsystem. The VTAM LU 6.2 access method is faster than the VTAM LU0 access method.

Step 2: Set SAS system options to specify selected access methods.

The SAS system option `COMAMID=` specifies which access method SAS/SHARE software should use as the primary or only access method. The SAS System options `COMAUX1=` and `COMAUX2=` specify secondary access methods. These options are specified, typically in a SAS System configuration file, by the SAS/SHARE Software Consultant.

The following table shows the value of these options for each access method:

Access Method	COMAMID=/COMAUX1=/COMAUX2= Value
cross-memory services	XMS
VTAM LU 6.2	APPC
VTAM LU 0	VTAM
TCP/IP	TCP

For a server, these three options have essentially the same meaning; each access method specified by these options will be initialized when the server is started, making the server accessible to users via any of those access methods.

For example, for a server that is to be accessible only to users who use the cross-memory services access method, specify

```
COMAMID=XMS
COMAUX1=
COMAUX2=
```

For a server that is to be accessible to users who use either the cross-memory services access method or the VTAM LU 6.2 access method, specify

```
COMAMID=XMS
COMAUX1=APPC
COMAUX2=
```

or

```
COMAMID=APPC
COMAUX1=XMS
COMAUX2=
```

For a user session, the access method specified by the `COMAMID=` option is the first one used to attempt to connect to a server. If the server is not found, the access method specified by the `COMAUX1=` option is used. If the server still is not found, the access method specified by the `COMAUX2=` option is used.

For example, to cause a user session to use only the cross-memory services access method, specify

```
COMAMID=XMS
COMAUX1=
COMAUX2=
```

Note that is not necessary to specify `COMAUX1=` or `COMAUX2=` if you do not want to specify a secondary access method.

To cause a user session to first try to locate a server using the cross- memory services access method and then to use the VTAM LU 0 access method if the server is not found, specify

```
COMAMID=XMS
COMAUX1=VTAM
COMAUX2=
```

To cause a user session to try the cross-memory services, VTAM LU 6.2, and TCP/IP access methods, in that order, specify

```
COMAMID=XMS
COMAUX1=APPC
COMAUX2=TCP
```

System Configuration for the Cross-Memory Access Method

Installing the SASVXMS Load Module

Note: This task is required.

To use the cross-memory access method for communication between a SAS/SHARE server and user, you must copy the module `SASVXMS0` from the SAS load library data set into an authorized link list library. You must then rename this module `SASVXMS` (removing the `0`). It is very important that you perform these two tasks in that order.

When SAS/SHARE software loads the module `SASVXMS`, it must find that module to be marked authorized, re-entrant, and reusable, and to have been loaded from an authorized library.

The version of SASVXMS that is distributed with each release of SAS/SHARE software can be used ONLY with that release. If you have a previous version of SAS/SHARE software installed, be sure to follow the special instructions in Step 2.

Step 1: Copy `SASVXMS0` into an authorized link list library.

You can copy the module `SASVXMS0` into any authorized library that is part of the link list. Alternatively, you can install this module into the link pack area. You can use any standard utility program to copy the module `SASVXMS0` from your `&prefix.LIBRARY` data set to your link list library.

Step 2: Rename `SASVXMS0`.

After copying `SASVXMS0` into the appropriate library, you must rename it. You can use any standard utility to rename the module.

If you do not have a previous version of SAS/SHARE software installed, rename `SASVXMS0` to `SASVXMS`. Specify the SAS system option `COMAMID=XMS` as described earlier.

If you have a previous version of SAS/SHARE software installed, rename SASVXMS0 to SASVXMSn, where n is the last digit of the release of the SAS System. Specify the SAS system option COMAMID=XMSn. For example, for Release 6.08, rename SASVXMS0 to SASVXMS8 and specify COMAMID=XMS8.

Defining an Anchor Point

Note: This task is required.

To use the default cross-memory access method for communication between a SAS/SHARE server and user, you must define an anchor point. The anchor point is a place in common memory that can be located by servers and users and used to store and retrieve cross-memory communication information. If you have defined an anchor point for a previous release of SAS/SHARE software, it is not necessary to repeat this step now.

Step 1: Define an inactive MVS subsystem.

The anchor point is specified by defining an inactive MVS subsystem. Defining an inactive subsystem causes MVS to create a subsystem communications vector table (SSCVT) at IPL time. The SSCVT chain is in common memory and easily accessible to the cross-memory access method routines. The SSCTSUSE field of the SSCVT is available to these routines and is used as the anchor point for their control blocks.

You should note that, although you define a subsystem to MVS, it will never be considered active and will provide no system services because the SSCTSSVT field of the SSCVT will never be non-zero.

You can define the inactive subsystem by adding an entry to any of the following:

- the SCHEDULER SYSGEN macro instruction
- the IEFJSSNT member of 'SYS1.LINKLIB'
- an IEFSSNxx member of 'SYS1.PARMLIB'.

Consult MVS system initialization and tuning documentation for the details of each alternative.

Regardless of which method you choose, you must include the subsystem name and you must **not** specify an initialization routine name. Use the name SAS0 unless it conflicts with standards or conventions at your site.

Step 2: Set the SAS system option `SUBSYSID=` to specify the inactive subsystem you defined.

The name you specify for the inactive subsystem defined as the anchor point for the cross-memory access method must also be specified as the value of the SAS system option `SUBSYSID=`. This option is specified, typically in a SAS System configuration file, by the SAS/SHARE Software Consultant. This option is described in the Technical Report "SAS/SHARE Software for the MVS Environment."

System Configuration for the VTAM LU 6.2 Access Method

Software Requirements

In order to use the VTAM LU 6.2 access method, you must have ACF/VTAM Version 3 Release 2 or higher installed.

Configuration for a Server

Step 1: Specify the SAS system option `APPCSEC=_SECURE_`.

Note: This task is required.

Specify the SAS system option `APPCSEC=_SECURE_` to cause the VTAM LU 6.2 access method to require users to supply a valid userid and password for the MVS system where the server is running in order to connect to the server.

Step 2: Define an LU for the Server to VTAM.

Note: This task is required.

You must define a logical unit (LU) for the server to VTAM via an APPL statement. This LU must be defined in the VTAM domain in which the server will run. The APPL statement for a server should be of the form

```
serverid    APPL  APPC=YES
                  MODETAB=mode-table
                  DLOGMOD=default-mode
                  DDRAINL=NALLOW,
                  DMINWNL=0,
                  DMINWNR=0,
                  DSESLIM=32767,
                  SECACPT=CONV
```

serverid specifies the name of the server. This name will be specified as the value for the `SERVER=` option on the `PROC SERVER`, `PROC OPERATE`, and `LIBNAME` statements.

mode-table specifies the communications mode table in which to look up mode names

default-mode specifies the communications mode to use when no mode name is specified by a connecting user session

All APPL statements must follow a `VBUILD TYPE=APPL` statement.

Step 3: Define the Server as a Cross-Domain Resource.

Note: This task may be required.

If the server will be communicating with users in a different VTAM domain, you must define the server as a cross-domain resource in the users' domain via a `CDRSC` statement. The `CDRSC` statement for a server should be of the form

serverid `CDRSC CDRM=`*cdrmname*`,ISTATUS=ACTIVE`

serverid specifies the name of the server. This name must be the same as that in the name field of the APPL statement for the server in the controlling domain.

cdrmname specifies the name of the CDRM in the domain in which the server is defined as an APPL.

Configuration for Users

Step 1: Define a User LU Pool to VTAM.

Note: This task is required.

You must define to VTAM a pool of logical units (LU's) for the users via a series of APPL statements. This LU pool must be defined in the VTAM domain where the users will run. The VTAM LU 6.2 access method dynamically selects an available LU for a user in order to connect to a server. The number of LU's in the pool should be equal to or greater than the maximum number of users that will be connected to servers via the VTAM LU 6.2 access method simultaneously. The APPL statement for a user should be of the form

```
lu-name   APPL   ACBNAME=LUPREFIX=||suffix,
                  APPC=YES,
                  MODETAB=mode-table
                  DLOGMOD=default-mode,
                  DDRAINL=NALLOW,
                  DMINWNL=conwin,
                  DMINWNR=0,
                  DSESLIM=seslimit,
                  SECACPT=CONV
```

lu-name is the LU name. This name must be unique across the SNA network.

LUPREFIX=||suffix specifies the ACBNAME associated with this LU. The zero filling done to produce an ABCNAME (as defined in the user application pool) using the LUPREFIX system option is dynamic based on the magnitude of the LULAST value, rather than always filling to 8 bytes as was done in previous releases. For example, a 5-byte LUPREFIX value combined with LULAST=9 is not zero-filled to produce a 6-byte ABCNAME; combined with LULAST=99 is zero filled with a single zero to produce a 7-byte ABCNAME and so on. Sites that have defined 8-byte ABCNAMES in the user application pool should ensure that LUPREFIX and LULAST values are specified that generate 8-byte ABCNAMES (LUPREFIX=SASIUO LULAST=10 for example). Although this parameter is not required, it is recommended to insulate your SAS/SHARE configuration from changes in LU naming conventions and to allow the same configuration to be shared by more than one MVS system in the SNA network (since ACBNAMEs must be unique only within a single domain). The prefix used should be specified to the SAS System via the SAS system option LUPREFIX=. The lower and upper bounds of the suffix range used should be specified via the system options LUFIRST= and LULAST=, respectively. If the ACBNAME= parameter is omitted it defaults to lu-name, which should then be constructed as a name prefix and numeric suffix.

mode-table specifies the communications mode table in which to look up mode names

default-mode specifies the communications mode to use when no mode name is specified by an incoming connection. Although mode-table and default-mode are not used by a SAS/SHARE user session, you should specify these parameters if this LU pool will be used by SAS/CONNECT remote sessions on MVS.

conwin specifies the minimum number of contention winner sessions. This value should be roughly half of seslimit.

seslimit specifies the maximum number of concurrent sessions for this LU. As a general rule of thumb, you should allow for two sessions for each SAS file or catalog entry accessed concurrently by user.

All APPL statements should follow a VBUILD TYPE=APPL statement. The ACBNAMEs for the APPLs in the pool should be constructed according to the description given for the SAS system options below.

This LU pool can also be used by the VTAM LU 6.2 access method for SAS/CONNECT remote sessions on MVS. It can also be used by the VTAM LU 0 access method for SAS/SHARE user sessions.

Step 2: Describe Your VTAM Configuration to the SAS System.

Note: This task is required.

You must describe your VTAM configuration to the SAS System via the VTAM LU 6.2 access method system options `LU62MODE=`, `LUPREFIX=`, `LUFIRST=`, and `LULAST=`.

The `LU62MODE=` system option specifies the name of the communications mode for the SNA session between the user and server LU's.

The `LUPREFIX=` system option specifies the prefix used in constructing the LU names or ACBNAMEs for the user LU pool.

The `LUFIRST=` and `LULAST=` system options specify the first and last numeric suffix used in constructing the LU names of ACBNAMEs for the user LU pool. In dynamically selecting an LU for a user, the VTAM LU 6.2 access method constructs an ACBNAME by appending a numeric suffix (zero-padded on the left to make a total ACBNAME length of 8) between `LUFIRST=` and `LULAST=` to the value of the `LUPREFIX=` option.

System Configuration for the VTAM LU 0 Access Method

Software Requirements

In order to use the VTAM LU 0 access method, you must have ACF/VTAM Version 2.1 or higher installed. If a link connection is used in your network, you must have ACF/NCP/VS Version 1.3 or higher installed.

Enabling the VTAM LU 0 Access Method

In order to use the VTAM LU 0 access method, you must specify the SAS system options `LU0SEC=_TRUST_` and `APPCSEC=_SECURE_` in the SAS configuration file for the server. If you omit these options, the server will refuse to start.

When you specify `LU0SEC=_TRUST_` for a server's SAS execution, the VTAM LU 0 access method presents the userid of a connecting user to the server as if it had been validated with a password. The server then uses that userid to validate the user's authority to access SAS libraries. **Note that the VTAM LU 0 access method does NOT in fact validate the userid.** This means that if the userid of a connecting user is defined to the security software on the server's system and belongs to that user, the authorization checks for SAS libraries made by the server will be valid. But if the connecting user's userid is defined but belongs to another user, the authorization check will be inappropriate and may allow the user to access SAS libraries that he would not be able to access directly.

Specifying LU0SEC=_TRUST_ preserves the behavior of the VTAM LU 0 access method and the server in previous releases of SAS/SHARE software.

Overview from the VTAM Perspective

SAS/SHARE software includes two basic functions, the server function and the user function, each of which runs as a VTAM application and must be defined to ACF/VTAM. The VTAM definition process described here must be performed by, or under the direction of, the installation systems or technical staff.

For each SAS server, a unique VTAM application ID is assigned and used as the server name. The VTAM systems programmer who defines a server name to ACF/VTAM with an `APPL` statement must give the name (APPL ID) to the SAS/SHARE Software Consultant for use as the server name in the SAS program that executes `PROC SERVER` and in SAS applications that access the server. Each SAS server should also be defined as a cross domain resource in other domains with `CDRSC` statements. Multiple SAS servers can be executed in the network as long as a unique VTAM APPL ID is assigned to each server and each server is defined correctly as a cross domain resource in other domains. Choose VTAM application names that avoid conflicts with your existing SAS servers.

For users, VTAM application IDs are defined to form a pool in each domain, much like the application pool defined for TSO/VTAM under MVS. All VTAM APPL IDs must be unique throughout the network. The VTAM APPL ID for each user is obtained dynamically from this pool. The number of applications defined in the pool is up to your installation, but it should be equal to or greater than the maximum number of concurrent SAS/SHARE VTAM users in the domain.

Planning Your SAS/SHARE VTAM Configuration

In order to create appropriate VTAM definitions, you first need to determine in which domains servers and users will execute, and how they will communicate. Plan to create VTAM definitions in a given domain as follows:

- ❑ Define an application for each server or user that will execute in that domain.
- ❑ Define each server that runs in another domain as a cross-domain resource.
- ❑ If your installation does not support dynamic `CDRSC` definition, define a pool of cross-domain resources to match each user application pool defined in another domain.

Creating VTAM Definitions

Note: This task is required.

Step 1: Define applications.

The SAS/SHARE servers and users that execute in a domain should be defined as applications to the ACF/VTAM that controls that domain. This is done using a `VBUILD` statement followed by `APPL` statements.

The following information describes these ACF/VTAM network definition statements and their selected parameters for SAS/SHARE servers and users. Refer to *VTAM Installation and Resource Definition* (SC27-0610 for ACF/VTAM Version 2, SC23-0111 for ACF/VTAM Version 3) for additional information. These definitions should be filed in members of your installation's VTAMLST data set. The member names should be added to the configuration startup list (member ATCCONxx).

The APPL IDs and ABCNAMEs referred to should be eight characters long, using zeroes where necessary to expand numbers to the requisite number of characters.

VBUILD Statement

```
VBUILD TYPE=APPL
```

TYPE=APPL specifies that this VBUILD statement defines an application major node.

APPL Statement for a SAS Server

name APPL AUTH=(ACQ),EAS=*#eas*,PARSESS=YES

name specifies the unique name for the server in the network (1 to 8 characters in length).

AUTH=(ACQ) specifies that this APPL can initiate a session.

#eas specifies the estimated number of concurrent sessions the server will have with users in the network. A good estimate for this number is the number of users that you expect to be connected to the server simultaneously, multiplied by three.

PARSESS=YES specifies parallel session capability

APPL Statements for SAS/SHARE Users

There should be one APPL statement for each application in the user application pool.

name APPL ACBNAME=*acbname*,AUTH=(ACQ),EAS=3,PARSESS=YES

name the VTAM APPL ID for the associated SAS/SHARE user application. This name must be unique for each statement across all domains in the network (1 to 8 characters in length).

acbname consists of the LUPREFIX value and a numeric suffix beginning with LUFIRST and incrementing by 1 through LULAST.

AUTH=(ACQ) specifies that this APPL can initiate a session.

EAS=3 specifies that a user has only three sessions at a time.

PARSESS=YES specifies parallel session capability.

Step 2: Define cross domain resources.

A multiple domain network is a set of connected domains, each controlled by an ACF/VTAM with a cross domain resource manager (CDRM). In a multiple domain network, information about other domains must be provided to each ACF/VTAM.

A SAS/SHARE server in a domain must be defined as a cross domain resource (CDRSC) to any other domains from which users will attempt to access that server. This is done using a VBUILD statement followed by CDRSC statements. In each ACF/VTAM domain there should be one CDRSC statement for each SAS server within another domain with which users in this domain can have a session.

If your installation does not use dynamic CDRSC definition, then all user applications in other domains which can have sessions with servers in this domain must also be defined as cross domain resources. SAS Institute recommends that you use dynamic CDRSC definition to reduce the number of CDRSC statements needed. For further explanation of dynamic cross domain resource definition, refer to *VTAM Installation and Resource Definition* (SC27-0610 for ACF/VTAM Version 2, SC23-0111 for ACF/VTAM Version 3).

VBUILD Statement

```
VBUILD TYPE=CDRSC
```

TYPE=CDRSC specifies that this is a cross domain resource major node.

CDRSC Statement for SAS Servers and SAS/SHARE Users

```
name     CDRSC CDRM=cdrmname,ISTATUS=ACTIVE
```

name specifies the name of a server or user application program in another domain. This name must be the same as that in the name field of the APPL statement for the SAS server or user in the controlling domain (1 to 8 characters in length).

cdrmname	specifies the name of the CDRM in the domain in which the server or user is defined as an APPL.
ISTATUS=ACTIVE	specifies that this CDRSC should be initially active.

Example VTAM Definitions

Here are some example ACF/VTAM definitions for a two-domain SNA network. In this example domain "1" has a SAS server. Users in domain "1" access the server in that domain via the cross-memory access method. They do not use the VTAM LU 0 access method. The other domain (domain "2") has SAS software users that access the SAS server in domain "1" via the VTAM LU 0 access method. The CDRM for domain "1" is C01CDRM; the CDRM for domain "2" is C02CDRM.

Domain 1 VTAMLST member C01ASAS:

```
************************************************************
*        Application major node for SAS/SHARE software     *
*        Server name is C01SHARE                           *
************************************************************
         VBUILD TYPE=APPL
*----------------------------------------------------------*
*        SAS Server application running in domain 1        *
*----------------------------------------------------------*
C01SHARE APPL AUTH=(ACQ),EAS=30,PARSESS=YES
```

Domain 1 VTAMLST member C01CSAS:

```
************************************************************
*        CDRSC major node for SAS/SHARE software           *
************************************************************
*----------------------------------------------------------*
*        CDRSCs for the SAS users in domain 2              *
*                                                          *
*        The following statements are needed only if your  *
*        installation is not using dynamic CDRSC definition
*----------------------------------------------------------*
             VBUILD TYPE=CDRSC
          C02SI001 CDRSC CDRM=C02CDRM,ISTATUS=ACTIVE
          C02SI002 CDRSC CDRM=C02CDRM,ISTATUS=ACTIVE
          C02SI003 CDRSC CDRM=C02CDRM,ISTATUS=ACTIVE
          C02SI004 CDRSC CDRM=C02CDRM,ISTATUS=ACTIVE
          C02SI005 CDRSC CDRM=C02CDRM,ISTATUS=ACTIVE
```

Domain 2 VTAMLST member C02ASAS:

```
************************************************************
*        Application major node for SAS/SHARE software     *
*        LUPREFIX = SASIU, LUFIRST = 1, LULAST = 5         *
************************************************************
         VBUILD TYPE=APPL
*----------------------------------------------------------*
*        SAS User applications running in domain 2         *
*        and communicating with server C01SHARE            *
*        in domain 1                                       *
*----------------------------------------------------------*
C02SI001 APPL ACBNAME=SASIU001,AUTH=(ACQ),EAS=3,PARSESS=YES
C02SI002 APPL ACBNAME=SASIU002,AUTH=(ACQ),EAS=3,PARSESS=YES
C02SI003 APPL ACBNAME=SASIU003,AUTH=(ACQ),EAS=3,PARSESS=YES
C02SI004 APPL ACBNAME=SASIU004,AUTH=(ACQ),EAS=3,PARSESS=YES
C02SI005 APPL ACBNAME=SASIU005,AUTH=(ACQ),EAS=3,PARSESS=YES
```

Domain 2 VTAMLST member C02CSAS:

```
************************************************************
*        CDRSC major node for SAS/SHARE software           *
************************************************************
*----------------------------------------------------------*
*        CDRSC for the SAS server in domain 1              *
*----------------------------------------------------------*
     VBUILD TYPE=CDRSC
C01SHARE CDRSC CDRM=C01CDRM,ISTATUS=ACTIVE
```

The APPL statement on domain "1" defines the application for the server running on domain "1". Domain "2" has a CDRSC statement defining the server on domain "1" as a cross-domain resource.

The APPL statements on domain "2" define a pool of applications for the users on domain "2" who will communicate with the server on domain "1". Domain "1" has CDRSC statements defining a corresponding pool of cross-domain resources for those users.

If users on domain "1" are to use the VTAM LU 0 access method rather than the cross-memory access method to communicate with the server on domain "1", a pool of applications for those users must be defined on domain "1". (No cross-domain resources need to be defined because the communication is within domain "1".)

To define a user application pool on domain "1" for users on domain "1", the VTAM definitions from the previous example must be modified. The following APPL statements must be entered into a new VTAMLST member (following a VBUILD TYPE=APPL statement) or added to the VTAMLST member C01ASAS containing the APPL statement for the server on domain "1" as shown in the previous example:

```
*----------------------------------------------------------*
*        SAS User applications running in domain 1         *
*----------------------------------------------------------*
C01SI001 APPL ACBNAME=SASIU001,AUTH=(ACQ),EAS=3,PARSESS=YES
C01SI002 APPL ACBNAME=SASIU002,AUTH=(ACQ),EAS=3,PARSESS=YES
C01SI003 APPL ACBNAME=SASIU003,AUTH=(ACQ),EAS=3,PARSESS=YES
C01SI004 APPL ACBNAME=SASIU004,AUTH=(ACQ),EAS=3,PARSESS=YES
C01SI005 APPL ACBNAME=SASIU005,AUTH=(ACQ),EAS=3,PARSESS=YES
```

Defining Your VTAM Configuration to the SAS System

Defining User Names

Information on the VTAM application pool for SAS/SHARE users is known to the SAS System through the SAS system options `LUPREFIX=`, `LUFIRST=`, and `LULAST=` which are typically specified in your system configuration file. These options describe the `ACBNAME`s in the pool. The `ACBNAME`s must be unique within the VTAM domain, while the APPL ID associated with each `ACBNAME` must be unique across all domains in the network.

The `LUPREFIX=` SAS system option specifies the prefix used in the `ACBNAME`s for the user application pool. The `LUFIRST=` and `LULAST=` system options specify the first and last numeric suffixes used in these `ACBNAME`s. The VTAM LU 0 access method constructs the user `ACBNAME` for communicating with a server by combining a numeric suffix between the values of the `LUFIRST=` and `LULAST=` options with the prefix specified by the `LUPREFIX=` system option. The zero filling done to produce an ABCNAME (as defined in the user application pool) using the `LUPREFIX` system option is dynamic based on the magnitude of the `LULAST` value, rather than always filling to 8 bytes as was done in previous releases. For example, a 5-byte `LUPREFIX` value combined with `LULAST=9` is not zero-filled to produce a 6-byte ABCNAME; combined with `LULAST=99` is zero-filled with a single zero to produce a 7-byte ABCNAME and so on. Sites that have defined 8-byte ABCNAMES in the user application pool should ensure that `LUPREFIX` and `LULAST` values are specified that generate 8-byte ABCNAMEs (`LUPREFIX=SASIUO LULAST=10`, for example).

Defining Server Names

The VTAM systems programmer who defines a server name to ACF/VTAM with an `APPL` statement must give the name (APPL ID) to the SAS/SHARE Software Consultant for use as the server name in the SAS program that executes `PROC SERVER` and in SAS applications that access the server.

System Configuration for the TCP/IP Access Method

Software Requirements

The SAS TCP/IP access method for MVS uses routines in the SAS/C transient library for communication services. This library in turn relies on an underlying layer of TCP/IP communication software such as IBM TCP/IP Version 2 for MVS. TCP/IP communications software handles the actual communications.

The SAS/C transient library has an open architecture that permits the use of TCP/IP products from different vendors. Vendors enable the transient library to utilize their communication software by providing an appropriate SAS/C transient library communications interface module. SAS Institute provides an interface module for IBM TCP/IP in the transient library.

To use the TCP/IP access method for MVS your site must have one of the following:

- ❑ IBM TCP/IP Release 2.0 or higher
- ❑ other communication software that supplies the required interface module.

The TCPIPMCH Option

If your site runs multiple instances of TCP/IP simultaneously, you can use this option to specify which TCP/IP to use. The value that you specify is the name of the started task for the TCP/IP that you want to use.

The value that you specify is stored into the SAS/C environment variable TCPIP_MACH. TCPIP_MACH defines the name of the address space that is running TCP/IP.

If the TCPIP_MACH environment variable is not defined, the value that SAS uses depends on which TCP/IP is used. If Interlink TCP/IP is used, then SAS uses the value ACSS; for all other TCP/IPs, SAS uses the value TCPIP.

System Configuration for TCP/IP

Specify the SAS System Option TCPSEC=_SECURE_ for the Server Execution

Note: This task is required.

Specify the SAS system option `TCPSEC=_SECURE_` to cause the TCP/IP access method to require users to supply a valid userid and password for the MVS system where the server is running in order to connect to the server.

Installing the SAS/C Transient Library

Note: This task is required.

Under MVS, the TCP/IP access method requires the SAS/C transient library, release 5.50 or later. It is included with both the SAS/SHARE and SAS/CONNECT products.

If your site has installed release 5.50 of the SAS/C transient library, you must either replace it with the included transient library (see installation below) or apply zap Z5500974 to your installed library.

If your site does not have this library installed or if your site has an earlier version installed, you must install the included transient library as follows:

Step 1: Install the SAS/C transient library

The `CNTL` data set member `ULCTRANL` contains JCL updated with job, `&_prefix` and allocation information you supplied in the `SASEDITP` member. If you run this job as supplied, it unloads the SAS/C Transient Library Version 5.50 or later from your install tape to a data set named `&prefix.SASC.TRANSLIB`.

If you desire a different name for the library change the `DSN=` on the `SASCTRAN` DD statement in the `IEFBR14` step, and on the `DDOT0` DD statement in the `IEBCOPY` step.

Submit the job and verify successful completion.

Step 2: Allocate the SAS/C transient library for SAS execution

Alter your SAS `CLIST` to add a `CTRANS` allocation as follows:

```
ALLOC F(CTRANS) DA('your.sasc.translib') SHR &SU11
```

Alter your SAS cataloged procedure to allocate the SAS/C Transient Library as follows:

```
//CTRANS DD DSN=your.sasc.translib,
            DISP=SHR
```

Note: If you choose to install your SAS/C Transient Library to a link list data set, you do not need to allocate it in your CLIST and cataloged procedure.

Specify Server Names and Ports

Note: This task is required.

To configure your installation for the TCP/IP access method, specify SAS/SHARE server names and port assignments. The server names and port assignments for the TCP/IP access method are defined in the services file (see "Network Configuration Data for TCP/IP" for more information on this 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 (@).

Ensure TCP/IP Configuration Data Is Accessible

Note: This task is required.

The TCP/IP access method requires that certain data sets containing configuration data be available to the SAS System. The following section, "Network Configuration Data", lists each data set and how the SAS System searches for each one. The SAS System locates these data sets by their common data set name prefix. One of the methods below must be used to inform SAS of the data set name prefix of these data sets.

Most sites already have these data sets available for existing TCP/IP applications. Furthermore, if your site already has TCP/IP applications running under the SAS/C library, this step was probably completed when it was installed.

Method 1: Use the default high-level qualifier, ETC, or the default prefix, TCPIP.

The easiest way to configure your system is to give the configuration data sets the ETC high-level qualifier, for example, `ETC.HOSTS`, and `ETC.SERVICES`. If this convention is not possible at your site and there are no conflicting DS names with the ETC high-level qualifier, you may utilize the default prefix to produce names like `TCPIP.ETC.HOSTS`.

For either style of default naming convention there are two restrictions. In each SAS session that acts as a server or user execution, the TCPIPPRF= option must not be used to override the default value of the TCP/IP prefix, "TCPIP". Also you must not apply the zap to change the default value of the TCP/IP prefix in the transient library.

Method 2: Zap the default TCP/IP prefix to your prefix

The default TCP/IP prefix is stored in a 26-character string array in `L$CNDBA` in the SAS/C transient library. You may change this value to suit your site's choice for configuration data set name prefix. For example, if names of the form `SYS.PROD.CONFIG.ETC.SERVICES` are desired, change the TCP/IP prefix to `"SYS.PROD.CONFIG"`. Apply zap number Z5504151 for this purpose.

Method 3: Use the `TCPIPPRF=` option to set your TCP/IP prefix

The `TCPIPPRF=` system option is an initialization time option that explicitly sets the TCP/IP prefix for that SAS session. Each SAS session that acts as a server or user employing the TCP/IP access method must set this option to the site value at initialization time. For example, if the names of you configuration data sets have the form `SYS2.VER2.TCP.ETC.HOSTS`, set the option thusly:
`TCPIPPRF=SYS2.VER2.TCP`

This option is intended primarily for additional flexibility when more than one set of TCP/IP configuration data sets is available at a site.

Create an ETC.RESOLV.CONF File for Name Resolution

Note: This task is optional.

If you want to use the resolver for name resolution, create a `<prefix.>ETC.RESOLV.CONF` file. See the subsection below, "Finding Host Names and Addresses" for more information about name resolution.

IBM TCP/IP sites do not need this file. They can use the pre-existing `<prefix.>TCPIP.DATA` file to supply resolver configuration.

Allocate the SASCTCPE DDName in SAS Sessions that Use the TCP/IP Access Method

Note: This task is optional.

Errors that occur in SAS/C transient library routines that support the TCP/IP access method are logged to the `SASCTCPE` DDName. In UNIX terminology, this destination is the standard error output for those routines.

If you experience unusual TCP/IP communication conditions, define this DDName to a SYSOUT data set or permanent file in the server's and/or user's SAS execution. This will aid in problem determination and prevent confounding error messages concerning the lack of a defined error message file.

Network Configuration Data for TCP/IP

The operation of the TCP/IP access method depends on its ability to access the configuration information for a site. This section discusses the location of site configuration files and provides a detailed explanation of how the SAS/C transient library finds these files.

You should have already created the relevant files this section discusses when you installed your communications software, such as IBM TCP/IP.

Configuration Data Sets

On a UNIX operating system, the following five data sets usually contain site-dependent configuration information for TCP/IP.

- /etc/hosts
- /etc/networks
- /etc/services
- /etc/protocols
- /etc/resolv.conf.

The TCP/IP access method uses equivalent data sets under MVS. However this access method does not utilize the /etc/networks or /etc/protocols files, they are listed here for sake of completeness.

The MVS file system differs from the UNIX file system, and local security or organization considerations can affect how data sets are named. Although the name of the data set may be different, the data set that contains site configuration information is in the same format as the equivalent data set in a UNIX operating system.

Search Logic

Under MVS, the data set that contains configuration information usually has a name that is derived from the equivalent UNIX filename. For example, the data set name `ETC.HOSTS` is derived from the UNIX filename /etc/hosts.

The transient library uses the following methods to look for each of the configuration data sets.

/etc/services

The transient library looks for the following data set names while searching for the MVS data set that is equivalent to `/etc/services`:

- `<TSO prefix>.ETC.SERVICES` under TSO or `<userid>.ETC.SERVICES` under batch execution
- `ETC.SERVICES`, if the TCP/IP prefix has the default value, `TCPIP`.
- `<TCP/IP prefix>.ETC.SERVICES`, if `<TCP/IP prefix>` is not blank.

/etc/hosts

The transient library looks for the following data set names while searching for the MVS data set that is equivalent to /etc/hosts:

- `<TSO prefix>.ETC.HOSTS` under TSO or `<userid>.ETC.HOSTS` under batch execution
- `ETC.HOSTS`, if the TCP/IP prefix has the default value, `TCPIP`.
- `<TCP/IP prefix>.ETC.HOSTS`, if `<TCP/IP prefix>` is not blank.

/etc/resolv.conf

The transient library looks for the following data set names while searching for the MVS data set that is equivalent to /etc/resolv.conf:

- `<TSO prefix>.ETC.RESOLV.CONF` under TSO or `<userid>.ETC.RESOLV.CONF` under batch execution
- `ETC.RESOLV.CONF`, if the TCP/IP prefix has the default value, `TCPIP`.
- `<TCP/IP prefix>.ETC.RESOLV.CONF`, if `<TCP/IP prefix>` is not blank.

When the library finds a data set with one of the above names, the name is retained for the duration of the SAS execution. You may need to restart SAS to cause it to find a different filename.

Finding Host Names and Addresses

In the UNIX environment, programs that need host names and addresses may use the /etc/hosts file, or they may call the resolver to contact the name server for the host name information.

If you are running a name server, the name server addresses are determined from the /etc/resolv.conf file. If this file does not exist and you are using IBM's TCP/IP, the `TCPIP.DATA` file is used instead to determine resolver configuration and IBM defaults. The TCP/IP access method only recognizes the first three name servers specified in this file. Both the UNIX operating system and the access method have a limit of three name servers.

Note that the transient library does not support the IBM TCPIP files, `HOSTS.LOCAL` and `HOSTS.SITEINFO`. The previous SAS TCP/IP access method used these files through Pascal transient library services. Sites that use these files must either switch to using name servers or create an equivalent '/etc/hosts' file.

The SAS/C transient library has default logic for finding host names and addresses. It uses this logic when interfacing to IBM TCP/IP. Other TCP/IP vendors may use this logic, augment it, or replace it. Refer to their documentation for details.

The default logic uses the following algorithm:

1. It looks for the /etc/resolv.conf file, using the rules listed above. If it does not find this file, it goes to step 2. Otherwise, if the `"nameserver"` statement in this data set specifies the use of the resolver and name server, it performs the requested queries and returns any answer it receives. If attempts to connect to the nameservers are refused, it goes to step 3.

2. It looks for a data set in the format of the IBM TCP/IP file `TCPIP.DATA`. The search rules for this data set are those used by IBM TCP/IP:

    a. It looks for `<TSO prefix>.TCPIP.DATA` under TSO or `<userid>.TCPIP.DATA` under batch execution.

    b. It looks for `<TCP/IP prefix>.TCPIP.DATA`. If the `NSINTERADDR` statement in this data set specifies the use of the resolver and name server, the library performs the specified queries. It returns any answer it receives. If attempts to connect to the nameservers are refused, it goes to step 3.

3. It looks for an /etc/hosts file, using the rules listed above. If it finds an /etc/hosts file, it returns the result, including failure.

The determination of the domain name in name server queries follows the same logic as the UNIX operating system in using the `"domain"` statement of the /etc/resolv.conf file, or the `DOMAINORIGIN` statement of `TCPIP.DATA`.

The ICSRSLV Option

Note: This option is available for Interlink sites only.

The ICSRSLV option enables sites that use Interlink TCP/IP to specify when or if the ICS name resolver is called to translate an IP address to a name.

The ICSRSLV option can be specified as part of a configuration file or as a SAS invocation option.

The syntax for the ICSRSLV option is as follows:

```
ICSRSLV=ONLY|FIRST|LAST|NEVER
```

where:

- `ONLY` specifies that only the ICS name resolver is called
- `FIRST` specifies that the ICS name resolver is called first. If there is an error, the SAS/C resolver is called.
- `LAST` specifies that the SAS/C resolver is called first. If there is an error, the ICS name resolver is called.
- `NEVER` specifies that the ICS name resolver is never called. The SAS/C resolver is always called.

If you do not specify a value for ICSRSLV=, then SAS acts as if ONLY had been specified.

Appendix T, Implementing SAS/TOOLKIT® Software

The SAS/TOOLKIT installation `CNTL` data set for each language contains sample JCL members that include in-stream cataloged procedures. To make it easier for your users to take advantage of the SAS/TOOLKIT product, you can customize these cataloged procedures for your site and install them in your standard cataloged procedure library.

The member `APROC` in the `&prefix.TOOLKIT.ASM.CNTL` library contains the definitions of the cataloged procedures `UWASM` and `UWLINKA`. These are needed by SAS/TOOLKIT assembler users.

The member `CPROC` in the `&prefix.TOOLKIT.C.CNTL` library contains the definitions of the cataloged procedures `UWC`, `UWCLINK`, and `UWLINKC`. These are needed by SAS/TOOLKIT SAS/C users.

The member `PPROC` in the `&prefix.TOOLKIT.PLI.CNTL` library contains the definitions of the cataloged procedures `UWPLI` and `UWLINKP`. These are needed by SAS/TOOLKIT PL/I users.

The member `FPROC` in the `&prefix.TOOLKIT.FORT.CNTL` library contains the definitions of the cataloged procedures `UWFORT` and `UWLINKF`. These are needed by SAS/TOOLKIT FORTRAN users.

In all cases, the procedures are defined as in-stream procedures. You must remove the `PEND` line as you add each member to the cataloged procedure library at your site. Also, follow the notes in the cataloged procedure text to see where you need to change data set names, entry points, etc. Any lowercase data set names should be changed to the correct data set names for your installation.

Appendix U, Implementing SAS/TUTOR® Courses

Verifying Data Set Access for Users

Note: This task is required.

If your installation uses IBM's RACF or other security software, insure that users have appropriate access rights to the installed data sets as follows:

1. Give student users READ access to:

   ```
   &prefix.CBT.*
   ```

2. Give student users WRITE access to:

   ```
   &prefix.CBT.CNTL
   ```
   (the control library)

Initializing the SAS/TUTOR System

Note: This task is required.

1. Once proper authorization has been assigned as previously described, initialize the SAS/TUTOR system by invoking the `SASTUTOR` CLIST at the system prompt. The `SASTUTOR` CLIST was copied to a CLIST library as specified in `SASEDITP` during installation.

2. On the Course Management System initialization screen, enter the password:

   ```
   SAS$INIT
   ```

3. If prompted, enter the location of the control library (`&prefix.CBT.CNTL`) without using quotation marks. A message informs you when the SAS/TUTOR system is initialized.

4. Select the option `Initialize a Course` from the Course Management System Main Menu.

5. Enter the ID of each course you installed (for example, CBT101).

6. If prompted, specify or verify the fully qualified MVS data set names where course files were installed.

7. When you have initialized all courses, exit the `SASTUTOR` CLIST.

You have now completed initialization of your SAS/TUTOR courses.

Verifying Installation and Initialization of SAS/TUTOR Courses

Note: This task is required.

1. At the operating system prompt, invoke the `SASTUTOR` CLIST.

2. 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. Select the option `Take a Course`.

3. If courses are properly initialized, a menu of installed courses is displayed.

Adding a Course Administrator to the SAS/TUTOR System

Note: This task is optional.

1. At the operating system prompt, invoke the `SASTUTOR` CLIST.

2. From the Course Management System Main Menu, select `Update the Course Administrator List`.

3. Enter the user ID of additional course administrators. You can enter up to eight user IDs.

Note: Once a user ID is listed in 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 perform the following tasks:

- ❑ add to or remove a course from the SAS/TUTOR Course Selection Menu
- ❑ activate, modify, and use student tracking system
- ❑ add or remove any logon ID from the course administrator list.

Restoring Tracking Data from Release 6.08 to Release 6.09

You can use your Release 6.08 tracking data by following these steps at any time after installing and initializing the SAS/TUTOR system.

1. Access Release 6.09 of the SAS System.

2. Assign librefs to the SAS/TUTOR control libraries for both Release 6.08 and Release 6.09 as follows:

```
libname OLD 'SAS-data-library';  /* Release 6.08 data */
libname NEW 'SAS-data-library';  /* Release 6.09 data */
```

3. Submit the following SAS program to append Release 6.08 tracking data to the Release 6.09 tracking data set:

```
proc append base=NEW.TRACK  data=OLD.TRACK;
proc sort data=NEW.TRACK  noduplicates;
by TRKVAR;
run;
```

Renaming SAS/TUTOR Data Sets

The installation process creates a SAS data library, data set `&prefix.CBT.CNTL`, which all SAS/TUTOR courses use. This SAS library contains student records and other administrative data needed by the course administrator.

The installation process stores pointers in the `&prefix.CBT.PROG.MAIN` SAS library pointing to the control library and each course library. The MVS data sets containing SAS/TUTOR cannot be renamed without invalidating the pointers. If renaming (NOT recommended) becomes mandatory, the pointers can be reset by following these steps:

1. Move all course libraries and the `&prefix.CBT.PROG.MAIN` library to their new locations.

2. Allocate the new `CNTL` library with the same specifications as the previously installed `&prefix.CBT.CNTL` library. Then delete the previously installed `&prefix.CBT.CNTL`.

3. Invoke SAS with the display manager system.

4. Assign a libref to the Course Management System library. For example:

```
libname cbtmain 'prefix.CBT.PROG.MAIN';
```

5. Delete all members in the `CBTMAIN` library except for the `MAIN` catalog.

   a. Issue the `LIBNAME` command to open the Libname window.

   b. Select the `CBTMAIN` libref by placing an `S` beside the libref and pressing ENTER.

   c. Delete each library member except `MAIN.CATALOG` by placing a `D` beside the member and pressing ENTER. Verify the deletions when prompted.

6. Modify the `SASTUTOR` CLIST to point to the new `CBT.PROG.MAIN` library.

7. Invoke the `SASTUTOR` CLIST and follow instructions to initialize the SAS/TUTOR course management system and all installed courses.

Note: If SAS/TUTOR data sets have been renamed and additional SAS/TUTOR courses are to be installed, the new `CnnnPOST` members of the `CBT.CNTL` data set must be manually updated after running the `SASIxxxx` jobs to reflect the new data set names. To determine if SAS/TUTOR courses have been renamed, examine the high-level qualifier of the production SAS libraries (for example, `SAS609.SAS.SASHELP`). If the prefix matches that of the SAS/TUTOR course libraries (for example, `SAS609.SAS.CBT.PROG.MAIN`), the data sets have not been renamed.

Appendix V, Post-Installation Setup for SAS/ASSIST® Software

This appendix describes how to migrate profiles from previous releases, and 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*.

This appendix also describes installing sample DB2 tables and a sample query manager for SAS/ASSIST query and reporting.

Profile Changes and Enhancements

To enhance the profile feature for Query and Reporting, some changes have been made to the profile structure. The profile option, `Query exit` which was previously in `Type: System Administration`, a master profile-only type, was moved to the `Type: Query` which exists at all profile levels. The profile option, `Additional Information` was moved from `Type: Access to DB2` to `Type: Query Manager`. This enables users running queries against SAS data to obtain customized information about the data they are accessing. DB2 users can continue to utilize this option to obtain customized information about their DB2 data. Refer to *SAS/ASSIST Software: Changes and Enhancements, Version 6* for additional information.

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. 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 that is provided with this release. In the Program Editor window type 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 be take advantage of the SAS/ASSIST start program, a profile option that runs a program when SAS/ASSIST software is invoked. The program must be a SOURCE entry, therefore you must save the code above 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 below in 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. Complete the following steps:

1. Type the following in the Program Editor window :

```
proc display cat=sashelp.qassist.profconv.scl; run;
```

2. Execute the `Save` command to save the entry:

```
SAVE SASHELP.QASSIST.PROFCONV.SOURCE
```

3. After the Master Profile has been created, open it and select `Type: General`

4. Specify the following: (The `R` status forces update)

Cmd Option	***Value***	***Status***
SAS/ASSIST start program	*SASHELP.QASSIST.PROFCONV. SOURCE*	*R*
Type of start program	*Catalog*	*R*

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. You may want to let them know to expect it. The user must accept this change since the option has a restricted status.

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, by removing its restricted status. Specify the following:

Cmd Option	***Value***	***Status***
SAS/ASSIST start program		*U*
Type of start program	*Catalog*	*U*

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.

Converting Existing Master and Group Profiles

To convert the master profile, type the following in the Program Editor and then submit it:

```
%let lib=sasabc.sas430.master;
proc display cat=sashelp.qassist.profconv.scl; run;
```

To convert group profiles, type the following in the Program Editor and then submit it:

```
%let lib=sasabc.sas430.master;
%let cat=catalog.grpname;
proc display cat=sashelp.qassist.profconv.scl; run;
```

Note: It is possible that some or all group profiles are stored in the same physical location as the master profile as sown in the above example. If you have multiple group profiles stored in the same physical location, you do not need to submit the %let lib= statement repeatedly. For example, if you have groups GRP1, GRP2, GRP3 all stored in sasabc.sas430.groups in the ASSIST catalog, you can submit the following to convert all three groups:

```
%let lib=sasabc.sas430.groups;
%let cat=assist.grp1;
proc display cat=sashelp.qassist.profconv.scl; run;
%let cat=assist.grp2;
proc display cat=sashelp.qassist.profconv.scl; run;
%let cat=assist.grp3;
proc display cat=sashelp.qassist.profconv.scl; run;
```

Adding a Master Profile

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 library that will contain the master profile. The following definitions are needed (3380 disk):

Data Set Name	userid.ASSIST.MASTER
Space units	CYLINDER
Primary quantity	1
Secondary quantity	1
Directory blocks	0
Record format	FS
Record length	6144
Block size	6144

   Example: userid.ASSIST.MASTER

   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 that conforms to the naming conventions at your installation. All users must have read-access to this library.

   - ❑ Modify the CLIST provided with installation to change the disposition of the SASHELP library to OLD.
   - ❑ Invoke the SAS System. No other users will be able to run this SAS session.
   - ❑ On line 1 of the Program Editor type the physical pathname to be used as the SAS library to store the master profile. Execute the `Save` command to save the entry as shown in the following example:

     ```
     SAVE SASHELP.QASSIST.PARMS.SOURCE
     00001 userid.ASSIST.MASTER
     00002
     ```

     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.
   - ❑ Exit the SAS System.
   - ❑ Free the SASHELP data set to release the exclusive lock:

     ```
     FREE DS('&prefix.SASHELP')
     ```
   - ❑ Modify the CLIST provided with installation to change the disposition of the SASHELP library back to SHR. Now other users are able to run this SAS session.

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, Version 6*.

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 user 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`. 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.

Installing Sample DB2 Tables and a Sample Query Manager

This section describes how to customize SAS/ASSIST software to run queries against DB2 sample data. It is recommended that you do this in order to get acquainted with the software before you start working with your own DB2 data. This example sets up a personal query manager. See Chapter 9, "Setting Up Query Managers," in SAS/ASSIST Software: Changes and Enhancements for more information.

Complete the following steps:

1. Create DB2 Sample Tables.

   Query and Reporting contains its own sample DB2 tables. These tables are used in the documentation and in the SAS training courses. Complete the following steps to create DB2 sample tables:

   a. Enter the following on the command line in the Program Editor:

      ```
      COPY SASHELP.QASSIST.SAMPLTAB.SOURCE
      ```

   b. Specify the DB2 subsystem id, creator, and database name (lines 54-59):

      See documentation in the program for further information.

   c. Execute this SAS program and the DB2 sample data will be created.

2. Create Query Manager Tables on the DB2 Sample Data

   Complete the following steps to create query manager tables for installation verification purposes:

   a. In the Program Editor, use the `COPY` command to copy the sample source from `SASHELP.QASSIST.DB2METAU.SOURCE`. This program will generate a set of Query Manager tables, which contain information on DB2 tables available to specific creators.

b. Specify the creators you want to use in line 21 as shown in the following example:

```
%let creators=('SASQR','DSN8230',USER);
```

Note: In this example `SASQR` and `DSN8230` are two specific creators which contain sample data from SAS Institute and IBM. Add `USER` if you want access to a DB2 table, which has a creator equal to your userid.

c. Specify the location of the Query Manager tables on line 25.

```
%let saslib=SASUSER;       *<--User QM library;
```

d. Execute this SAS program and the Query Manager tables will be created. The following SAS tables will be created:

SASUSER_DB2TAB	DB2 table information
SASUSER_DB2COLS	DB2 column information
SASUSER_DB2RELS	Relations for joining tables
SASUSER_DB2INDX	Defined indexes in DB2.

3. Create the Query Manager Definitions

The Query Manager contains information that indicates the database to be used as well as the location of the SAS Query Manager tables created in the last step. You can also specify the name of the program to be used to recreate (refresh) the SAS Query Manager tables. See Chapter 9 in *SAS/ASSIST Software: Changes and Enhancements* for more information.

a. Select the following from the SAS/ASSIST Primary menu to get to the Query Manager Administration window:

```
DATA MGMT...
QUERY...
Query and Reporting...
SETUP...
Administration
```

b. Enter the following information to identify the location of the Query Manager tables as shown below:

- ❏ For `Database`, enter `DB2`
- ❏ For `Program to Generate Query Manager tables`, select `No`
- ❏ For `Location of the Query Manager tables`, enter `SASUSER`

Note: The remaining parameters are selected by default.

c. Save the Query Manager definition.

Select `Save As` from the `File` menu.

d. Enter name and description as shown in the following example (the Type and Catalog are already specified):

```
Type:         MANAGER
Name:         db2samp
Description:  Sample DB2 data
Catalog:      SASUSER.MANAGER
```

e. Select `OK` to save it.

4. Using the Query Manager

a. Select the following from the SAS/ASSIST Primary menu to get to the Query window:

```
DATA MGMT...
QUERY...
Query and Reporting...
QUERY...
```

The Query window may attempt to load a Query Manager other than the one you defined (in Step 3 above), or you might be notified that one or more Query Manager tables are not found. You will be asked if you want to generate them. Select `No`.

b. To use the Query Manager that you defined (see Steps 2 and 3 above), select `Select Query Manager...` from the `Locals` menu.

A pop-up menu is displayed. Select the Query Manager you just defined DB2SAMP (in Step 3 above).

c. Select the `Select` button to get a list of DB2 data.

See Chapter 6, "Querying Data" in *SAS/ASSIST Software: Changes and Enhancements* for more information.

Appendix W, Logging Directly On to the SAS® System

MVS sites can choose to substitute the SAS System for the standard TSO terminal monitor program. Sites can insulate users from the TSO environment by automatically invoking the SAS System or a SAS application when users log on.

Because the SAS System is running as its own terminal monitor program, TSO commands are not accessible to users.

This technique is intended for MVS sites interested in restricting interactive user access to the TSO environment or shielding novice users from having to learn how to work in the mainframe environment. Sites that use this technique also save a little memory.

This appendix describes how to install and use the direct logon procedure, and provides an example. It also discusses the differences between logging on to the SAS System using display manager, using a windowing application, as well as the possibility of using the direct logon process with SAS/CONNECT software.

In most circumstances, only system administrators need to read this appendix. If you are not a system administrator and are interested in logging directly on to the SAS System, see your SAS Software Representative.

Installing the Direct Logon Procedure

When users log on to the system, a JCL stream called a logon procedure (logon proc) is automatically executed. Normally, the logon procedure activates the TSO terminal monitor program that sends the TSO READY prompt to the display when the logon process is complete. To make the SAS System the logon environment, replace this procedure with a logon procedure that activates the SAS System as the terminal monitor program.

To use this capability you must still start TSO. Any user logging on to the SAS System must have a valid TSO userid. However, invoking the SAS System directly results in a reduction of approximately 50K in working set size for each user.

Complete the following steps to allow users to log directly on to the SAS System:

- ❑ Create a logon procedure that is used by all users directly logging on to the SAS System.
- ❑ Install the logon procedure into your site's logon procedure library.
- ❑ Specify the SAS logon procedure as each user's logon procedure.

The logon procedure that you create is similar to the standard SAS cataloged procedure. This procedure is in the BAPROC01 member of your site's CNTL installation data set. Documentation for the SAS cataloged procedure is in Chapter 8, "Using the SAS Cataloged Procedure," in the *SAS Companion for the MVS Environment, Version 6, First Edition*. Also, an example logon procedure is provided in the next section.

Example Logon Procedure

Example JCL for a logon procedure is shown below. This example is similar, but not identical to, the standard SAS cataloged procedure. Important changes from the standard SAS cataloged procedure are marked with the comment `<=CHANGE` in the right margin. These changes are summarized after the code.

```
//SAS609 PROC ENTRY={ob entry} ,                              <=CHANGE
//             PRODFIX='{ob sas607.prefix} ',
//*            CONFIG=NULLFILE,                               <=CHANGE
//             OPTIONS=,
//             WORK='500,200'
//*****************************************************************
//*  PRODUCT: MVS SAS RELEASE 6.09                                 ***
//*  DOCUMENTATION: SAS COMPANION FOR THE MVS ENVIRONMENT, V6      ***
//*  FROM: SAS INSTITUTE INC., SAS CAMPUS DR., CARY, NC  27513     ***
//*****************************************************************
//SAS607   EXEC PGM=&ENTRY,PARM='&OPTIONS',REGION=4096K
//STEPLIB   DD DISP=SHR,DSN=&PRODFIX..LIBRARY
//CONFIG    DD DISP=SHR,DSN=&PRODFIX..CNTL(TSOXA)             <=CHANGE
//*         DD DISP=SHR,DSN=&CONFIG                           <=CHANGE
//SASAUTOS  DD DISP=SHR,DSN=&PRODFIX..AUTOLIB
//SASHELP   DD DISP=SHR,DSN=&PRODFIX..SASHELP
//SASMSG    DD DISP=SHR,DSN=&PRODFIX..SASMSG
//WORK      DD UNIT=SYSDA,SPACE=(6144,(&WORK),,,ROUND),
//             DCB=(RECFM=FS,DSORG=PS,LRECL=6144,BLKSIZE=6144)
//*SASLOG   DD SYSOUT=*                                       <=CHANGE
//*SASLIST  DD SYSOUT=*                                       <=CHANGE
//SASPARM   DD UNIT=SYSDA,SPACE=(400,(100,300)),
//             DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)
//SYSUDUMP  DD SYSOUT=*
//** ADD A LINE LIKE THE FOLLOWING TO CREATE A MACHINE-READABLE DUMP
//*SYSMDUMP DD DSN=DUMP,UNIT=SYSDA,DISP=(NEW,CATLG),SPACE=(TRK,(20,5))
```

The following is a summary of the differences between this example logon procedure and the standard SAS cataloged procedure:

- ❑ The user CONFIG file has been removed.
- ❑ The system CONFIG file is changed to the TSOXA or TSO370 CONFIG file.
- ❑ The allocations for the SASLOG and SASLIST file are removed. The information written to these files is routed to the user's display manager session.

After you have modified the cataloged procedure, install it into the site's logon procedure library. To enable users to access the SAS direct logon facility, modify their userids to use the modified logon procedure.

Using Direct Logon

You can use the direct logon technique to log on to the SAS System using display manager, or you can choose to log directly on to a windowing application. You can even use this technique in combination with SAS/CONNECT software to log directly on to the SAS System on the mainframe from your workstation.

The purpose of combining the direct logon technique with SAS/CONNECT software is to restrict users that connect to the mainframe from having access to the TSO environment. For information on using SAS/CONNECT software, refer to *SAS/CONNECT Software, Usage and Reference, Version 6, First Edition* and SAS Technical Report P-224, *SAS/CONNECT Software: Changes and Enhancements, Release 6.08*.

Logging On to the SAS Display Manager System

Use the example logon previously described. If you need to allocate special files for each user, such as individual SASUSER files, you must create a separate logon procedure for each user because of a system restriction.

Unless you are using the Amdahl Logon Pre-prompt Exit Version 2.7.5, you do not have any control over supplying customized SAS system options, configuration files, or the dynamic allocation of a user's SASUSER data set to a single logon procedure.

Logging On to a Windowing Application

To log directly on to a windowing application, specify an autoexec file for the application. To do this, add a SASEXEC statement that supplies the data set name of the file containing the autoexec code to the example logon procedure. This SASEXEC statement has the following form:

```
//SASEXEC DD DISP=SHR,DSN=OS-data-set-containing-autoexec-file
```

For more information on modifying the way in which the SAS System is invoked, see "Tailoring SAS Initialization Processing," in Chapter 2 of *SAS Companion for the MVS Environment*.

Restrictions

Using the SAS System as the logon environment implies certain restrictions. For example, because the SAS System is the terminal monitor program, users cannot execute TSO commands or access TSO facilities such as ISPF from their SAS sessions. Nor can users issue the TSO or X command from their SAS sessions to gain access to the TSO environment.

However, The SAS Display Manager System contains operating-system-dependent statements, windows, and a full-function editor that perform many of the same utilities available in ISPF. These services are available to users that log directly on to the SAS System. Users can dynamically allocate any files they are authorized to access using LIBNAME and FILENAME statements. They can also use the INCLUDE command to include external files and members of partitioned data sets into SAS editor windows. The DSINFO, FNAME, and MEMLIST windows provide operating-system-dependent information about external files. For more information on these and other operating-system-dependent language features, see Chapter 13, "Windowing Considerations," and Chapter 16, "Other Host-Specific Language Features," in the {it SAS Companion for the MVS Environment}.

If the logon procedure you have provided includes a DDname assigned to the internal reader, users are able to submit batch jobs from within their SAS sessions.

Accounting Considerations

Substituting the SAS System for the standard IBM terminal monitor program affects records produced by SMF and TSO/MON. SMF type 30, 34, and 35 records have the SAS entry name in the program name field rather than IKJEFT01 or ADFMDF03. Type 32 (TSO command) records are not produced.

If you are using LEGENT Corporation's TSO/MON product, TSO/MON system records contain complete resource usage, transaction, and response time information, but no command information. TSO/MON command detail records are not produced.

Appendix X, Licensing the SAS® System (Action G)

Introduction

Use this procedure to renew licensing for an existing SAS System. Some sites may have been notified that the SETINIT received on the installation tape is already expired. If this is the case for your site, enter the SETINIT information you received as part of your installation package into the `RENEWPRM` member of the CNTL data set before you run the jobs to update your system.

You will need to run this job for each version 6.08 SASHELP you have in service, including staged SASHELP.

For convenience, Actions A, B, and C create renew jobs using the prefix supplied in the SASEDITP member. The jobs are located in the CNTL data set with the following names:

RENEW	updates the production libraries
RENEWSTG	updates the staging libraries
RENEWNLS	updates production NLS libraries
RENEWSNL	updates staging NLS libraries

You can modify these jobs to update any set of libraries you need to update. The modifications require that you know the location of the important data sets.

If you prefer, you can use the install process to generate the customized renew job. The instructions for that method are below.

Processing Renewal of the SAS System

Note: This task is required if you received an expired SETINIT.

Step 1: Supply `SASEDITP` parameter values.

- ❑ Blank out the `*NO*` that precedes the action name `STANDALONE-RENEW`. Verify that you have only one action value active. If more than one action is selected, a return code of 12 is set, and error messages specifying the duplicate selections are posted to `SYSPRINT` and `SYSTERM`.

- ❑ Specify the prefix of the `SASHELP` library to which the SETINIT will be applied. Specify this value as the `RENEW-PREFIX` value.

IMPORTANT: If base SAS is not included in `&RENEW-PREFIX` (`&RENEW-PREFIX` is a staging prefix which requires license renewal), also supply the following:

- **`RNW-BASE-PFX`** as the prefix to Release 6.09 of the SAS System containing at least a complete base SAS. This prefix is not updated, and is only used for execution. Be sure to blank out the `*NO*` on this line to enable it.

This parameter is contained in the installation `ACTION G` grouping in `SASEDITP`.

Step 2: Edit the `RENEWPRM` member of the `CNTL` data set to include the updated `SETINIT` parameters supplied at license renewal time by SAS Institute.

The information contained in the `RENEWPRM` member must appear **exactly** as it does on the renewal text received from SAS Institute in order for the renewal date to be properly updated.

Step 3: Supply `SASINSGO/SASIHOLD` parameter values.

First modify the jobcard information to reflect those values used by your site. Then modify the procedure parameters as described in the following:

- **`CNTLDSN=`** specifies the name of the installation `CNTL` data set you allocated using the `IEBUPDTE` job in Step 1 of "Unload the Installation Jobs" in this document.
- **`SASEDTP=`** specifies the name of the `CNTL` data set member that contains the `SASEDITP` user site parameter values you have entered to control installation jobs. The default is `SASEDITP`.
- **`PRODSEL=`** is not significant for Action G. You may use the default, `PRODSEL`.
- **`LIBSEL=`** is not significant for Action G. You may use the default, `LIBSEL`.
- **`DISKUNI=`** specifies the unit name at your site for temporary storage.
- **`SYSOUT=`** defaults to `*` and specifies the `SYSOUT` class you want to use for jobs.

Step 4: Submit the `SASINSGO/SASIHOLD` job.

Be sure to check the return code of the job to verify that the SAS software products have been renewed correctly. Also be sure to check the SAS log, regardless of the `SASIRENW` job's return code.

Note: This full process does not have to be executed every time you update your setinit. Once you have created the `SASIRENW` job, it resides in the CNTL data set. Your update process consists of updating the `RENEWPRM` member with the new information and resubmitting the `SASIRENW` job.

SETINIT Troubleshooting

The following is a list of common error messages and solutions that may occur when attempting to update your SETINIT information. If you still receive errors, contact the Technical Support department at SAS Institute. (Refer to the Transmittal letter enclosed in your installation package for information on contacting the Technical Support department).

ERROR:

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

SOLUTION:

The SETINIT information in the `RENEWPRM` member of the CNTLDSN must be entered **EXACTLY** as it appears on the paper SETINIT. If any text of the SETINIT is not the same, the above error occurs when you attempt to execute the `SASIRENW` job.

Note: A common mistake is typing the letter 'O' in place of the numeral zero and vice versa. Also check for any unprintable characters that might appear in the text of the SETINIT information (`not '40'x`)

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 IBM xxxx-xxxx SERIAL NUMBER yyyyyy
```

SOLUTION:

When the SETINIT is executing on a processor that is not included in the SETINIT, the above error message is issued. Be sure that the SAS System is running on the processor indicated in the SETINIT. If your model name, number, or serial number is different than the one listed in the SETINIT, contact your SAS Institute Customer Service Representative for an updated SETINIT.

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.
```

SOLUTION:

The above error indicates that UPDATE access to the SASHELP library was denied. This is most likely due to not specifying the SETINIT option when using `DISP=SHR`, not having a `DISP=OLD`, or not having the appropriate access authority (UPDATE required) to the SASHELP library. Make the necessary changes to the SASIRENW job and resubmit.

The following is the information that appears in the SASLOG for the SASIRENW job after successful update of the SETINIT information. The information on the SECONDARY SETINIT is part of the SETINIT process, but does not relate to a site running in the MVS environment.

```
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.
```

If the above notes appear, indicating a successful update of the SETINIT information, but your SAS System still indicates the previous expiration dates, then verify that the SASHELP DD in the SASIRENW job is the same as the SASHELP library being used by your CLIST and CATPROC.

Appendix Y, Installing National Language Support (NLS)

This appendix provides the instructions you need to provide National Language Support, NLS, to your SAS System under MVS. You should be familiar with the installation of the SAS System before reading this appendix.

Important Notes

- ❑ NLS can ONLY be installed to a SAS System maintained to the same TSLEVEL as the national language support.
- ❑ All MVS NLS media contain the maintenance files to upgrade your system to the current NLS TSLEVEL .
- ❑ Circumventing the procedures in this supplement can cause a failed install, a non-functional SAS System, or corrupt data, or seriously complicate maintenance in the future. Some procedures may seem redundant, particularly if you are installing NLS beyond English and one NLS extension. These procedures ensure that modules from one maintenance level cannot interact with incompatible modules from a prior maintenance level and produce unpredictable results.
- ❑ Many TSLEVEL violations will be detected by the SASINEW/SASIHOLD/SASINSGO jobs and cause them to terminate abnormally without generating the installation jobs. In these cases, log messages in the abending step will explain the reasons for the rejection.
- ❑ Do not attempt to install additional NLS extensions to the same system without reading the section, "Installing a Subsequent Language."

General Information

The following principles govern the installation of language support and are helpful in understanding it:

- ❑ A default new system install from NLS media automatically installs language support unless disabled by the installer in the SASEDITP member of the control data set.
- ❑ Maintenance, NLS, and newly licensed products can all be installed simultaneously with a single install from an NLS media set. This is done by enabling the selection of any newly licensed products in the PRODSEL member of the control data set, and running an otherwise default install. This is the recommended method for existing systems.

- ❑ You should not attempt to install NLS without any maintenance or newly licensed products unless directed for specific situations.

- ❑ To save DASD space, the install only unloads NLS support for pre-existing products (and new products selected in PRODSEL) on your system. The pre-existing product list is automatically sensed by the install for each individual SAS System, and does not require any action by the installer.

- ❑ NLS does not *replace* the English component of your SAS System, it *supplements* it using an extension of your SAS prefix, which can be protected under RACF or other system security applications. This is represented elsewhere with `&PREFIX.LX`, where `LX` is the two character language extension for the particular NLS.

- ❑ NLS, when permanently installed, is an extension of your *final* `&PREFIX`. When language support is installed using a staged install (Action C), it is installed to an extension of your *staging* `&PREFIX` as shown in the following examples:

  `MVSSYS.SAS.V609`
  final SAS prefix in SASEDITP

  `MVSSYS.SAS.V609.ES`
  final SAS prefix for Spanish support files

  `MVSSYS.SAS.V609.STAGELIB`
  staging library prefix in SASEDITP

  `MVSSYS.SAS.V609.STAGELIB.ES`
  staging library prefix for Spanish support files.

- ❑ The extension `.ES` is automatically assigned by the system based upon the language supported (Spanish in the previous example, `.DA` for Danish, and so on). Changing this extension from the system assignment can cause program failure at some point, and complicate future maintenance. **Be sure NOT to include the language extension in any of the prefix specifications in SASEDITP except for RENEW-PREFIX when renewing your license with an Action G.**

- ❑ The install provides a separate working CLIST and PROC (`NLSCLIST & NLSPROC`) in the control data set. These invoke SAS in the language on those media. These members should be renamed, moved, and amended as needed for your system.

- ❑ Libraries are searched in the following order when NLS CLISTs and PROCs are running. `SASLIBX` or `SASNLIBX` represent any of the various SAS component libraries.

Maintained, Production Status System:

1. Search NLS extension for translated modules.
2. Search production library for remaining modules.

```
//SASLIBX DD DSN=MVSSYS.SAS.V609.ES.SASLIBX
//        DD DSN=MVSSYS.SAS.V609.SASLIBX
```

Staged Maintenance & NLS in Staging Libraries:

1. Search NLS stagelib for translated and maintained modules.
2. Search regular stagelib for maintained modules.
3. Search production library for remaining modules.

```
//SASLIBX DD DSN=MVSSYS.SAS.V609.STAGELIB.ES.SASLIBX
//        DD DSN=MVSSYS.SAS.V609.STAGELIB.SASLIBX
//        DD DSN=MVSSYS.SAS.V609.SASLIBX
```

Note: Since SAS data libraries cannot be concatenated, each NLS language will have its own complete `&PREFIX.LX.SASHELP` .

- ❑ An NLS version of the SAS System is invoked with the corresponding NLS CLIST or PROC. The concatenations described above determine the language behavior. The language cannot be changed from within a SAS session.

- ❑ When maintenance is copied to production libraries (Action D) on a system with NLS installed, the following scheme is used:

  1. Promotion of regular maintenance to production:

     ```
     //SLIBFROM DD DSN=MVSSYS.SAS.V609.STAGELIB.SASLIBX
     //SLIBTO   DD DSN=MVSSYS.SAS.V609.SASLIBX
     ```

     Non-NLS maintenance and newly licensed product content is copied from staging libraries to final production libraries.

  2. Promotion of NLS to production:

     ```
     //NLIBFROM DD DSN=MVSSYS.SAS.V609.STAGELIB.ES.SASNLIBX
     //NLIBTO   DD DSN=MVSSYS.SAS.V609.ES.SASNLIBX
     ```

     NLS support for pre-existing and newly licensed products (including translated maintenance) is copied from the NLS extension of the staging libraries to the NLS extension of the final production libraries.

- ❑ Both phases are accomplished by a single install Action D from the control data set used to install the NLS extension.

Installing NLS for any Language

From the tables that follow in this section, choose the installation you want to perform and follow the specified procedure. Note the following before proceeding:

- ❑ If you have not already done so, unload `SAS.SASROOT` from your installation media using the utility described in the installation instructions.
- ❑ Examine the `#CONTENT` member of the control data set. Note whether or not the following are included: Base SAS software, any additional products for which you are licensed, system maintenance, and any desired language support.

  WARNING: If `#CONTENT` does not exist, lists the wrong language, or does not list language support, all of the products at your site, the products you intend to install, or maintenance/utility files for these products, or does not specify TS450 as the maintenance level, **this media cannot be used** to install your language. Check another media or contact your SAS Representative to obtain language support, products, and required maintenance.
- ❑ In the table below, `#CONTENT`, `PRODSEL`, and `SASEDITP` refer to the respective members of the control data set.
- ❑ If preparing for an Action D (Copy Stage to Final), read the section, "Promoting Subsequent Language Systems to Production Status," and follow any special procedures listed.

Installing a New SAS System Plus One NLS Language

Action	Installation Work Desired	Installation Situation	Procedure
NA	Installing a New SAS System with language support	You are installing a *new* Release 6.09 SAS System and language support. Your media contain Base SAS software, any products for which you are licensed, *and* the desired language support.	Perform a new system install (Action A). Leave `SKIP-NLS` and `NLS-ONLY` at their default settings (commented out) in SASEDITP. All language support for your selected products unloads by default. If you are installing additional languages as part of the initial installation, use Action N2B, described in the section, "Installing a Subsequent Language."

Installing to a System Where any Prior Installation Activity is Complete and Has Been Promoted to Your Production (Final) Libraries

Action	Installation Work Desired	Installation Situation	Procedure
NC	Installing New Products and NLS to an Existing SAS System	You are installing *new products* and language support to an *existing* SAS System. Your media contain your existing products, any new products for which you are licensed, maintenance, and the desired language support.	Perform a staging install (Action C) for your selected products. Leave `SKIP-NLS` and `NLS-ONLY` at their default settings (commented out) in SASEDITP. Selected new products, current maintenance for your existing products, and any language support, will unload to your staging prefix.
	Installing New Products to an Existing NLS System	You are installing *new products* to an *existing* SAS System that *already has* language support. Your media contain your existing products, any new products for which you are licensed, maintenance, *and* support for the language on your system.	Follow the procedure for Action NC, "Installing New Products and NLS to an Existing SAS System" as described above. This ensures consistency at the current maintenance (TS475) level.
NM	Installing Maintenance and NLS to an Existing SAS System	You are installing maintenance and language support to an existing SAS System. Your media contain maintenance for all products on your system, *and* the desired language support.	Perform a staging install (Action C) for maintenance. Leave `SKIP-NLS` and `NLS-ONLY` at their default settings (commented out) in SASEDITP. Additionally, in PRODSEL, comment out `DEFLTSEL=%TURNEDON` (`*` in column 1), and uncomment `DEFLTSEL=%TURNDOFF` (blank in column 1). Current maintenance and any language support will unload to your staging prefix.

Action	Installation Work Desired	Installation Situation	Procedure
	Installing NLS to an Existing SAS System	You are installing language support to an existing SAS System. Your media contain all products on your system, maintenance *and* the desired language support.	Follow the procedure for Action NM in the above section, "Installing Maintenance and NLS to an Existing SAS System." This ensures consistency at the current maintenance (TS475) level.
	Installing Maintenance to an Existing NLS System	You are installing maintenance to an existing SAS System with language support. Your media contain all products on your system, maintenance, *and* support for the language on your system.	Follow the procedure for Action NM in the above section, "Installing Maintenance and NLS to an Existing SAS System." This ensures consistency at the current maintenance (TS475) level. **Note: Always install maintenance to a system with NLS from a media with that NLS on it to ensure compatibility with the new installed maintenance level.**

Installing to a System Where a Prior Staged Installation Has Not Been Promoted to Your Production (Final) Libraries

Action	Installation Work Desired	Installation Situation	Procedure
NS	Add NLS to a Staged Install at TS475	You have already installed *current maintenance* (TS475) using a staged install (Action C) but have *not yet* promoted it to your production libraries (Action D). Your media contain all products on your system, and the desired language support. **If you have any doubt that you are at TS475 in the staging libraries, proceed as if you are installing NLS to an existing system by first deleting the staging libraries.**	Perform a staged install using Action C. In SASEDITP, supply the same values for `STAGED-LIBR-PFX` and `FINAL-SASLIB-PFX` as used for installing the TS475 maintenance. Blank out the `*NO*` before `NLS-ONLY`. Leave `SKIP-NLS` commented out (default). **IMPORTANT: When you promote maintenance and language support to your production libraries (Action D), you MUST run the Action D from the control data set used to install the language support.**

Action	Installation Work Desired	Installation Situation	Procedure
NN	Add NLS to a Staged Install with New Products at TS475	You have already installed *current maintenance* (TS475) and *new products* using a staged install (Action C) but have *not yet* promoted it to your production libraries (Action D). Your media contain all products in your staging libraries, and the desired language support. **If you have any doubt that you are at TS475 in the staging libraries, proceed as if you are installing new products and NLS to an existing system by first deleting the staging libraries.**	Perform a staged install using Action C. In PRODSEL, select the same list of new products as you have currently installed to the staging libraries. In SASEDITP, supply the same values for `STAGED-LIBR-PFX` and `FINAL-SASLIB-PFX` as used for installing the TS475 maintenance. Blank out the `*NO*` before `NLS-ONLY`. Leave `SKIP-NLS` commented out (default). **IMPORTANT: When you promote new products, maintenance and language support to your production libraries (Action D), you MUST run the Action D from the control data set used to install the language support.**
NP	Add NLS to a Staged Install at TS450	You have already installed *new products and/or maintenance from a prior TS level* (TS450) using a staged install (Action C). You have *not yet* promoted them to your production libraries (Action D). Your media contain all products in your staging libraries, and the desired language support.	Ignore the TS450 installation. First delete the staging libraries, then perform a staged install using Action C. In PRODSEL, select the same list of new products as you may have currently installed to the staging libraries. In SASEDITP, supply the same values for `STAGED-LIBR-PFX` and `FINAL-SASLIB-PFX` as used for the earlier installation.

Short Installs to Add NLS to an Existing System

Action	Installation Work Desired	Installation Situation	Procedure
NB	NLS *only* to SAS System TS475 (Short Install, Not Staged)	Your production (final) libraries are already at current maintenance (TS475). Your media contain all products on your system, and the desired language support. Do not use this install to add NLS to a staged install. **If you have any doubt that you are at TS475 in the production libraries, proceed as if it is older maintenance and follow the procedure for installing NLS to an existing system.**	Perform a direct install (Action B). In SASEDITP, leave `SKIP-NLS` commented out (default), and blank out the `*NO*` before `NLS-ONLY`. In PRODSEL, comment out `DEFLTSEL=%TURNEDON` (`*` in column 1), and uncomment `DEFLTSEL=%TURNDOFF` (`blank` in column 1). The English based system referred to by `EXISTING-SAS-PFX` will remain unchanged. **See the note on this install procedure below.**
NX	NLS to SAS System TS450 (Short Install, Not Staged)	Your media contain all products on your system, and the desired language support. This install is intended as a short-cut "shotgun" install to testing systems, or systems that can be taken completely off-line for upgrading and subsequent testing, and restored if problems develop. Do not use this install to add NLS to a staged install. **This install is NOT recommended for regular production facilities.**	Perform a direct install (Action B). In SASEDITP, leave `SKIP-NLS` and `NLS-ONLY` commented out (default). In PRODSEL, if you are not adding a newly licensed product, comment out `DEFLTSEL=%TURNEDON` (`*` in column 1), and uncomment `DEFLTSEL=%TURNDOFF` (blank in column 1). **The English based system referred to by `EXISTING-SAS-PFX` will have maintenance, and any newly licensed products, installed *directly* to it.**

Note: Action NB (Installing NLS only to a TS475 SAS System) is equivalent to a staged install since all modules are installed under a language extension of `EXISTING-SAS-PFX`. For example, `MVSSYS.SAS.V609.ES` where `EXISTING-SAS-PFX=MVSSYS.SAS.V609` in SASEDITP. As no existing or running applications will be referencing it, the access privileges for `EXISTING-SAS-PFX.LX` may be set differently than `&prefix` to suit installation needs at your site. Do not use this install if installing to a system with existing language support. See the section, "Installing a Subsequent Language," for information on the special considerations involved.

Installing a Subsequent Language

The following situations describe installations to place third language support (English plus two or more NLS extensions) on your system. See the section, "Promoting Subsequent Language Systems to Production Status," for important considerations for completing your installation with Action D.

IMPORTANT: If you have previously installed an NLS extension(s) to your system and your current maintenance level is not TS475, perform the following:

1. Make sure all prior installations to this system are complete before proceeding

2. Contact your SAS Representative to obtain TS475 language support media for all other languages on your system. Install TS475 maintenance and NLS support to the existing system for one existing NLS extension, using Action NM as described in the section, "Installing to a System Where any Prior Installation Activity is Complete and Has Been Promoted to your Production Libraries."

3. Install TS475 NLS support for any remaining preexisting languages, and for your new languages using Action N2C as described in the following section.

4. Perform Action D from each NLS control data set only after reading the section, "Promoting Subsequent Language Systems to Production Status."

Action	Installation Work Desired	Installation Situation	Procedure
N2C	Second NLS Install to Staging Library	You have already installed maintenance and another NLS extension in staging libraries at the TS450 maintenance level. Your media contain all products on your system, and the desired language support.	Perform a staged install using Action C. Supply the same values in SASEDITP for `STAGED-LIBR-PFX`, `FINAL-SASLIB-PFX` and in PRODSEL, including the setting for `DEFLTSEL`, as used for installing the first NLS and TS450 maintenance. Blank out the `NO` before `NLS-ONLY`. Leave `SKIP-NLS` commented out (default). Perform Action D from each NLS control data set only after reading the section, "Promoting Subsequent Language Systems to Production Status."
N2B	Second NLS Install to Final Library	You have completed installing maintenance and support for another NLS language at the TS450 maintenance level to final libraries. Your media contain all products on your system, and the desired language support.	Perform a direct install (Action B). In SASEDITP, leave `SKIP-NLS` commented out (default), and blank out the `NO` before `NLS-ONLY`. In PRODSEL, comment out `DEFLTSEL=%TURNEDON` (`*` in column 1), and uncomment `DEFLTSEL=%TURNDOFF` (blank in column 1).
	Third and Subsequent NLS Install	You have already installed support for a third language at TS450, and you are now installing a fourth.	If the second NLS (third language) was installed using Action N2C above, use Action N2C to install this NLS. If you installed using Action N2B above, use Action N2B to install this NLS.

Promoting Subsequent Language Systems to Production Status and Promoting any NLS to Production Status over a Prior TS Level NLS (Action D)

This section outlines important considerations for completing your installation with Action D (Copy Stage to Final), if you have used staging installations to install multiple NLS extensions, or a single NLS extension over prior NLS.

When promoting a system with three or more languages (two or more NLS) to production status, (or promoting NLS where the final libraries contain a prior NLS extension), note the following:

- ❏ You must perform one Action D for each NLS extension.
- ❏ Each Action D that is taken must be launched from the control data set used to install the particular NLS.
- ❏ The first (or only) Action D run **must** include copying maintenance from stage to final, even if all NLS extensions were installed with `NLS-ONLY` *un*commented in SASEDITP. In the latter case, see the next item, otherwise first use the NLS which also installed maintenance (`NLS-ONLY` commented out with `NO` in SASEDITP).
- ❏ If all your NLS installs were `NLS-ONLY`, then pick any NLS to run first. *Comment out* (specify `NO` starting in column 1 before) `NLS-ONLY` and otherwise run an Action D.
- ❏ If this maintenance/NLS promotion overlays an earlier TS-level and NLS installation, then access to any overlaid NLS must be disabled from the time maintenance begins to copy down, until that particular NLS Action D has safely completed. This must be done to prevent *prior* TS-level NLS from running with *current* TS-level maintenance. Use any method satisfactory to your site to accomplish this. This includes but is not limited to:
  - ❏ Perform Action D jobs during system maintenance time, using SASIHOLD to prepare them in advance. After the Action D with maintenance is run successfully, remaining Action D jobs can be run in parallel if more than one remains. Action D normally runs fast compared to Actions A, B, or C.
  - ❏ Rename CLISTs and PROCs accessing NLS support until promotion is complete. Make sure the libraries are not in use before promoting them.
  - ❏ Clear users from, and then delete the production (final) `&prefix.LX.SASHELP` for each NLS extension just prior to starting the first Action D. (Using the prefix examples earlier in this appendix, `MVSSYS.SAS.V609.ES.SASHELP`.) Action D reallocates the file automatically.

Renewing the License for a System with One or More NLS Extensions

If it becomes necessary to renew your system license after installation of NLS extensions to your SAS System, you will have to run an Action G for each `&prefix.SASHELP` and `&prefix.LX.SASHELP`, including staging libraries. Run an individual Action G for each SASHELP, setting `RENEW-PREFIX=&prefix.LX` and `RNW-BASE-PFX=&prefix` for the NLS extension SASHELPs.

Using the examples from a Spanish NLS extension in the section, "General Information," the prefix settings for an Action G to renew the SETINIT of the Spanish extension SASHELP would appear as follows:

```
RENEW-PREFIX=MVSSYS.SAS.V609.ES
RNW-BASE-PFX=MVSSYS.SAS.V609
```

If it were necessary to renew the SETINIT of the SASHELP of a language extension in a staging library, the prefix settings would be as follows:

```
RENEW-PREFIX=MVSSYS.SAS.V609.STAGELIB.ES
RNW-BASE-PFX=MVSSYS.SAS.V609
```

Note that `RNW-BASE-PFX` must point to the final `&prefix` in the above examples.

Using NLS Media to Perform a Non-NLS Installation

To install a new system, maintenance, and/or new products from this media without installing language support, complete the following steps:

1. Examine the `#CONTENT` member of the control data set and verify that the media contains maintenance for your existing products and any new products.

2. Blank out the `*NO*` before `SKIP-NLS` in SASEDITP.

3. Perform any appropriate install. No language support will be installed.

Government Notice

Reviewing the Federal Government Rights Notice

If your installation is a Federal Government site or a Federal Government Prime Contractor site, you are responsible for the information contained in a usage rights notice that has been included during installation.

Processing the Government Rights Notice

Note: This task is required.

Review the Government Rights Notice information that is contained in the `GVTNOTE` member of the `CNTL` data set.