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Managing SAS® Libraries to Improve Your Programming Environment

Marje Fecht, Prowerk Consulting, Cape Coral, FL

Larry Stewart, SAS Institute, Cary, NC

ABSTRACT

You already know that SAS data sets are stored in SAS libraries, but do you know what else can be stored in SAS libraries? Do you know how to manage files in SAS libraries? Do you know what can be stored in SAS catalogs? Do you know what a catalog entry is?

This Hands On Workshop answers these questions and many more.

You will learn

- how to explore the contents of a SAS library and understand its properties
- what information is stored in the most commonly used types of catalogs
- how to take advantage of catalog information to tailor your SAS environment
- how to manage the contents of catalogs through the SAS windowing environment and through the CATALOG procedure
- how user-defined formats are stored and how to access those formats
- how to improve your programming by taking advantage of catalogs for commonly accessed information.

INTRODUCTION

As SAS has matured over the years, many new types of SAS files have been added to the software. These new types of SAS files enable you to store information such as SAS views, SAS programs, compiled SAS programs, function key settings, and user-defined formats. Additionally, as new SAS versions are released, users often are faced with accessing SAS files that were created under different SAS versions.

This workshop is appropriate for beginning and intermediate SAS users who want to learn more about SAS libraries and their contents. The workshop also addresses issues surrounding SAS data sets created under different SAS versions. This [overview](#) paper provides a snapshot of the concepts presented in the hands-on workshop.

WHAT ARE SAS LIBRARIES?

A library is a collection of SAS files that are stored and referenced as a unit. The SAS files typically reside in a single folder (directory) in your operating system, but by using the appropriate syntax, the files may reside in multiple folders (directories).

REFERENCING SAS LIBRARIES

A *libref* (logical name) is used to identify the physical location of your SAS files. Some reserved librefs are:

- SASUSER
- SASHELP.

WHAT ARE “SAS FILES”?

Most likely, the first SAS file you learned about is a *SAS data set* (or *SAS table*). A single SAS data set can have many supporting components stored in a library such as:

- Indexes
- Formats
- Audit Files.

When viewed at the operating system level, each SAS file type has a unique file extension associated with it. In the WINDOWS environment, Version 8 SAS files have the following extensions.

Partial Listing of SAS file types:

SAS File	Version 8 File Extension	Version 6 File Extension
SAS data set	sas7bdat	sd2
SAS view	sas7bview	sv2
Index for a SAS data set	sas7bndx	si2
Catalog (for formats, etc)	sas7bcat	sc2
Stored compiled program	Sas7bpgm	ss2
MDDB	Sas7bmdb	sm2

EXPLORING THE LIBRARIES

The SAS Explorer window is a useful tool for determining what libraries are defined and then exploring the contents of the libraries. Using the Explorer window, you can view properties of each library such as the physical location and the SAS engine. Each individual SAS file in the library is visible in the Explorer window, and the SAS file properties can easily be viewed.

HOW CAN I CONTROL THE VERSION?

When you create a SAS library, the version of SAS files is defined using the engine. If you do not specify an engine name when you define the library, SAS will attempt to determine the engine that should be assigned. A partial list of valid values of the ENGINE option includes V9, V8, V7, V6, and BASE.

Using Windows as an example, SAS looks at the file extensions in the specified folder and uses the following rules:

- If the folder contains SAS data sets from only one of the native engines, that engine is assigned.
- If there are no SAS data sets in the specified folder, the default engine is assigned.
- If the folder contains SAS data sets from more than one engine, it is a mixed mode library. The library is assigned the default engine and a message will print in the SAS log indicating that you have a mixed mode library.

Suppose the folder c:\workshop\ws191\SeattleData contains 3 files, all with the extension **sas7bdat**. The following LIBNAME statement submitted using SAS version 8.2 would assign the V8 engine.

```
libname sugi28 'c:\workshop\ws191\SeattleData';
```

Suppose the folder `c:\workshop\ws191\Mixed` contains 2 files with the extension `sd2` and 1 file with the extension `sas7bdat`. The following `libname` statement submitted using SAS version 8.2 would assign the V8 engine and would produce a log warning.

```
libname sugi28 'c:\workshop\ws191\SeattleData';
```

To access the Version 6 files, you would use:

```
libname sugi28 V6
'c:\workshop\ws191\SeattleData';
```

WHAT ARE SAS CATALOGS?

SAS catalogs are special SAS files that store many different kinds of information in smaller units called catalog entries. Each entry has an entry type that identifies its purpose. A single SAS catalog can contain several different types of catalog entries.

SAS CATALOG NAMES

SAS catalog entries are fully identified by a four-level name in the following form:

libref.catalog.entry-name.entry-type

libref	is the logical name of the SAS data library to which the catalog belongs.
catalog	is a valid SAS name for the file.
entry-name	is the name of the entry in the catalog.
entry-type	is automatically assigned by SAS to identify the type of information stored in the entry.

SAS CATALOG ENTRIES

There are a variety of catalog entry types, each designed for a specialized purpose. Some of the common entry types are listed below.

Partial Listing of Catalog Entry types:

Entry Type	Purpose
Keys	Key definitions
Wsave	Window definitions
Format	Numeric formats
Formatc	Character formats
Infmt	Numeric informats
Infmtc	Character informats
Macro	Macros
Grseg	Graphics output
Source	SAS programs

EXPLORING SAS CATALOGS

Because SAS catalogs are stored in SAS libraries, you can use the SAS Explorer window to explore SAS catalogs. Simply drill down to a specific catalog entry by clicking on the desired SAS library and catalog. Once you click on the catalog, you will see a list of the entries in that catalog. For some entry types, such as a Source entry, you can double click on the entry name to see the contents of the entry. However, some entry types cannot be opened through the SAS Explorer.

ALTERING YOUR WINDOWING ENVIRONMENT

The default settings for your SAS session are stored in several catalogs in the SASHELP library. If you make any changes to function key settings, window attributes, or other options, the new information is stored in your user profile catalog named SASUSER.PROFILE. For example, suppose you want to define your F7 function key to scroll backward and your F8 function key to scroll forward. Using the menu bar at the top of your SAS session, select **Tools → Options → Keys**. In the Keys window, type backward beside F7 and forward beside F8, and close the Keys window. Use the SAS Explorer to select the SASUSER.PROFILE catalog. You should see an entry named DMKEYS.

Each time you start a new SAS session, SAS uses the information in your SASUSER.PROFILE catalog to define your SAS session. In this example, F7 and F8 have been permanently assigned new definitions. You can restore the original default settings by deleting the appropriate entries from your SASUSER.PROFILE catalog. In this example, you would delete the DMKEYS.keys entry. SAS then uses the corresponding entry from the SASHELP library for subsequent SAS sessions.

CREATING AND STORING SAS FORMATS

By default, user-defined formats are stored in a temporary SAS catalog named WORK.FORMATS. The entry name is defined by the format name and the type of format determines the entry type. For example, the following code creates a catalog entry named WORK.FORMATS.DIST.FORMATC.

```
proc format;
  value $dist
    'W'='Walk'
    'S'='Short Drive'
    'L'='Long Drive';
run;
```

To permanently store the format, simply add a LIBNAME statement and a LIBRARY= option as shown below.

```
libname sugi28 'c:\workshop\ws191';
proc format library=sugi28;
  value $dist
    'W'='Walk'
    'S'='Short Drive'
    'L'='Long Drive';
run;
```

The code above creates a catalog entry named SUGI28.FORMATS.DIST.FORMATC.

Once the format is permanently stored, you must use the FMTSEARCH= option to tell SAS where to find the format before you can use it. The code below illustrates how to access a permanently stored format.

```
libname sugi28 'c:\workshop\ws191';
options fmtsearch=(sugi28);
proc print data=sugi28.seattlesites;
  format DistanceFromSUGI $dist.;
run;
```

MANAGING SAS CATALOGS

You can manage your SAS catalogs interactively with the SAS Explorer or in batch mode with PROC CATALOG. For example, suppose you have changed some of your function key definitions and want to return to the SAS defaults. In the SAS Explorer, double click on **Sasuser → Profile**. Next, right click on the

DMKEYS entry and select **Delete**. When prompted to confirm the delete, select **Ok**.

You can also delete an entry using the CATALOG procedure. For example, the code below illustrates how to use PROC CATALOG to delete the DMKEYS entry.

```
proc catalog catalog=sasuser.profile;
  delete dmkeys.keys;
run;
```

Creating a team Environment

If you work with a team of SAS developers, there are ways to share your environment so you aren't "reinventing the wheel". You likely want to use common formats, common libraries, and perhaps other SAS files amongst your team members.

To enable a team environment, store your formats and libraries in a location accessible by the entire team. Use a common autoexec.sas file containing:

- LIBNAME statements for the libraries accessed by the group, including the library containing your format catalog
- OPTIONS statement that includes the FMTSEARCH option
- Other statements assigning macro locations, etc.

If all team members use a common autoexec.sas, they will have access to a common set of tools.

CONCLUSION

Most SAS programmers know that SAS Data Sets can be stored in SAS libraries. This paper attempted to expand your awareness of other files that can reside in a library, along with how some of those files can be used to more effectively manage your SAS programming environment.

CONTACT INFORMATION

Larry Stewart
SAS Institute Inc
SAS Circle
Cary, NC 27513
Email: larry.stewart@sas.com

Marje Fecht
Prowerk Consulting
PO Box 100549
Cape Coral, FL 33904
Email: Marje.Fecht@prowerk.com

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