A Guide for the SAS/C® Compiler Consultant, Release 7.00

The Power to Know™

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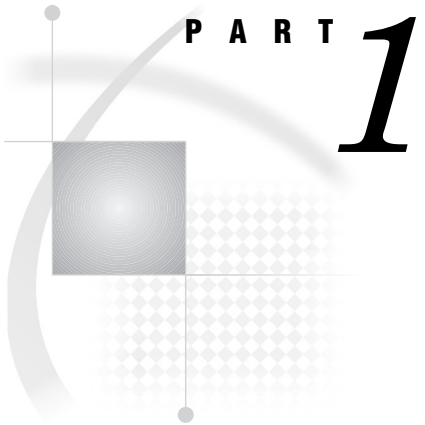
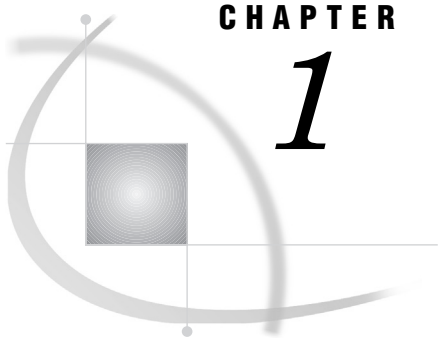


PART 1

Information for the Compiler Consultant



CHAPTER

1

Service and Support from SAS

Introduction

This guide describes the support services provided by SAS for the SAS/C Compiler products. This guide tells you how to report problems, gives information that is useful for diagnosing suspected problems, explains SAS/C Compiler product maintenance procedures, and describes how to use our electronic support facilities.

The last section of this chapter tells you how to reach SAS/C Technical Support. Feel free to contact us with any questions about this guide or about features of the SAS/C and SAS/C++ product suite.

The SAS/C Installation Representative and Support Consultant

Licensing SAS/C software includes filling out a Customer Service Information Sheet. The information sheet identifies two persons at your site who will deal directly with SAS/C Technical Support.

The SAS/C Installation Representative is the person in your organization responsible for product installation and maintenance. The Installation Representative is familiar with the hardware platform and local development environment. SAS Institute ships product updates and installation instructions to the Installation Representative.

The SAS/C Support Consultant (sometimes called the Support Representative) is the liaison between SAS/C Technical Support staff and developers using the compiler products at your site. The Support Consultant has an intimate knowledge of the C/C++ language and is familiar with the hardware and software installed at your site.

The designation of an Installation Representative and a Support Consultant does not preclude developers at your site from directly contacting SAS/C Technical Support. Experience shows that SAS/ C Technical Support can be more effective, and resolve questions more quickly, by working initially through your designated representatives. After a preliminary diagnosis and review of a reported problem with the Support Consultant, SAS/C Technical Support may contact the developer who encountered the problem directly.

SAS/C Technical Support Service

The SAS/C Compiler Research and Development Division provides technical support for the compiler products. We strongly believe that having technical support integrated within the Compiler R&D division ensures that our customers receive support of the highest quality in the industry. SAS/C Technical Support services are provided free of charge to licensed customers.

When contacting the SAS Technical Support Division by phone, identify the question or problem as related to the SAS/C Compiler. SAS/C Technical Support consultants are available weekdays between 9:00 AM and 5:00 PM., eastern standard time.

Guidelines for reporting problems and for gathering information that may be requested by a SAS/C Support Consultant follow.

When to Call Technical Support

Some problem types and their symptoms are listed below.

- Compiler-related problems. The compiler:
  - generates an unexpected warning or error for correct source code.
  - fails to accurately diagnose incorrect source code.
  - generates incorrect object code.
  - detects an internal error condition and exits with a CXERR.
  - terminates abnormally, with or without an ABEND code.

- COOL or LKED-related problems. The linker:
  - reports unresolved references.
  - terminates abnormally, with or without an ABEND code.

- Run-time problems. A library or function:
  - does not produce correct results.
  - fails to diagnose erroneous conditions.
  - produces unexpected warning or error messages.
  - generates 12xx ABEND (abnormal termination) that is unexplained: for example, not the result of a call to **`abort()`** or a storage overlay.
  - generates an unexplained ABEND.
  - after upgrading to a new library version, an existing program fails to execute properly.

Contact the local Support Consultant prior to contacting SAS/C Technical Support. The Support Consultant may be able to quickly resolve a problem. But where assistance is required, the Support Consultant may contact SAS/C Technical Support.

Information Needed by Technical Support

Provide the following information to the Support Consultant before he or she calls to report a SAS/C problem:

- your eight-digit site number. For mainframe customers, this number can be found on the first page of a compiler listing. For Cross-Platform customers, this number can be found on the output listing from the "dset" utility command. (See the Installation Instructions for instructions on how to execute this command.) The site number is also printed on the cover letters accompanying your SAS/C product media and also on the Institute Program Products Master License agreement.
- the product and version number. For example: SAS/C++ 7.00C orSAS/C 6.50C. The version is printed on the first page of the compiler listing and is included on cover letters received with the product. The version of the library can be obtained by using the **`=version`** run-time option. The version number is of the form *n.nnx*, where *n* is a digit and *x* is an alphabetic suffix.
- operating system and version.
- a phone or fax number or e-mail address, including any special contact instructions such as shift schedules.
- a clear description of the problem, including its external symptoms, the results of your investigation, and the problem type (related to the compiler, the linker, or run time).
- a clear description of the application structure, for example, single or mixed language, all-resident, multitasking, client/server, and so on.
- diagnostic information, including:
  - the *exact* text of any diagnostic messages. Many diagnostic messages contain dynamic substitution of parameters, based upon the existing conditions. It is imperative that we have the complete diagnostic message. This includes messages produced by SAS/C and the operating system.
  - a library *traceback* if the problem involves an ABEND. "Reading a SAS/C Traceback" shows a sample traceback and explains how to interpret it.
  - if it can be re-created, a code segment demonstrating the problem in a form that may be transmitted to SAS/C Technical Support.

Collecting Diagnostic Information

There are many diagnostic features within the compiler and run-time library to assist in the isolation of problems, and having this information handy saves time during consultations with Technical Support. The sections below tell you how to enable compiler, linker, and run-time diagnostics.

Isolating Code Generation or Compiler Problems

- Ensure that the compiler option **`Warn`** (enabled by default) is not disabled.

- Enable the **Hlist**, **Ilist**, and **Mlist** options. These options cause the compiler to print, to the listing file, the complete header and macros processed by the preprocessor.
- For code generation problems, enable the OMD (Object Module Dissambler).
- If your site uses the SAS/C Cross-Platform compiler, use the **-v** (verbose) option to force full message output.
- Provide a complete list of compiler options in effect when the problem occurs, for example, EXTNAME RENT OPTIMIZE DEFINE (*any_user_defines*). Options affect compiler behavior, and occasionally it is possible to circumvent a problem by specifying different options.
- Provide any traceback generated by the compiler, including the CXERR (Compiler Internal Error) message showing the line number and errcode of the error.

Isolating Link Problems

Unresolved external references are the most common problems related to the COOL, ILCLINK, or LKED programs. For all link problems, the following information is required:

- input JCL or Command line syntax
- COOL, ILCLINK, and LKED linkage editor control statements
- expanded JCL or LOG for the command, with any generated error messages and listings
- for COOL, the output generated with the ENXREF option enabled.

Problems reported as link errors sometimes result from source code or compiler details. You should have a detailed knowledge of the source code that generated the input OBJECTS or LOAD MODULEs, and be prepared to discuss the source code and its compilation with a SAS/C Support Consultant.

Isolating Run-time Problems

- For a run-time failure that does not generate a traceback, enable the library run-time options **=btrace** and **=warning**. This will force the library to print all tracebacks and suppressed warnings, assuming the problem has not corrupted library control blocks.
- If a dump is needed and the library is only producing a warning message, use the **=quit**, **=warning**, and **=fdump** run-time options. This will force the library to abnormally terminate after generating the warning message. You can then use the SAS/C Debugger to verify that there are no logic errors within the source code.
- For storage overlays or heap management problems, enable the library run-time option **=storage** to print a storage analysis report at program termination. Then use the SAS/C Debugger, which is very effective at isolating storage problems. For details, see the “storage” command in the *SAS/C Debugger User’s Guide and Reference*.
- Ensure you have complete SAS/C or operating system diagnostic messages. SAS/C diagnostic messages are written to **stderr**, whose exact location is dependent on the operating system and environment: SYSTERM DD (OS/390 batch), Terminal (VM, TSO), SASE (CICS).

  Messages are explained in *SAS/C Software Diagnostic Messages*. A message consists of an ID and text. The format of a message ID is LSC*xnnn*, where *x* is C for compiler, D for debugger, G for GENCSEG, I for ILCLINK, L for CLINK, P for

the CICS preprocessor, T for the C++ translator, X for the library, or Z for APPLYZAP; *nnn* is the message number. The message number is followed by text. Library messages (prefixed by LSCX) generally have three levels: the first is a severity code; the second is the location of the error; and the third is an explanation. APPLYZAP diagnostic messages are documented in Appendix 1 of this manual.

For operating system problems, the diagnostic message may be one of many types of IBM error messages. Under OS/390, these generally start with the letter I. Under VM/SP and VM/XA, the messages may start with DMK (CP) or DMS (VM).

There are some occasions where a message is issued without a number. In these cases, it is even more important to get the entire text of the message. If you are running under VM, check to see if messages are turned on by using the CP command QUERY SET. Turn messages on with the command SET EMSG ON. Under TSO, ensure you are running with PROFILE WTPMSG on.

Diagnostic messages can be output to many places. Places to look are:

- OS/390 job log (OS/390 batch)
- SYSTERM DD file (OS/390 batch)
- terminal (VM, TSO)
- program output file.

Reading a SAS/C Library Traceback

The traceback feature is extremely helpful for isolating the location of an ABEND. Often the traceback contains the exact line that caused the abnormal behavior. Additionally, the traceback shows the calling sequence of active functions, line numbers, and offsets, at the time of the error conditions. A typical ABEND traceback is shown below, with line numbers added for purposes of reference.

```
Calling trace:
       Function        Line  Offset  Context
12   LSCABTM(LSCABTM)   ---  000124
11  SIGROUT(LSCZRTE)   --  000228  Raising signal SIGABRT
10   SIGLDR(LSCZLDR)   --  00007A
 9    RAISE(LSCZGEN)   --  00008E
 8    ABORT(LSCABRT)   --  000052
 7    CXERR(FILE1)      865  000152
 6   REPDEL(TASN)       974  0000B2
 5     TREF(TASN)       297  00006C
 4     RVFQ(TASN)       214  0001EE
 3    WTHDR(WTHDR)      149  0003A4
 2   DYNAMN(MAIN1)      366  0009D2
 1     MAIN(LC1370S)     68  000128
```

Line 1 indicates that function **`main()`**of the C MAIN program, in source file **`lc1370s`**, executed a call to function **`wthdr()`** at line number 68 and offset 000128. The function call forced SAS/C dynamic loading to occur and subsequently a call to **`wthdr()`**.

Line 2 indicates that a function **`dynamn()`** in source file **`main1`**, at line 366 and offset 0009d2, called the function **`wthdr()`**.

Lines 3–5 illustrate the calling sequence for functions on the stack. The line numbers and offsets show where function calls were made.

Line 6 indicates that an error probably occured at line 974 of function **`repdel()`** in source file **`tasn`**. **`repdel()`** called **`cxerr()`** to generate an ABEND and subsequent compiler messages for a CXERR condition.

Lines 7–12 show the sequence of SAS/C Library functions that get invoked when the function **abort()** is called within a C program.

Submitting Diagnostic Information to SAS/C Technical Support

The previous sections have explained how to obtain detailed descriptive information about a SAS/C problem. Sometimes this is not sufficient. If you contact SAS/C Technical Support, the consultant may request additional information about your problem. Additional information that is often requested and how to obtain it are described below.

1. Source code showing function calls, parameter lists, and so on.
2. Compiler and linkedit listings and maps.
3. Logs of program execution generated with the **=warning** and **=btrace** run-time options enabled. Commands for capturing execution logs are
   - OS/390 BATCH: enable MSGLEVEL=(1,1).
   - OS/390 TSO: enable Session Manager, execute the program with the problem, and issue the command SMCOPY TODATASET(*your.dataset*). Session Manager will then copy the entire contents of the Session Manager window to *yourid.your.dataset*.
   - VM CMS: issue the command SPOOL CONSOLE * STAR, execute the program with the problem, then issue the command SPOOL CONSOLE * STOP CLOSE. The log will be sent to your reader.
4. A system ABEND traceback dump.

   On OS/390 BATCH, issue //SYSDUMP DD or //SYSMDUMP DD.

   Note: If Abend-AID (a dump formatting utility) is installed at your site, turn it off for this job by adding the following statement to your execution JCL: **//ABNLIGNR DD DUMMY**. But first, check with your systems programmer to ensure that your site does not use a different mechanism for turning off Abend-AID. △

   On OS/390 TSO, allocate a SYSUDUMP or SYSABEND data set, then execute the program with the problem.

   On VM CMS, obtain dumps for program exceptions or library-produced abends by doing the following:
   - Issue the commands SET RUN OFF and TRACE PROG before invoking your program. This causes CP to transfer control to you when the exception occurs.
   - Issue the command DUMP T to send the dump to the printer.
   - When the dump is complete, issue the BEGIN command. The abend will resume, and a traceback from the library will be produced.
   - To turn off PROG tracing, issue the TRACE END command.
   - After a library-produced ABEND (such as an ABEND U1207), spool your console to your reader, then enter the DEBUG command. This will produce a register map and other information. Next, close the console log and then obtain a dump in the same way as for a program exception.

     Note that a dump from a 2M machine can generate 25K lines to the printer. Make your machine size as small as possible before generating a dump. If you want to send the dump on tape, you can spool your printer to your reader (SPOOL PRINT *). Then you can use the VM MOVEFILE command to copy the dump to tape. Make sure the input DDname has a blocksize of 133 bytes. Tapes produced by a VM command including VMFPLC2, TAPE, and SPTAPE are acceptable.

See Chapter 5 for instructions on how to get requested information to SAS/C Technical Support.

Obtaining Product Updates and Support

SAS/C Technical Support provides regular maintenance updates for compiler and library products and makes this material available to SAS/C customers in various ways. The Installation Representative is responsible for installing and maintaining SAS/C products at your site.

SAS/C problems are tracked by Usage Notes. Each Usage Note describes the symptoms of a problem, identifies the component and release where the problem occurs, and tells how to fix or avoid the problem.

The Installation Representative corrects software defects by applying zaps to the compiler objects or load modules, using the **`APPLYZAP`** utility. If a zap is available for a problem, this will be indicated in the Usage Note for that problem. Not every problem described in a Usage Note has a corresponding zap, but every zap is referenced in one or more Usage Notes.

The SAS/C Usage Notes Product Tape contains all Usage Notes and zaps available at the time of the tape's issue. New SAS/C customers receive this tape at time of purchase. SAS/C Technical Support periodically updates the tape, which is shipped automatically to licensed customers.

Chapter 2 contains detailed information about Usage Notes. Chapter 3 explains how to apply zaps to compiler products. Applying zaps is also explained in the installation instructions accompanying the SAS/C Compiler.

Chapter 5 explains how to access the SAS Institute Inc. Web page from a Web browser. From the SAS/C support page, you can search Usage Notes for current information about SAS/C problems and solutions, download zaps, and report problems via an online form.

User Feedback

Beyond Technical Support, there are other mechanisms for providing user feedback. The annual SAS Users Group International (SUGI) conference provides a forum where SAS users may share ideas and suggestions with each other and with company staff members. Your suggestions are used as the basis of the SASware Ballot, which is sent as part of the SUGI conference registration packet to all names on the SAS Communications mailing list. The results of the ballot are presented at the SUGI conference and are printed along with the proceedings of the conference. The valuable user feedback provided through the SASware Ballot has a major influence on the future direction of all Institute software and services. SUGI is open to all users of the SAS System or SAS/C software.

The SUGI conference includes formal paper presentations, roundtable luncheons, tutorials, demonstrations, and informal "birds-of-a-feather" sessions. Among the conference topics are a number of items of specific interest to users of SAS/C software. The company encourages you, as SAS/C software customers, to take an active part in the SUGI conference and welcomes your suggestions for conference topics. Sample topics might include debugging with the SAS/C Debugger, interfacing with other software, portability issues, and specialized areas of support fitting your needs. Please submit your topic suggestions in writing to the Technical Support Division, Attention: SAS/C Software.

Details about upcoming SUGI conferences, as well as the latest information about SAS products and support services, can be found in SAS Communications, a quarterly magazine for SAS Institute software users. To add your name to the mailing list, contact the mailing list coordinator at SAS.

The company is also interested in assisting SAS/C software customers who would like to start a C user's group. To obtain information about starting a C user's group in your area, contact your Marketing Representative for SAS/C software.

Company Telephone Numbers

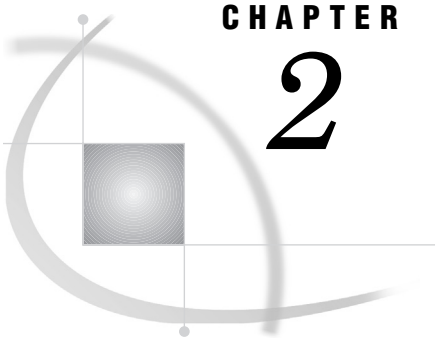
Table 1.1 lists the telephone numbers that the SAS Installation Representative, Support Consultant, and user can call to obtain support for the SAS/C product.

rob

Table 1.1 SAS Institute Phone Numbers

Main Phone	(919) 677-8000
Fax	(919) 677-4444
Technical Support Phone[1]	(919) 677-8008
Online Customer Support Facility	(919) 677-8155

1 For SAS/C Support Consultants or Installation Representatives only



CHAPTER

2

Usage Notes and Zaps

Usage Notes Description

The Technical Support Division of SAS provides machine-readable Usage Notes and zaps to assist you in diagnosing and correcting known errors with products. The Usage Notes file is a collection of reports of errors, known problems, information not yet in the reference manuals, and other useful information. The zaps file is a collection of patches to correct problems that are identified in the usage notes.

The Usage Notes are intended to be used as a reference in the event that you encounter a problem with one of the products. If your problem has already been reported, it will be documented in a Usage Note. The Usage Note contains a description of the problem, information about any fixes available, and any cautionary information.

Along with the name of the zap associated with a problem, the Usage Note also specifies the maintenance category of the zap. The maintenance category denotes the severity level of the zap. We advise users to apply all zaps in the REQUIRED, RECOMMENDED, and SPECIAL CONSIDERATION categories. These categories are explained in the section “Usage Notes Tape and Contents”.

Copies of the Usage Notes tape can be requested through the SAS/C Software Technical Support. The company requests that you send the tape back to the Distribution Center at SAS after installing the Usage Notes and zap files.

Usage Notes Tape and Contents

The Usage Notes and zaps for SAS/C software products can be obtained for OS/390 and VM. They are all contained on a magnetic tape with standard labels for all files except those created on VM via VMFPLC2, which creates unlabeled tapes. The tape is either a 1600 BPI, a 6250 BPI, or a 3480 cartridge, depending on your installation requirements. The tape volume serial numbers are of the format UCyymm, where yy is the year and mm is the month. For example, the Usage Notes tape for August, 1997, has the volume serial UC9708.

Zaps are contained in an OS/390 PDS, VM MACLIB, or individual files. All zaps should be applied using the APPLYZAP utility for both OS/390 and VM; however, it is possible to use either OBJZAP or IBM AMASPZAP on OS/390 and the VM ZAP utility on VM, if necessary.

The members of the zap library consist of individual zaps and zap indices. A zap index contains a list of the zaps that are applicable to a specific release (such as 7.00)

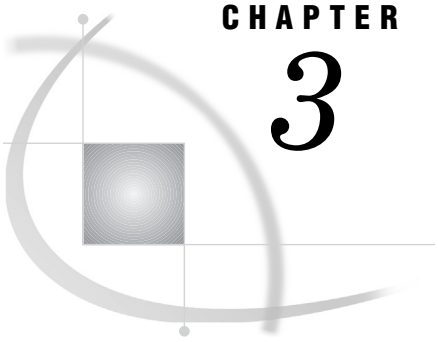
and in a specific maintenance category (such as REQUIRED). The names of these index members are of the form $rrrxxxx, where rrr are the digits of release number and xxxx are the first four characters of the zap category. For example, an index of all the REQUIRED zaps for Release 7.00 is contained in the member $700REQU. The maintenance categories for zaps are as follows:

REQUIRED
: corrects severe problems with incorrect execution, code generation, and so on. This zap should be applied by all sites that license the specified product on the specified operating system.

RECOMMENDED
: can be applied without adverse effects at the discretion of the site.

SPECIAL CONSIDERATION
: is only for certain situations, or requires special instructions to be applied. This zap requires that you read the corresponding Usage Note before deciding whether to apply it. You should not apply it unless you have encountered the specific situation it describes.

REMOVE
: was found to cause problems and should be removed from your system. You should read the corresponding Usage Note for details. Please note that a zap marked REMOVE should only be removed if it has previously been applied to your system.



CHAPTER

3

Applying Zaps to the SAS/C Software Products

Applying Zaps to the SAS/C Software Products

Maintaining SAS/C software products includes applying zaps to one or more of the libraries provided with the products. Utilities available for applying zaps are as follows:

APPLYZAP
A SAS utility for zapping OS/390 and VM SAS/C libraries, modules, and text files.

AMASPZAP
An IBM utility for zapping OS/390 load modules.

OBJZAP
A SAS utility for zapping OS/390 object modules.

ZAP
An IBM utility for zapping VM LOADLIBs, TXTLIBs, and MODULES.

ZAPTEXT
An IBM utility for zapping VM TEXT files.

The recommended utility for applying zaps to SAS/C software products is APPLYZAP. APPLYZAP preprocesses the specified zaps, selects the appropriate zap utilities, applies the zap, records the application of the zap, and produces informational reports (upon request) detailing what zaps have been applied.

General Information about Zaps and Zapping Utilities

In order to facilitate APPLYZAP, zaps provided by SAS Institute Inc. for SAS/C software products contain additional keywords in the NAME statement. The additional arguments are a list of libnames, denoting the libraries to which the zap should be applied.

The form of the NAME statement is

```
NAME module-name csect-name libname1 <.ext> <...libname4 <.ext >>
```

The acceptable values of the optional .ext argument are shown in Table 3.1.

Table 3.1 Library Filename Extensions

.ext	File Description
.A	SAS/C AR370 archive
.L	OS/390 load format library or a VM LOADLIB
.M	VM MODULE file
.O	OS/390 object format library or a VM TXTLIB
.T	VM TEXT file

APPLYZAP uses the list of libnames to determine which libraries the zap is to be applied to (there is a limit of four libnames per zap). Thus, one zap can be applied to several libraries during one execution of APPLYZAP.

Note: If you need to use a zap utility other than APPLYZAP, the libnames will not need to be removed from the NAME statement. The other utilities mentioned previously will ignore everything after the csect-name in the NAME statement. △

OS/390 Zaps

Under OS/390, zaps include CHECKSUM statements. These CHECKSUM statements are verified by SAS Technical Support before a zap is made available to users. APPLYZAP ensures that the CHECKSUM statements are correct. If CHECKSUM is incorrect, the cause is almost certainly a typographical error. In this case, APPLYZAP prints a diagnostic message and does not apply the zap. Because incorrectly applied zaps may result in incorrect program execution or ABENDs, APPLYZAP ensures that the zaps are applied correctly.

For OS/390, zaps also include an IDRDATA statement. The IDRDATA statement is used by APPLYZAP to denote the end of a zap segment and to identify the zap. For each NAME statement, an IDRDATA statement is expected to follow. If a NAME statement is read and an IDRDATA statement is not found before the end of the zap or before another NAME statement is found, an error occurs and processing of that zap stops.

For OS/390 zaps that apply to load module format libraries, APPLYZAP invokes the IBM utility AMASPZAP. For zaps that apply to object module format libraries (including the AR370 Archived Libraries), APPLYZAP invokes the OBJZAP utility provided by SAS Institute Inc.

VM Zaps

Unlike OS/390, VM zaps do not currently include CHECKSUM statements. However, if CHECKSUM statements are provided in the future, APPLYZAP on VM will process them.

VM zaps include a LOG statement that is very similar to the OS/390 IDRDATA statement. The LOG statement is used by APPLYZAP to denote the end of a zap segment and to identify the zap. For each NAME statement, a LOG statement is expected to follow. If a NAME statement is read and a LOG statement is not found before the end of the zap or before another NAME statement is found, an error occurs and processing of that zap stops.

VM zaps are applied using one of two separate utilities: ZAP or ZAPTEXT. APPLYZAP invokes the ZAP utility to apply zaps to LOADLIBs, TXTLIBs, and MODULES, and it invokes the ZAPTEXT utility to apply zaps to TEXT files and AR370 archived members.

Technical Description of APPLYZAP

The APPLYZAP utility can be invoked with the options shown in Table 3.2. On OS/390, the options are specified in the PARM string. On VM, the options are specified as command line options.

Table 3.2 APPLYZAP Options

Options	Negative	Default	Short Form *
CHECK	NOCHECK	CHECK	–C
ECHO	NOECHO	NOECHO	N/A
ERROR	NOERROR	ERROR	–E
FILEDEF	NOFILEDEF	NOFILEDEF	–F VM ONLY
INPUT(zname)	N/A	N/A	N/A
INPUT zname	N/A	N/A	N/A
LINKNAME(lnkn)	N/A	N/A	–Klnkn
LINKNAME lnkn	N/A	N/A	–Klnkn
LIST	NOLIST	LIST	–L
OVERRIDE	NOOVERRIDE	NOOVERRIDE	–O
PRECK	NOPRECK	PRECK	–P
REPORT	NOREPORT	NOREPORT	–R
TERM	NOTERM	TERM	–T
UPPER	NOUPPER	NOUPPER	–U
ZAPNAME(zapu)	N/A	N/A	–Zzapu
ZAPNAME zapu	N/A	N/A	–Zzapu

*

* Replace the dash (-) with the NOT sign (!) to negate the short form.

Options

CHECK
validates CHECKSUMs.

ECHO
displays diagnostic information about the input read, the output zap statements formed, and the actual command used to apply the zap. There is no short form.

ERROR
instructs APPLYZAP to be tolerant of errors. NOERROR causes termination if any errors occur.

FILEDEF *VM Only*
allows user FILEDEFs to override the libname<.ext> keyword.

INPUT(zname) || INPUT zname
overrides the default input file (OS/390: the DDname SYSZIN; VM: the file SYSZIN ZAP), which contains control statements for APPLYZAP. Under OS/390, zname is searched for in the PDS defined to the SYSZLIB DDname. Under VM, APPLYZAP first checks for a file zname on an accessed disk with filetype of ZAP. Then it checks for a member zname in a MACLIB with a FILEDEF of SYSZLIB. There is no short form.

Note: Valid APPLYZAP control statements include NAME, VER, REP, IDRDATA, LOG, ALIAS, GO, EXIT, the comment statement (*), the IEBUPDTE control card (./), and the additional APPLYZAP commands as discussed below. △

LINKNAME(lnkn) || LINKNAME lnkn
overrides the default linkage editor. The default is IEWL for OS/390 and LKED for VM.

LIST
generates a list of zaps applied and the result of the attempt.

OVERRIDE
instructs APPLYZAP to pass the zap directly to the appropriate zap utility even if APPLYZAP's records indicate that the zap has already been applied.

PRECK
checks for prerequisite zaps.

REPORT
produces a zap information report showing zaps applied during each execution only. Zap informational reports can also be generated for specific libraries using the REPORT command.

TERM
directs diagnostic output to the terminal when running in an interactive session. NOTERM suppresses output to the terminal.

UPPER
causes all output to be uppercased.

ZAPNAME(zapu) || ZAPNAME zapu
overrides the default utility to be used for applying zaps to OS/390 LOAD format libraries, VM LOADLIBs, VM TXTLIBs, and VM MODULES. The default utility is AMASPZAP for OS/390 and ZAP for VM.

Commands

APPLY zname
specifies an input file to be preprocessed. Under OS/390, zname is searched for in the PDS defined to the SYSZLIB DDname. Under VM, APPLYZAP first checks for the file zname on an accessed disk with filetype of ZAP, then it checks for a member zname in a MACLIB with a FILEDEF of SYSZLIB.

REPORT ZAP=zname LIB=libname
produces a zap informational report based on the ZAP= and LIB= parameters. Specifying a ZAP=zname allows you to narrow the range of a report to only that particular zap. Specifying LIB=libname narrows the report to the specified library. To produce an exhaustive list of all zaps that have been applied to a specific library, specify REPORT LIB=<DDname>. Either a LIB= or a ZAP= must be specified in each REPORT command.

SYSTEM command
passes a command to the operating system. This command makes use of the C Language **`system`** function. See the SAS/C Library Reference, Volume 1, Second Edition for further details on the **`system`** function.

Input and Output Files

As shown in Table 3.3, several files are needed during each execution of APPLYZAP. Under OS/390, the name of a file is simply a DDname that must be defined in the JCL. Under VM, the name of the file is a filename and a filetype. The only exception to this rule is the SYSZLIB file. SYSZLIB is a DDname under OS/390 and VM. In this document, a file is referred to only by its DDname or VM Filename.

Table 3.3 APPLYZAP Files

DDname or VM Filename	VM Filetype	File Use
SYSZIN	ZAP	standard input file for APPLYZAP. All APPLYZAP statements are taken from this unless the INPUT(zname) option has been used or an APPLY command is being processed.
SYSZLIB	***	DDname that defines a PDS under OS/390 or a MACLIB under VM where zaps can be found. This DDname is used for the INPUT option and the APPLY command.
SYSZOUT	LISTING	standard output file for APPLYZAP. All APPLYZAP messages are written to this file.
SYSPRINT	LISTING	standard output file for the zap utilities and the linkage-editor utility.
ZAPPED	MACLIB	log of applied zaps (by module name). This is a PDS under OS/390 and a MACLIB under VM.
SYSZRPT	LISTING	output from the REPORT option (which produces a list of zaps applied during a run) or REPORT command (which can be used to produce a list of zaps that were previously applied). This is a list of currently applied zaps.
SYSZLIN	TEXT	output of the linkage editor (temporary file).

DDname or VM Filename	VM Filetype	File Use
SYSIN	ZAP	actual zap sent to the zap utility (temporary file).
libname	TXTLIB, TEXT, LOADLIB, MODULE, or A	identifies the SAS/C library containing the member or members to be zapped. Valid library names can be found in the APPLYZAP procedure catalogued under OS/390 or the APPLYZAP EXEC under VM.

Processing

APPLYZAP processes one zap at a time, each zap having one or more zap segments. A zap segment begins with a NAME statement and ends with an IDRDATA (OS/390) or LOG (VM) statement. APPLYZAP validates all CHECKSUMs, ensures that the zap has not been previously applied, ensures that all VER statements verify, ensures that all prerequisite zaps have been applied, applies the zap, generates any necessary diagnostics, and then continues to the next zap. If the zap has already been applied, then APPLYZAP issues a warning and continues to the next zap. If a CHECKSUM does not validate, or if any one of the VER statements does not verify, or if a prerequisite zap has not been applied, then an error is issued and APPLYZAP continues to the next zap (provided that the NOERROR option was not specified).

Zaps are processed regardless of the results of previous zaps, unless a zap utility returns a fatal error or NOERROR is specified. Upon termination, APPLYZAP will generate an appropriate error message and return code.

Using APPLYZAP

The Release 6.50 version of APPLYZAP can be used to apply zaps to any release of the SAS/C software products. The Release 6.50 version of APPLYZAP requires the Release 6.50 version of the transient library (OS/390: sasc.LINKLIB, VM: LSCRTL LOADLIB) to be available. Previous releases of APPLYZAP can be used to maintain SAS/C software of that release and earlier only.

Note: APPLYZAP was unavailable on VM prior to Release 5.00G. △

OS/390 Specifics

Table 3.4 provides a list of required DDnames for an execution of APPLYZAP.

Table 3.4 Required DDnames

DDname	DCB notes and Special Cases
SYSPRINT	LRECL=121, RECFM=FBA
SYSTERM	
SYSZOUT	

DDname	DCB notes and Special Cases
SYSZRPT	Only required if the REPORT option or command is used.
SYSIN	
SYSZLIN	LRECL=80, RECFM=FB, BLKSIZE=3200
SYSZIN	Not required if the INPUT option is used (input file must be sequential).
SYSZLIB	Required only if the INPUT option or APPLY commands are used.
ZAPPED	LRECL=132, RECFM=FB
libname	A SAS/C library to be zapped (specified in NAME statement of zap).

For each distinct libname found in the NAME statement of a zap being processed, there must be a corresponding DDname. For example, suppose a DDname of LOAD has been defined as follows:

```
//LOAD  DD  DSN=sasc.LOAD,DISP=SHR
```

Then the following NAME statement can be issued:

```
NAME LC1370 DSUP@:  LOAD
```

For a list of possible SAS/C DDnames, refer to the APPLYZAP catalogued procedure. Example 3.1 illustrates sample OS/390 JCL to execute APPLYZAP.

Example 3.1 Sample OS/390 JCL to Run to Apply Multiple Zaps to Several Libraries

```
//jobname  JOB job-card information
//APPLYZAP      EXEC PGM=APPLYZAP,
//              PARM='UPPER'
//STEPLIB       DD DSN=sasc.LOAD,DISP=SHR
//              DD DSN=sasc.LINKLIB,DISP=SHR
//SYSPRINT      DD SYSOUT=*,DCB=(LRECL=121,RECFM=FBA)
//SYSZRPT       DD SYSOUT=*
//SYSZLIN       DD DSN=&&ZLIN,DISP=NEW,SPACE=(TRK,(2,2)),
//                 UNIT=SYSDA,DCB=(RECFM=FB,LRECL=80,BLKSIZE=3200)
//SYSZOUT       DD SYSOUT=*
//SYSTERM       DD SYSOUT=*
//ZAPPED        DD DSN=sasc.ZAPPED,DISP=OLD,
//                 DCB=(LRECL=132,RECFM=FB)
//SYSIN         DD DSN=&&TEMP,DISP=NEW,SPACE=(TRK,(2,2)),
//                 UNIT=SYSDA,DCB=(LRECL=80,RECFM=FB)
//SYSZLIB       DD DSN=uprefix.SASC.ZAPS,DISP=SHR
//LOAD          DD DSN=sasc.LOAD,DISP=SHR
//ARESOBJ       DD DSN=sasc.ARESOBJ,DISP=SHR
//LINKLIB       DD DSN=sasc.LINKLIB,DISP=SHR
//SYSZIN        DD *
*
APPLY Z6001509
*
REPORT ZAP=Z6001509
*
*   NAME: Z6001509  PRODUCT: SASC     CATEGORY: RECO    SYSTEM: MVS
*   DATE: 08NOV96   STATUS:  DZ+UT    USAGE-ID: LIBRARY-C1509
*
*   LSCX041, S0C4 ABEND in AMCLOSE, L$CRPWT(L$CRPOS), message LSCX548
*
*   NOTE:      APPLY TO SASC.LINKLIB (TRANSIENT RUN-TIME LIBRARY IN
*              LOAD MODULE FORMAT), AND SASC.ARESOBJ (ALL-RESIDENT
*              RUN-TIME LIBRARY IN OBJECT FORMAT) USING THE APPLYZAP
*              UTILITY.
*   NOTE:      RELINK OR ZAP ANY ALL-RESIDENT PROGRAMS WHICH INCLUDE
*              THIS MODULE.
*   END
NAME     L$CRPSO  L$CRPOSO  LINKLIB ARESOBJ
CHECKSUM
VER      0C7A     5850,5000
VER      0F7A     5850,5000
REP      0C7A     0707,0707
REP      0F7A     0707,0707
CHECKSUM CF52D552
IDRDATA  Z6001509
*
REPORT LIB=LOAD
*
REPORT LIB=LINKLIB
/*
//
```

Example 3.1 uses APPLYZAP to apply several zaps to different libraries and also to obtain several zap informational reports. APPLYZAP will decide which utility and library to use for each zap. Note that zaps may be applied using the APPLY command, in which case APPLYZAP looks in SYSZLIB for the zap, or by directly including the zap into SYSZIN.

Example 3.2 illustrates sample OS/390 JCL to execute APPLYZAP using the APPLYZAP catalogued procedure.

Example 3.2 Sample OS/390 JCL to Run APPLYZAP to Apply Zaps with the APPLYZAP PROC

```
//jobname  JOB job-card information
//APPLYZAP      EXEC APPLYZAP,
//              PARM.APPLY='UPPER'
//APPLY.SYSZLIB DD DSN=uprefix.SASC.ZAPS,DISP=SHR
//APPLY.SYSZIN  DD *
*
APPLY Z6001507
*
REPORT ZAP=Z6001507
*
*   NAME: Z6001507  PRODUCT: SASC     CATEGORY: RECO    SYSTEM: MVS
*   DATE: 12DEC96   STATUS:  DZ+UT    USAGE-ID: CXX-C1507
*
*   LSCT439, Object of abstract class <class_name> cannot be declared
*
*   NOTE:      APPLY TO SASC.LOAD (COMPILER AND UTILITIES LIBRARY IN
*              LOAD MODULE FORMAT) USING THE APPLYZAP UTILITY.
*   END
NAME     LCXX#    DECLARE@    LOAD
CHECKSUM
VER      002DEE   4390,F081
VER      002DF2   8990,001B
VER      002DF6   8890,001F,1299
*
REP      002DEE   9110,F081
REP      002DF2   4780,538C
REP      002DF6   D503,8000,C044
CHECKSUM 06C5E186
IDRDATA  Z6001507
*
REPORT LIB=LOAD
/*
//
```

Example 3.2 applies zaps with the APPLYZAP catalogued procedure, which is provided to help in executing APPLYZAP. The APPLYZAP catalogued procedure is located on the SAS/C Usage Notes tape in the .CNTL file. If the APPLYZAP catalogued procedure has been installed into an accessible catalogued procedure library (.PROCLIB) and edited to contain installation-specific names, this example may be used to accomplish the same task as Example 3.1.

In both Example 3.1 and Example 3.2, zap Z6001507 is found in the PDS file defined at DDname SYSZLIB and is contained directly in the JCL file. Listed below are descriptions of the options and commands used with the example APPLYZAP jobs:

REPORT ZAP=zname
generates a report containing a list of all the libraries that the named zap (zname) has been applied to.

REPORT LIB=libname
generates a report containing a list of all the zaps applied to the named library (libname).

PARM='UPPER'
generates all output in uppercase.

Use the APPLYZAP catalogued procedure to ensure that all of the necessary data sets are allocated.

APPLYZAP will apply any number of zaps, however, the input file (SYSZIN) must be sequential. Therefore, a specific PDS member as well as concatenated PDS members are acceptable.

VM Specifics

The libname keyword used in the NAME statement of a zap, the LIB= parameter of the REPORT command, and the libname keyword found in all APPLYZAP output, are used to identify a particular VM SAS/C software file.

For each distinct libname found in the NAME statement of the zap being processed, there must be a corresponding VM file or VM FILEDEF pointing to a VM file. In determining how to interpret the libname, APPLYZAP considers the following:

1. Was *.ext* supplied?
2. Was the FILEDEF option specified?
3. Does an actual FILEDEF that matches the libname exist?

Table 3.5 provides a Truth Table that indicates how APPLYZAP will interpret the libname based on the above considerations for a libname of LOAD or LOAD.L.

Table 3.5 APPLYZAP Options

.EXT Supplied?	FILEDEF Option ON?	FILEDEF Exists?	File/DDname to Search for
yes	yes	yes	DDN: LOAD
yes	yes	no	LOAD LOADLIB *
yes	no	yes	LOAD LOADLIB *
yes	no	no	LOAD LOADLIB *
no	yes	yes	DDN: LOAD
no	yes	yes	Error
no	no	yes	DDN: LOAD
no	no	no	Error

For a list of supplied DDnames, refer to the APPLYZAP EXEC.

There are no DDnames required to run APPLYZAP under VM unless a particular zap indicates it by not supplying an .ext in the libname. However, it is possible, using

the FILEDEF option, to cause APPLYZAP to zap a file pointed to by a FILEDEF that you supply.

Another use of DDnames in APPLYZAP is with the INPUT option and the APPLY command. Zaps specified in the INPUT option and in the APPLY command can be obtained from a MACLIB defined to the DDname of SYSZLIB. It is important to realize that APPLYZAP will first search for the zap on an accessed disk with a filetype of ZAP. By default, the DDname SYSZLIB is allocated to the ZAP MACLIB (the name of the MACLIB on the Usage Notes tape that contains all of the zaps).

To run APPLYZAP on VM, first ensure that the mini-disks containing APPLYZAP and the zaps to be applied are at least read accessible. Next, ensure that the mini-disks containing the libraries to be zapped, the ZAPPED MACLIB (which is created on the first run of APPLYZAP) and LC370 LOADLIB, are write accessible. Then do one of the following:

- Copy the zap to a file with the name of SYSZIN ZAP and then issue the following command:

```
APPLYZAP options...
```

- Make use of the INPUT option by issuing the following command:

```
APPLYZAP INPUT zname additional-options
```

  where *zname* is the filename of the zap with a filetype of ZAP, or a member of a MACLIB FILEDEFed to SYSZLIB.

Example 3.3 shows VM sample for applying multiple zaps to several libraries.

Example 3.3 VM Sample for Applying Multiple Zaps to Several Libraries

```
*
*   NAME:Z6001507 PRODUCT:SASC   CATEGORY:RECO  SYSTEM:CMS/ESA
*   DATE:12DEC96  STATUS: DZ+UT  USAGE-ID:CXX-C1507
*
*   LSCT439, Object of abstract class <class_name> cannot be
*   declared
*   NOTE:      APPLY TO CXX LOADLIB (C++ TRANSLATOR) USING
*              THE APPLYZAP UTILITY.
*   NOTE:      IF THE LIBRARY IS INSTALLED IN A DCSS, THE DCSS
*              MUST BE RESAVED.
*   END
NAME     LCXX#    DECLARE@    CXXLOAD
VER      002DEE   4390,F081
VER      002DF2   8990,001B
VER      002DF6   8890,001F,1299
*
REP      002DEE   9110,F081
REP      002DF2   4780,538C
REP      002DF6   D503,8000,C044
LOG Z6001507 ZAPLOG DECLARE@ LSCT439, Object of abstract class
<class_name> cann
*
REPORT LIB=LC370.L
```

Example 3.3 can be applied to the SAS/C software products by following these steps:

1. Ensure that all libraries to be zapped are on a write accessible disk. In this case, ensure that the LC370 LOADLIB, the LC370CIC TXTLIB, and the LC370VSE TXTLIB files are on a write accessible disk. The library information can be obtained from reading the header note in each zap; LC370CIC and LC370VSE are associated with zap Z5000158.
2. If this is the first time running APPLYZAP, the ZAPPED MACLIB is created on a write accessible disk. If this is not the first time running APPLYZAP, ensure that the ZAPPED MACLIB is on a write accessible disk.
3. Ensure that the disk containing the APPLYZAP utility is linked with at least read access.
4. If the MACLIB containing the zaps is not named ZAP MACLIB, issue a FILEDEF defining SYSZLIB to the correct MACLIB.
5. Invoke APPLYZAP in the following way:

   ```
   APPLYZAP INPUT myzap
   ```

   where *myzap* is the name of a file that must have a filetype of ZAP and contain the data listed in Example 3.3

This example uses APPLYZAP to apply two zaps to different libraries and also to obtain several informational zap reports. APPLYZAP will decide which utility and library to use for each zap.

Note that a zap may be applied using the APPLY command (in which case APPLYZAP will look for a file with a filetype of ZAP on an accessed disk first, then in the MACLIB defined to SYSZLIB for the zap) or by directly including the zap into SYSZIN.

Listing Applied Zaps

APPLYZAP maintains a log of all applied zaps in three ways. First, if the LIST option is in effect, APPLYZAP produces a listing of its run-time activity in the SYSZOUT file. This listing shows which library the zap was applied against and the result of the attempt. If the attempt failed, then the listing will show the reasons for the failure. Regardless of whether LIST or NOLIST is specified, a summary table is generated. This table details the number of libraries used, the number of zaps from input, the number of zaps applied as well as previously applied and not applied, the number of object deck zaps, the number of load module zaps, and the maximum return code from utility. Example 3.4 shows a sample of the APPLYZAP summary table.

Example 3.4 Sample APPLYZAP Summary Table

```
APPLYZAP Summary:
Zaps:
     Name          Applied   NOT Applied   Previously Applied
     --          ----   ------   ---------
     Z5500873                                      X
Statistics:
        Number of libraries used           :    1
        Number of zaps from input          :    1
        Number of zaps applied             :    0
        Number of zaps previously applied  :    1
        Number of zaps not applied         :    0
        Number of object deck zaps         :    0
        Number of load module zaps         :    0
        Maximum return code from utility   :    4
```

Second, a log of applied zaps is maintained in the form of a zaps applied file, called ZAPPED. This file, an OS/390 PDS or VM MACLIB, contains a member for each module zapped. The ZAPPED member-names correspond to the module name. For each zap, information is kept regarding the CSECT name, time, userid, utility used, and filename of the library zapped. This file can be checked to see if a zap has ever been applied.

Third, a report of applied zaps can be obtained by using the REPORT option or the following command: **REPORT LIB=<**libname **>**

REPORT processing causes APPLYZAP to list the contents of an internal record of applied zaps for each defined library. The report is written to the SYSZRPT file. A defined library under OS/390 is any SAS/C library that has been defined with a DD statement. A defined library under VM is a SAS/C library found on a write accessed disk. This method is the most accurate because both the SYSZOUT listing and ZAPPED file can be discarded or overwritten.

Automatic Application of Maintenance

Maintenance to the SAS/C software products is shipped periodically on a Usage Notes tape. This Usage Notes tape contains zaps and Usage Notes. In addition to the zaps themselves, several index files are included. These files are named in the form of $rrrxxxx, where rrr are the digits of the release number and xxxx are the first four characters of the zap category or the word AUTO (for example, $650AUTO, $650RECO, and so on). The $rrrAUTO index file is the focus of this section. Refer to Chapter 2, "Usage Notes and Zaps," for additional information on the other index files.

The $rrrAUTO index file contains several APPLY commands that will cause all of the REQUIRED, RECOMMENDED, and REMOVAL zaps to be applied to the SAS/C software products. Using this file as input to APPLYZAP automatically maintains your SAS/C software. Because APPLYZAP can determine if a zap has been previously applied, attempting to apply a previously applied zap will only result in a descriptive warning. By applying all of the zaps on the current Usage Notes tape, through use of the $rrrAUTO index file, a site can be assured that all of the REQUIRED, RECOMMENDED, and REMOVAL maintenance has been applied to their copy of the SAS/C Software products.

OS/390 Automatic Example

Examples 3.5 shows sample OS/390 JCL for automatic application of maintenance.

Example 3.5 Sample OS/390 JCL for Automatic Application of Maintenance

```
//jobname  JOB job-card information
//AUTOZAP       EXEC APPLYZAP,
//              PARM.APPLY='ECHO'
//APPLY.SYSZLIB DD DSN=uprefix.SASC.ZAPS,DISP=SHR
//APPLY.SYSZIN  DD *
*
APPLY $650AUTO
/*
//
```

Example 3.5 applies all of the current REQUIRED, RECOMMENDED, and REMOVAL zaps for Release 6.50 of SAS/C software.

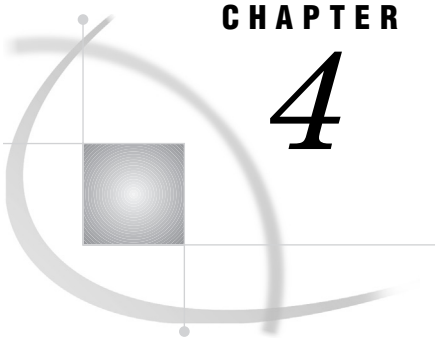
VM Automatic Example

The following sequence of instructions allow all of the current REQUIRED, RECOMMENDED, and REMOVAL zaps for Release 6.50 to be applied to the SAS/C software products.

1. Ensure that all of the SAS/C libraries are on a write accessible disk because all zaps will be applied.
2. If this is the first time running APPLYZAP, the ZAPPED MACLIB is created on a write accessible disk. If this is not the first time running APPLYZAP, ensure that the ZAPPED MACLIB is on a write accessible disk.
3. Ensure that the disk containing the APPLYZAP utility is linked with at least read access.
4. If the MACLIB containing the zaps is not named ZAP MACLIB, issue a FILEDEF defining SYSZLIB to the MACLIB.
5. Invoke APPLYZAP in the following way:

```
APPLYZAP INPUT $650AUTO  ECHO TERM
```

Note: ECHO is specified so that all diagnostics will be generated. NOTERM is specified so that the large amount of diagnostics that are generated with ECHO will not appear on the terminal screen but instead in the SYSZOUT file only. △



CHAPTER

4

SAS/C Sample Library

Using the Library

The SAS/C Sample Library is a diverse collection of SAS/C programs included on the Usage Notes tape to assist system and application developers. The library contains programs, functions, and utilities that demonstrate features of the SAS/C Compiler library. The sample library also includes the necessary JCL and directions to compile, link, and execute SAS/C programs. The sample library includes C to assembler and assembler to C programs, interlanguage communication between C and other high-level languages (COBOL, FORTRAN, PL1), TCP/IP client and server applications, along with C and C++ samples. Some of the programs require special products, such as ISPF, DB2®, or the SAS/C FSSL product in order to execute.

All sample programs contain the following copyright restrictions:

The table below lists and describes the contents and organization of the sample library:

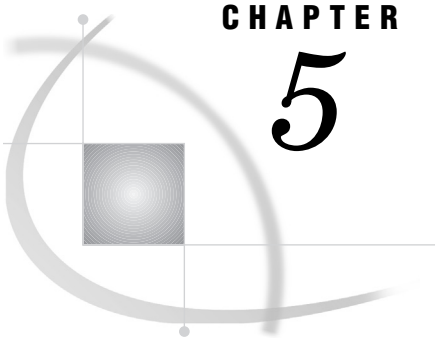
- The directory names given are the simple directory names on the release media. The full names are dependent on the operating system and the installation.
- Each directory contains a file, ##README, briefly describing the examples in that directory and indicating any special compilation or execution dependencies.
- JCL statements requiring customization for the local environment are flagged by "<==verify" or "<==check." Be sure to verify these statements.

Table 4.1 Organization of the SAS/C Sample Library

Description	MVS Name	CMS Name	UNIX Name
Samples that demonstrate the communication between SAS/C and Assembler	SAMPLE.ASM	SAMPLASM	samples/asm
JCL, sample Debugger configuration files, hypertext cards, ISPF Panel definitions, and the like	SAMPLE.AUX	SAMPLAUX	samples/aux
Sample C program source files	SAMPLE.C	SAMPLC	samples/c
Sample C++ program source files	SAMPLE.CXX	SAMPLCXX	samples/cxx
Header files for the samples	SAMPLE.H	SAMPLHDR	samples/h
Interlanguage Communication Feature samples	SAMPLE.ILC	SAMPLILC	samples/ilc

For each program in the sample library, there is a corresponding file that explains how to compile, link, and execute the program. For example, the FTOC program converts Farenheit to Celsius temperature readings. For instructions on compiling, linking, and executing this program:

- on MVS, see **`SAMPLE.AUX(FTOC)`**
- on CMS, see **`SAMPLE MACLIB,MEMBER FTOC.`**



CHAPTER

5

Electronic Support Services

Introduction

The three methods of obtaining SAS/C support information or service from the electronic support facilities of SAS Institute Inc. are as follows:

- Using the SAS Technical Support Web Site
- Using the File Transfer (FTP) Facility
- Using e-mail to Report Problems.

To read the SAS Web page a Web browser that supports frames (such as Netscape 2.0 or later or Microsoft Explorer 3.0 or later) is recommended. A Web browser is not required to use the file transfer and e-mail support facilities.

Using the SAS Technical Support Web Site

The SAS Support Web site is the best source of current information about support problems or issues, and it is also the simplest way to obtain SAS Technical Support or information. The SAS/C Technical Support services appear on the Technical Support main page. There are two ways to get to this page. You can reach it directly by opening its URL: **`http://www.sas.com/service/techsup/intro.html`**. Or you can navigate to it from the main SAS Web page at URL **`http://www.sas.com`**.

The URLs are subject to change. If you get an error when attempting to open one of the URLs listed in the table, go to the SAS main page, navigate to the Technical Support page, and select the desired task or facility from there. The SAS/C Technical Support Web page is also subject to change. Since the last time you requested SAS/C support or information, an important new feature or piece of relevant information may have been added to the SAS Web site. We recommend that you periodically browse our Web site, which is continually being enhanced and expanded.

Using the File Transfer (FTP) Facility

You can also transfer files between your site and the SAS support facility by directly using a local FTP client program:

- Go to the directory or location on the local host to which you want the downloaded files to be stored.
- Connect to the SAS Anonymous FTP host by typing this command:

```
ftp ftp.sas.com
```

- When prompted for a username, enter ANONYMOUS. When prompted for a password, enter your e-mail address.

- Use the FTP program's **cd** (change directories), **ls** (list files), and **pwd** (display the name of the present working directory) commands to navigate to the SAS/C download area that you are interested in. For example, to go to the SAS/C download directory, display the files there, and download the file named **xmit**by typing these commands:

  ```
  cd /techsup/download/SASC/download
  ls
  get xmit
  ```

  To download zap **z6001555** for Release 6.00 of the SAS/C compiler for the MVS operating system, type these commands:

  ```
  cd /techsup/download/zap/sasc/mvs/600
  get z6001555
  ```

You can also transfer files from your local system to the SAS FTP site. For example, to transfer a file named **T1234567_open_dump** located in directory **outgoing** to the **upload** directory on the SAS FTP host, type this series of commands:

```
cd outgoing
ftp ftp.sas.com
username: anonymous
password: your_email_address
cd upload
put T1234567_open_dump
```

Using E-mail to Report Problems

Use e-mail to report SAS/C problems or to communicate with SAS/C support consultants. You can also register to receive automatic e-mail updates from SAS support about problems and solutions.

The Electronic Mail Interface to Technical Support (EMITS) system logs your mail to the attention of the Technical Support Division and sends an e-mail message acknowledging receipt of your mail.

You must register to use EMITS. If you have accounts on multiple machines, register from the same host system that you want to use for sending messages to the Technical Support Division. EMITS extracts your e-mail address from the header of your message and uses this address as your account ID. You may register from multiple machines if you want to send messages to Technical Support from more than one machine. The SAS Institute Technical Support e-mail address isSUPPORT@SAS.COM.

In the subject field of the message, type EMITS.

Start in column 1 in the body of the message and type:

```
\./register= customer name
\./company= company name
\./site= valid site number
\./phone= phone number
```

When your account is added, EMITS notifies you by e-mail and sends you a complete guide to using EMITS.

Once you are registered for EMITS, you can receive online documentation by sending an e-mail message with the following test:

\./help

Here are several points to keep in mind when sending mail to EMITS:

- All e-mail messages to EMITS should be sent to SUPPORT@SAS.COM.
- All e-mail messages intended for EMITS must contain the words EMITS in the subject line.
- EMITS is not case sensitive.
- EMITS can process only one request for each e-mail message that you send. For example, send two separate e-mail messages to SUPPORT@SAS.COM to register and to request the help file.

Registering for Automatic E-mail Updates

Use the Technical Support News Listing (TSNEWS-L) facility to receive automatically technical information such as

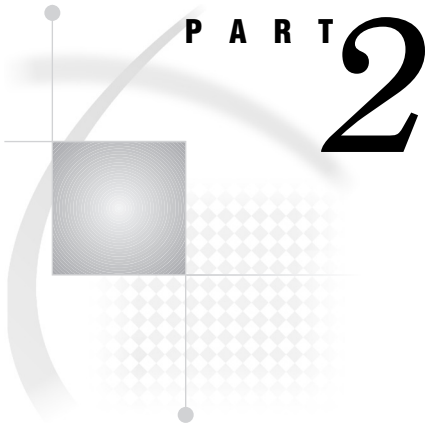
- Problem Alert Letters
- Alert Notes.

You can subscribe to TSNEWS-L by sending e-mail to LISTSERV@VM.SAS.COM. The body of your message should consist of this line: SUBSCRIBE TSNEWS-L **`your name`**.

You can find what is available through TSNEWS-L by sending e-mail to LISTSERV@VM.SAS.COM with this in the body of the message: INDEX TSNEWS-L.

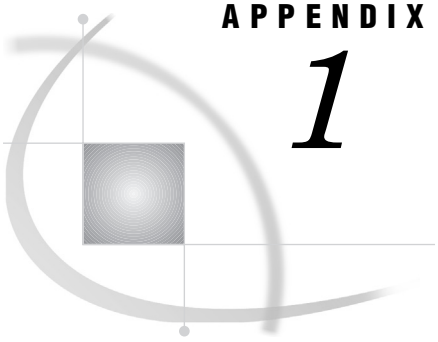
TSNEWS-L responds with a message listing all the documents that are available for downloading. Once you know the name and type of a document you want, issue this command to receive it: GET **`filename filetype`** TSNEWS-L.

To receive documentation on commonly used LISTSERV commands, send e-mail to LISTSERV@VM.SAS.COM with this in the body of the message: HELP.



PART 2

Appendices



APPENDIX

1

APPLYZAP Error Messages

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Return Codes

APPLYZAP may return the following return codes:

APPLYZAP Return Codes

Return Code	Meaning
0	no diagnostics generated.
4	warning message generated. Refer to SYSZOUT and SYSPRINT for details.
8-24	error messages generated by APPLYZAP or the zap utility. Refer to SYSZOUT and SYSPRINT for details.
1012	termination requested regardless of severity of error. See the SYSZOUT listing for details. Note: This code can be returned only when the NOERROR option is specified.
1016	fatal error in APPLYZAP. See the SYSZOUT listing for details.
1020	internal error in APPLYZAP. Call SAS Institute Technical Support for assistance.

Messages

The following is a list of notes, warnings, and errors that may be issued by APPLYZAP:

LSCZ000

```
ERROR: Internal error 0.
```

Explanation
An internal error occurred. Contact SAS/C Technical Support for assistance.

LSCZ001

```
ERROR: Error occurred - check log for more information.
```

Explanation
Additional information about the error is specified in the log.

LSCZ002

```
ERROR: Comments resemble data - check for missing comma.
```

Explanation
Comments in a VER or REP statement resemble data. Check to see if a comma is missing. A blank space in the data is treated as the delimiter for a comment.

LSCZ005

```
ERROR: VER/REP target not in specified CSECT.
```

Explanation
A VER or REP statement specified a target that could not be found in the CSECT specified by the NAME statement.

LSCZ006

```
ERROR: Only 1 IDR LOG statement per CSECT is allowed.
```

Explanation
Only one IDRDATA statement is allowed.

LSCZ007

```
ERROR: No processing done due to invalid control statements in this set.
```

Explanation
Look for syntax errors in control statements.

LSCZ008

```
ERROR: Invalid control file record length (lrecl != 80).
```

Explanation
When using an input data set for your control statements, ensure that LRECL=80.

LSCZ009

```
ERROR: Trying to verify/replace non-existent offset.
```

Explanation
Either a VER or a REP statement specified an offset that does not exist in the CSECT specified by the NAME statement.

LSCZ010

```
ERROR: Invalid/Incomplete OBJZAP requested.
```

Explanation
The NAME statement is either incomplete or incorrect. Make sure that the NAME statement specifies a valid member name and CSECT.

LSCZ012

```
ERROR: Invalid module name specified.
```

Explanation
The member name specified in the NAME statement is either incomplete or incorrect. Correct the NAME statement and retry.

LSCZ013

```
ERROR: No CSECT name specified.
```

Explanation
The NAME statement does not specify a CSECT. Correct the NAME statement and retry.

LSCZ014

```
ERROR: Invalid CSECT name specified.
```

Explanation
The NAME statement specifies an invalid CSECT. Correct the NAME statement and retry.

LSCZ015

```
ERROR: Invalid VER/OFF offset specified.
```

Explanation
Either VER or REP data was rejected because the offset was invalid. Check to make sure the correct number of digits was specified for the offset and that the offset is valid.

LSCZ016

```
ERROR: No VER/OFF data specified.
```

Explanation
The offset for a VER statement is missing. Check VER statements to make sure they all specify an offset.

LSCZ017

```
ERROR: VER/REP data rejected - invalid.
```

Explanation
A VER or REP statement was rejected because it contained invalid data. Check VER and REP statements to make sure all data are valid.

LSCZ018

```
ERROR: VER/REP data rejected - odd number of digits.
```

Explanation
A VER or REP statement contains an odd number of digits. All VER and REP data fields should contain an even number of digits. Check VER and REP statements to make sure all data are valid.

LSCZ019

```
ERROR: Not executed. Missing/unsuccessful NAME verb preceded this one.
```

Explanation
A NAME statement was not executed either because of a missing or invalid NAME statement preceding the statement that was not executed. Check all NAME statements for errors.

LSCZ020

```
ERROR: Member not found or SYSLIB not defined.
```

Explanation
OBJZAP could not find the data set member containing the CSECT to be zapped. Check to make sure that the SYSLIB statement specifies the correct data set. Also make sure the specified CSECT is present in the member specified by the NAME statement.

LSCZ021

```
ERROR: VERIFY NOT SUCCESSFUL: CSECT will not be further modified.
```

Explanation
The data in the VER statements does not match the data in the module being zapped. Make sure the zap is for the release level of the library being zapped. Also check to make sure you are zapping the correct library.

LSCZ022

```
ERROR: REP statement not processed due to previous unsuccessful VER/REP.
```

Explanation
Fix the error that caused the previous VER or REP statement to fail and retry.

LSCZ023

```
ERROR: Specified CSECT not present in this member.
```

Explanation
The specified CSECT was not in the member specified by the NAME statement. Make sure you have the correct zap for the release level of the library that you are zapping. Also make sure you are specifying the correct library.

LSCZ024

```
ERROR: Can only dump the current CSECT and member.
```

Explanation
A DUMP statement was specified with either an incorrect CSECT or module. Only the current CSECT and member can be dumped. Correct and retry.

LSCZ025

```
ERROR: This CSECT has already been dumped due to a VER/REP failure.
```

Explanation
A DUMP statement was specified for the current CSECT; however, a VER error was detected and the CSECT has already been dumped.

LSCZ026

```
ERROR: IDR data exceeds 10 bytes - a maximum of 10 bytes is permitted.
```

Explanation
More than 10 bytes of data were specified on the IDRDATA statement. Reduce the data to 10 bytes and retry.

LSCZ027

```
ERROR: IDR not updated due to missing/unsuccessful REPs.
```

Explanation
The IDRDATA statement was not executed because a REP statement had not been executed prior to the IDRDATA statement. Either fix the errors in existing REP statement or add at least one REP statement before the IDRDATA statement.

LSCZ028

```
ERROR: ALIAS name starts with an invalid character.
```

Explanation
An ALIAS must begin with an alphabetic character or a **$**, **#**, or **@**. Correct the ALIAS statement and retry.

LSCZ029

```
ERROR: ALIAS name contains and invalid character.
```

Explanation
The second through final characters of an ALIAS must be either alphabetic characters, numeric characters, or the **$**, **#**, or **@** characters. Correct the ALIAS statement and retry.

LSCZ030

```
ERROR: ALIAS name is longer than 8 characters.
```

Explanation
Correct the length of the ALIAS and retry.

LSCZ031

```
ERROR: ALIAS name has been specified before.
```

Explanation
Either remove the redundant ALIAS statement or correct the ALIAS and retry.

LSCZ032

```
ERROR: ALIAS name cannot be the same as member.
```

Explanation
Specify an ALIAS for the member and retry.

LSCZ033

```
ERROR: Can have only 16 aliases for each member.
```

Explanation
Greater than 16 aliases were specified for a member. Reduce the number of aliases to 16 and retry.

LSCZ034

```
ERROR: Alias processing: no space in directory.
```

Explanation
The PDS directory does not contain enough space to add the alias. Increase the amount of directory space allocated for the PDS and retry.

LSCZ035

```
ERROR: Alias processing: I/O error.
```

Explanation
An I/O error occurred while writing the alias to the PDS directory. Check the JES log for the cause of the error.

LSCZ036

```
ERROR: Alias processing: STOW macro failed.
```

Explanation
An error occurred while attempting to replace an existing alias in the PDS directory. Reallocate the PDS with a larger directory size and retry.

LSCZ037

```
ERROR: Aliases not replaced as no output operation was performed.
```

Explanation

A successful REP operation was not performed and the aliases were not updated. Check REP statements and retry.

LSCZ038

```
ERROR: Checksum error - no output operation was performed.
```

Explanation

The checksum for the zap does not match the value given by the CHECSUM statement. Check the entire zap for typographical errors and retry.

LSCZ039

```
ERROR: Not a valid checksum string (8 hex digits).
```

Explanation

The value argument to the CHECKSUM statement must be 8 hexadecimal characters and cannot contain commas. Correct the CHECKSUM value and retry.

LSCZ040

```
ERROR: Open failed - additional messages provide more information.
```

Explanation

A problem occurred while opening the member specified by the NAME statement. Verify that the NAME statement is correct and retry.

LSCZ041

```
ERROR: Options '-l' and '-a' are mutually exclusive.
```

Explanation

The **-l** and **-a** options are used with OBJZAP on the cross-platform compiler to apply maintenance. (Refer to the installation instructions for more information about these options.) You cannot use both the **-l** and the **-a** option at the same time.

LSCZ042

```
ERROR: AR370 error occurred - Check the archive for correctness.
```

Explanation

An error occurred when attempting to retrieve the object from an AR370 archive. Use the AR370 utility to verify the integrity of the archive.

LSCZ045

```
ERROR: LOG zapnum exceeds 8 bytes - a maximum of 8 bytes is permitted.
```

Explanation
The zap number specified on the LOG statement is greater than 8 characters long. Check the length of the zap number specified and retry.

LSCZ046

```
ERROR: LOG filetype exceeds 8 bytes - a maximum of 8 bytes is permitted.
```

Explanation
The filetype specified on the LOG statement is greater than 8 characters long. Check the length of the filetype specified and retry.

LSCZ048

```
ERROR: BASE Control Record not currently supported.
```

Explanation
A BASE control statement was specified that is not supported by OBJZAP. Remove the BASE control statement and retry.

LSCZ049

```
ERROR: ZAP/Control File Not Found.
```

Explanation
The file containing the zap was not found. Under OS/390, check your SYSIN DD statement to ensure that it is correct and retry. Under UNIX or Windows, make sure you have specified the correct path and name for the input file.

LSCZ050

```
ERROR: PRINT File Not Found.
```

Explanation
The PRINT file could not be opened. Under OS/390, check your SYSPRINT DD statement to ensure that it is correct and retry. Under UNIX or Windows, the PRINT output is routed to **stdout**.

LSCZ200

Zap <zap-name> to module <module-name> in <library-name> applied successfully.
Level: NOTE
ZAP applied successfully.

LSCZ201

Zap <zap-name> to module <module-name> in <library-name> applied but generated warnings.
Level: NOTE
ZAP applied successfully, however, it generated warnings. See the ZAP output in SYSPRINT for more details.

LSCZ202

Zap <zap-name> to module <module-name> in <library-name> did not apply.

Level: NOTE

ZAP did not apply. See ZAP output in SYSPRINT for more details.

LSCZ203

Zap <zap-name> to module <module-name> in <library-name> returned a severe error.

Level: NOTE

A severe error occurred in attempting to apply the ZAP. APPLYZAP will not continue. See ZAP output in SYSPRINT for more details.

LSCZ204

Severe error returned from <utility-name> attempting to apply <zap-name> to <module-name> : <library-name>.

Level: NOTE

The utility returned a severe error. Under OS/390, see the job log for more details. Under VM, type HELP on any generated VM message for further details. Also, check SYSPRINT.

LSCZ205

Severe error: <utility-name> RC=nn.

Level: ERROR

Ensure that all zapping utilities needed (that is, under OS/390, OBJZAP, and AMASPZAP, and under VM, ZAP and ZAPTEXT) are accessible to the program. Also, check SYSPRINT for a more complete explanation of why the ZAP utility terminated.

LSCZ206

Fatal error: <utility-name> RC=nn.

Level: ERROR

Check SYSPRINT for a more complete explanation of why the ZAP utility terminated.

LSCZ207

No module name on NAME card - execution cancelled.

Level: ERROR

A NAME card did not contain a module name. Check NAME statements to find the problem.

LSCZ208

SYSPRINT not defined or LRECL not 121; or RECFM not FBA.

Level: ERROR

An OS/390 only error. The SYSPRINT file is used by all zapping utilities. This DDname must be defined and AMASPZAP requires it to have an LRECL of 121.

LSCZ209

Zap file write error or out of space - terminating.
Level: ERROR
APPLYZAP could not write to the SYSIN file or not enough space was allocated. Check to ensure proper space allocation and access authority.

LSCZ210

Required ddname not defined or defined incorrectly: <DDname>.
Level: ERROR
An OS/390 only error. The <DDname> is not defined to APPLYZAP. See instructions for required DDnames.

LSCZ211

Work file cannot not be created; RC=nn.
Level: ERROR
A temporary work file that is used by APPLYZAP could not be created.

LSCZ212

Missing IDRDATA/LOG card - Processing terminated.
Level: ERROR
An IDRDATA or LOG statement was expected and not received. Processing was terminated. Each zap segment begins with a NAME statement and must end with an IDRDATA or LOG statement. A zap segment has been found that does not contain an ending IDRDATA or LOG statement. Check the zap for errors.

LSCZ213

Requested Option <option>.
Level: NOTE
An option was requested at run time. The <option> confirms which option was requested.

LSCZ214

Library specified in zap does not exist.
Level: ERROR
The NAME statement specified a library that is not valid or was not defined. Check the list printed out with the error message for valid libnames and then (OS/390) compare that with the JCL or (VM) ensure that the library is on a write accessed disk.

LSCZ215

Invalid checksum characters; must be 8 hex digits <checksum-value-specified>.

Level: WARNING

CHECKSUM specified is not valid. Verify CHECKSUM value given for correctness.

LSCZ216

Checksum error - zap cancelled: <module-name>.

Level: ERROR

CHECKSUM value given was incorrect for zap. Make sure all CHECKSUM statements are in the correct place and have correct values.

LSCZ217

Invalid VER/REP offset specified: <VER/REP statement>.

Level: ERROR

Offset value given on VER or REP card is invalid. Make sure value is correct.

LSCZ218

VER/REP data rejected - invalid: <VER/REP data>.

Level: ERROR

Data value given on VER or REP card is invalid. Make sure value is correct.

LSCZ219

VER/REP data rejected - odd number of digits: <VER/REP data>.

Level: ERROR

Data value must be given with an even number of hex digits. Make sure value is correct.

LSCZ220

No VER/REP offset found - zap cancelled: <VER/REP statement>.

Level: ERROR

VER or REP card did not contain an offset value. Check VER/REP statement.

LSCZ221

No VER/REP data found - zap cancelled: <VER/REP statement>.

Level: ERROR

VER or REP card did not contain a data value. Check VER/REP statement.

LSCZ222

Remaining zap statements discarded due to EOF.

Level: ERROR

A zap statement was found before a valid NAME card was encountered. Make sure zap is specified correctly.

LSCZ223

<ZAPPED | ZAPPED MACLIB> not defined.

Level: ERROR

The zaps applied data set, is not defined. This data set must be defined in order for APPLYZAP to execute. On OS/390, issue a DD statement in the JCL for ZAPPED (see JCL examples in Chapter 3). On VM, link the disk that contains the ZAPPED MACLIB as write access.

LSCZ224

Cannot update <ZAPPED | ZAPPED MACLIB> information: <member-name>.

Level: ERROR

An error occurred when attempting to update the ZAPPED information. Check SYSTERM for more details.

LSCZ225

No Memory available - terminating.

Level: ERROR

An attempt to allocate needed memory failed. 4M is the suggested region size under OS/390 and virtual machine size under VM. Check region specification or machine size.

LSCZ226

Writing <ZAPPED | ZAPPED MACLIB> information: <member-name>.

Level: ERROR

An I/O error occurred on the zaps applied data set. On OS/390, this may indicate a need to compress the data set.

LSCZ227

No valid library specified - see APPLYZAP doc for valid libraries.

Level: ERROR

There are no SAS/C libraries defined. On OS/390, define the SAS/C libraries with DDnames LOAD, LINKLIB, and so on. On VM, define the SAS/C libraries by ensuring that the files are on a write accessible disk. See the USING APPLYZAP section under your specific system for valid library names.

LSCZ228

Module does not exist in library: <library-name>.

Level: ERROR

Module found on NAME card does not exist in the specified library. Ensure that the correct libraries are defined.

LSCZ229

Diagnostics generated: <utility-name> RC=nn.
Level: WARNING
The specified zap may not have applied. Check the return code given by the zap utility and look at SYSPRINT to obtain an explanation of the problem.

LSCZ230

No library name and AUTO not specified.
Level: ERROR
The NAME statement contains no library specification and NOAUTO is in effect. APPLYZAP cannot apply this zap.

LSCZ231

Current zap may not be completely applied.
Level: WARNING
The zap failed to apply to one of multiple libraries; therefore further execution with this zap is terminated. Check SYSPRINT for details on why the zap failed to apply.

LSCZ232

Error in creation of <ZAPPED | ZAPPED MACLIB>.
Level: ERROR
Creating the zaps applied data set produced an error. Under OS/390 ensure that the DD statement for ZAPPED is correct (see previous JCL examples) and retry. Under VM, ensure that adequate disk space is available and retry.

LSCZ233

No more ZAPPED information kept.
Level: WARNING
Issued to inform the user that for the remainder of this execution, APPLYZAP will not attempt to keep any information in the zaps applied data set. This is a direct result of LSCZ232. See that message for more details.

LSCZ234

Error applying zap - additional libraries will be bypassed.
Level: WARNING
Issued to inform the user that additional libraries may be bypassed due to a previous error. This is a direct result of LSCZ231. See that message for more details.

LSCZ235

Permanent ZAPPED information cannot be obtained - terminating.
Level: ERROR

The specified library had no permanent ZAPPED information when it should have or the information could not be obtained. See SYSTERM and SYSPRINT for more details.

LSCZ236

Zap name incorrect - check IDRDATA or LOG card - <zapname>.
Level: ERROR
The specified zap name was not correct. It should have the form of "trrrxxxx" where rrr is the release, xxxx is a number from 0000-9999 indicating the zap number, and t is "Z", "R", or "$". Correct the name in the IDRDATA or LOG card and retry.

LSCZ237

Zap already applied - <zapname | Overridden>.
Level: WARNING
The zap has been previously applied. This message may be issued in two separate cases. If an attempt is made to apply a zap that has been previously applied, this message will be issued and processing of this zap will end unless the OVERRIDE option was specified. If a zap requires a prerequisite zap and the prerequisite zap has been previously applied, then this message will be issued and processing of the zap will continue.

LSCZ238

Prerequisite zap has not been applied - <prereq zapname>.
Level: ERROR
A prerequisite zap, required by the current zap, has not been previously applied. Processing of this zap will end unless the NOPRECK option was specified.

LSCZ240

No memory available from POOL - terminating.
Level: ERROR
The initial attempt to allocate memory failed. Increase region and retry.

LSCZ241

Attempt to bootstrap OBJECT module information failed - <SYSZLIN | SYSZLIN TEXT | library-name>.
Level: ERROR
APPLYZAP attempted to create the initial permanent ZAPPED information for the object format library <library-name>. See SYSTERM and SYSPRINT for more details.

LSCZ242

Attempt to bootstrap LOAD module information failed - <library-name>.
Level: ERROR
APPLYZAP attempted to create the initial permanent ZAPPED information for the load format library <library-name>. See SYSTERM and SYSPRINT for more details.

LSCZ243

Attempt to apply permanent zap information failed - <utility-name> RC=nn.

Level: ERROR

APPLYZAP attempted to maintain the permanent zap information and failed. See SYSTERM and SYSPRINT for more details.

LSCZ244

Load module zapped information failure - <library-name>.

Level: ERROR

An attempt was made to retrieve the permanent zap information and failed. For more details on the cause of the failure, see SYSTERM and SYSPRINT.

LSCZ245

Processing of zap terminated due to application failure - <zap-name>.

Level: ERROR

One or more VER statements did not verify; therefore, a failure resulted. Either the zap has been previously applied using another utility besides APPLYZAP or the zap is in error. Ensure that the zap has not been previously applied before calling SAS Institute Technical Support.

LSCZ246

Invalid zap number range. Range is 0-9999 - <zap-name>.

Level: ERROR

The last four bytes of the zap name was not in the range of 0-9999. The zap name must contain a number from 0-9999 in the last four bytes in order for APPLYZAP to process the zap.

LSCZ247

Library specified is not of the correct format - <library-name>.

Level: WARNING

The specified library was found to be in the wrong format. For example, APPLYZAP thought that it should have been an object module library, but found that it was instead a load module library. APPLYZAP will make the internal adjustments and continue processing the zap.

LSCZ248

Invalid command. Command is ignored - <command>.

Level: WARNING

The specified command is not valid. It will be ignored and processing will continue.

LSCZ249

Unable to open APPLYZAP input file - <DDname | filename>.

Level: WARNING

The specified input file in the INPUT option or the APPLY command could not be opened. Check to ensure that the file exists and that the filename was spelled correctly. Under OS/390, ensure that the SYSLIB DD defines the library in which the file resides. Under VM, if the file is not in a MACLIB, ensure that it has a filetype of ZAP and is on an accessed disk; if the file is in a MACLIB, ensure that the SYSZLIB FILEDEF defines the MACLIB where the file resides.

LSCZ250

APPLYZAP command processed - <command>.

Level: NOTE

The APPLYZAP command <command> was processed.

LSCZ251

APPLYZAP command out of sequence.

Level: ERROR

An APPLYZAP command was found within a zap segment. APPLYZAP commands (APPLY, REPORT, or SYSTEM) can only reside outside of a zap segment. Because a zap segment is bracketed by a NAME statement and an IDRDATA or LOG statement, APPLYZAP commands cannot appear between a NAME statement and an IDRDATA or LOG statement. The command is ignored and processing of the zap continues.

LSCZ252

Zap library file does not exist - SYSZLIB.

Level: ERROR

The INPUT option or APPLY command was processed and the DD for the zap library, SYSZLIB, was not defined. Under VM, this message also indicates that a file with a filetype of <zap-name> and a filetype of ZAP could not be located on any accessed disk.

LSCZ253

Input obtained from - <SYSZLIB(zap-name) | zap-name ZAP>.

Level: NOTE

The zap input was obtained from SYSZLIB(zap-name) or on VM from zap-name ZAP.

LSCZ254

*****No zap obtained and eof not found*** - terminating.**

Level: ERROR

APPLYZAP has failed on an internal error check. Please obtain the listings from SYSZOUT, SYSPRINT, SYSTERM, and the OS/390 JES log or VM console log before contacting SAS Institute Technical Support.

LSCZ255

Error returned from system routine - <command> RC=nn.

Level: ERROR

The return code nn was returned from the system function when trying to execute the command. Check the particular documentation for information on the specified commands.

LSCZ256

Zap cannot be applied - Original zap not applied <zap-name>.

Level: WARNING

When attempting to apply a removal zap, it was discovered that the original (bad zap) had never been applied. Processing of the zap ends because there is no need to remove a zap that has never been applied.

LSCZ258

Applying current zap(/segments).

Level: NOTE

An APPLYZAP command (for example, APPLY, REPORT, or SYSTEM) has been found outside of a zap segment; however, it cannot be determined if the command is within the current zap (between 2 zap segments) or if the command is beginning a new zap. APPLYZAP commands should not be intermixed with zap statements. This message is issued to inform that the zap may be incorrectly split.

LSCZ259

Invalid option specified - <option>.

Level: WARNING

The specified option is not a valid APPLYZAP or utility option.

LSCZ260

Required library on the NAME card does not exist - <libname**> rc = <rc>.**

Level: ERROR

The libname specified in the NAME statement could not be found. On OS/390, check to make sure a DD card for <libname > was given in the JCL. On CMS, if a <.ext > was supplied in the libname, ensure that the corresponding file is on a write accessible disk. On CMS, if the <.ext > was NOT given on the libname, ensure that a FILEDEF for <libname> is specified and points to a file on a write accessible disk.

LSCZ261

AR370 Library Manager issued diagnostics - <libname **> rc = <rc>.**

Level: ERROR || WARNING

Refer to the SYSPRINT and SYSZOUT files for the complete message from AR370 and take the appropriate actions. Also, consult the SAS Technical Report C-112, "Changes and Enhancements to the SAS/CCompiler, Library, and Debugger, Release 5.50".

References

IBM (1987), IBM MVS/XA System Programming Library: Service Aids (GC28-1159)

SAS Institute Inc. (1989), SAS/C Compiler and Library User's Guide, Third Edition, Cary, NC: SAS Institute Inc.

APPENDIX

2

Using OBJZAP on OS/390

Introduction

OBJZAP is a utility that can be run under OS/390 to make changes to object modules (because several parts of the products are supplied in object form). OBJZAP operates on object modules that are members of partitioned data sets, allowing users to

- examine data and instructions
- change data and instructions
- dump any control section (CSECT) of the object deck.

Although OBJZAP was designed to be similar to the IBM utility program AMASPZAP (also known as superzap), several important differences exist, notably in the algorithm used by the CHECKSUM statement. OBJZAP uses several control statements that specify the operations to be performed. This section includes a brief synopsis of the control statements and detailed syntax rules, followed by an example of an OS/390 job stream to run OBJZAP in batch.

Control Statements

This section provides an introduction to the organization of the control statements that are used to run the OBJZAP utility. Following this introduction is a detailed description of each statement and a brief discussion of the syntax rules.

Organization

Control statements for the OBJZAP utility are listed below. (Control statements are not case sensitive.)

```
NAME member csect
   VER offset expected-content
   REP offset replacement-data
   CHECKSUM value
```

```
ALIAS alias1,alias2, . . .
IDRDATA xxxxxxxxxx
DUMP member csect
```

Each set of control statements begins with a NAME statement. The VER, REP, ALIAS, IDRDATA, and DUMP statements following the NAME statement apply to the partitioned data set (PDS) member and the CSECT that the NAME statement identifies.

The VER, REP, ALIAS, IDRDATA, and DUMP statements can appear in any order, but it is better to code all VER statements before the first REP statement to ensure that the data are verified before anything is replaced. The DUMP statement must follow the NAME statement; the CHECKSUM statement can appear anywhere in the sequence of statements. When a new NAME statement occurs, it defines a new CSECT (possibly in a new member) as the object of succeeding VER, REP, ALIAS, IDRDATA, and DUMP statements.

Statement Descriptions

- **NAME** ***member csect***

  NAME gives the identity of the object deck *member* containing the *csect* (control section) that all succeeding control statements operate on. There is no restriction on the number of NAME statements that can appear.

- **VER** ***offset expected-content***

  VER compares the contents of a location in the CSECT (*offset*)with the expected content (*expected-content*) supplied by the user. If the two fields do not compare as equal, the VER operation fails and a formatted dump is provided for the *csect*. No further REP operations are performed until the next NAME statement occurs. *offset* contains the hexadecimal displacement of the data in *csect*. The VER operation fails if *offset* is outside the boundaries for the CSECT specified by the NAME statement (*offset* can be an even or odd number of digits).

  expected-content
  contains the hexadecimal representation of the data expected at the offset in *csect*. The data must be expressed as an even number of two hexadecimal values, for example,

  ```
  4741D175 (or, with commas: 4741,D175).
  ```

  If commas are used to separate data, the number of digits between them must also be even. Blanks cannot be used to separate digits. A blank ends *expected-content*; any data following a blank are treated as comments and ignored. For data that will not fit in one 80-byte VER statement, a second statement must be used.

- **REP** ***offset replacement-data***

  REP changes the data in a CSECT defined in the NAME statement. It replaces the data specified at *offset* with the data specified in *replacement-data*. The REP operation fails if *offset* is outside the boundaries for the CSECT specified in the NAME statement. The formats of the arguments to REP follow the same rules as the formats of the VER arguments.

  The VER operation should always be performed to determine what will be changed with the REP function. If more than one VER and REP operation is to be performed on a CSECT, statements should be ordered so that all VER statements appear before all REP statements. The reason for this order is to ensure that no REP statement is performed if any VER operation fails.

  When REP is successful, the old data are printed out, and the IDR information in the object deck is automatically updated. (See the IDRDATA discussion.)

□ **CHECKSUM <*value*>**

The CHECKSUM statement performs one of two tasks, depending on whether the optional *value* argument is used. The *value* argument must be eight hexadecimal digits and cannot contain commas.

If the *value* argument is present, the statement compares the number specified in *value* and the accumulated CHECKSUM. The checking is done when OBJZAP reads the control statements. If the accumulated CHECKSUM and the number specified by *value* are not equal, no processing is done.

If the *value* argument is not present, the accumulated CHECKSUM is printed in hexadecimal.

The accumulated CHECKSUM starts at zero and is reset to zero by each CHECKSUM statement. Only the offsets and data from REP statements are used in accumulating the CHECKSUM.

The CHECKSUM statement guards effectively against typographical errors in making a change. All fixes to object modules supplied by SAS Institute contain CHECKSUM statements, and you should not remove them.

You can use a comment in the CHECKSUM statement if the CHECKSUM statement contains a *value* argument. (See the discussion of comments later in this chapter.)

□ **ALIAS *alias1<,alias2, . . .>***

The ALIAS statement establishes aliases for the PDS member being zapped. Each ALIAS statement can have one or more *alias* values separated by commas; no blanks can occur between aliases in an ALIAS statement. Up to sixteen unique aliases are allowed for each member.

The ALIAS statement uses the member name from the latest NAME statement. ALIAS statements can occur anywhere after the NAME statement; however, ALIAS information is updated only if there has been a successful REP operation (that is, if IDR data are updated).

Note: The ALIAS statement is needed because OBJZAP does not update in place. Therefore, aliases must be explicitly re-established; the ALIAS statement does this. Zaps to the resident portion of the run-time library from SAS Institute contain the names of any necessary aliases in an ALIAS statement as part of the zap.

□ **IDRDATA *xxxxxxxxxx***

The IDRDATA control statement is executed only if at least one REP operation is executed. IDRDATA puts a maximum of 10 bytes of user data into bytes 1 to 10 at the location of the second IDR item (on the END card of the deck that contains the CSECT). *xxxxxxxxxx* is the ten bytes of data, expressed without embedded blanks. Blanks are added at the right if less than 10 bytes are specified. IDRDATA is useful for tracing what zaps have been applied.

Note that when a REP operation is performed, the following occurs:

1. no IDRDATA operation is specified, *UNKNOWN* is inserted in bytes 1– 9 of the second IDR field.
2. If an error occurs later, the string ER is inserted in bytes 11– 12 on the END card. Otherwise, bytes 11– 12 are blanked out.
3. The Julian date (*yyddd*) is inserted in bytes 15– 19 on the END & card.

If there is more than one CSECT in the deck on which a REP is performed, the IDRDATA from the last CSECT is used. If there was no previous IDR statement, *UNKNOWN* is used. It is customary for zaps supplied by SAS Institute to contain IDRDATA statements with the release and zap numbers as identification.

□ **DUMP <*member*> <*csect*>**

DUMP or DUMPT dumps the CSECT identified in the NAME statement. The *csect* and *member* arguments are optional, and if specified, they must be the same as in the NAME statement. The output of the DUMP command is in hexadecimal format. When this command is used, the IDR data from the most recent zap (successful or unsuccessful) are printed, in addition to the contents of the CSECT. Note that a NAME statement must always come before the DUMP statement.

- **GO**

  GO delimits a set of control statements. It is primarily intended for interactive execution of OBJZAP under TSO.

  The GO statement instructs OBJZAP to perform the preceding control statements. OBJZAP does syntax checking and executes the statements if it finds no syntax errors. You can then enter a new set of OBJZAP control statements. (The new set must begin with a NAME statement.)

- ***** ***Comments***

  Comment statements: You can use comments in the OBJZAP command stream. Comment statements must be in the form **comment*. (The number of comments is not limited.) OBJZAP writes the comment statements to the standard output data set (**stdout**).

  Comments included on control statements: You can also include comments on control statements, other than the DUMP or DUMPT statements. In a control statement, place the comment after the last argument that the statement requires. Precede the comment with a blank. You do not need an asterisk (*) to indicate a comment on a control statement. If no arguments are present, you cannot use a comment on the control statement.

Detailed Syntax Rules

As described earlier in this chapter, statement syntax is similar to that for the IBM program AMASPZAP. The detailed syntax rules follow:

- An OBJZAP operation name must be specified before any arguments in a statement.
- The statement can be entered starting in any column. Control statements can be up to 80 bytes long. (Information beyond column 72 is ignored.)
- Several blanks can separate the OBJZAP operation name and its first argument, but there must be at least one blank. Similarly, one or more blanks must separate arguments in the statement.
- Commas can be used in data fields other than offsets and the CHECKSUM *value*. Blanks are not allowed inside data fields. A blank terminates a data field.
- Values in the *expected-content* field (VER statement) and the *replacement-data* field (REP statement) must be expressed as an even number of hexadecimal digits.
- Comment statements are specified by an asterisk. Comments can also be used in control statements other than the DUMP statement. In a control statement, a space separates the comment from the last argument that the statement takes. No asterisk (*) is needed for comments on control statements.
- Control statements are not case sensitive.

JCL Execution

The following DD statements are required to execute OBJZAP:

SYSIN
contains the OBJZAP control statements.

SYSPRINT
identifies the standard output message data set (sequential).

SYSLIB
identifies the partitioned data set containing the member(s) to be zapped.

STEPLIB
compiler library and transient library.

The following statement is optional:

SYSTERM the data set to be used for diagnostic messages.

Example B.1 shows a sample OS/390 JCL routine to run OBJZAP.

Example Code A2.1 Sample JCL for OBJZAP

```
//jobname JOB jobcard information
//OBJZAP  EXEC PGM=OBJZAP
//STEPLIB DD DSN=sasc.LOAD,DISP=SHR
//        DD DSN=sasc.LINKLIB,DISP=SHR
//SYSIN   DD *
    NAME XXX   BUILD@$
    VER 002 C5E2C3
    REP 002 C6E3C4
    IDRDATA ABCDEF1237
* A NEW CSECT IN A DIFFERENT PDS MEMBER.
    NAME ZZZ   MAIN@$
    VER 35 969540F1
    VER 6D A3009096
    IDRDATA XXXXEF1237
//SYSLIB   DD  DSN=sasc.object.library,DISP=SHR
//SYSPRINT DD  SYSOUT=*
//SYSTERM  DD  SYSOUT=*
//
```

In batch mode, OBJZAP reads all control statements before processing them.

Interactive Execution

You can run OBJZAP interactively under TSO by entering OBJZAP control statements from the terminal, followed by a GO statement. The GO statement executes all control statements you enter before the GO statement. Use the string EOF (in uppercase) to signal end-of-input when you are finished with OBJZAP.

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