

z/OS



DFSMS Installation Exits

Version 2 Release 1

Note

Before using this information and the product it supports, read the information in "Notices" on page 251.

This edition applies to Version 2 Release 1 of z/OS (5650-ZOS) and to all subsequent releases and modifications until otherwise indicated in new editions.

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About This Document

This document helps you customize DFSMS with installation exit routines and modules that extend or replace IBM-supplied functions at your installation. Storage administrators and system programmers can use this information to centralize customization at their installations. All routines described reside in system libraries; installing them requires authority to update the system library.

This document does not cover all installation exits available in DFSMS. The following table indicates the documents that cover installation exits for the indicated components.

Component	Document
Network File System	<i>z/OS Network File System Guide and Reference</i>
DFSMSrmm	<i>z/OS DFSMSrmm Implementation and Customization Guide</i>
Object Access Method	<i>z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support, z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries, and z/OS DFSMS OAM Application Programmer's Reference.</i>

When you install the z/OS[®] system, initialization parameters and SMS options let you tailor the system to your requirements. How you tune z/OS can affect how you customize MVS[™] and DFSMS.

Related reading:

- For additional information about initialization parameters, see the *z/OS MVS Initialization and Tuning Guide*.
- For information about the installation exits that MVS provides, see *z/OS MVS Installation Exits*.
- For information about customization at a system level, see *z/OS MVS Using the Subsystem Interface*.
- For information about SMS options, see the *z/OS DFSMSdfp Storage Administration*.

For information about the accessibility features of z/OS, for users who have a physical disability, see “Accessibility,” on page 247.

Required product knowledge

To use this document effectively, you should be familiar with:

- Assembler language
- Job control language
- Standard program linkage conventions
- Data management access methods and macro instructions.

Referenced documents

The following publications are referenced in this document. You can order these documents by order number.

Publication Title	Order Number
<i>SMP/E for z/OS Reference</i>	SA23-2276
<i>z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN</i>	SA23-1372
<i>z/OS MVS Programming: Authorized Assembler Services Reference EDT-IXG</i>	SA23-1373
<i>z/OS MVS Programming: Authorized Assembler Services Reference LLA-SDU</i>	SA23-1374
<i>z/OS MVS Programming: Authorized Assembler Services Reference SET-WTO</i>	SA23-1375
<i>z/OS MVS Diagnosis: Reference</i>	GA32-0904
<i>z/OS DFSMSHsm Implementation and Customization Guide</i>	SC23-6869
<i>z/OS DFSMSHsm Diagnosis</i>	GC52-1387
<i>z/OS Problem Management</i>	G325-2564
<i>z/OS MVS Initialization and Tuning Guide</i>	SA23-1379
<i>z/OS DFSMS Access Method Services Commands</i>	SC23-6846
<i>z/OS DFSMSdfp Diagnosis</i>	SC23-6863
<i>z/OS DFSMS Using Data Sets</i>	SC23-6855
<i>z/OS DFSMSdfp Storage Administration</i>	SC23-6860
<i>z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support</i>	SC23-6866
<i>z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries</i>	SC23-6867
<i>z/OS DFSMS OAM Application Programmer's Reference</i>	SC23-6865
<i>z/OS DFSMSdfp Advanced Services</i>	SC23-6861
<i>z/OS DFSMS Using Magnetic Tapes</i>	SC23-6858
<i>z/OS DFSMSdfp Utilities</i>	SC23-6864
<i>z/OS Security Server RACF System Programmer's Guide</i>	SA23-2287
<i>z/OS MVS Using the Subsystem Interface</i>	SA38-0679
<i>z/OS MVS System Messages, Vol 1 (ABA-AOM)</i>	SA38-0668
<i>z/OS MVS System Messages, Vol 2 (ARC-ASA)</i>	SA38-0669
<i>z/OS MVS System Messages, Vol 3 (ASB-BPX)</i>	SA38-0670
<i>z/OS MVS System Messages, Vol 4 (CBD-DMO)</i>	SA38-0671
<i>z/OS MVS System Messages, Vol 5 (EDG-GFS)</i>	SA38-0672
<i>z/OS MVS System Messages, Vol 6 (GOS-IEA)</i>	SA38-0673
<i>z/OS MVS System Messages, Vol 7 (IEB-IEE)</i>	SA38-0674
<i>z/OS MVS System Messages, Vol 8 (IEF-IGD)</i>	SA38-0675
<i>z/OS MVS System Messages, Vol 9 (IGF-IWM)</i>	SA38-0676
<i>z/OS MVS System Messages, Vol 10 (IXC-IZP)</i>	SA38-0677
<i>z/OS MVS Installation Exits</i>	SA23-1381

Publication Title	Order Number
<i>z/OS MVS Diagnosis: Tools and Service Aids</i>	GA32-0905

z/OS information

This information explains how z/OS references information in other documents and on the web.

When possible, this information uses cross document links that go directly to the topic in reference using shortened versions of the document title. For complete titles and order numbers of the documents for all products that are part of z/OS, see *z/OS Information Roadmap*.

To find the complete z/OS library, including the z/OS Information Center, go to the z/OS Internet library (<http://www.ibm.com/systems/z/os/zos/bkserv/>).

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- Visit the IBM Support Portal at z/OS support page (<http://www.ibm.com/systems/z/support/>).

Summary of changes

This information includes terminology, maintenance, and editorial changes. Technical changes or additions to the text and illustrations are indicated by a vertical line to the left of the change.

Summary of changes for z/OS Version 2 Release 1 (V2R1) as updated September, 2014

The following changes are made for z/OS V2R1 as updated September, 2014.

Changed

- “ARCBDEXT: Data Set Backup Installation Exit” on page 156 and “ARCMDEXT: Space Management Exit” on page 167 include SETSYS commands with the ZCOMPRESS parameter.
- “ADRUF0 Parameter List” on page 224.

z/OS Version 2 Release 1 summary of changes

See the following publications for all enhancements to z/OS Version 2 Release 1 (V2R1):

- *z/OS Migration*
- *z/OS Planning for Installation*
- *z/OS Summary of Message and Interface Changes*
- *z/OS Introduction and Release Guide*

Chapter 1. Introduction

DFSMS installation exits allow you to extend the capabilities of DFSMS to customize your installation's z/OS operation. You can also create standard user exits that your application programmers can use from their programs.

Choosing between Installation and User Exits

You might decide to customize DFSMS to:

- Enforce your standards.
- Intercept errors for analysis and additional processing.
- Add specialized tape label processing.
- Tailor I/O processing.
- Extend security controls.
- Change or bypass processing.

There are two ways to customize with exits in DFSMS. Choose an installation exit if the areas you need to customize affect every user of a function. These exits affect the entire installation's processing. Or, choose a user exit if the application programmers should have the opportunity to bypass the modification or to use their own. Whichever exit you choose, consider the impact your modifications have on users especially because some changes can only be made with installation exits.

DFSMS is a licensed program and can be modified for your own use only. IBM supports and maintains only unmodified IBM-supplied modules.

Using Installation Exits

DFSMS provides replaceable modules or exit points for installation exit routines that modify DFSMS system functions. A replaceable module is an IBM-supplied module that you can modify or replace.

Following are the types of replaceable modules or exit locations that are defined as installation exits:

- Dummy modules. The IBM-supplied module does not perform a useful function, it just supplies a return code to its caller. For example, the DADSM exit routines are dummy modules.
- Functional modules. The IBM-supplied module already performs a useful function. Although you can replace these modules, carefully consider whether you should preserve the IBM-supplied functions. For example, the data management abend installation exit (IFG0199I) is a functional module.
- No module. IBM does not supply a module, but does supply an exit point so that you can create an exit routine if you desire. If you do not supply a routine, the exit is not taken. For example, the nonstandard tape label processing exit points do not come with a replaceable module.

Any modules you create for installation exits must be reentrant and refreshable. You can install them during system installation by using SMP/E or you can link-edit the module into the appropriate library.

Installation exits are available at a variety of points in DFSMS processing. The sections for each exit documented in this information specify where in the system's processes the exits are called.

Using User Exits

DFSMS provides user exit locations as part of macros and commands where you can specify the name or address of your user-written exit routine. The DCB macro, VSAM macros, and some access method services commands contain parameters in which you specify the address or name of your exit routine. Some data set utility programs also provide user exit locations for modifying data set processing.

You can create a library of proven user exits to provide standard functions for frequently used exits; however, each user program must request the exits. Application programmers can create their own exit routines instead of the ones you provide.

User exit routines do not need to be reentrant.

User exits are available at various points in data set processing, such as:

- End-of-data
- I/O errors
- Logical errors
- Non-VSAM abend conditions
- Open, close, and end-of-volume processing
- DESERV macro processing

For more information on the user exits available in DFSMS, see the following publications.

Document	Order Number
<i>z/OS DFSMS Access Method Services Commands</i>	SC23-6846
<i>z/OS MVS Program Management: Advanced Facilities</i>	SA23-1392
<i>z/OS DFSMS Using Data Sets</i>	SC23-6855
<i>z/OS DFSMSdfp Utilities</i>	SC23-6864
<i>z/OS DFSMSrmm Implementation and Customization Guide</i>	SC23-6874

The DESERV user exit is described in *z/OS DFSMSdfp Advanced Services*.

Programming Considerations

Most requirements for coding vary depending on the part of DFSMS you customize. Be aware of these:

- The examples in this information are written in assembler language and you can also create exits in assembler.
- At entry to your exit routine, save all registers and restore them before you return to your calling routine. The section for each exit specifies any registers that you must return with special contents. For example, frequently you must supply a return code in register 15 upon returning to DFSMS processing.
- If you replace a module, make sure you thoroughly test it before you make it available.
- Your routine should be reentrant so it can handle concurrent requests.

- Keep an unmodified copy of any replaceable modules you modify.

Installing Exits

There are two types of installation exits:

- An IBM-supplied routine which the system programmer replaces, usually a dummy routine
- A new routine that the system programmer adds to the system

In this information, the term *installation* refers to one or more computing systems, the work the systems perform, and the people who manage, operate, and service the systems, apply the systems to problems, and use the output they produce.

The term *installation exit* refers to a routine which the system programmer adds or replaces in the operating system. It does not refer to the process of installing the operating system.

If you install an installation exit, you should use SMP/E. You can do that before or after the product is installed. After following these steps, do the APPLY or ACCEPT or both steps. For additional information see *SMP/E for z/OS Reference*.

Replacing an Existing Exit

The following shows SMP/E system modification statements. Follow these steps to replace a module which was supplied by IBM or by the installation.

```
++USERMOD(changename) /* Replacement of existing module */
.
++VER(Z038) FMID(fmid) PRE(xxxxxxx) SUP(yyyyyyy)
.
++SRC(modname) SYSLIB(SUSERLIB) DISTLIB(ASRCLIB)
.
```

Figure 1. Replacing an Existing Exit

Explanation of Figure 1:

1. Replace *changename* with a name to identify the system change. For example, you might select the name UPDATE5.

```
++USERMOD(changename) /* Replacement of existing module */
```

2. In place of *fmid*, use the actual FMID (function modification identifier). You can find this in the report generated by the SMP/E list command LIST SYSMODS. When you first install this exit, you probably will omit the *PRE(xxxxxxx) SUP(yyyyyyy)* because there probably is no prerequisite or superseding. If you later replace your own exit, you will code a different *changename* on the ++USERMOD statement and use the old *changename* with the SUP keyword.

```
++VER(Z038) FMID(fmid) PRE(xxxxxxx) SUP(yyyyyyy)
```

3. Replace *exitname* with the name of the exit. For some exits, the entry point name must match the exit name. The control section (CSECT) name should be the same name unless you choose a different name and code that name with the CSECT keyword. SYSLIB points to the target source library which contains the source code. You can omit the DISTLIB keyword and value unless stated

Replacing an Existing Exit

otherwise in this information. It is only needed when SMP/E has copied the existing routine into the system while copying an entire library.

```
++SRC(exitname) SYSLIB(SUSERLIB) DISTLIB(ASRCLIB)
```

4. Place the source code after the ++SRC statement.

```
4. (source code)
```

If you prefer, you can code the equivalent of a sequential concatenated DD statement as shown below:

```
// DD DSN=SYSPROG.EXIT.S.OBJ(modname),DISP=SHR
```

Adding a New Exit

This publication describes three dynamic exits. IBM suggests that you use SMP/E to install them. They require definition as described in Chapter 9, “IEHINITT Dynamic Exits,” on page 237 and in Chapter 4, “Pre-ACS Installation Exit IGDACSXT,” on page 131.

The following example shows SMP/E system modification statements to add a new module which does not replace an exit.

```
++USERMOD(changename) /* USERMOD for new module. Has JCLIN */  
.  
++VER(Z038) FMID(fmid) PRE(xxxxxxx) SUP(yyyyyyy)  
.  
++JCLIN .  
// EXEC LINKS,  
// PARM='NCAL,LIST,XREF,RENT,LET',NAME=targlib  
//SYSEXITS DD DISP=SHR,VOLUME=(,RETAIN),DSNAME=exitlibrary  
//SYSLIN DD *  
  INCLUDE SYSEXITS(exitname)  
  NAME exitname(R)  
/*  
++ MOD(exitname) LEPARM(LET,LIST,NCAL,RENT,XREF) .  
  (object module)
```

Figure 2. Installing a New Exit

Explanation of Figure 2:

1. Replace *changename* with a name to identify the system change. For example, you might choose a name such as UPDATE6.

```
++USERMOD(changename) /* USERMOD for new module. Has JCLIN */
```

2. In place of the *fmid*, use the actual FMID (function modification identifier). When you first install this exit, omit the *PRE(xxxxxxx) SUP(yyyyyyy)* because there probably is no prerequisite or superseding. If you later replace your own exit, you will code a different *changename* on the ++USERMOD statement and use the old *changename* with the SUP keyword.

```
++VER(Z038) FMID(fmid) PRE(xxxxxxx) SUP(yyyyyyy)
```

3. Replace the link edit or binder options in quotation marks as appropriate. Do not specify AC(1) directly with JCL. That would be a possible violation of system integrity and would serve no purpose. System integrity rules are described in *z/OS MVS Programming: Authorized Assembler Services Guide*. That

would give APF authorization and allow someone to call the exit. Replace *targetlib* with the DD name for the target library. The typical DD name is LINKLIB or LPALIB.

```
// PARM='NCAL,LIST,XREF,RENT,LET',NAME=targetlib
```

- Replace *exitlibrary* with the DD name of a PDS for load modules or a PDSE for program objects. When you later submit an SMP/E ACCEPT statement, SMP/E will call the linkage editor or binder to store the exit in this library. You can choose a different name to replace SYSEXITS on this line and in the INCLUDE line.

```
//SYSEXITS DD DISP=SHR,VOLUME=(,RETAIN),DSNAME=exitlibrary
```

- Replace the three occurrences of *exitname* with the name of the exit stated in this publication. For some exits, the entry point name must match this name. The CSECT name should be the same name unless you choose a different name and code that name with the CSECT keyword. You can omit the DISTLIB keyword and parameter because that information is in the JCLIN statements. Some exit descriptions show control statements which you must use instead of these INCLUDE and NAME statements.

```
INCLUDE SYSEXITS(exitname)
NAME exitname(R)
/*
++ MOD(exitname) LEPARM(LET,LIST,NCAL,RENT,XREF) .
```

- Place the object module after the ++MOD statement.

```
6. (object module)
```

Testing Exits

You can use several techniques to make your exit testing safer and easier. They include:

- Protecting the system from exit errors
- Invoking dumps, either to retrieve debugging information or to determine what information is available in system data areas
- Issuing messages from the exits.
- Tracing module flow in OPEN, CLOSE and EOVS.

Protecting the System from Exit Errors

To protect the system from exit errors, you should:

- Avoid frequent IPLs during testing because the exits reside in the link pack area (LPA).
- Prevent overwriting of vital storage because exits typically run in protection key zero.
- Limit the scope of the exit so that testing can proceed with minimal impact on other work in the system.

For exits that reside in SYS1.LPALIB you can at least partially resolve these problems by:

- Writing a test exit and placing it in a modified LPA library
- Placing the original exit code in another library, such as SYS1.LINKLIB

Testing Exits

You can then limit the front-end test exit in scope (testing for specific job names, for example). Afterwards, when it completes its task, the test exit gives control to the original exit code outside the LPA.

The test exit, after being coded and tested, is unlikely to need frequent changes. The original exit is now in another library, where it can be changed without the assistance of an IPL. This eliminates the need for reentrant code in the original exit during testing, because it is loaded for each invocation. Run additional tests later with the original exit in the LPA to ensure that exits are truly reentrant.

A safety feature of this testing method is that, should something be wrong with the test exit, you can eliminate it by an IPL without the MLPA parameter. You should run an exit from outside the LPA only in a testing environment because of the overhead involved in loading the exit each time it is entered.

After the exit is in production mode, you can prevent unexpected problems by having the exit check the contents of the CVTUSER field (at offset 204 in the CVT). If the contents are zero (the usual case if CVTUSER is not being used by your installation), the exit should proceed. If not, it should return to the caller without taking further action (except to set register 15 to zero). When the exit is being used and an unexpected error is encountered, the contents of CVTUSER should be set to a nonzero value with console alter or display functions. This temporarily disables the exit code (a re-IPL causes CVTUSER to become zero again, reactivating the exit).

Invoking Dumps

While testing your exit, you might need a dump to debug or to examine data areas to determine where to look for information your exit requires. For general information on using dumps, refer to *z/OS V2R1.0 MVS Diagnosis: Tools and Service Aids*. For information on analyzing dumps, refer to *z/OS V2R1.0 MVS Diagnosis: Reference*. For information on requesting and reading dumps, refer to *z/OS Problem Management*. The items in this topic contain useful advice for calling dumps.

Issuing the ABEND Macro in an Exit

If an ABEND is issued explicitly from a preprocessing exit entered for allocation (IGGP00), you get message IEF197I SYSTEM ERROR DURING ALLOCATION. The job attempting the allocation fails with a JCL error, and a dump is not called. We do not recommend issuing ABEND alone for getting the information you need in that exit, but it is useful in other exits.

Setting CVTSDUMP

The CVTSDUMP flag in the CVT can be set on to cause dumps to SYS1.DUMP to be started when ABEND is issued from a DADSM function (this includes the exits). This flag is at offset 272 in the CVT, and can be set on with the console alter or display functions. If you are testing under VM, use the appropriate CP commands (such as DISPLAY and STORE).

Issuing the SDUMP Macro

You can call dumps from exits with the SDUMP macro. As an alternative to the CVTSDUMP procedure described in Setting CVTSDUMP, this eliminates modifying storage to start the dump. For information on the syntax and coding of the SDUMP macro, refer to *z/OS V2R1.0 MVS Diagnosis: Tools and Service Aids*. For information on analyzing dumps, refer to *z/OS V2R1.0 MVS Diagnosis: Reference*. For information on requesting and reading dumps, refer to *z/OS Problem*

Management and *z/OS V2R1.0 MVS Diagnosis: Reference*. For information on the SVC dump that is produced by issuing the the SDUMP macro, refer to *z/OS Problem Management*.

Using the Console DUMP Command

By issuing a WTOR from the exit and letting the exit wait for the reply, you can suspend the exit's processing at any point. From there you can start a console dump to SYS1.DUMP using the DUMP operator command.

Issuing Messages

To check that your exit is functioning correctly, especially during the early stages of testing, you can enter messages giving the current status of processing. For example, if you are testing a DADSM exit, you can enter a message early in the exit giving the reason for entry (allocate, extend, scratch, partial release, or rename). If you use WTO with a routecode of 11 (sometimes called 'write to programmer'), the message appears on the output of the job that issued the DADSM request. Messages can also indicate that certain data areas have been found successfully and can display selected contents of data areas.

When the exit begins handling large numbers of jobs, remove the code that produces these messages. Large numbers of messages consume system message buffers, and the text unnecessarily adds to the user's output. Some exception messages might be required.

Tracing Module Flow in OPEN, CLOSE and EOVS

The OPEN, CLOSE and EOVS functions support a function called module flow tracing. It is for debugging system code and can help with debugging the OPEN, CLOSE and EOVS exits that are described in Chapter 3, "Tape Label Processing Installation Exits," on page 65. You can request this function by coding DIAGNS=TRACE on the DD statement. You also must start generalized trace facility (GTF) to trace USR events. *z/OS DFSMSdfp Diagnosis* describes OPEN, CLOSE, and EOVS module flow tracing. *z/OS MVS Diagnosis: Tools and Service Aids* describes GTF.

Chapter 2. Data Management Installation/Dynamic Exits

This topic discusses how installation-written exit modules can:

- Take control before and after DADSM processing.
- Take control during open for a DCB.
- Recover from errors that can occur during the opening, closing, or handling of an end-of-volume condition for a data set associated with the user's task.
- Bypass, limit, or override system-calculated values that assist you in selecting optimum DASD data set block size or control interval size.
- Alter messages sent to 3480, 3490, and 3590 tape operators.

You can substitute your own exit routines for the data management replaceable modules listed in Table 1.

Table 1. Data Management Replaceable Modules

Module Name	Description	When Available
IFG0EX0B	DCB open installation exit	At open
IFG0199I	Data management abend installation exit	Open, close, end-of-volume abnormal conditions
IGBDCSX1 IGBDCSX2	Precalculation and postcalculation exit	DASD calculation services
IGGDARU3	DADSM RENAME postprocessing exit	Before exit from RENAME
IGGDASU3	DADSM SCRATCH postprocessing exit	Before exit from SCRATCH
IGXMSGEX	Message display exit	Before end of tape cartridge message display processing

The data management replaceable modules you replace must be named the same as the IBM-supplied modules. In general, the module you replace must:

- Handle multiple requests (be reentrant).
- Reside in SYS1.LPALIB (or be link-edited into LINKLIB).
- Save and restore registers.

You can also add an exit routine for the data management dynamic exits listed in Table 2.

Table 2. Data Management Dynamic Exits

Module Name	Description	When Available
IGGPREE0_EXIT IGGPOST0_EXIT	DADSM pre-processing and post-processing dynamic exit routine. The system will add IGGPRE00 and IGGPOST0 as an exit routine to their respective dynamic exit.	DADSM create, extend, scratch, partial release and rename functions

Other products can impact the modifications you install. For example, RACF®, a component of the Security Server for z/OS, takes control at the same time as some

of the installation exits. They could compete for resources.

DADSM Installation/Dynamic Exits General Information

This topic addresses considerations specific to the DADSM installation exits.

User Interfaces with DADSM Installation/Dynamic Exits

Design and implement the interface between your DADSM exits and the system so the advantages are apparent and acceptable to users. You might be introducing new restrictions to users' methods and you might want to explain the new advantages.

Messages

You can get DADSM exit messages from:

- The system, from errors or return codes produced by the exits
- Programs that use DADSM functions, which might get new return codes from DADSM because of your exit routines
- The exits themselves, which can issue messages directly.

System Messages

Following are some of the messages the system might issue when DADSM preprocessing and postprocessing exits have been implemented.

IEF197I SYSTEM ERROR DURING ALLOCATION

This message might appear if the exit abends while entered for an allocation request.

IEC223I rc,mod,jjj,sss, ddname[-#],dev,ser,dsname

Where **mod** is IGGPRE00. This message might appear if a program check occurs in the exit during a create request.

IEF274I jjj sss ddn SPACE REQUEST REJECTED BY INSTALLATION EXIT, REASON CODE nnnn

This message is produced when the exit has rejected a DADSM create request without allowing retry on other non-system-managed volumes (the return code in register 15 is 8, as set by the exit). The reason code is the code placed in the installation reject reason code field IEXREASN of the exit's parameter list by the exit before returning to DADSM. The *jjj* value indicates the job, *sss* the step, and *ddn* the ddname.

IEF275I jjj sss ddn SPACE REQUEST CANNOT BE SATISFIED, INSTALLATION EXIT REASON CODE nnnn

This message is produced when the exit has rejected a DADSM Create request and allowed retry on other non-system-managed volumes, but the request could not be satisfied (the return code in register 15 is 4, as set by the exit). The reason code is the code placed in the installation reject reason code field IEXREASN of the exit parameter list by the exit before returning to DADSM. The *jjj* value indicates the job, *sss* the step, and *ddn* the ddname.

Messages from Other Programs

Utility programs can provide nonzero return codes received from DADSM in their messages. Here is a summary:

- Create
 - X'B0' exit unconditionally rejected the request; no further volumes attempted
 - X'B4' exit conditionally rejected the request; try another volume

- Extend
 - -20 exit rejected the request
- Scratch
 - 4 exit rejected the request (in addition to the other meanings for this return code)
- Partial Release
 - 16 exit rejected the request (in addition to the other meanings for this return code)
- Rename
 - 4 exit rejected the request (in addition to the other meanings for this return code).

Exit Messages

If you want to selectively reject allocation requests, you can set installation reject reason codes in the exit parameter list and allow the IEF274I and IEF275I messages or the corresponding dynamic allocation reason codes (X'47B0' and X'47B4') to appear, rather than creating your own messages from the exit. It might be better to have a message or code that is documented in a standard publication and then document the rejection reason codes locally, than to have a completely new message. That way the user can look up the IEF messages in *z/OS MVS System Messages, Vol 8 (IEF-IGD)* to understand why the job failed. If you do create your own message, make the contents self-explanatory so that separate documentation is not necessary.

Sometimes it helps to provide additional information. For example, if you are monitoring how much DASD space is used by a specific user or set of users, you might want to document the current running space total issued when you reject a job that asked for space that would make its total too high. Then the user has some basis on which to make a decision- perhaps to resubmit the job and ask for less space on that DD statement. This type of space management function is better performed using ACS routines, which are described in *z/OS DFSMSdfp Storage Administration*.

If your installation has someone who monitors I/O-related messages, you might want to produce a warning message when a running space total is getting close to being exceeded. There is little point in putting this message on the user's listing unless that user is the only one whose space is being accumulated against that identifier. A warning message sent to the appropriate routing code alerts a space manager that a space shortage problem is imminent.

Documenting Your Exits

Provide documentation to publicize your space control policies. Logical section headings might be:

- The need for space control
- Space usage standards
- How usage standards are enforced
- Space conservation hints
- New messages
- Installation rejection reason codes

DADSM Pre- and Post processing Dynamic Exits (IGGPRE00_EXIT, IGGPOST0_EXIT)

All DADSM functions (create, extend, scratch, partial release, and rename) call a common pre-processing dynamic exit routine (IGGPRE00_EXIT) and a common post-processing exit routine (IGGPOST0_EXIT). The system adds the IGGPRE00 and IGGPOST0 modules as exit routines to their associated dynamic exits. These two modules are equivalent to what was provided in releases prior to z/OS V1R13. DADSM functions will call each dynamic exit using dynamic exit services (CSVDYNEX) during pre- and post-processing so that each added exit routine to IGGPRE00_EXIT and IGGPOST0_EXIT is called, allowing the exit routine to gain control before and after DADSM processing.

Adding DADSM pre and post processing exit routines

All existing operator commands and system services that apply to managing dynamic exits will apply to these two dynamic exits. For example, to add an exit routine to a dynamic exit the following services could be used:

- A program can use CSVDYNEX REQUEST(ADD).
- The SETPROG EXIT operator command.
- The EXIT statement of a PROGxx PARMLIB member, followed by the SET PROG=xx operator command.

For example using the SETPROG operator command, the following will add the IGGPRE01 exit routine to the pre-processing dynamic exit of IGGPRE00_EXIT

```
SETPROG EXIT,ADD,EXITNAME=IGGPRE00_EXIT,MODNAME=IGGPRE01
```

You can now have multiple exit routines associated with each dynamic exit.

Replacing an already active IGGPRE00 or IGGPOST0 dynamic exit routine without an IPL is also supported. For example, the SETPROG EXIT,DELETE operator command can be issued followed by the SETPROG EXIT, ADD operator command to replace a dynamic exit routine.

Characteristics of the IGGPRE00_EXIT and IGGPOST0_EXIT Exit Dynamic Exits, Exit Routines

The exit routines run under the following conditions:

- Reenterable
- Protection key zero
- Supervisor state
- With no locks held

The exit routines can run in either 24-bit or 31-bit addressing mode. If they operate in 24-bit mode, consider the following:

For create, extend, and partial release, the DADSM caller passes the address of the job file control block (JFCB), or of a copy of the JFCB, in the IEXPTR1 field of the parameter list. It might be a 31-bit address, so if your exit routine is called for either create, extend, or partial release, and the JFCB resides above the 16MB line, your routine must be in 31-bit addressing mode before using the IEXPTR1 field.

Please note that the references to IGGPRE00 and IGGPOST0 in the following sections generically refer to the exit routine(s) that have been added to the

IGGPRE00_EXIT and IGGPOST0_EXIT dynamic exits. The system will add IGGPRE00 and IGGPOST0 as exit routines, but others could be added.

Understanding when IGGPRE00_EXIT and IGGPOST0_EXIT dynamic exits, exit routines are available

IGGPRE00 receives control *after* the successful initial validity check, and *before* the first VTOC update. The parameter list passed to IGGPRE00 contains a function code, which identifies the DADSM function requested, and the addresses of required input data. IGGPRE00 receives control once for each volume in the volume list provided for scratch and rename. IGGPRE00 can use the IEXRSVWD field in the parameter list to pass data to IGGPOST0.

The operating system gives control to IGGPOST0 after a DADSM function has been completed or attempted. The system gives control to IGGPOST0 if it gives control to IGGPRE00, whether the DADSM function was successful or not. The system does not give IGGPOST0 control if it does not give IGGPRE00 control, nor if the DADSM function terminates abnormally. IGGPRE00 can establish a recovery routine, if required, to clean up system resources. The DADSM recovery routine does not give IGGPOST0 control. Input to IGGPOST0 is the same parameter list passed to IGGPRE00. No return codes from IGGPOST0 are defined.

The EOF mark that is written during creation of certain data sets (with primary space specified and either DSORG=PS or no DSORG) is written after IGGPOST0 receives control.

DADSM, or the program that invokes DADSM, acquires the system resources it needs to serialize system functions (by issuing enqueues, reserves, or others). These enqueues can prevent other system services from completing successfully. In particular, IGGPRE00 and IGGPOST0 must not issue dynamic allocation, open, close, end-of-volume, locate, or other DADSM functions, because they issue an enqueue on the SYSZTIOT resource. If the exit routines require access to an installation data set, the control blocks required to access that data set (DCB, DEB) should be built during system initialization (IPL, NIP).

The type and number of resources held by DADSM depend upon the DADSM function and which exit routine is being given control. For example, on entry to IGGPRE00, DADSM holds an enqueue on the VTOC and a reserve on the device for the volume specified by a scratch, rename, or partial release request. DADSM dequeues these resources before IGGPOST0 is given control.

You must anticipate potential system resource contention when IGGPRE00 or IGGPOST0 request services. For example, RACF services issue an enqueue on the RACF data set or a reserve on that data set's volume. This contention can cause system performance problems or an interlock condition.

Rejecting DADSM requests in IGGPRE00_EXIT dynamic exit, exit routines

To reject a DADSM request in IGGPRE00 provide either return code 4 or 8 to the calling DADSM function. A 4 indicates the request is rejected for the current volume, and might be retried on another volume. An 8 is an unconditional rejection.

Rejecting a Partial Release Request: If you reject a partial release request in IGGPRE00, partial release provides a return code that indicates an I/O error.

Data Management Exits

Rejecting a Scratch or Rename Request: If you reject a scratch or rename request in IGGPRE00, scratch and rename provide a status code that indicates an I/O error.

In the integrated catalog facility environment, VSAM deletes the VVR entry first and then calls DADSM to continue with the scratch of the format-1 DSCB when deleting a data set. If IGGPRE00 rejects the scratch request, the VVR entry has been deleted, but the format-1 DSCB still exists. This makes the data set inaccessible and corrupts the catalog by creating inconsistencies between the BCS, VVDS, and VTOC. **You are responsible for ensuring that your IGGPRE00 routine does not reject a DADSM scratch request for a VSAM data set.** You can test bit DS1ORGAM in the DSCB, which is on for VSAM data sets.

Rejecting a Create (Allocate) Request in IGGPRE00: If you reject a create (allocate) request in IGGPRE00, create (allocate) provides either return code X'B0' or X'B4' to its caller. You can write IGGPRE00 to provide a reason code in the IEXREASN field of the parameter list, which create returns to its caller along with the X'B0' or X'B4' return code. The reason code appears as the last two bytes of the diagnostic information displayed as part of message IGD17040I.

Scheduler allocation treats return code X'B0' from allocate as an unconditional rejection of the allocate request. Scheduler allocation treats X'B4' as a conditional rejection of the allocate request, only rejecting 'the request' for the volume being processed. If the allocate request is not for a specific volume, another volume can be chosen and the allocate function retried.

Rejecting an Extend Request: If you reject an extend request in IGGPRE00, extend provides error return code X'FFFF FFEC' to its caller. If the caller is end-of-volume, end-of-volume issues an E37-0C abend.

Returning a Model Format-1 DSCB

For create and extend requests on a new volume, IGGPRE00 can return, in the IEXFMT1 field of the parameter list, the address of the data portion of a model format-1 DSCB, which starts with field PD1FMTID, also called DS1FMTID. Move the DSCB to the create or extend work area before you build the format-1 DSCB. The only fields that can be nonzero in the model DSCB are the DS1REFD field (the data-last-referenced field) and fields currently unused. Failure to zero out all fields, except for DS1REFD and all currently unused fields in the model format-1 DSCB, can abnormally terminate the task or cause unpredictable results. All other fields are initialized by allocate or extend.

IGGPRE00 might not provide a DSCB address in the IEXFMT1 field for a VIO allocate request (indicated by flag, IEXVIO, set to one), or if a partial DSCB has been provided to allocate instead of a JFCB (indicated by flag IEXMF1 being set to one). In the latter case, IEXFMT1 is passed to IGGPRE00, initialized to the address of the PD1FMTID field of the partial format-1 DSCB (supplied to allocate by its caller) in the create work area, and DS1REFD can be initialized by IGGPRE00. If extend is successful, IEXFMT1 is zeroed out before giving control to IGGPOST0.

Registers on Entry to the IGGPRE00 and IGGPOST0 Exit Routines

Following are the registers on entry to the IGGPRE00 and IGGPOST0 exit routines.

Register

Contents

- 1 Address of the pre- or postprocessing exit parameter list
- 0, 2-12 Not applicable

- 13 Address of an 18-word save area
- 14 Return address to DADSM
- 15 Address of the entry point to IGGPRE00 or IGGPOST0

IGGPRES0_EXIT and IGGPOST0_EXIT dynamic exits, exit routine Parameter List

Register 1 contains the address of the DADSM preprocessing or postprocessing exit parameter list, obtained from storage below the 16MB line. The IECIEXPL macro maps the parameter list shown in Table 3:

Table 3. IGGPRE00, IGGPOST0 Parameter List. Mapped by IECIEXPL.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	4	IEXID	ID = 'IEPL'
04 (X'04')	1	IEXLENG	Length of parameter list
05 (X'05')	1	IEXFUNC	DADSM function code
	0000 0111	IEXVEXT	Extend (VSAM caller without DEB parameter). If IEXVEXT is on, you must ensure that your exit routines do not attempt to use the IEXPTR2 field (DEB address is undefined for the extend function).
	0000 0110	IEXPREL	PARTREL partial release
	0000 0101	IEXREN	Rename
	0000 0100	IEXPR	Partial release
	0000 0011	IEXSCR	Scratch
	0000 0010	IEXEXT	Extend
	0000 0001	IEXALL	Create (allocate)
	06 (X'06')	1	IEXEXTCD	Extend code
1000 0001			Extend VSAM data set on current volume
0000 0100			Extend non-VSAM data set on new volume
0000 0001			Extend non-VSAM data set on current volume

Data Management Exits

Table 3. IGGPRE00, IGGPOST0 Parameter List (continued). Mapped by IECIEXPL.

Offset	Length or Bit Pattern	Name	Description
07 (X'07')	1	IEXFLAG	Flag byte
	1...	IEXENQ	VTOC is enqueued upon entry
	.1..	IEXVIO	VIO data set
	..1.	IEXMF1	IEXFMT1 points to PD1FMTID of a partial format-1 DSCB (partial DSCB passed as input to allocate, and JFCB is not available)
	...1	IEXFDSCB	Full format-1 DSCB (ALLOC=ABS)
	.... xxx.	IEXAVGR	Average record value. These bits apply only to the allocate function (IEXALL) with the JFCB specified (IEXPTR1). At most, one of these three bits might be on. If all are zero, this is not an average record space request.
	.... 1..	IEXAVGRU	Average record space request. Multiply JFCBPQTY and JFCBDRLH to get requested primary space in bytes. Multiply JFCBSQTY and JFCBDRLH to get requested secondary space in bytes.
	.... .1..	IEXAVGRK	Average record space request. Multiply JFCBPQTY, JFCBDRLH, and 1024 to get requested primary space in bytes. Multiply JFCBSQTY, JFCBDRLH, and 1024 to get requested secondary space in bytes.
	.... ..1.	IEXAVGRM	Average record space request. Multiply JFCBPQTY, JFCBDRLH, and 1,048,576 to get requested primary space in bytes. Multiply JFCBSQTY, JFCBDRLH, and 1,048,576 to get requested secondary space in bytes.
	.... ...1	IEXFEDT2	Extent descriptor table 2 (pointed to by IEXEDT2) contains valid extent information. This bit is always on for pre- and postexit for scratch and partial release and postexit for create and extend. If you want your exit also to run on earlier systems that do not have an extent descriptor table 2, then IBM recommends this logic for non-VIO data sets: If IEXFEDT2 is on, then use IEXEDT2, otherwise use IEXEDT1.
08 (X'08')	2	IEXREASN	Installation reject reason code
10 (X'0A')	BIT(8)	IEXDSFLG	Data set indicators
	111.	*	RESERVED
	...1	IEXCOMPR	Compressable extended
	.... 1..	IEXPDSE	PDSE data set
	.... .1..	IEXSTRP	Extended format data set
	.... ..1.	IEXPDSEX	HFS data set
	.... ...1	IEXVSAM	VSAM data set
11 (X'0B')	1	IEXNUMF9	Number of contiguous format 9 DSCBs at the IEXFMT9 storage address that is provided by the pre-exit for create. In z/OS V1R10, the values of zero and one are valid.

Table 3. IGGPRE00, IGGPOST0 Parameter List (continued). Mapped by IECIEXPL.

Offset	Length or Bit Pattern	Name	Description
12 (X'0C')	4	IEXUCB	Address of the UCB. It will be an actual 31-bit UCB address above or below the 16MB line. The UCB address is not available to the pre-exit for VIO allocation.
16 (X'10')	4	IEXPTR1	Address of one of the following: <ul style="list-style-type: none"> JFCB or a copy of the JFCB (create, extend, partial release) Data set name (PARTREL partial release) Scratch or rename parameter list (See <i>z/OS DFSMSdfp Advanced Services</i> for a description of the scratch or rename parameter list.) <p>When the scheduler work area (SWA) resides above the 16MB line, you might have to modify the exit routine references to the IEXPTR1 field. See "Characteristics of the IGGPRE00_EXIT and IGGPOST0_EXIT Exit Dynamic Exits, Exit Routines" on page 12 for further information.</p>
20 (X'14')	4	IEXPTR2	Address of one of the following: <ul style="list-style-type: none"> DEB (extend on old volume) DCB (partial release entered by CLOSE). Partial DCB (PARTREL partial release, caller is VSAM). DCBFDAD and DCBDEBA are defined, the associated DEB has been constructed; DEBDSCBA, DEBNMEXT, and the DEBDASD segments are defined. DEBDVMOD is not defined. Current volume list entry (scratch, rename)
24 (X'18')	4	IEXDSN	Address of the data set name
28 (X'1C')	4	IEXFMT1	Address of the 96-byte data portion of the format-1 DSCB (pre-exit for scratch; pre- and post-exit for partial release and rename; post-exit for create). Might be supplied by pre-exit of create, and extend on new volume, to serve as a model if IEXMF1 and IEXVIO are zero. The format-1 DSCB is mapped by the IECSDSL1 macro. You can find the fields in <i>z/OS DFSMSdfp Advanced Services</i> . For large format data sets, unique bit settings in fields DS1FLAG1 and DS1LSTAR may need to be examined.
32 (X'20')	4	IEXFMT9	Storage address of a format 9 DSCB model. Pre-exit and post-exit for create. Might be supplied by the pre-exit for create to serve as a model if IEXMF1 is zero. Allows the pre-exit to alter the contents of the following fields: DS9ATRI1, DS9ATRV1. DS9ATRI1 and DS9ATRI2 may contain reserved fields. The values in the remaining fields will have no effect. The exit should leave reserved fields as binary zeroes to prevent them from updating the real DSCB when IBM defines new fields in future releases.
36 (X'24')	4	IEXFMT3	Address of the format-3 DSCB (ALLOC=ABS)

Data Management Exits

Table 3. IGGPRE00, IGGPOST0 Parameter List (continued). Mapped by IECIEXPL.

Offset	Length or Bit Pattern	Name	Description
40 (X'28')	4	IEXEDT1, IEXEXTBL	Address of extent descriptor table 1 with 2-byte relative track addresses (pre- and postexit for scratch and partial release; postexit for create and extend). For the VIO create post-exit, this is the address of DS1EXT1 in the virtual format-1 DSCB (IEXEDT1 is a synonym for IEXEXTBL). If the volume capacity is more than 65,535 tracks, then this table does not contain extent information. There is no mapping macro for this table. This extent descriptor table is provided for coexistence with previous releases of the system. See the descriptions of IEXFEDT2 and IEXEDT2.
44 (X'2C')	4	IEXDCC	DADSM return code (post-exit only). The return code from the called DADSM function is put here.
48 (X'30')	4	IEXRSVWD	Reserved word for use by exit routine
52 (X'34')	4	IEXEDT2	Address of extent descriptor table 2 with 4-byte relative track addresses (pre- and postexit for scratch and partial release; postexit for create and extend). Macro ICVEDT02 maps this table. The format of this table is described in <i>z/OS DFSMSdfp Advanced Services</i> . For VIO create postexit, IEXEDT2 is the address of DS1EXT1 in the virtual format-1 DSCB. Also see bit IEXFEDT2.

System Control Blocks Used by IGGPRE00_EXIT and IGGPOST0_EXIT dynamic exits, exit routines

The common IGGPRE00 and IGGPOST0 parameter list contains the addresses of system control blocks. The following table shows the mapping macros:

Mapping Macro	Control Block
DCBD	DCB ¹
ICVEDT02	EDT02
IECIEXPL	DADSM pre- and postprocessing installation exit parameter list
IECPDSCB	Partial DSCB
IECDSL1	DSCB
IEFJFCBN	JFCB ¹
IEFTIOT1	TIOT ¹
IEFUCBOB	UCB ¹
IEZDEB	DEB ¹
IHADSAB	DSAB ¹

¹Only certain fields in these control blocks are intended as programming interfaces.

For create, extend, and partial release, the address of the JFCB passed to the user exit points to a copy of the real JFCB. Updating the JFCB copy does not cause a corresponding change to the real JFCB. During catalog processing, a dummy JFCB is built with minimal information and passed to DADSM for space allocation. Certain bits that are turned on in the real JFCB might not be turned on in this

dummy JFCB. For a create request on an SMS-managed volume, if the pre-processing exit changes any space amount, it will have no effect.

For partial release, the DCB and DEB whose addresses appear in the parameter list are created for internal DADSM processing only.

During extend processing for a VSAM data set, the exit is provided with the address of a dummy DEB. This DEB does not contain any extent information. DEBs for PDSEs and for sequential extended-format data sets contain incomplete extent information.

Registers on Return from the IGGPRE00_EXIT and IGGPOST0_EXIT dynamic exits, exit routines

When IGGPRE00 or IGGPOST0 returns to DADSM, register contents must be as follows:

Register

Contents

0-14 Same as on entry to IGGPRE00, IGGPOST0
15 Return code for IGGPRE00

IGGPRE00_EXIT dynamic exit, exit routine return codes

No return codes are defined for IGGPOST0. These return codes only apply to IGGPRE00.

Return Code

Description

00 (X'00')
Continue processing the DADSM request
04 (X'04')
Reject the request for the current volume. The request might be retried on another volume.
08 (X'08')
Unconditionally reject the DADSM request.

Scratch and Rename Installation Exits (IGGDASU3, IGGDARU3)

You can use the scratch and rename installation exits to do special processing after DADSM scratch and rename processing.

Replacing the Scratch and Rename Exit Routines

See “Replacing an Existing Exit” on page 3.

You can apply PTFs to scratch or rename with SMP/E without modifying your own versions of the two exit routines.

Characteristics of the Scratch and Rename Exit Routines

The exit routines run under the following conditions:

- Reenterable
- Protection key 5
- 31-bit addressing mode
- Standard linkage conventions

When DADSM scratch is called, IGGDASU3 receives control immediately *after* scratch processing completes.

Data Management Exits

When DADSM rename is called, IGGDARU3 receives control immediately *after* rename processing completes.

The DASSVCEP flag bit in the DASFLAG6 of the scratch parameter list, and the DARSVCEP flag bit in the DARFLAG4 field of the rename parameter list indicate whether the function was called through an SVC. You might test these bits in your exit routines to determine how the DADSM function was called.

Registers on Entry to the Scratch and Rename Exit Routines

Following is the list of registers on entry to the scratch and rename exit routines.

Register

Contents

- 1 Address of the parameter list used by all exit routines
- 0, 2-12 Not applicable
- 13 Address of an 18-word save area
- 14 Return address to DADSM scratch or rename
- 15 Address of the entry point to the exit routine

Scratch Parameter List (IGGDASCR)

Register 1 contains the address of the scratch parameter list used by IGGDASU3. See Table 4. The address of a list of DASD volumes is also passed to the exit routines in the DASAVOLL field of the scratch parameter list.

Table 4. Scratch Parameter List. Mapped by IGGDASCR.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	44	IGGDASCR	DADSM scratch parameter list
00 (X'0')	8	DASPLID	ID = 'IGGDASCR'
08 (X'08')	2	DASPVER	Version of parameter list
10 (X'0A')	2	DASPLEN	Length of parameter list
12 (X'0C')	1	DASPKEY	Key of parameter list
	xxxx	DASPSKEY	Storage key of parameter list
13 (X'0D')	1		Reserved
14 (X'0E')	2	DASHRTCD	DADSM scratch return code
16 (X'10')	4	DASDIAGI	Diagnostic information
16 (X'10')	1	DASERRCD	DADSM scratch error code
17 (X'11')	1	DASSFNID	DADSM scratch subfunction ID
18 (X'12')	1	DASSFRET	Subfunction return code
19 (X'13')	1	DASSFREA	Subfunction reason code
20 (X'14')	1		Reserved
21 (X'15')	1	DASFLAG2	SMS indicator flag
	1...	DASSMSG	System-managed data set
	.1..	DASUNCAT	Uncataloged system-managed data set
	..1.	DASCATCL	Catalog is the caller
	...1	DASGDGRO	GDG rolloff in progress
	.... 1..	DASGDGRN	GDG rolloff noscratch

Table 4. Scratch Parameter List (continued). Mapped by IGGDASCR.

Offset	Length or Bit Pattern	Name	Description					
22 (X'16')	1	DASFLAG3	Functionally authorized request flags (Part 1)					
	1... ..	DASFAUTH	Caller guarantees functional authorization of request					
	.1.. ..	DASSAUTH	Caller guarantees security authorization of request					
	..1.	DASPROFM	RACF profile managed by caller					
	...1	DASBTIOT	Bypass SYSZTIOT ENQ					
 1...	DASBDSN	Bypass SYSDSN ENQ					
1..	DASBDEB	Bypass DEB check (DSN not open)					
1.	DASNVALL	Do not dynamically allocate volumes					
23 (X'17')	1	DASFLAG4	Functionally authorized request flags (Part 2)					
	1... ..	DASVOLMT	Caller guarantees that the volume is already mounted					
24 (X'18')	1	DASFLAG5	Authorization not required request flags					
	1... ..	DASOVRPD	Override purge date					
	.1.. ..	DASVRFRD	Verify last-referenced-date unchanged (DFSMSHsm)					
	..1.	DASERASE	Erase all extents					
25 (X'19')	1	DASFLAG6	Parameter flag byte					
	x... ..	DASSVCEP	<table border="0"> <tr> <td>If</td> <td>Then</td> </tr> <tr> <td>0</td> <td>Scratch entered with SMS branch entry</td> </tr> <tr> <td>1</td> <td>Scratch entered at SVC entry point</td> </tr> </table>	If	Then	0	Scratch entered with SMS branch entry	1
If	Then							
0	Scratch entered with SMS branch entry							
1	Scratch entered at SVC entry point							
26 (X'1A')	2		Reserved					
28 (X'1C')	4	DASUCB	Address of primary mountable UCB. Can be captured or actual below the 16 MB line.					
28 (X'1C')	4	DASVDSCB	Address of UCB for a VIO data set					
32 (X'20')	4	DASAVOLL	Address of volume list mapped by (IGGDAVLL); see Table 6 on page 22.					
36 (X'24')	4	DASADSN	Address of data set name					
40 (X'28')	3	DASREFDT	Reference date to check (DFSMSHsm)					
43 (X'2B')	1		Reserved					

Rename Parameter List (IGGDAREN)

Register 1 contains the address of the rename parameter list used by IGGDARU3. The IGGDAREN macro maps the rename parameter list, shown in Table 5. The address of a list of DASD volumes is also passed to the exit routines in the DARAVOLL field of the rename parameter list.

Table 5. Rename Parameter List. Mapped by IGGDAREN.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	44	IGGDAREN	DADSM rename parameter list
00 (X'00')	8	DARPLID	ID = 'IGGDAREN'
08 (X'08')	2	DARPVER	Version of parameter list
10 (X'0A')	2	DARPLEN	Length of parameter list

Data Management Exits

Table 5. Rename Parameter List (continued). Mapped by IGGDAREN.

Offset	Length or Bit Pattern	Name	Description						
12 (X'0C')	1	DARPKKEY	Key of parameter list						
	xxxx	DARPSKEY	Storage key of parameter list						
13 (X'0D')	1		Reserved						
14 (X'0E')	2	DARHRTCD	DADSM rename return code						
16 (X'10')	4	DARDIAGI	Diagnostic information						
16 (X'10')	1	DARERRCD	DADSM rename error code						
17 (X'11')	1	DARSFNID	DADSM rename subfunction ID						
18 (X'12')	1	DARSFRET	Subfunction return code						
19 (X'13')	1	DARSFREA	Subfunction reason code						
20 (X'14')	1		Reserved						
21 (X'15')	1	DARFLAG2	SMS indicator flag						
	1...	DARSMMSG	SMS-managed data set						
	.1..	DARUNCAT	Rename uncataloged data sets only						
22 (X'16')	1	DARFLAG3	Functionally authorized request flags (Part 1)						
	1...	DARFAUTH	Caller guarantees functional authorization of request						
	.1..	DARSAUTH	Caller guarantees security authorization of request						
	..1.	DARPROFM	RACF profile managed by caller						
23 (X'17')	1	DARFLAG4	Functionally authorized request flags (Part 2)						
	x...	DARSVCEP	<table border="0"> <tr> <td>If</td> <td>Then</td> </tr> <tr> <td>0</td> <td>Rename entered with SMS branch entry</td> </tr> <tr> <td>1</td> <td>Rename entered at SVC entry point</td> </tr> </table>	If	Then	0	Rename entered with SMS branch entry	1	Rename entered at SVC entry point
	If	Then							
0	Rename entered with SMS branch entry								
1	Rename entered at SVC entry point								
.x..	DARBPDSC	When this bit is on, do not update "data set changed" bit in the format-1 DSCB							
24 (X'18')	4		Reserved						
28 (X'1C')	4	DARUCB	Address of primary mountable UCB. Can be captured or actual below the 16MB line.						
32 (X'20')	4	DARAVOLL	Address of volume list mapped by (IGGDAVLL); see Table 6.						
36 (X'24')	4	DARADSN	Address of old data set name						
40 (X'28')	4	DARANDSN	Address of new data set name						

DADSM Volume List (IGGDAVLL)

Table 6 shows the DADSM volume list mapped by IGGDAVLL.

Table 6. DADSM Volume List (Mapped by IGGDAVLL)

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	16	IGGDAVLL	DADSM volume list
00 (X'00')	16	DAVLLHDR	Volume list header
00 (X'00')	8	DAVLLID	ID = 'IGGDAVLL'
08 (X'08')	2	DAVLVER	Version of volume list
10 (X'0A')	2	DAVLLEN	Length of volume list header

Table 6. DADSM Volume List (Mapped by IGGDAVLL) (continued)

Offset	Length or Bit Pattern	Name	Description
12 (X'0C')	1	DAVLKEY	Key of volume list
	xxxx ...	DAVLSKEY	Storage key of parameter list
13 (X'0D')	1		Reserved
14 (X'0E')	2	DAVCOUNT	Number of volumes
16 (X'10')	12	DAVLVOLE	Volume entries; number = DAVCOUNT
16 (X'10')	4	DAVLUCBT	Device type
20 (X'14')	6	DAVLVOLS	Volume serial number
26 (X'1A')	1	DAVLSSTC	Secondary status byte
27 (X'1B')	1	DAVLSTAT	Scratch or rename status byte

Registers on Return from the Scratch and Rename Exits

When you return control to DADSM, register contents must be as follows:

Register

Contents

0-14 Same as on entry to the exits

dDASD Calculation Services Installation Exits (IGBDCSX1, IGBDCSX2)

Many of the system's services use DASD calculation services (DCS) to determine optimum block sizes for non-VSAM data sets and optimum control interval sizes for VSAM data sets. You can use the DASD calculation services installation exits to influence the size chosen. The precalculation exit routine, IGBDCSX1, indicates to DCS which value to use when calculating the optimum block or control interval size. The postcalculation exit routine, IGBDCSX2, lets you override the DCS-calculated optimum block or control interval size with your own value.

Replacing the IGBDCSX1 and IGBDCSX2 Exit Routines

See "Replacing an Existing Exit" on page 3. Your routine must have an entry point name that matches the exit name. Your CSECT is linked together with certain system CSECTs into a single load module.

Characteristics of the IGBDCSX1 and IGBDCSX2 Exit Routines

IGBDCSX1 and IGBDCSX2 run under the following conditions:

- Reenterable
- Calling program's protection key
- Runs AMODE (31), RMODE (ANY), and resides in ELPA storage
- Calling program's system state (problem or supervisor)
- DCS provides 1KB of working storage for each exit routine

IGBDCSX1 gains control *before* DCS calculates the optimum block size or control interval size. You can use IGBDCSX1 to either bypass or limit the DCS-calculated optimum block or control interval size. IGBDCSX2 gains control *after* DCS calculates the statistics you requested. You can use it to override the DCS-calculated optimum block or control interval size with a value of your own.

Data Management Exits

DCS retrieves DASD data set information, performs calculations, and returns statistics to its caller. These statistics are primarily provided for display by ISMF (Interactive Storage Management Facility). The values returned are designated in kilobytes or bytes, rather than cylinders or tracks, to eliminate device dependency.

IGBDCSX1 and IGBDCSX2 allow you to exercise control over the values returned. However, because the access methods limit maximum block size to 32,760, if an exit routine returns an override or limit greater than this, DCS sets the block size to 32,760. DCS also verifies that exit-supplied control interval size override values do not violate VSAM restrictions.

Registers on Entry to the IGBDCSX1 and IGBDCSX2 Exit Routines

The following is a list of the registers on entry to the IGBDCSX1 and IGBDCSX2 exit routines.

Register

Contents

- 1 Address of a 4-byte field containing the address of the parameter list
- 0, 2-12 Not applicable
- 13 Address of an 18-word save area
- 14 Return address to DCS
- 15 Address of the entry point to IGBDCSX1 or IGBDCSX2

IGBDCSX1 and IGBDCSX2 Parameter List

Register 1 contains an address of a 4-byte field that has the address of the DCS pre- and postcalculation exit parameter list. The IGBDCSIE macro maps the parameter list, shown in Table 7. For PDSEs and extended format data sets the block size is simulated and DASD calculation service returns device-independent larger values.

Table 7. IGBDCSX1/IGBDCSX2 Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		DCSIEPL	DCS installation exit parameter list
00 (X'00')	44	DCSIEDSN	Data set name

Table 7. IGBDCSX1/IGBDCSX2 Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
44 (X'2C')	2	DCSIEDSO	Data set organization (only physical sequential, partitioned and VSAM should come to this exit). The unmovable bit might be on if not SMS-managed.
	X'8000'	DCSIEIS	Indexed sequential organization
	X'4000'	DCSIEPS	Physical sequential organization, standard or extended format, possibly compressed.
	X'2000'	DCSIEDA	Direct organization (BDAM)
	X'1000'	DCSIECX	BTAM or QTAM line group
	X'0200'	DCSIEPO	Partitioned organization (partitioned data set or PDSE)
	X'1011'	DCSIEU	U-unmovable. The data contains location-dependent information. This bit can be on for all data set organizations except VSAM.
	X'0080'	DCSIEGS	Graphics organization
	X'0008'	DCSIEAM	VSAM data set
46 (X'2E')	2		Reserved
48 (X'30')	4	DCSIEKP	Key position
52 (X'34')	4	DCSIELRL	Logical record length (average record length if VSAM)
56 (X'38')	4	DCSIETC	Track capacity
60 (X'3C')	4	DCSIEBUF	Buffer space
64 (X'40')	4	DCSIESTG	Exit workspace address
68 (X'44')	2	DCSIEKL	Key length
70 (X'46')	2	DCSIEBS	Block size (current physical block size if VSAM)
72 (X'48')	2	DCSIECOB	Calculated optimum block size
74 (X'4A')	6	DCSIEVSN	Volume serial number, if available, or blanks

Registers on Return from the IGBDCSX1 and IGBDCSX2 Exit Routines

Before returning control to DCS, the exit routines must set up these registers:

Register

Register	Contents
0	Block or control interval size, if the return code is non-zero.
1-14	Same as on entry to the exit routine
15	Return code for the exit

IGBDCSX1 and IGBDCSX2 Return Codes

When you return control to DASD calculation services, you must place one of the following return codes in register 15, depending on the exit.

IGBDCSX1:

Return Code	Description
-------------	-------------

00 (X'00')	DCS can proceed normally.
------------	---------------------------

04 (X'04')	DCS can proceed, using the unsigned value in register 0 as the maximum possible value. Size provided in register 0.
------------	---

08 (X'08')	Bypass DASD calculation services and use the size you put in register 0.
------------	--

IGBDCSX2:

Return Code	Description
-------------	-------------

00 (X'00')	You accepted the calculated block or control interval size.
------------	---

08 (X'08')	You are overriding the DCS-calculated block or control interval size with the value you provided in register 0.
------------	---

Example of the IGBDCSX1 Exit Routine

Figure 3 on page 27 is a sample of IGBDCSX1. It returns the installation-defined maximum block size for non-VSAM data sets whose first four characters are SYS2 or SYS3. For non-VSAM data sets whose first four characters are SYS4 or SYS5, IGBDCSX1 returns the only block size allowed. For all other data sets, no restrictions apply. The figure is intended to be used as a learning aid for the installation system programmer and is not guaranteed to run on a particular system without some modification.

```

*****
*
* $MOD(IGBDCSX1): DASD CALCULATION SERVICES PRE-CALCULATION EXIT
*
* DESCRIPTIVE NAME = DCS PRE-CALCULATION EXIT
*
* COPYRIGHT = NONE
*
* FUNCTION = SEE TEXT FOR ENTRY AND EXIT INFORMATION
*
* PROCESSOR = ASSEMBLER
*
* ATTRIBUTES = CALLER KEY, CALLER STATE, ENABLED,
*             AMODE(31),RMODE(ANY)
*****
      EJECT
IGBDCSX1  CSECT
IGBDCSX1  AMODE 31
IGBDCSX1  RMODE ANY
*
*   SET UP ADDRESSABILITY
*
      STM   REG14,REG12,12(REG13)  SAVE CALLER'S REGS
      LR   REG12,REG15             LOAD IGBDCSX1 ADDR INTO BASE REG
      USING IGBDCSX1,REG12
      L    REG1,0(,REG1)           SET UP PARM LIST ADDRESSABILITY
      USING DCSIEPL,REG1
*
*   CHECK FOR VSAM DATA SET
*
      TM   DCSIEDS0+1,DCSIEAM  TEST DATA SET ORGANIZATION
      BO   EXIT                 BRANCH IF VSAM DATA SET
*
*   CHECK FIRST-FOUR CHARACTERS OF DATA SET NAME FOR SYS2
*
      CLC  DCSIEDSN(4),SYS2     IS DSN SYS2?
      BNE  SYS3CHK              NO - CHECK FOR SYS3
      L    REG0,MAXSYS2         SET MAX BLOCKSIZE FOR SYS2 DS
      LA   REG15,4              SET RETURN CODE INDICATING A
*                               LIMIT WAS SET

```

Figure 3. Sample Listing of IGBDCSX1 Part 1 of 2

Data Management Exits

```
      B      EXIT
*
* CHECK FIRST-FOUR CHARACTERS OF DATA SET NAME FOR SYS3
*
SYS3CHK CLC      DCSIEDSN(4),SYS3  IS DSN SYS3?
        BNE      SYS4CHK          NO - CHECK FOR SYS4
        L        REG0,MAXSYS3     SET MAX BLOCKSIZE FOR SYS3 DS
        LA       REG15,4          SET RETURN CODE INDICATING A
*                                     LIMIT WAS SET
      B      EXIT
*
* CHECK FIRST-FOUR CHARACTERS OF DATA SET NAME FOR SYS4
*
SYS4CHK CLC      DCSIEDSN(4),SYS4  IS DSN SYS4?
        BNE      SYS5CHK          NO - CHECK FOR SYS5
        L        REG0,SYS4BSZ     SET ONLY BLOCKSIZE FOR SYS4 DS
        LA       REG15,8          SET RETURN CODE INDICATING TO
*                                     BYPASS CALCULATION
      B      EXIT
*
* CHECK FIRST-FOUR CHARACTERS OF DATA SET NAME FOR SYS5
SYS5CHK CLC      DCSIEDSN(4),SYS5  IS DSN SYS5?
        BNE      NOLIMIT          NO - NO LIMITS SET
        L        REG0,SYS5BSZ     SET ONLY BLOCKSIZE FOR SYS5 DS
        LA       REG15,8          SET RETURN CODE INDICATING TO
*                                     BYPASS CALCULATION
      B      EXIT
*
* INDICATE NO LIMITS SET
*
NOLIMIT LA       REG15,0
*
* RETURN TO DCS
*
EXIT    EQU      *
        L        REG14,12(,REG13) RESTORE CALLER'S REG 14
        LM       REG1,REG12,24(REG13) RESTORE REST OF CALLER'S REGS
        BR       REG14           BRANCH BACK TO CALLER
        EJECT
* *  DEFINE VARIABLES
*
SYS2    DC       C'SYS2'
SYS3    DC       C'SYS3'
SYS4    DC       C'SYS4'
SYS5    DC       C'SYS5'
*
REG0    EQU      0
REG1    EQU      1
REG12   EQU      12
REG13   EQU      13
REG14   EQU      14
REG15   EQU      15 *
MAXSYS2 DC       F'5120'
MAXSYS3 DC       F'10240'
SYS4BSZ DC       F'4096'
SYS5BSZ DC       F'8192'
*
*
      IGBDCSIE
*
      END      IGBDCSX1
```

Figure 4. Sample Listing of IGBDCSX1 Part 2 of 2

Example of the IGBDCSX2 Exit Routine

Figure 5 is a sample of IGBDCSX2. It returns a block size to override the calculated optimal block size of a non-VSAM data set if the DCS-calculated block size exceeds an installation limit and the data set resides on a particular volume. The figure is a learning aid for the installation system programmer and is not guaranteed to run on a particular system without some modification.

```

*****
*
* $MOD(IGBDCSX2):  DASD CALCULATION SERVICES POST-CALCULATION EXIT
*
* DESCRIPTIVE NAME = DCS POST-CALCULATION EXIT
*
* COPYRIGHT = NONE
*
* FUNCTION = SEE TEXT FOR ENTRY AND EXIT INFORMATION
*
*   PROCESSOR = ASSEMBLER
*
*   ATTRIBUTES = CALLER KEY, CALLER STATE, ENABLED,
*               AMODE(31),RMODE(ANY)
*****
IGBDCSX2  CSECT
IGBDCSX2  AMODE 31
IGBDCSX2  RMODE ANY
*

```

Figure 5. Sample Listing of IGBDCSX2 Part 1 of 2

Data Management Exits

```
* SET UP ADDRESSABILITY
*
      STM   REG14,REG12,12(REG13)  STORE CALLER'S REGS
      LR    REG12,REG15             LOAD IGBDCSX1 ADDR INTO BASE REG
      USING IGBDCSX2,REG12
      L     REG1,0(,REG1)           SET UP PARM LIST ADDRESSABILITY
      USING DCSIEPL,REG1

*
* CHECK FOR BLOCKSIZE GREATER THAN INSTALLATION LIMIT IF THE DATA
* SET IS NON-VSAM AND RESIDES ON THE SPECIFIED VOLUME
*
      TM    DCSIEDSO+1,DCSIEAM CHECK FOR VSAM DATA SET
      BO    EXIT                    BRANCH IF VSAM DATA SET
      SPACE
      CLC   DCSIEVSN(6),VOLSER DOES DS RESIDE ON THIS VOLUME?
      BNE   BLKSZOK                 NO - BLOCK SIZE IS OK
      SPACE
      CLC   MAXBLKSZ(2),DCSIECOB IS CALCULATED BIGGER?
      BNH   BLKSZOK                 NO - BLOCK SIZE IS ACCEPTABLE
      SPACE
      LH    REG0,MAXBLKSZ           SET MAX BLOCKSIZE
      LA    REG15,8                 SET RETURN CODE INDICATING AN
*                                     OVERRIDE VALUE
      B     EXIT

*
* CALCULATED BLOCK SIZE IS OK
*
BLKSZOK EQU *
        SR   REG15,REG15

*
* RETURN TO DCS
*
EXIT    EQU *
        L    REG14,12(,REG13) RESTORE CALLER'S REG14
        LM   REG1,REG12,24(REG13) RESTORE REST OF CALLER'S REGS
        BR   REG14              BRANCH BACK TO CALLER
        EJECT

*
* DEFINE VARIABLES
*
REG0    EQU    0
REG1    EQU    1
REG12   EQU    12
REG13   EQU    13
REG14   EQU    14
REG15   EQU    15
*
MAXBLKSZ DC    H'31744'
VOLSER   DC    C'SPECIL'
*
*
        IGBDCSIE
*
        END    IGBDCSX2
```

Figure 6. Sample Listing of IGBDCSX2 Part 2 of 2

Data Management Abend Installation Exit (IFG0199I)

You can use the IBM-provided IFG0199I installation exit to recover fromabend situations caused by tape positioning errors. They might occur during the opening, closing, or processing of an end-of-volume condition for a non-VSAM data set associated with your application program.

The exit might need to examine the DCB, DCBE or DEB to ensure that fields were used correctly for the type of data set. For mappings of the DCB and DCBE fields, see *z/OS DFSMS Macro Instructions for Data Sets*. For mappings of the DEB fields, see *z/OS DFSMSdfp Advanced Services*.

Replacing the IFG0199I Exit Routine

The source code (written in assembler language) that is similar to the IBM-provided IFG0199I exit routine is in member OPENEXIT of SYS1.SAMPLIB. You can modify it to handle other data management abend situations and replace the IBM-provided IFG0199I module in SYS1.LPALIB with the modified routine. If you replace the IBM-provided IFG0199I, the replacement module you supply must have the entry point name IFG0199I.

For additional information, see “Replacing an Existing Exit” on page 3.

Characteristics of the IFG0199I Exit Routine

IFG0199I runs under the following conditions:

- Reenterable
- Protection key zero
- 24-bit addressing mode
- Supervisor state

When an abnormal condition occurs, control first passes to the DCB abend *user* exit routine, if its address is provided in the DCB exit list. If a DCB abend user exit routine is not provided, or if it requests immediate abnormal termination of the task, the system passes control to IFG0199I. For a description of the DCB exit list and the DCB abend user exit routine, see *z/OS V2R1.0 DFSMS Using Data Sets*.

The IBM-supplied IFG0199I checks the system completion code and the return code to determine whether the abend condition is the result of a tape positioning error. If the system completion code is other than 613 with return code X'08' or X'0C', IFG0199I returns control to the calling module with return code 0, indicating that abend processing should continue.

Otherwise, IFG0199I checks the counter in the 4-byte work area to determine whether an attempt to reposition the tape has been made. If not, IFG0199I provides return code 4, indicating that repositioning should be attempted. If it has, IFG0199I issues message IEC613A to the operator asking whether to attempt repositioning again.

If the operator requests another try, IFG0199I provides return code 4 to the calling module, indicating that open should rewind the tape and attempt positioning. If the operator specifies that tape positioning should not be retried, IFG0199I provides return code 0 to the calling module, and abend processing continues.

Data Management Exits

You can modify IFG0199I to perform recovery actions for other data management abend conditions. For abend codes for which you can use IFG0199I to attempt recovery, see *z/OS V2R1.0 DFSMS Using Data Sets*.

Registers on Entry to the IFG0199I Exit Routine

Following are the registers on entry to the IFG0199I exit routine.

Register

Contents

- 1 Address of the data management abend installation exit parameter list
- 0, 2-12 Not applicable
- 13 Address of an 18-word save area
- 14 Return address to open or end-of-volume
- 15 Address of the entry point to IFG0199I

IFG0199I Parameter List

Register 1 contains the address of the Data Management abend parameter list. The OAIXL DSECT maps the parameter list, shown in Table 8.

Table 8. IFG0199I Parameter List. Mapped by OAIXL DSECT. See Figure 12 on page 38 for an example of the assembler code for OAIXL.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	0	OAIXL	Data management abend installation exit parameter list
00 (X'00')	1	OAIXUKEY	User protection key
01 (X'01')	1	OAIXFLGS	Option flags
	1...	OAIXEXIT	DCB user abend exit was taken. If 0, the user exit was not taken. The system sets this bit.
	.1..	OAIXREW	Indicates that you want the tape rewound. The bit is zero at entry to IFG0199I. If you leave it zero, the tape is not rewound.
02 (X'02')	2		Reserved
04 (X'04')	4	OAIXPDCB	Address of protected copy of DCB used by open
08 (X'08')	4	OAIXUDCB	Address of user DCB related to the abend
12 (X'0C')	4	OAIXUCBA	Address of UCB related to the abend. Can be zero for certain data sets such as dummy, spooled, TSO terminal, or z/OS UNIX file. If the application program specified the UCB nocapture (S99ACUCB) option, the UCB address might point above the 16 MB line.
16 (X'10')	4	OAIXJFCB	Address of JFCB related to the abend
20 (X'14')	4	OAIXTIOT	Address of TIOT entry related to the abend
24 (X'18')	4	OAIXCODE	Abend code, for example X'613000C'
28 (X'1C')	4	OAIXAREA	4-byte work area
		OAIXLEN	Length of parameter list (32)

Registers on Return from the IFG0199I Exit Routine

Before you return control to open or end-of-volume, set up these registers:

Register

Contents

- 2-12 Same as on entry to IFG0199I
- 15 Return code (see following description)

IFG0199I Return Codes

Before you return control to open, place one of the following codes in register 15:

Return Code**Description****00 (X'00')**

Continue with abend processing

04 (X'04')

The system attempts to recover from the abend. If the option flag bit one is on (OAIXREW) the system rewinds the tape volume and sets the UCBFSCCT and UCBFSEQ fields in the UCB to zero before attempting to recover from the abend.

If the option flag bit 1 is off, the system attempts to recover from the abend.

Example of the IFG0199I Exit Routine

Figure 12 on page 38 is a sample of IFG0199I. Its source is available in SYS1.SAMPLIB member OPENEXIT.

```

*****
*
* MODULE NAME = IFG0199I
*
* DESCRIPTIVE NAME = DATA MANAGEMENT ABEND INSTALLATION EXIT
*
* FUNCTION = THE SYSTEM CALLS THIS EXIT FOR MOST ABENDS ISSUED
* IN OPEN,CLOSE,EOV FOR THE ACCESS METHODS OTHER THAN VSAM.
* IF THE APPLICATION PROGRAM SUPPLIED A DCB ABEND EXIT, THEN
* IT DID NOT RECOVER FROM OR PREVENT THE ABEND. THIS MODULE
* DOES THE FOLLOWING:
*
* 1. GET STORAGE FOR A WORK AREA.
* 2. BRANCH TO EXIT LOGIC TO CONTINUE THE ABEND IF IT IS NOT
* A 613-08 OR 613-0C ABEND OR IF THE USER DCB ABEND EXIT
* WAS CALLED. THESE TWO ABENDS HAVE TO DO WITH TAPE
* POSITIONING ERRORS.
* 3. IF THIS IS THE FIRST INSTANCE OF ONE OF THESE TWO ABENDS
* DURING THIS OPEN, THEN BRANCH TO EXIT LOGIC TO RETRY.
* 4. IF THIS IS THE SECOND TIME IT HAS OCCURRED IN THIS OPEN,
* ENTER WTOR TO ASK AN OPERATOR WHETHER TO RETRY UP TO TWO
* MORE TIMES OR TO CONTINUE THE ABEND.
*
* PATCH LABEL = PATCH
*
* ATTRIBUTES = REENTRANT, REFRESHABLE, ENABLED, READ ONLY,
* PRIVILEGED, SUPERVISOR STATE, KEY ZERO,
* LINK PACK AREA RESIDENT/PAGEABLE, 24-BIT
* ADDRESSING MODE
*

```

Figure 7. Sample Listing of IFG0199I Part 1 of 7.

Data Management Exits

```
* LINKAGE = BALR R14,R15  BRANCH AND LINK *
*
* INPUT REGISTERS = *
* 1 - ADDRESS OF PARAMETER LIST MAPPED BY MACRO IEICOIEXL *
* 13 - ADDRESS OF STANDARD SAVE AREA *
* 14 - ADDRESS OF CALLER *
* 15 - ADDRESS OF ENTRY POINT IN THIS MODULE. *
*
* CONTROL BLOCK = JFCB, DCB, UCB, TIOT, OAIXL *
*****
IFG0199I CSECT
START  STM  R14,R12,12(R13)      SAVE SYSTEM REGISTERS
      BASR  R11,0                LOAD PROGRAM BASE
      USING *,R11                USING R11 AS BASE REGISTER
      L     R0,SIZDATAD          GET DSECT SIZE
      GETMAIN R,LV=(0)           GET DSECT STORAGE
      LR   R10,R1                SAVE GETMAINED AREA
      USING DATAD,R10           REGISTER 10 DSECT REGISTER
      ST   R13,SAVEAREA+FOUR     SAVE R13 FOR BACK POINTER
      LM   R15,R1,16(R13)        RELOAD CALLERS REGISTERS
      ST   R10,8(R13)            SAVE R10 FOR FORWARD POINTER
      LR   R13,R10               POINT TO NEW SAVE AREA
      LR   R12,R1                LOAD OAIXL REGISTER FROM PARM
      USING OAIXL,R12           DEFINE BASE TO OAIXL
PSATOLD EQU  X'21C'              ADDRESS OF CURRENT TCB
TCBTIO  EQU  X'00C'              DISPLACEMENT IN TCB
      L     R8,PSATOLD           LOAD TCB ADDR FROM PSA
      L     R7,TCBTIO(,R8)       LOAD TIOT ADDR FROM TCB
      USING TIOT,R7             DEFINE BASE TO TIOT
*
      L     R6,OAIXUCBA          LOAD UCB ADDR FROM PARAMETERS
      USING UCB,R6              DEFINE BASE TO UCB
*
*****
* CHECK THE ABEND CODE TO BE SURE THIS IS A 613-08/0C ABEND *
*****
CHKABEND LH  R8,OAIXCODE          LOAD FIRST TWO BYTES OF CODE
          CH  R8,HEX613           COMPARE CODE TO ABEND 613
          BNE CONTINUE           CONTINUE WITH ABEND
          CLI OAIXCODE+THREE,HEX08 COMPARE CODE TO ABEND 613-08
          BE  CHKEXIT            YES, CHECK EXIT TAKEN
          CLI OAIXCODE+THREE,HEX0C COMPARE CODE TO ABEND 613-0C
```

Figure 8. Sample Listing of IFG0199I Part 2 of 7.

```

      BNE  CONTINUE                NO, CONTINUE WITH ABEND
*
*****
*      CHECK IF THE DCB USER ABEND EXIT WAS TAKEN                *
*****
CHKEXIT  TM   OAIXFLGS,OAIXEXIT    TEST IF DCB USER EXIT TAKEN
          BO   CONTINUE            DO NOT OVERRIDE THE USER EXIT'S
*                                     DECISION TO ABEND
*
*****
*      CHECK THE COUNTER TO BE SURE WE HAVE RETRIED ONE TIME    *
*****
CHKAREA  L    R8,OAIXAREA          LOAD AREA COUNTER INTO REG 8
          LA   R8,ONE(R8)          ADD ONE TO AREA COUNTER
          ST   R8,OAIXAREA          STORE NEW SUM INTO COUNTER
          CLI  OAIXAREA+THREE,MAXTRIES COMPARE COUNTER TO TWO
          BL   RETRY               LOW, CONTINUE TO RETRY
          SLR  R9,R9               CLEAR REGISTER 9
          ST   R9,OAIXAREA          STORE ZERO INTO COUNTER
*
*****
*      SETUP TO ENTER THE WTOR                                  *
*****
TRYAGAIN SLR  R9,R9               CLEAR REGISTER 9
          ST   R9,REPLYECB          STORE ZERO INTO REPLY ECB
*
          MVC  WTORAREA(WTORLEN),WTORLIST MOVE IN WTOR LIST
*
          MVC  WTOJOB,TIOCNJOB      MOVE JOB NAME TO WTO AREA
          OC   WTOJOB,BLANKS        FOLD TO UPPER CASE
          CLI  WTOJOB,BLANK         JOB NAME BLANK?
          BNE  BLANKJOB            NO, BRANCH
          MVI  WTOJOB,COMMA        INDICATE MISSING JOB NAME
BLANKJOB EQU  *
          MVC  WTOSTEP,TIOCSTEP     MOVE STEP NAME - WTO AREA
          OC   WTOSTEP,BLANKS      FOLD TO UPPER CASE
*
          UNPK WTODEV(L'WTODEV+1),UCBCHAN(L'UCBCHAN+1) SPREAD DIGITS
          MVI  WTODEV+L'WTODEV,C', ' FIX SIGN GARBAGE FROM UNPK
          TR   WTODEV,HEXTABLE-C'0' CONVERT TO PRINTABLE HEX CHARS
          CLI  WTODEV,C'0'         TEST FOR LEADING ZERO DIGIT
          BNE  GETVOL              BRANCH IF FOUR-DIGIT HEX NUMBER
          MVI  WTODEV,C' '         BLANK THE LEADING ZERO
GETVOL   EQU  *

```

Figure 9. Sample Listing of IFG0199I Part 3 of 7.

Data Management Exits

```

MVC  WTOVOL,UCBVOLI          MOVE VOLUME SERIAL
OC   WTOVOL,BLANKS          ENSURE UPPER CASE
*
LA   R2,REPLY              LOAD ADDRESS OF REPLY
LA   R3,REPLYECB          LOAD ADDRESS OF REPLY ECB
*
*****
*   ENTER MESSAGE TO THE OPERATOR, AND WAIT FOR          *
*   HER REPLY TO 'U' CONTINUE OR 'R' RETRY.             *
*****
      WTOR  ,(R2),,(R3),MF=(E,WTORAREA)  ISSUE WTOR SVC
      LR   R9,R1                SAVE MSG ID FOR DOM
*****
*   ISSUE WAIT                                          *
*****
      WAIT  ECB=REPLYECB        WAIT ON REPLY
*
*****
*   ISSUE DOM                                          *
*****
      DOM  MSG=(R9)            DOM MESSAGE
*
*****
*   CHECK REPLY FROM OPERATOR                          *
*****

OC   REPLY,BLANKS          MAKE REPLY UPPER CASE
CLI  REPLY,C'U'           WAS REPLY A 'U'
BE   CONTINUE             GO AND CONTINUE WITH ABEND
CLI  REPLY,C'R'           WAS REPLY A 'R'
BE   RETRY                GO AND CONTINUE TO RETRY
B    TRYAGAIN             INVALID RESPONSE, TRY AGAIN
*****
*   SET THE RETURN CODE FOR RETRY OR CONTINUE WITH ABEND *
*****
RETRY LA  R15,FOUR        SET RETURN CODE TO FOUR
      OI  OAIXFLGS,OAIXREW  SET ON REW BEFORE RETRY FLAG
      B   EOJ              BRANCH TO END OF JOB
CONTINUE LA R15,ZERO      SET RETURN CODE TO ZERO
EOJ   L   R13,SAVEAREA+FOUR  GET CALLERS SAVE AREA ADDRESS
      ST  R15,16(R13)      SAVE RETURN CODE REGISTER
      L   R0,SIZDATAD      GET DSECT STORAGE SIZE

```

Figure 10. Sample Listing of IFG0199I Part 4 of 7.

```

FREEMAIN R,LV=(0),A=(R10)    ISSUE FREEMAIN
LM   R14,R12,12(R13)        RESTORE ALL REGISTERS
BR   R14                    RETURN TO CALLER

*
*****
*           CONSTANTS           *
*****
*
WTORLIST  WTOR   'IEC613A JJJJJJJJ,SSSSSSS,DEVN,VOLSER TAPE POSITION ERRX
                OR -- REPLY 'R' RETRY OR 'U' CONTINUE WITH ABEND', X
                ,4,ROUTCDE=(1,3,5),MF=L
WTORLEN   EQU    *-WTORLIST          LENGTH OF WTOR
*
                DS    0H
HEX613    DC    X'6130'              CONSTANT FOR 613 ABEND
*
BLANKS    DC    C'          '        BLANKS FOR REPLY
*
HEXTABLE  DC    C'0123456789ABCDEF'  TO TRANSLATE TO PRINTABLE HEX

*
PATCH    DC    ((*-START)/20)X'00'  PROGRAM PATCH AREA
*****
*           DSECT STORAGE       *
*****
*
DATAD     DSECT
                DS    0D
WTORAREA  DS    CL20
WTOJOB    DS    CL8                JOB NAME
                DS    C
WTOSTEP   DS    CL8                STEP NAME
                DS    C
WTODEV    DS    CL4                DEVICE NUMBER
                DS    C
WTOVOL    DS    CL6                VOLUME SERIAL
                DS    CL74         REMAINDER OF MESSAGE
*
REPLYECB  DS    F                  REPLY ECB
REPLY     DS    CL4                REPLY RETURN AREA
*
SAVEAREA  DS    18F                PROGRAM SAVE AREA
*
R0        EQU    0

```

Figure 11. Sample Listing of IFG0199I Part 5 of 7.

Data Management Exits

```

R1      EQU  1
R2      EQU  2
R3      EQU  3
R4      EQU  4
R5      EQU  5
R6      EQU  6
R7      EQU  7
R8      EQU  8
R9      EQU  9
R10     EQU 10
R11     EQU 11
R12     EQU 12
R13     EQU 13
R14     EQU 14
R15     EQU 15
ZERO    EQU  0
ONE     EQU  1
MAXTRIES EQU  2                MAXIMUM NUMBER OF TRIES
TWO     EQU  2
THREE   EQU  3
K3      EQU  3
FOUR    EQU  4
FIVE    EQU  5
K6      EQU  6
K8      EQU  8
HEX08   EQU  X'08'
HEX0C   EQU  X'0C'
BLANK   EQU  C' '                CHARACTER ' ' (BLANK)
COMMA   EQU  C','                CHARACTER ', ' (COMMA)
*****
*      OPEN ABEND INSTALLATION EXIT PARAMETER LIST      *
*****
*
OAIXL   DSECT                ABEND INSTALLATION EXIT LIST
OAIXUKEY DS   XL1            PROTECT KEY OF USER DCB
OAIXFLGS DS   XL1            OAIXL FLAG BYTE
OAIXEXIT EQU  X'80'          DCB USER EXIT TAKEN (SET BY SYSTEM)
*                                00 = DCB USER EXIT NOT TAKEN
*                                80 = DCB USER EXIT TAKEN
OAIXREW  EQU  X'40'          REWIND TAPE BEFORE RETRY (CAN BE SET
*                                BY THE EXIT ROUTINE)
*                                00 = DO NOT REWIND THE TAPE
*                                40 = REWIND THE TAPE
OAIXRESV DS   H              Reserved
OAIXPCB  DS   A              ADDRESS OF PROTECTED COPY OF THE DCB

```

Figure 12. Sample Listing of IFG0199I Part 6 of 7.


```

OAIXUDCB DS      A          ADDRESS OF THE USER'S DCB
OAIXUCBA DS      A          UCB ADDRESS
OAIXJFCB DS      A          JFCB ADDRESS
OAIXTIOT DS      A          TIOT ADDRESS
OAIXCODE DS      F          ABEND CODE- EXAM X'6130000C'
OAIXAREA DS      F          INSTALLATION WORK AREA
OAIXLEN EQU      *-OAIXL    LENGTH OF OAIXL
*
*****
*          DCB - THE DCBD MACRO IS IN SYS1.MACLIB
*****
          DCBD DSORG=(PS,IS,DA,TQ),DEV=(DA,TA)          MAP FOR DCB
*****
*          UCB - THE IEFUCBOB MACRO IS IN SYS1.AMODGEN          *
*****
UCB          DSECT
          IEFUCBOB LIST=YES
*****
*          TIOT - THE IEFTIOT1 MACRO IS IN SYS1.AMODGEN          *
*****
TIOT          DSECT
          IEFTIOT1
*****
*          JFCB - THE IEFJFCBN MACRO IS IN SYS1.AMODGEN          *
*****
JFCB          DSECT
          IEFJFCBN LIST=YES
*****
*          DATA DEFINITIONS FOR DYNAMIC STORAGE AREA          *
*****
IFG0199I CSECT
          DS      0F
          DC      AL1(230)          SUBPOOL NUMBER
          DC      AL3(ENDDATA-DATAD)          SIZE OF DSECT
          DATAD          DSECT
          ORG      +*1-(*-DATAD)/( *-DATAD)  INSURE DSECT DATA
          ENDDATA EQU      *
          END

```

Figure 13. Sample Listing of IFG0199I Part 7 of 7.

DCB Open Installation Exit (IFG0EX0B)

You can use the IFG0EX0B installation exit to:

- Specify an installation-determined value for the number of buffers for QSAM DCBs.
- Direct the system to determine the block size for an output data set.
- Modify the JFCB to:
 - Request partial release of DASD space
 - Change the DASD secondary space request parameters.

Replacing the IFG0EX0B Exit Routine

See “Replacing an Existing Exit” on page 3. Your routine must have an entry point name that matches the exit name. Your CSECT is linked together with certain system CSECTs into a single load module.

Characteristics of the IFG0EX0B Exit Routine

IFG0EX0B runs under the following conditions:

- Protection key 0
- 24-bit addressing mode
- Supervisor state
- No locks held

During IFG0EX0B-related processing, system enqueues are issued to serialize system functions. These enqueues might prevent other system services from completing successfully. In particular, IFG0EX0B should not start dynamic allocation, open, close, end-of-volume, or DADSM functions, because of an enqueue on the SYSZTIOT resource.

If IFG0EX0B requires access to an installation data set, the control blocks needed to access that data set (DCB, DEB) should be built during system initialization. RACF macros can be called from the exit.

If your exit does not update a particular DCB during a parallel open and that DCB does not have an exit list with a DCB OPEN exit entry or a JFCBE entry, then when your exit is processing a different DCB for the same OPEN, the two copies of the first DCB might differ. OPEN will make them consistent later.

Understanding IFG0EX0B Execution Environment

Table 9 shows when IFG0EX0B receives control, and the processing that occurs before and after it is called.

Table 9. IFG0EX0B's Execution Environment

Step	Action
1	Begin open processing For DASD data sets: <ul style="list-style-type: none">• Mount the volume• Read the format -1, -2, and -3 DSCBs• Merge information from the format 1 DSCB to the JFCB For tape data sets: <ul style="list-style-type: none">• Mount the volume• Verify the header labels• Merge information from the header labels to the JFCB For all data sets: <ul style="list-style-type: none">• Merge information from the JFCB to the DCB• Take the DCB open user exit or the JFCBE user exit, if either is specified in the DCB's exit list.• Perform RACF or password verification processing.

Table 9. IFG0EX0B's Execution Environment (continued)

Step	Action
2	<p>Call IFG0EX0B in the following cases:</p> <ul style="list-style-type: none"> • When the OPEN macro (with or without the TYPE=J parameter) processes a DCB, including when two or more DCBs are opened in parallel through a single invocation. • When a program is reading a sequential concatenation of data sets with unlike attributes. IFG0EX0B receives control as the program begins reading each data set. Data sets are considered unlike only if the program has turned on the DCBOFPPC flag in the DCBOFLGS field. For example, data sets with different record format are considered unlike.
3	<p>Complete open processing:</p> <ul style="list-style-type: none"> • Calculated the block size if the block size in the DCB or DCBE is zero. • Merge information from the DCB to the JFCB (not all fields are merged). • Merge information from the JFCB to the format-1 DSCB for DASD data sets (not all fields are merged). • Write header labels for output tape data sets. • Perform access-method-dependent processing (obtain buffers, DEB, and other control blocks). • Update the system copy of the JFCB.

Using the Data Control Block (DCB)

Open maintains a protected copy of the user DCB (in the user's program) in the combined work and control block area. IFG0EX0B can use open's copy of the DCB to test DCB field values. If you use IFG0EX0B to modify either the user DCB or OPEN's copy, you must also modify the other. The protection key of the user DCB is supplied in the parameter list passed to IFG0EX0B. IFG0EX0B must use this key to get information from, or modify the user DCB. Open does not copy the DCBE. OPEN requires that the DCBE be writable in the same key as the program that issued the OPEN macro. To maintain system integrity, your exit routine must switch to the key of the issuer of OPEN whenever accessing the user's DCB or DCBE.

If you use IFG0EX0B to change values in the DCB for a data set that has been allocated to a system-managed volume, you must not specify values that would change the data set to a type that cannot be SMS managed. Doing so causes abnormal termination of the task. For example, you cannot specify an unmovable data set organization.

Be sure you determine the type of DCB and device passed to the exit before testing access-method or device-dependent fields in the DCB. The sample exit shown in "Example of the IFG0EX0B Exit Routine" on page 47 provides an example of excluding all DCBs from processing except for QSAM DCBs being opened to a DASD or tape device.

Specifying a Value for the Number of Buffers

You can use IFG0EX0B to provide an installation-determined value for the number of buffers for QSAM DCBs, if a value has not yet been supplied. See "Example of the IFG0EX0B Exit Routine" on page 47.

- For QSAM DCBs, do not override a nonzero value in DCBBUFNO without knowing what dependency the user program might have on that value. If the

Data Management Exits

DCBBUFCA field in the DCB contains a buffer pool control block address, it indicates that buffers have been acquired before open. Thus, you cannot override DCBBUFNO. After return from IFG0EX0B, if DCBBUFCA is zero, open turns on the low order bit (the absence of a buffer pool control block is indicated by the low order bit of DCBBUFCA being one). Unless the user specified RMODE31=BUFF in the DCBE, the user program is responsible for freeing buffer space after closing the DCB.

- For BSAM DCBs with DCBBUFCA set to one, do not override a zero value in DCBBUFNO without knowing what dependency the user program might have on that value. If the user program does not want open to acquire buffer storage space, it indicates this by setting DCBBUFNO to zero and DCBBUFCA to one. If the user program wants open to acquire buffer storage space, it can override DCBBUFNO with a nonzero value.

Modifying the Job File Control Block (JFCB)

The JFCB address provided in the OIEXJFCB field of the parameter list points to a copy of the JFCB in the combined work and control block area. If you are accessing concatenated partitioned data sets, other JFCBs might be associated with the OPEN macro.

If you modify the JFCB through IFG0EX0B, you must provide return code 4 to open. This causes open to update the system copy of the JFCB. Do not modify the JFCB through IFG0EX0B if the user program has set JFCNWRIT (bit 4) in byte JFCBTSDM, because this indicates that the system copy of the JFCB should not be updated. A sample IFG0EX0B routine that modifies the JFCB is shown in “Example of the IFG0EX0B Exit Routine” on page 47.

If the OPEN macro specifies EXTEND or OUTINX, and the disposition in the JFCB is not MOD, open temporarily changes its JFCB copy to specify DISP=MOD.

Requesting Partial Release of DASD Data Set Space

The best way to control partial release is to assign SMS management classes to data sets. The PARTIAL RELEASE management class attribute is easier to define and maintain than using IFG0EX0B, and the management classes give you greater flexibility in defining and changing your partial release policy. You can modify the JFCB in the open work area to specify partial release, as shown in “Example of the IFG0EX0B Exit Routine” on page 47. The example sets JFCRLSE (bits 0 and 1; mask X'CO') to 1 in the JFCBIND1 field, indicating a request for partial release. Do this only for DASD physical-sequential data sets, sequential extended-format data sets, or partitioned data sets opened for OUTPUT, OUTIN, EXTEND, and OUTINX and processed by one of the following:

- EXCP with a 5-word device-dependent section present in the DCB
- BSAM
- QSAM
- BPAM

Be careful when you change the JFCB release bits. If you frequently open a data set for output and write varying amounts of data each time, DADSM can extend the data set after each OPEN and create many small extents, and perhaps reach the extent limit for the data set. This could result in a B37 abend.

Also, use caution when setting the JFCBSPAC bits to define the space quantity units when the partial release flag, JFCBRLSE, is also set on. A cylinder-allocated extent can be released on a track boundary if JFCBSPAC does not indicate cylinder units or average block length units with ROUND specified. This causes the

cylinder boundary extent to become a track boundary extent, thereby losing the performance advantage of cylinder boundary extents. Zeroing the release indicator and increasing secondary allocation quantity (for example, when the data set has extended a large number of times) can prevent such a B37 abend. Setting the release indicator could result in more space being made available to other users sharing the volume.

Updating DASD Secondary Space Data

You can modify the JFCB in open's work area to update the secondary space quantity for DASD data sets, as shown in "Example of the IFG0EX0B Exit Routine" on page 47. The JFCBCTRI field contains the space request type coded in the DD statement or merged from the format-1 DSCB. The JFCBSQTY field contains the amount of secondary space requested. The JFCBPQTY field contains the amount of primary space requested. The JFCBCTRI field specifies the units in cylinders, tracks, or average blocks. If bit JFCBAVR is on, then the unit is either average blocks or average records.

Changing the value of the JFCONTIG bit has no effect on the space allocation because that bit affects only the primary space, which has already been allocated before IFG0EX0B is called.

Using the Unit Control Block (UCB)

For BDAM and concatenated partitioned data sets, the UCB whose address is supplied to the exit might not be the only UCB that is associated with the DCB that is being opened. Do not modify the UCB. Data sets such as dummy, spooled, TSO terminal, and z/OS UNIX file have a zero UCB address.

Finding the Task Input/Output Table (TIOT) Entry

The TIOT address provided in the OIEXTIOT field points to a TIOT entry (TIOENTRY) label in the data area mapped by the IEFTIOT1 macro. For concatenated partitioned data sets, other TIOT entries might be associated with the DCB being opened. If the application program is opening a concatenation of unlike attributes, the TIOT entry can have a blank DDNAME field.

Finding the Data Set Control Blocks (DSCBs)

The format-1 DSCB address provided in the OIEXDSCB field points to the start of the DS1FMTID field for the DSCB in the common work and control block area. Format-2 and -3 DSCBs might be associated with the format-1 DSCB. For BDAM and concatenated partitioned data sets, other format-1 through -3 DSCBs might be associated with the DCB being opened.

A format-1 DSCB may have several fields set uniquely if the data set is a large format data set. The fields affected are DS1FLAG1 and DS1LSTAR. For specific values in these fields that are unique to large format data sets, see *z/OS DFSMSdfp Advanced Services*. For a large format data set, the DCBE might also have BLOCKTOKENSIZE=LARGE specified to indicate that the program conforms to interfaces that are required for some uses of large format data sets. These interfaces, which support increased track numbers, are required for EXCP, or BSAM with NOTE or POINT, or if the IGDSMSxx member of SYS1.PARMLIB specifies BLOCKTOKENSIZE(REQUIRE). For a mapping of the DSCB, see *z/OS DFSMSdfp Advanced Services*.

If the VTOC is being opened, OIEXDSCB points to a format-4 DSCB. You can determine if the DSCB is a format-4 by testing the DS1FMTID field for a value of X'F4', or by testing the data in the JFCBDSNM field for 44 bytes of X'04'. For

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IFG0EX0B to receive control when processing a VSAM data space, you must provide a DCB, not an access method control block (ACB).

Directing the System to Determine Block Size

If DCBLRECL has been set up and DCBRECFCM specifies either F, V, or D you can write a routine as part of the IFG0EX0B exit to have the system determine the block size for the data set. Do this by setting the user's block size field to zero before the exit returns to its caller. If you are requesting a system determined block size, the DCBBLKSI field in the DCB and the DCBEBLKSI field in the DCBE, if present, should be set to zero. A sample is shown in "Example of the IFG0EX0B Exit Routine" on page 47.

The user's block size value is in the 2-byte DCBBLKSI in the DCB if both of the following are true:

- Bit DCBMRECP is off, meaning it is not an EXCP DCB.
- Any of DCBH0, DCBH1, DCBESLBI and DCBEULBI is off. The user is not using LBI, large block interface.

The user's block size value is in the 4-byte DCBEBLKSI in the DCBE if all of the following are true:

- The DCB is not for EXCP, meaning that bit DCBMRECP is off or it is on and the 5-word device interface section of the DCB is valid, meaning bit DCBMR5WD is on.
- Bits DCBH0 and DCBH1 are on, meaning that DCBDCBE points to the DCBE.
- Bit DCBESLBI is on, meaning that the system supports LBI for this DCB.
- Bit DCBEULBI is on, meaning that the user requests LBI.

For an EXCP DCB that is not using the DCBE BLKSIZE field, your exit can use the BLKSIZE field in the JFCB but the application program might not use it.

If a system-determined block size is used, open turns on the reblockable indicator in the format-1 DSCB (bit 2 of the DS1SMSFG field). When the data set is opened for OUTPUT or OUTIN and the merging of the block size fields occurs, open checks the indicator. If the block size is a system-determined block size, and the logical record length or record format have changed from those specified in the data set label, open determines the block size again.

Registers on Entry to the IFG0EX0B Exit Routine

Following are the registers on entry to the IFG0EX0B exit routine.

Register

	Contents
1	Address of the DCB open installation exit parameter list
0, 2-12	Not applicable
13	Address of an 18-word save area
14	Return address to open
15	Address of the entry point to IFG0EX0B

IFG0EX0B Parameter List

Register 1 contains the address of the DCB open installation exit parameter list. The IECOIEXL macro maps the parameter list, shown in Table 10 on page 45.

Table 10. IFG0EX0B Parameter List. Mapped by IEEOIEXL.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	0	OIEXL	DCB Open installation exit parameter list
00 (X'00')	1	OIEXOOPT	Open option (last four bits)
	.... 1111	OIEXOOOUT	OUTPUT or EXTEND
	.... 0111	OIEXOOIN	OUTIN or OUTINX
	.... 0100	OIEXOUPD	UPDAT
	.... 0011	OIEXOINO	INOUT
	.... 0001	OIEXORDB	RDBACK
	.... 0000	OIEXOINP	INPUT
01 (X'01')	1	OIEXUKEY	User protection key (key of user DCB)
02 (X'02')	2	OIEXLTH	Length of open installation exit parameter list (OIEXL)
04 (X'04')	4	OIEXUDCB	Address of user DCB in user protection key (OIEXUKEY)
08 (X'08')	4	OIEXPDCB	Address of protected copy of DCB used by open
12 (X'0C')	4	OIEXJFCB	Address of JFCB
16 (X'10')	4	OIEXDSCB	Address of data portion of the format-1 or format-4 DSCB
20 (X'14')	4	OIEXTIOT	Address of TIOT entry
24 (X'18')	4	OIEXUCB	Address of UCB. Can be captured or actual below the 16MB line.

Registers on Return from the IFG0EX0B Exit Routine

Before you return control to the caller, set up the registers as follows:

Register

Contents

- 0-14 Same as on entry to IFG0EX0B
- 15 Return code

IFG0EX0B Return Codes

Following are the return codes for IFG0EX0B exit routine.

Return Code

Description

- 00 (X'00')
You have not modified the JFCB.
- 04 (X'04')
You have modified the JFCB.

Processing: BUFNO Subroutine

If the number of buffers indicated in the QSAM DCBBUFNO field for certain DASD or tape data sets is zero when IFG0EX0B gets control, the BUFNO subroutine defaults the number of buffers. The block size in the DCB (DCBBLKSI) is used, together with a fixed amount of storage (64 KB in the example) to determine a buffer number. The buffer number is limited to a fixed value (32 in the example). Storage quantity and maximum buffer number are contained in two tables, DAMAX and TPMAX, that are used for DASD devices and tape devices,

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respectively. Storage quantity is expressed in units of 1024 (1 KB) bytes. You can use IFG0EX0B to alter the values in the DAMAX and TPMAX tables.

Processing: SCREEN Subroutine

The SCREEN subroutine determines whether the RLSE or SPTY subroutines should be run. DASD sequential and partitioned data sets being processed by BSAM or QSAM and opened for OUTPUT or OUTIN are selected. The VTOC and data sets starting with SYS1. are excluded. You can write IFG0EX0B to make further selection tests or add other support, for example:

- You can handle secondary allocation differently for an sequential extended-format data set. They can have up to 123 extents per volume, whereas physical sequential data sets can have up to 16 user data extents.
- Default the number of buffers larger if the data set is an sequential extended-format data set.
- For a compressed data set, a spooled data set, dummy data set, or z/OS UNIX file it is not useful to override the QSAM BUFNO default of 1. The extra buffers are not used productively. If you know the application program has no dependence on the number of buffers, your exit can decrease a user-provided BUFNO.

Processing: RLSE Subroutine

The RLSE subroutine sets the partial release indicators to 'on' in the JFCB if the number of extents in the data set is less than a fixed value (8 in the example). It sets the partial release indicators in the JFCB to 'off' if the number of extents in the data set is equal to or greater than a fixed value (8 in the example). Partitioned data sets are not processed because they can be opened many times to write one new member for each OPEN-CLOSE macro sequence.

Processing: SPTY Subroutine

The SPTY subroutine provides a default secondary space quantity if none is specified. The default is one-half of the primary space quantity if it is greater than one. If the primary quantity is zero, the secondary is set to a fixed default number of tracks (5 in the example). If the primary quantity is one, the secondary is set to the same fixed default (5); the secondary quantity shown is in units of tracks, cylinders, or average blocks, depending on the unit of the primary quantity.

If the secondary space quantity is not zero, the SPTY subroutine tests the number of extents in the data set. If the number of extents is equal to, or greater than, a fixed value (10 in the example), then the secondary quantity is increased by 50% if it is greater than 1. It is set to a default quantity (5 in the example) if the secondary quantity is one; the secondary quantity shown is in units of tracks, cylinders, or average blocks, depending on that of the primary quantity.

You can provide space defaults more efficiently by using data classes. This allows greater selectivity according to the type of data set. To use data classes, SMS must be running, but the data set does not have to be SMS-managed.

Example of the IFG0EX0B Exit Routine

The following program listing is a sample of IFG0EX0B. The four subroutines (BUFNO, SCREEN, RLSE, and SQTY) show examples of the process you can do in your installation's version of IFG0EX0B.

```

IFG0EX0B CSECT
*****
*
* FUNCTION =
*   FOUR SAMPLE ROUTINES ARE SUPPLIED.
*
*   BUFNO - DEFAULT DCBBUFNO
*   DCBBUFNO (NUMBER OF BUFFERS) IS DEFAULTED FOR
*   OPENS TO PHYSICAL SEQUENTIAL AND PARTITIONED DATA SETS
*   ON DASD AND TAPE USING QSAM, FOR WHICH DCBBUFNO IS ZERO.
*   DCBBUFNO FOR SYSIN, SYSOUT, TERMINAL, AND DUMMY DATA SETS
*   IS SET TO THE EQUATE, INOUTBNO, OR THE VALUE IN THE
*   FULLWORD, INOUTBN.
*
*   DCBBUFNO IS SET TO THE NUMBER OF DCBBLKSZ BUFFERS WHICH
*   FIT IN A GIVEN AMOUNT OF STORAGE. THE AMOUNT OF STORAGE IS
*   DEFINED BY THE EQUATES, DAMXK AND TPMXK (OR THE FULLWORDS
*   AT LABELS, DAMAXK AND TPMAXK), FOR DASD AND
*   TAPE, RESPECTIVELY.
*   THE EQUATES DEFINE THE AMOUNT OF
*   STORAGE FOR BUFFERS IN UNITS OF 1024 (IF DAMXK IS 32, THEN
*   THE AMOUNT OF STORAGE IS 32K, OR 32768).
*   DAMXK OR TPMXK TIMES 1024 IS DIVIDED BY DCBBLKSI TO
*   DETERMINE THE NUMBER OF BUFFERS TO DEFAULT.
*
*   THE EQUATES, DAMXBNO AND TPMXBNO, OR THE FULLWORDS
*   AT LABELS, DAMAXBNO AND TPMAXBNO,
*   DEFINE THE MAXIMUM NUMBER OF BUFFERS TO BE
*   DEFAULTED FOR DASD AND TAPE IF THE CALCULATION, ABOVE,
*   RESULTS IN A LARGER NUMBER.
*
*   SCREEN - SCREEN OUT CASES FOR RLSE, SQTY
*
*   RLSE - SET OR ZERO PARTIAL RELEASE

```

Figure 14. Sample Listing of IFG0EX0B Part 1 of 13.

Data Management Exits

```
*      THIS ROUTINE SETS PARTIAL RELEASE FOR DASD PS (NOT PO) DATA *
*      SETS BEING OPENED FOR OUTPUT OR OUTIN. *
*
*      PARTIAL RELEASE IS SET ON IF THE NUMBER OF EXTENTS IS LESS *
*      THAN A QUANTITY DEFINED BY THE EQUATE, RLSE1, OR THE BYTE, *
*      EXTRLSE1. *
*
*      PARTIAL RELEASE IS SET OFF IF THE NUMBER OF EXTENTS IS NOT *
*      LESS THAN A QUANTITY DEFINED BY THE EQUATE, RLSE0, OR THE *
*      BYTE, EXTRLSE0. *
*
*      SQTY - SET OR UPDATE SECONDARY SPACE QUANTITY *
*      THIS ROUTINE UPDATES THE SECONDARY SPACE *
*      QUANTITY FOR DASD PS OR PO DATA SETS BEING *
*      OPENED FOR OUTPUT OR OUTIN. *
*      IF THE SECONDARY QUANTITY IS NOT ZERO, *
*      AND IF THE NUMBER OF EXTENTS IN THE DATA SET IS *
*      AT LEAST EQUAL TO THE QUANTITY IN THE EQUATE, EXTSQT (OR *
*      THE BYTE AT LABEL, EXTSQTY), THEN: *
*      1. IF THE SECONDARY QUANTITY IS GREATER THAN ONE, *
*      SECONDARY QUANTITY IS INCREASED BY ONE HALF *
*      (50%). *
*
*      2. IF THE SECONDARY QUANTITY IS ONE, *
*      SECONDARY QUANTITY IS SET TO THE VALUE IN THE FULLWORD *
*      AT LABEL, SQTYDFLT (EQUAL TO THE EQUATE, SQTYDFL). *
*
*      IF THE SECONDARY QUANTITY IS NOT ZERO, *
*      AND IF THE NUMBER OF EXTENTS IN THE DATA SET IS *
*      LESS THAN THE QUANTITY IN THE EQUATE, EXTSQT (OR *
*      THE BYTE AT LABEL, EXTSQTY), SECONDARY QUANTITY *
*      IS LEFT UNCHANGED. *
*
*      IF SECONDARY QUANTITY IS ZERO, IT IS SET TO ONE HALF *
*      OF PRIMARY QUANTITY IF PRIMARY IS NOT ZERO OR ONE. *
*      IF PRIMARY QUANTITY IS ZERO, THE SPACE TYPE IS SET TO TRACKS, *
*      AND SECONDARY QUANTITY IS SET TO THE VALUE IN THE FULLWORD *
*      AT LABEL SQTYDFLT (EQUAL TO THE EQUATE, SQTYDFL). *
*      IF PRIMARY QUANTITY IS ONE, SECONDARY QUANTITY IS SET TO *
*      VALUE IN THE FULLWORD AT LABEL SQTYDFLT (EQUAL TO THE *
*      EQUATE, SQTYDFL). *
*
*      NOTES = SEE BELOW *
*
*      DEPENDENCIES = *
```

Figure 15. Sample Listing of IFG0EX0B Part 2 of 13.

```
*          CLASS ONE CHARACTER CODE.  THE EBCDIC CHARACTER CODE      *
*          WAS USED FOR ASSEMBLY.  THE MODULE MUST BE REASSEMBLED   *
*          IF A DIFFERENT CHARACTER SET IS USED FOR EXECUTION.      *
*                                                                    *
*          RESTRICTIONS = NONE                                       *
*                                                                    *
*          REGISTER CONVENTIONS =                                     *
*          R1  OIEXL ADDRESS                                         *
*          R2  DCB ADDRESS                                           *
*          R3  UCB ADDRESS                                           *
*          R4  DCB BLOCK SIZE                                         *
*          R5  ADDRESS OF TPMAX OR DAMAX TABLES                     *
*          R6  EVEN REGISTER OF EVEN/ODD PAIR                       *
*          R7  ODD REGISTER OF EVEN/ODD PAIR                       *
*          R8  TIOT ENTRY ADDRESS                                    *
*          R9  JFCB ADDRESS                                           *
*          R10 FORMAT 1 DSCB ADDRESS                                  *
*          R11 SAVE RETURN CODE                                       *
*          R13 SAVE AREA ADDRESS                                       *
*          R14 RETURN ADDRESS                                         *
*          R15 BASE REGISTER                                         *
*                                                                    *
*          PATCH LABEL = PATCH                                       *
*                                                                    *
*          ATTRIBUTES = REENTRANT, REFRESHABLE, READ-ONLY, ENABLED,  *
*                   PRIVILEGED, SUPERVISOR STATE, KEY ZERO,        *
*                   LINK PACK AREA RESIDENT/PAGEABLE                *
*                                                                    *
*          ENTRY POINT = IFG0EX0B                                     *
*                                                                    *
*          PURPOSE = SEE FUNCTION                                     *
*                                                                    *
*          LINKAGE =                                                 *
*                   BALR 14,15                                       *
*                                                                    *
*          INPUT = STANDARD LINKAGE CONVENTIONS                     *
*                                                                    *
*          OUTPUT =  DCBBUFNO DEFAULTED                              *
*                   PARTIAL RELEASE SET OR RESET                    *
*                   CONTIGUOUS FLAG SET TO ZERO                    *
*                   SECONDARY SPACE REQUEST MODIFIED                *
*                   RETURN CODE IN REGISTER 15                      *
*                   0 IF JFCB NOT MODIFIED                          *
*                   4 IF JFCB MODIFIED                              *
*                                                                    *
*                                                                    *
```

Figure 16. Sample Listing of IFG0EX0B Part 3 of 13.

Data Management Exits

```
* EXIT-NORMAL = *
*      BR 14 *
* *
* EXIT-ERROR = *
*      NONE *
* *
* EXTERNAL REFERENCES = SEE BELOW *
* *
*      ROUTINES = NONE *
* *
*      DATA AREAS = NONE *
* *
*      CONTROL BLOCK = DCB, JFCB, UCB, TIOT, DSCB *
* *
* TABLES = NONE *
* *
* MACROS = MODESET, IECDIEXL, DCBD, IEFUCBOB, IEFTIOT1, IEFJFCBN, *
*      IECSDSL1 *
* *
*****
*****
*
*      REGISTER EQUATES
*
*****
R1      EQU 1          OIEXL PARAMETER LIST ADDRESS
RDCB    EQU 2          DCB ADDRESS
RUCB    EQU 3          UCB ADDRESS
RBKSIZ  EQU 4          DCB BLOCK SIZE
RMAX    EQU 5          ADDRESS OF TPMAX OR DAMAX
REVEN   EQU 6          EVEN REGISTER OF EVEN/ODD PAIR
RODD    EQU 7          ODD REGISTER OF EVEN/ODD PAIR. HAS *
                        DCBBUFNO DEFAULT
RTIOT   EQU 8          TIOT ENTRY ADDRESS
RJFCB   EQU 9          JFCB ADDRESS
RDSCB   EQU 10         FORMAT 1 DSCB ADDRESS
RINCODE EQU 11         INTERNAL RETURN CODE
R12     EQU 12
RSAVE   EQU 13         SAVE AREA ADDRESS
RET     EQU 14         RETURN ADDRESS
RCODE   EQU 15         BASE REGISTER/RETURN CODE ON EXIT
*****
*
*      RETURN CODE
*
```

Figure 17. Sample Listing of IFG0EX0B Part 4 of 13.

```

*****
MODJFCB EQU 4 RETURN CODE IF JFCB MODIFIED
        USING IFG0EX0B,RCODE
*****
*
* START OF SAMPLE PROGRAM
*
*****
        B AFTRID1
        DC C'IFG0EX0B JDM1137 &SYSDATE'
AFTRID1 SAVE (14,12) SAVE REGISTERS
        XR RINCODE,RINCODE ZERO RETURN CODE
        USING OIEXL,R1 PARAMETER LIST
        BAL RET,BUFNO DEFAULT BUFNO
        BAL RET,SCREEN SCREEN OUT CASES WHERE RLSE, *
                                AND SQTY SHOULD NOT BE CALLED
        BAL RET,RLSE SET PARTIAL RELEASE
        BAL RET,SQTY SET SECONDARY QUANTITY
EXIT EQU * RETURN TO CALLER
*****
* RETURN TO CALLER
*****
        LR RCODE,RINCODE
        RETURN (14,12),RC=(15) RESTORE REGISTER
BUFNO EQU * DEFAULT DCB BUFNO
*****
*
* DEFINE DEFAULT VALUES
* DAMXK = NUMBER OF K (1024) OF BUFFERS FOR DASD
* TPMXK = NUMBER OF K (1024) OF BUFFERS FOR TAPE
* DAMXBNO = MAXIMUM NUMBER OF BUFFERS FOR DASD
* TPMXBNO = MAXIMUM NUMBER OF BUFFERS FOR TAPE
* NOTE THAT DAMXBNO AND TPMXBNO MUST NOT BE GREATER THAN 255
*
*****
DAMXK EQU 64 64K BUFFERS FOR DASD
TPMXK EQU 64 64K BUFFERS FOR TAPE
DAMXBNO EQU 32 32 BUFFERS MAXIMUM FOR DASD
TPMXBNO EQU 32 32 BUFFERS MAXIMUM FOR TAPE
INOUTBNO EQU 1 DCBBUFNO DEFAULT FOR SYSIN, SYSOUT, *
                                AND DD DUMMY
ONEK EQU 10 SHIFT ARGUMENT TO MULTIPLY BY 1024
        B AFTRID2
        DC CL8'BUFNO' BUFNO ROUTINE ID
AFTRID2 BCR 0,RET NOP RETURN
        L RDCB,OIEXPDCB PROTECTED COPY OF DCB
        USING IHADCB,RDCB

```

Figure 18. Sample Listing of IFG0EX0B Part 5 of 13.

Data Management Exits

```
*****
*      DO NOT PROCESS EXCP, BSAM, DSORG NOT PS OR PO,
*      DCBBUFNO SPECIFIED
*****
      TM  DCBMACF1,DCBMRECP  EXCP DCB?
      BO  RETBUFNO           RETURN IF EXCP
      TM  DCBMACF1,DCBMRRD  READ MACRO
      BO  RETBUFNO           RETURN IF READ-NOT QSAM
      TM  DCBMACF2,DCBMRWT  WRITE MACRO
      BO  RETBUFNO           RETURN IF WRITE-NOT QSAM
      TM  DCBDSRG1,DCBDSGPS+DCBDSGPO PS OR PO
      BZ  RETBUFNO           EXIT IF NOT PS OR PO
      CLI DCBBUFNO,0         IS DCBBUFNO SPECIFIED
      BNE RETBUFNO           RETURN IF DCBBUFNO SPECIFIED
*****
*      DEFAULT DCBBUFNO TO 1 FOR SYSIN, SYSOUT, TERMINAL, DUMMY
*****
      L   RTIOT,OIEXTIOT    TIOT ENTRY ADDRESS
      USING TIOENTRY,RTIOT
      L   RODD,INOUTBN      BUFNO DEFAULT FOR SYSIN/SYSOUT/
                          DD DUMMY
      TM  TIOELINK,TIOESSDS+TIOTTERM SYSIN/SYSOUT OR TERMINAL
      BNZ STORE             BRANCH IF SYSIN OR SYSOUT OR TERMINAL
      L   RJFCB,OIEXJFCB    JFCB ADDRESS
      USING INFMJFCB,RJFCB
      CLC JFCBDSNM(L'NULLFILE),NULLFILE DUMMY DATA SET
      BE  STORE             BRANCH IF DUMMY
*****
*      EXIT IF NO UCB ADDRESS OR BLOCK SIZE NOT POSITIVE
*****
      L   RUCB,OIEXUCB      UCB ADDRESS
      LTR RUCB,RUCB         ANY UCB?
      BZ  RETBUFNO           EXIT IF NO UCB
      LH  RBKSIZ,DCBBLKSI   DCB BLOCK SIZE
      LTR RBKSIZ,RBKSIZ     ANY BLOCK SIZE?
      BNP RETBUFNO           RETURN IF NO BLOCK SIZE

*****
*      GET TAPE OR DASD MAX TABLE
*****
      USING UCBOB,RUCB
      TM  UCBTBYT3,UCB3DACC  DASD UCB?
      BZ  BUFTAPE           BRANCH IF NOT DASD
```

Figure 19. Sample Listing of IFG0EX0B Part 6 of 13.

```

LA    RMAX,DAMAX      MAX TABLE FOR DASD
L     RDSCB,OIEXDSCB  POINT TO DSCB
USING DS1FMTID,RDSCB
CLI  DS1FMTID,C'1'    BRANCH IF NOT FORMAT 1
BNE  CALC
TM   DS1SMSFG,DS1STRP GO IF EXTENDED SEQ., SYSTEM
BO   RETBUFNO         DEFAULT BUFNO IS BETTER
B    CALC             GO CALCULATE BUFNO
BUFTAPE EQU *
TM   UCBTBYT3,UCB3TAPE TAPE UCB?
LA   RMAX,TPMAX      MAX TABLE FOR TAPE
BZ   RETBUFNO        RETURN IF NOT DASD OR TAPE
CALC EQU *           DEFAULT DCBBUFNO

*****
*      CALCULATE DEFAULT BUFFER NUMBER
*****
USING MAX,RMAX
XR   REVEN,REVEN      ZERO EVEN REG
L    RODD,MAXBUF      MAXIMUM STORAGE FOR BUFFERS
SLL  RODD,ONEK        SHIFT TO MULTIPLY BY 1024
DR   REVEN,RBKSIZ     DIVIDE MAX BUFFER SPACE BY BKSI
C    RODD,MAXBNO      ARE THERE TOO MANY BUFFERS?
BNH  STORE           USE CALCULATION IF NOT TOO LARGE
L    RODD,MAXBNO      USE MAXIMUM NUMBER OF BUFFERS
STORE EQU *          DEFAULT DCBBUFNO FOR USER/COPY DCB
STC  RODD,DCBBUFNO    PUT IN PROTECTED COPY OF DCB
L    RDCB,OIEXUDCB    USER DCB
XR   REVEN,REVEN      MODESET USES REG 6 = REVEN
MODESET KEYADDR=OIEXUKEY,WORKREG=6 GET IN USER KEY
STC  RODD,DCBBUFNO    PUT IN USER DCB
MODESET EXTKEY=ZERO   BACK TO KEY ZERO
RETBUFNO EQU *       RETURN FROM BUFNO
BR   RET              RETURN
INOUTBN DC A(INOUTBNO) SYSIN/SYSOUT/DUMMY BUFNO DEFAULT
*****
*
*      MAX TABLE FOR TAPE
*
*****
DS   0F
DC   CL8'TPMAX'      TPMAX ID
TPMAX DS 0F
TPMAXX DC A(TPMXX)   MAXIMUM SIZE FOR BUFFERS IN UNITS *
OF 1024
TPMAXBNO DC A(TPMXBNO) MAXIMUM NUMBER OF BUFFERS

```

Figure 20. Sample Listing of IFG0EX0B Part 7 of 13.

Data Management Exits

```
*****
*
*      MAX TABLE FOR DASD
*
*****
      DS      0F
      DC      CL8'DAMAX'      DAMAX ID
DAMAX  DS      0F
DAMAXK DC      A(DAMXK)      MAXIMUM SIZE FOR BUFFERS IN UNITS *
                                OF 1024
DAMAXBNO DC    A(DAMXBNO)    MAXIMUM NUMBER OF BUFFERS
SCREEN EQU    *              SCREEN OUT CASES WHERE RLSE, *
                                AND SQTY SHOULD NOT RUN
*****
*      DO NOT PROCESS IF
*      SYSIN/SYSOUT/TERMINAL
*      DD DUMMY
*      USER ASKS JFCB NOT BE RE-WRITTEN
*      SYSTEM DATA SET ('SYS1.XXX')
*      NON-DASD UCB
*      NOT A FORMAT 1 DSCB
*      EXCP DCB
*      DSORG IN DCB IS NEITHER PS NOR PO
*      DSORG IN DSCB IS NEITHER PS NOR PO
*      NEITHER PUT NOR WRITE MACRO CODED IN DCB
*      OPEN FOR OTHER THAN OUTPUT OR OUTIN
*****
      B      AFTRID3
      DC      CL8'SCREEN'      SCREEN ROUTINE ID
AFTRID3 L      RTIOT,OIEXTIOT  TIOT ENTRY ADDRESS
      TM      TIOELINK,TIOESSDS+TIOTTERM SYSIN/SYSOUT OR TERMINAL
      BNZ     EXIT              EXIT IF SYSIN OR SYSOUT OR TERMINAL
      L      RJFCB,OIEXJFCB    JFCB ADDRESS
      CLC     JFCBDSNM(L'NULLFILE),NULLFILE DUMMY DATA SET
      BE     EXIT              EXIT IF DUMMY
      CLC     SYS1,JFCBDSNM     SYS1.XXX DATA SET
      BE     EXIT              EXIT IF SYSTEM DATA SET
      TM      JFCBTSDM,JFCNWRIT DON'T MODIFY JFCB
      B0     EXIT              EXIT IF YES
      L      RUCB,OIEXUCB      UCB ADDRESS
      LTR     RUCB,RUCB        ANY UCB?
      BZ     EXIT              EXIT IF NO UCB
      TM      UCBTBYT3,UCB3DACC DASD UCB?
      BNO    EXIT              EXIT IF NOT DASD
```

Figure 21. Sample Listing of IFG0EX0B Part 8 of 13.


```

L      RDSCB,OIEXDSCB      FORMAT 1 DSCB ADDRESS
USING DS1FMTID,RDSCB
CLI   DS1FMTID,C'1'      IS THIS A FORMAT 1 DSCB
BNE   EXIT                EXIT IF NOT
L      RDCB,OIEXPDCB      PROTECTED DCB ADDRESS
TM    DCBMACF1,DCBMRECP  EXCP DCB?
BO    EXIT                EXIT IF EXCP
TM    DCBDSRG1,DCBDSGPS+DCBDSGPO PS OR PO DCB
BZ    EXIT                EXIT IF NOT PS OR PO
NC    DS1DSORG,DS1DSORG  IS DSORG SPECIFIED
BZ    TSTMACRF           TRUST DCB IF NOT SPECIFIED
TM    DS1DSORG,DS1DSGPS+DS1DSGPO IS DATA SET PS OR PO
BZ    EXIT                EXIT IF NOT PS OR PO
TSTMACRF EQU *           TEST MACRF IN DCB
TM    DCBMACF2,DCBMRPUT  PUT MACRO
BO    TSTOOPT           TEST OPEN OPTION
TM    DCBMACF2,DCBMRWRT  WRITE MACRO
BZ    EXIT                EXIT IF NOT WRITE
TSTOOPT EQU *           TEST OPEN OPTION
TM    OIEXOOPT,OIEXOOUT  OPEN FOR OUTPUT
BO    SCREENOK          BRANCH IF YES
TM    OIEXOOPT,OIEXOIN  OPEN FOR OUTIN
BNO   EXIT                EXIT IF NO
SCREENOK EQU *
BR    RET                RETURN TO CALL RLSE, SQTY
RLSE  EQU *              SET PARTIAL RELEASE
*****
*
*      DEFINE DEFAULT VALUES
*      RLSE0  = NUMBER OF EXTENTS. IF THE DATA SET HAS THIS
*              NUMBER OF EXTENTS OR MORE, THEN PARTIAL RELEASE
*              IS NOT BE ALLOWED.
*      RLSE1  = NUMBER OF EXTENTS. IF THE DATA SET HAS LESS THAN
*              THIS NUMBER OF EXTENTS, PARTIAL RELEASE IS
*              REQUIRED.
*
*      NOTE THAT RLSE0 MUST NOT BE GREATER THAN RLSE1
*
*      SETTING RLSE0 TO 17 OR GREATER CAUSES THIS ROUTINE TO
*      NEVER PREVENT A REQUEST FOR PARTIAL RELEASE
*
*      SETTING RLSE1 TO 0 CAUSES THIS ROUTINE TO
*      NEVER FORCE A REQUEST FOR PARTIAL RELEASE
*
*****

```

Figure 22. Sample Listing of IFG0EX0B Part 9 of 13.

Data Management Exits

```

RLSE0    EQU    8                SET RELEASE BIT TO ZERO IF NUMBER OF *
                                           EXTENTS EQUAL OR GREATER THAN THIS
RLSE1    EQU    8                SET RELEASE BIT TO ONE IF NUMBER OF *
                                           EXTENTS LESS THAN THIS
AFTRID4  B      AFTRID4
         DC     CL8'RLSE'        RLSE ROUTINE ID
         BCR   0,RET            NOP RETURN
         L      RDSCB,OIEXDSCB   FORMAT 1 DSCB ADDRESS
         TM     DS1DSORG,DS1DSGPO IS DATA SET PARTITIONED
         BO     TSTRLSE         DO NOT SET RELEASE FOR PARTITIONED
         CLC    DSINOEVPV,EXTRLSE1 FEW ENOUGH TO SET RELEASE
         BNL    TSTRLSE         BRANCH IF NOT
         L      RJFCB,OIEXJFCB
         OI     JFCBIND1,JFCRLSE SET RELEASE
         LA     RINCODE,MODJFCB  JFCB MODIFIED
         B      RETRLSE         RETURN
TSTRLSE  CLC    DSINOEVPV,EXTRLSE0 ENOUGH TO ZERO RELEASE
         BL     RETRLSE         BRANCH IF NO
         NI     JFCBIND1,255-JFCRLSE ZERO RELEASE
         LA     RINCODE,MODJFCB  JFCB MODIFIED
RETRLSE  EQU    *                RETURN FROM RLSE
         BR     RET             RETURN
         DC     CL8'RLSECONS'    RLSE CONSTANTS ID
         DS     0H
EXTRLSE1 DC     AL1(RLSE1)       IF FEWER THAN THIS NUMBER OF EXTENTS,*
                                           PARTIAL RELEASE IS SET
EXTRLSE0 DC     AL1(RLSE0)       IF THIS NUMBER OR MORE EXTENTS, *
                                           PARTIAL RELEASE IS ZEROED
SQTY     EQU    *                SET SECONDARY QUANTITY
*****
*
*      DEFINE DEFAULT VALUES
*      SQTYDFL = DEFAULT SECONDARY QUANTITY. THIS QUANTITY IS
*              SET IF THE SECONDARY QUANTITY IS ZERO AND THE
*              PRIMARY QUANTITY IS ZERO OR ONE. IT IS USED
*              IF SECONDARY QUANTITY IS ONE, AND THE NUMBER OF
*              EXTENTS IS EQUAL OR GREATER TO EXTSQT.
*      EXTSQT  = NUMBER OF EXTENTS. IF THE DATA SET HAS THIS MANY
*              EXTENTS OR MORE, THEN INCREASE SECONDARY QUANTITY.
*
*****
SQTYDFL  EQU    5                DEFAULT SECONDARY QUANTITY
EXTSQT   EQU    10              IF DATA SET HAS THIS MANY EXTENTS, *
                                           THEN INCREASE SECONDARY QUANTITY
         B      AFTRID6

```

Figure 23. Sample Listing of IFG0EX0B Part 10 of 13.

	DC	CL8'SQTY'	SQTY ROUTINE ID
AFTRID6	BCR	0,RET	NOP RETURN
	L	RJFCB,OIEXJFCB	JFCB ADDRESS
	NC	JFCBSQTY,JFCBSQTY	ANY SECONDARY QUANTITY
	BZ	TSTPRIM	TEST PRIMARY IF NOT
	L	RDSCB,OIEXDSCB	FORMAT 1 DSCB ADDRESS
	CLC	DSINOEPV,EXTSQTY	ENOUGH TO ADD TO SECONDARY QTY
	BL	RETSQTY	BRANCH IF NOT
	XR	RODD,RODD	
	ICM	RODD,7,JFCBSQTY	GET SECONDARY QUANTITY
	LR	REVEN,RODD	SAVE IN REVEN
	SRL	REVEN,1	HALVE SECONDARY QUANTITY
	LTR	REVEN,REVEN	IS SECONDARY ONE
	BZ	SETDFLT	DEFAULT SECONDARY IF ONE
	AR	RODD,REVEN	150% OF SECONDARY
	B	STSQTY	
TSTPRIM	EQU	*	SECONDARY QUANTITY IS ZERO
	NC	JFCBPQTY,JFCBPQTY	IS PRIMARY QUANTITY ZERO
	BZ	DFLTSQTY	DEFAULT SECONDARY
	XR	RODD,RODD	
	ICM	RODD,7,JFCBPQTY	
	SRL	RODD,1	HALVE PRIMARY
	LTR	RODD,RODD	IS PRIMARY ONE
	BNZ	STSQTY	BRANCH IF NOT
SETDFLT	EQU	*	USE QUANTITY IN SQTDFLT
	L	RODD,SQTDFLT	DEFAULT SECONDARY
	B	STSQTY	STORE SECONDARY
DFLTSQTY	EQU	*	PRIMARY AND SECONDARY ZERO
	L	RODD,SQTDFLT	GET DEFAULT SECONDARY
	TM	JFCBCTRI,JFCBSPAC	
	BNZ	STSQTY	
	CLI	DS1EXT1,X'01'	TRACK EXTENT
	BE	DFLTTRK	YES -- SET TRACKS
	CLI	DS1EXT1,X'81'	CYL EXTENT
	BNE	RETSQTY	NO -- RETURN
	OI	JFCBCTRI,JFCBCYL	SET CYLINDER UNITS
	B	STSQTY	
DFLTTRK	EQU	*	SET TRACK UNITS
	OI	JFCBCTRI,JFCBTRK	MAKE TRACK REQUEST
STSQTY	EQU	*	STORE SECONDARY QTY
	STCM	RODD,7,JFCBSQTY	
	LA	RINCODE,MODJFCB	JFCB MODIFIED
RETSQTY	EQU	*	RETURN FROM SQTY
	BR	RET	RETURN
	DS	0F	

Figure 24. Sample Listing of IFG0EX0B Part 11 of 13.

Data Management Exits

```
      DC   CL8'SQTYCONS'   SQTY ROUTINE CONSTANTS ID
SQTYDFLT DC   A(SQTYDFL)   DEFAULT SECONDARY QUANTITY
      DC   AL1(0)         NOTE ONE BYTE OF ZERO BEFORE EXTSQTY
EXTSQTY  DC   AL1(EXTSQT)  IF DATA SET HAS THIS MANY EXTENTS, *
                                     THEN ADD TO SECONDARY QUANTITY
*****
*
*       CONSTANTS / PATCH AREA
*
*****
NULLFILE DC   C'NULLFILE '   DD DUMMY DATA SET NAME
SYS1     DC   C'SYS1.'       START OF SYSTEM DATA SET NAMES
      DS   0F
PATCH   DC   C'IFG0EX0B PATCH AREA '
      DC   XL50'00'
*****
*
*       MAX TABLE MAPPING DSECT (MAPS TPMAX OR DAMAX)
*
*****
MAX      DSECT
MAXBUF   DS   A             MAXIMUM SIZE FOR BUFFERS
MAXBNO   DS   A             MAXIMUM NUMBER OF BUFFERS
*****
*
*       DCB OPEN INSTALLATION EXIT PARAMETER LIST
*       --THE IEFCOIEXL MACRO
*
*****
IEFCOIEXL
*****
*
*       DCB - THE DCBD MACRO
*
*****
DCBD DSORG=PS,DEV=DA
*****
*
*       UCB - THE IEFUCBOB MACRO
*
*****
UCB      DSECT
         IEFUCBOB LIST=YES
*****
*
```

Figure 25. Sample Listing of IFG0EX0B Part 12 of 13.

```

*          TIOT - THE IEFTIOT1 MACRO
*
*****
TIOT      DSECT
          IEFTIOT1
*****
*
*          JFCB - THE IEFJFCBN MACRO
*
*****
JFCB      DSECT
          IEFJFCBN LIST=YES
*****
*
*          FORMAT 1 DSCB - THE IECSDSL1 MACRO *
*****
F1DSCB    DSECT
          IECSDSL1 (1)
          END

```

Figure 26. Sample Listing of IFG0EX0B Part 13 of 13.

VSAM EOV Installation Exit (IDAEOVXT)

This module allows users to dynamically add to allocation control block information during extends of certain VSAM data sets. For information about supported data sets, see “Characteristics of the IDAEOVXT Exit Routine.”

Replacing the IDAEOVXT Exit Routine

Products or installations that replace the VSAM version of IDAEOVXT with their own module must link-edit their version into LPALIB as a separate load module that is named IDAEOVXT. For more information about replacing exit routines, see “Replacing an Existing Exit” on page 3.

Characteristics of the IDAEOVXT Exit Routine

IDAEOVXT is packaged as a single load module. It is entered in 31-bit addressing mode and must return in 31-bit addressing mode. You can replace IDAEOVXT with another module that sets a return code of 0 and causes VSAM EOV to try the extend. The replacement IDAEOVXT module must be reentrant and is entered in the supervisor state and key 0. Return to VSAM EOV must be in supervisor state and key 0.

IDAEOVXT receives control when all candidate volumes have been used and dynamic volume count usage is unsuccessful. IDAEOVXT receives control for all extended format VSAM data sets and VSAM data sets that are SMS managed, except for the following data sets:

- Keyrange data set
- IMBED data set
- Temporary data set
- Catalog
- Catalog opened as a data set
- “System” data set
- VVDS
- Data set that was opened for improved control interval processing

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- Data set using control blocks in common
- SNAPSHOT EOVS

IDAEOVXT is not used for VSAM RLS.

Registers on Entry to the IDAEOVXT Exit Routine

The following is a list of the registers on entry to the IDAEOVXT exit routine.

Register

Contents

- 1 Address of the VSAM EOVS installation exit parameter list
- 0, 2–12 Not applicable
- 13 Address of an 18-word save area
- 14 Return address to VSAM EOVS
- 15 Address to the entry point to IDAEOVXT

IDAEOVXT Parameter List

Register 1 contains the address of the VSAM EOVS parameter list, which is shown in Table 11.

Table 11. IDAEOVXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 1-byte area that contains the indicator of the condition that caused IDAEOVXT to be entered: <ul style="list-style-type: none">• X'01' — Out of space and no volumes are available with space for the required allocation• X'00', X'02'-X'FF' — Reserved
04 (X'04')	4	The address of a 44-byte area that contains the VSAM component name.
08 (X'08')	4	The address of a 4-byte area that contains the DSAB address of the DSAB being used by VSAM EOVS for the current extend. It might not be the DSAB for the ACB that actually caused EOVS to be entered.

Registers on Return from the IDAEOVXT Exit Routine

When IDAEOVXT returns to VSAM EOVS, the contents of register 15 are as follows:

Register

Contents

- 15
 - 0 VSAM EOVS must try the extend.
 - 4 VSAM EOVS must continue with EOVS termination.

All other values are reserved for future use.

Tape Cartridge Message Display Installation Exit (IGXMSGEX)

You can use the message display installation exit to:

- Customize messages for display on an IBM® 3480, 3490, or 3590 tape drive by modifying the message text pointed to by the parameter list, based on job name, step name, or some other means. The message text includes the parameters from the MSGDISP macro. The system issues the MSGDISP macro for system-managed drives the same as it does for non-managed drives.
- Specify no automatic cartridge loading.

If you plan to use DFSMSrmm, you must use the IGXMSGEX exit routine it provides. If you have already written your own IGXMSGEX routine, you might have to merge it with the source code provided by DFSMSrmm. See *z/OS V2R1.0 DFSMSrmm Implementation and Customization Guide* for more information.

Installing the IGXMSGEX Exit Routine

See “Replacing an Existing Exit” on page 3. Your routine's entry point name must be IGXMSGEX. The MSGDISP function calls IGXMSGEX for MOUNT, DEMOUNT, VERIFY, and GEN.

Characteristics of the IGXMSGEX Exit Routine

IGXMSGEX runs under the following conditions:

- Reenterable
- Supervisor state
- Protection key 0
- 31-bit addressing mode
- Any residency mode

If you want to process differently based on the job or step name, use the PSATOLD pointer to the current TCB. If TCBTIO is nonzero, then it points to the TIOT which contains the job name and the step name. See Figure 27 on page 63 to see how to use PSATOLD and the TIOT to find job and step names.

Controlling the Automatic Cartridge Loader

To request that no automatic cartridge loading be performed, use the IGXMSGEX routine to set bit 7 in the format control byte to zero. To request automatic cartridge loading, set bit 7 to one.

When IGX00030 receives control back from IGXMSGEX, it processes according to the fields that IGXMSGEX might have modified in the two display data fields and in bit 7 in the format control byte when it issues the LOAD DISPLAY channel command. IGX00030 also checks to see if the device in the UCB in the parameter list supports automatic cartridge loading if it is active. If the device does not support automatic cartridge loading and IGXMSGEX set bit 7 to one, IGX00030 resets the bit to zero before issuing the LOAD DISPLAY channel command.

If IGXMSGEX is not link-edited with IGX00030, MSGDISP allows automatic cartridge loading only if the device supports automatic cartridge load, and if the volume serial number is either SCRTCH or PRIVAT.

Registers on Entry to the IGXMSGEX Exit Routine

Register

	Contents
0	Not applicable
1	Address of the tape cartridge message display parameter list
2-12	Not applicable
13	Address of a save area
14	Return address to the calling program
15	Address of the entry point to IGXMSGEX

IGXMSGEX Parameter List

Register 1 contains the address of the IGXMSGEX parameter list, which contains the following fields:

Data Management Exits

Table 12. IGXMSGEX Parameter List

Offset	Length	Description
00 (X'00')	4	Address of the UCB. Might be above or below the 16 MB line. If it is below the line, it might be a captured or actual address.
04 (X'04')	4	Address of MSGTEXT

The second word of the parameter list points to MSGTEXT, which is shown in Table 13.

Table 13. MSGTEXT for IGXMSGEX

Offset	Length	Description
0 X'00'	1	Control byte. You can only change the following bit:
	.... ...1	Use the automatic cartridge loader, if available. Set this bit to 0 to disable automatic cartridge loading.
01 X'01'	8	First message text. You can modify this text.
09 X'09'	8	Second message text. You can modify this text.

Registers on Return from IGXMSGEX

Before you return control to the caller, set up the registers as follows:

Register

Contents

0-14 Same as on entry

15 Not applicable. There are no return codes for this exit.

Example of the IGXMSGEX Exit Routine

Figure 27 is an example of the IGXMSGEX exit routine.

```

IGXMSGEX  CSECT
IGXMSGEX  AMODE 31
IGXMSGEX  RMODE ANY
          STM    14,12,12(13)    save callers registers
          LR     12,15           establish base register
          USING  IGXMSGEX,12
*  NOTE: This module must be RE-ENTRANT!!! This example does not
*  obtain a save area, but if one is necessary, it would need to
*  be GETMAINED.
*
*  To test for a specific job name or step name the following
*  code sequence may be used
*  NOTE: This code assumes that a deferred tape mount is done
*  if deferred tape mounts are not requested, the TIOCJOB
*  field will contain 'INIT  ' and the TIOCSTEP+8 field
*  will contain the 8 byte job name
          USING  PSA,0
          L      15,PSATOLD      get TCB address
          USING  TCB,15         map TCB
          L      15,TCBTIO      get TIOT address
          USING  TIOT,15        map TIOT
          LTR    15,15          is there a TIOT
          BZ     NOTIOT          no, branch
          CLC    TIOCJOB,MYJOB   check for interesting job
          BNE   NOTMYJOB        branch if "not my job"
          CLC    TIOCSTEP(8),MYSTEP  check for interesting step
          BNE   NOTMYSTP        branch if "not my step"
          DROP  15
*  Of the bits in the control byte, only the ACL request bit
*  may be modified. If any other bit is changed, IGX00030 will
*  reset it to the original state. If the ACL request bit is
*  set on, it will only be honored if the device actually
*  supports the automatic cartridge load (ACL) feature. The UCB
*  can be tested to ensure that the ACL feature is supported.
*  The system will have set ACL request bit on if the device
*  supports ACL, the ACL load is ready, and the volser is SCRTCH or
*  PRIVAT.
          USING  PLIST,1        map input parameters
          L      2,MSGTEXTA     get message text address
          USING  MSGTEXT,2      map message text
          TM     CONTROL,ACL    is ACL request bit on
          BO     ACLON          yes branch
          L      3,UCBA         get UCB address from PLIST
          USING  UCB,3

```

Figure 27. Sample Listing of IGXMSGEX Part 1 of 2

```

* We could just always set the bit on and let the calling module
* (IGX00030) test to see if the ACL is supported, but we will test
* the UCB just as an example.
      TM      UCBTFL1,UCBCSL      is ACL supported
      BNO     ACLOFF              no, branch
      OI      CONTROL,SETACLON    set ACL request bit on
SETACLON EQU  X'01'              ACL on bit
ACLON      EQU  *                ACL on
ACLOFF     EQU  *                ACL off
*
NOTMYJOB   EQU  *
NOTMYSTP   EQU  *
NOTIOT     EQU  *
* NOTE: This exit could also be used to update the message text
* in the parameter list (i.e. MSG1 and MSG2 fields). An example
* of this has not been included because the update would be
* specific to implementation details of a specific installation.
      LM      14,12,12(13)        restore callers registers
      SR      15,15              set return code, (not used by
*                               IGX00030, just good practice)
      BR      14                 return to caller
MYJOB      DC   CL8'MYJOB'        job name of interest
MYSTEP     DC   CL8'MYSTEP'      step name of interest
* Parameter list pointed to be register 1
PLIST      DSECT
UCBA       DS   A                UCB address
MSGTEXTA   DS   A                Message text address
MSGTEXT    DSECT
CONTROL    DS   CL1
ACL        EQU  X'01'            ACL request bit
MSG1       DS   CL8              first message
MSG2       DS   CL8              second message
***** Include control block mapping macros
      IHAPSA                      PSA mapping
      IKJTCB                      TCB mapping
TIOT       DSECT                  provide DSECT statement for TIOT
      IEFTIOT1                    TIOT mapping
UCB        DSECT                  provide DSECT statement for UCB
      IEFUCBOB                    UCB mapping
      END

```

Figure 28. Sample Listing of IGXMSGEX Part 2 of 2

Chapter 3. Tape Label Processing Installation Exits

This topic discusses installation exits for specialized tape processing. With these replaceable modules you can:

- Create and process nonstandard tape labels.
- Edit labels when versions, label types, density, or volume serial number conflicts are detected.
- Control volume access, file access, and label validation for ISO/ANSI Version 3 and Version 4 volumes.
- Selectively convert pre-Version 3 volumes to Version 3 or Version 4 volumes.

Table 14 lists the replaceable modules available for tape label processing.

Table 14. Tape Label Processing Modules

Module Name	Description	When Available
IFG019LA	Label anomaly	Called from open and end-of-volume (EOV)
IFG019VM	Volume mount	Called from open and EOV
IFG019FV	File validation	Called from open and EOV
IFG019FS	File start on volume	Called from open and EOV
IFG055FE	File end on volume	Called from close and EOV
NSLOHDRI NSLEHDRI	Nonstandard label processing routines for input headers	Called from open and EOV
NSLOHDRO NSLEHDRO	Nonstandard label processing routines for output headers	Called from open and EOV
NSLETRLI	Nonstandard label processing routine for input trailers	Called from open
NSLETRLO NSLCTRLO	Nonstandard label processing routines for output trailers	Called from EOV and close
IEFXVNSL	Automatic volume recognition (AVR) nonstandard label processing	When AVR cannot identify the first record on a magnetic tape volume as a standard label
NSLREPOS	Volume verification using the dynamic device reconfiguration (DDR) option for nonstandard label processing	When DDR is used for nonstandard labels
IFG0193C IFG0553C	Volume label editor routines for open and EOV	At open and EOV
IFG0193G	ISO/ANSI Version 3 and Version 4 label installation exits for volume access, file access, label validation, and label validation suppression	At open or EOV file access: after positioning to a requested data set
IEECVXIT	Replaced by IEAVMXIT	No longer available
IEAVMXIT	WTO, WTOR message processing installation exit	Label version conflict

Programming Considerations

In general, your replaceable module must:

- Follow the naming conventions for the particular module you are replacing.
- Save and restore registers.
- Reside in SYS1.LPALIB and in the LPALST concatenation.

Open, Close, End-of-Volume Tape Management Exits

The open, close, and end-of-volume (EOV) tape management exits allow tape management systems to avoid changing system control blocks or issuing channel programs against tapes in order to maintain a tape inventory.

During the course of opening, processing and closing a tape data set, the system always calls the File Validation, File Start on volume and File End on Volume. Open or EOV calls the file validation exit for each volume regardless of whether it already was mounted or verified.

Many conditions affect whether various exits are called and their sequence. During one call to Open or EOV, the following is a typical sequence:

1. File end on volume exit (if EOV)
2. Volume mount exit for volume verification (if volume was not previously mounted and verified)
3. Volume mount exit for volume security (if volume was not previously mounted and verified)
4. File validation exit (if labels exist)
5. Volume mount exit for volume write function (if the tape has standard labels, the user is writing and the file is the first file on the volume)
6. File start on volume exit

Installing the Open, Close, and EOV Exits

The open, close, and EOV exits are always present and link edited with open, close, and EOV modules. IBM supplies dummy versions of these exits. They have no effect and you can replace them by using the SMP/E USERMOD function. For the volume mount exit, the dummy version always gives the return code that means to continue.

For additional information, see "Replacing an Existing Exit" on page 3.

Characteristics of the Open, Close and EOV Exits

These exits run under the following conditions:

- Supervisor state
- Protection key five
- TCB mode
- 31-bit addressing mode

You must save and restore registers other than register 15.

Registers on Entry to the Open, Close and EOV Exits

Register

	Contents
1	Address of Open, Close, and EOV main parameter list which includes a pointer to the appropriate function-specific parameter list
13	Standard 18 word save area
14	Address of exit caller
15	Address of exit entry point

Open, Close, and EOV Main Parameter List

IFGTEP (tape exit parameters) maps the main parameter list for all of the open, close, EOV tape management exits. It also maps the function-specific parameter lists. The parameter lists are in protection key five.

The IFGTEP macro supports positional parameters in any order that say which parameter list or lists to expand. These values can be coded in any combination to get the indicated parameter list:

- MAIN - Main parameter list (see Table 15)
- LABAN - Label anomaly parameter list (see Table 16 on page 76)
- VOLM - Volume mount parameter list (see Table 17 on page 81)
- FILEV - File validation parameter list (see Table 18 on page 85)
- FILES - File start on volume parameter list (see Table 19 on page 86)
- FILEE - File end of Volume parameter list (see Table 20 on page 88)

The format of the main parameter list is:

Table 15. Open, Close, EOV Main Parameter List.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPM	Beginning of the parameter list
00 (X'00')	8	TEPMID	Control block identifier ("TEPMAIN")
8 (X'08')	4	TEPMLN	Length of main parameter list
12 (X'0C')	1	TEPMVER	Version of parameter list (1)
13 (X'0D')	3		Reserved
16 (X'10')	1	TEPMFUNC	Calling function (binary numeric): <ol style="list-style-type: none"> 1. OPEN. The call can be during like or unlike concatenation. 2. EOV or FEOV (Note that for QSAM output the caller of EOV might be CLOSE because it reached the end of the tape when writing out the last buffers. EOV will soon continue on a new volume with the file start on volume exit and CLOSE will resume with the file end on volume exit.) The call might be for the first volume during like concatenation. 3. CLOSE with TYPE=T. 4. CLOSE without TYPE=T.
17 (X'11')	1	TEPMOPENOP	First option for the DCB in the OPEN parameter list. Valid during all calls to the exits with one exception. If the application program used OPEN TYPE=J and suppressed the JFCB update, these bits will show EXTEND and OUTINX as OUTPUT and OUTIN during EOV and CLOSE. Note that all options except UPDAT are valid on tape.
	.... 0000		INPUT
	.... 0001		RDBACK
	.... 0011		INOUT
	.... 0110		OUTINX
	.... 0111		OUTIN
	.... 1110		EXTEND
	.... 1111		OUTPUT

Tape Exits

Table 15. Open, Close, EOVS Main Parameter List. (continued)

Offset	Length or Bit Pattern	Name	Description
18 (X'12')	2	TEPMCONC	Concatenation number. First or only data set is 0.
20 (X'14')	2	TEPMVSEQ	Volume sequence number. The first volume is 1.
22 (X'16')	6	TEPMVOL	Requested volume serial number, blank if output nonspecific or output VOL=REF and it is still not resolved. Not necessarily in JFCB, might be in JFCBX. First byte will not be X'FF', which would mean it is not resolved. Bit TEPMSYINV means that the system synthesized the volume serial number from other than a volume label. The volume mount exit can set bit TEPMNEWLAB to mean that the exit has changed this field to substitute the volume serial.
28 (X'1C')	1	TEPMFLAG1	Flags
	1...	TEPMSMS	SMS-managed volume.
	.1..	TEPMTLDS	Tape Library Dataserver.
	..1.	TEPMCHKPT	Data set is a checkpoint data set.
	...1	TEPMASCII	The system translated the label from ASCII to EBCDIC or will translate from EBCDIC to ASCII. On input the system translates only if the label begins with ASCII HDR, EOVS or EOF.
	.... 1...	TEPMSAB	System issued an ABEND for this data set. Its ABEND completion code is in TEPMABC.
	.... .1..	TEPMAB	The current task is abending apparently because of a reason that is not related to this tape. Its code is shown in field TEPMABCODE.
	.... ..1.	TEPMLWRIT	Current operation. "1" means that the caller will be writing or rewriting labels. If the caller is OPEN, then this bit will be zero if the OPEN option is INPUT, INOUT, RDBACK, EXTEND or OUTINX or if the OPEN option is OUTPUT or OUTIN with DSP=MOD. If the caller is OPEN, then this bit will be one for OUTPUT or OUTIN without DISP=MOD. If the caller is EOVS, then a zero means that the user's last I/O was to read. Either it read a tape mark or the user issued an FEOVS or EOVS macro. If the caller is EOVS, then a one means that the user's last I/O was to write. Either it encountered the end of the tape or the user issued an FEOVS or EOVS macro.
.... ...1	TEPMACCESS	Access intent. This will be 0 to indicate "read-only" if the OPEN option was for INPUT or RDBACK and it will be 1 to indicate "write" for any other OPEN option.	
29 (X'1D')	1	TEPMFLAG2	Flags
	1...	TEPMSYINV	Volume serial number in TEPMLABEL was synthesized by the system, possibly from sense bytes.
	.1..	TEPMVFRY	Volume has been verified.
	..1.	TEPMLBS	The block size value is contained in TEPMBLKS

Table 15. Open, Close, EOJ Main Parameter List. (continued)

Offset	Length or Bit Pattern	Name	Description
30 (X'1E')	1	TEPMFLAG3	Flags
	1... ..	TEPMLABAN	Label anomaly exit being called
	.1.. ..	TEPMVOLM	Volume mount exit being called
	..1.	TEPMFILEV	File verification exit being called
	...1	TEPMFILES	File start of volume exit being called
	.... 1..	TEPMFILEE	File end on volume exit being called
	.... .1..	TEPMATL	Allocated device is in the automated tape library
	.... ..1.	TEPMMTL	Allocated device is in the manual tape library
	.... ...1	TEPMWRIT	Write channel program issued to tape in OPEN, EOJ or CLOSE.
31 (X'1F')	1	TEPMRECTK	Recording technology
	0000 0000		Unknown
	0000 0001		18-track
	0000 0010		36-track
	0000 0011		128-track
	0000 0100		256-track
	0000 0101		384-track
	0000 0110		EFMT1
	0000 0111		EFMT2
	0000 1010		EFMT3
	0000 1000		EEFMT2
	0000 0110		EEFMT3
	32 (X'20')	1	TEPMFLAG5	Flags
1... ..		TEPMWORM	Worm tape mounted.
.1.. ..		TEPMCRYP	On - the key-related fields have data. Off - the key-related fields contain binary zeroes.
..xx xxxx		Reserved	
33 (X'21')	1	TEPMFLAG6	Flags set by the exit
	1... ..	TEPMNEVLAB	Exit supplied a volume label. Valid only for label anomaly and volume mount exits.
	.1.. ..	TEPMSCRTCH	Original volume request was for a nonspecific volume
	..xx xxxx	Reserved	Set to zeros
34 (X'22')	1	TEPMMEDT	Media type
	0000 0001		Media1
	0000 0010		Media2
	0000 0011		Media3
	0000 0100		Media4
	0000 0101		Media5
	0000 0110		Media6

Tape Exits

Table 15. Open, Close, EOVS Main Parameter List. (continued)

Offset	Length or Bit Pattern	Name	Description
	0000 0111		Media7
	0000 1000		Media8
	0000 1001		Media9
	0000 1010		Media10
35(X'23')	1		Reserved
36 (X'24')	4	TEPMABCODE	Task is abending with this code, in form <i>xyyyzzz</i> , where <i>yyy</i> is system ABEND code that is normally displayed in hex and <i>zzz</i> is user ABEND code. Valid only if TEPMSAB or TEPMAB is on. Same format as TCBCMP.
40 (X'28')	4	TEPMDCB	<p>Address of DCB copy in protection key 5 storage. Can include DEN, TRTCH, OPTCD=B, block count on current volume, MACRF (indicates BSAM, QSAM or EXCP, length of EXCP DCB and whether DCBBLKCT is valid), BUFNO, NCP, address of DCBE, BLKSIZE, LRECL and RECFM. The block count normally is zero at file start on volume except when the data set is open for read backwards or is being extended. For EXCP, DCBMACRF includes an indicator as to whether the user program is keeping a block count in DCBBLKCT (REPOS=Y). If it is off, DCBBLKCT is not valid. It is invalid for any of these reasons:</p> <ul style="list-style-type: none"> • The EXCP user did not code REPOS=Y on the DCB macro. • The BSAM user issued the CNTRL FSM macro and the system was not able to reestablish the block count later. • While open for read backward, the user issued FEOV or CLOSE before reading the tape mark. • Extending (DISP=MOD or OPEN EXTEND or OUTINX) an unlabeled or NSL tape. During OPEN, this DCB does not have a pointer to the DEB. <p>In the current release, the copy of the DCB points to the user's DCBE if one was supplied. For system integrity reasons refer only to the DCBE in the user's key.</p>
44 (X'2C')	4	TEPMUCB	Address of the captured UCB. At the call to the file-end-on-volume exit, the UCB should have volume error statistics because the tape was mounted or SVC 91 cleared them. These statistics differ in format between reels and cartridges. The UCB also tells whether a cartridge stack loader is attached.

Table 15. Open, Close, EOVS Main Parameter List. (continued)

Offset	Length or Bit Pattern	Name	Description
48 (X'30')	4	TEPMJFCB	Address of JFCB copy. Includes data set name, required label type, requested expiration date, requested volume serials (any that start with X'FF' have not yet been resolved), approximate limit on the volume count, density, file sequence number in the volume group, TRTCH, FREE=CLOSE. If the OPEN option was EXTEND or OUTINX and at least one volume serial was specified, then DISP in the JFCB has been changed to MOD. If DISP=MOD was coded and the OPEN option was EXTEND or OUTINX, but no volume serial was specified, then OPEN changes DISP=MOD to DISP=OLD. The exit should not modify the JFCB.
52 (X'34')	4	TEPMDSAB	Address of DSAB. To get the DDname the exit can get the TIOT entry address from the DSAB. The name might be blank, which means concatenation.
56 (X'38')	4	TEPMLABEL	Address of label (80 bytes). If the address is 0 and the tape is SL or AL, then the data set was being read and the user issued FEOV or CLOSE without reading the tape mark. As much of the header label 1 or trailer label 1 for read backwards as the system could read up to 80 bytes. Note: The creation date and expiration date in the header label might differ from that in the trailer label. This might be because of DISP=MOD or OPEN EXTEND. The System code field (13 bytes) is available at beginning of data set. It tells whether an AL tape meets IBM's definition of certain label 2 fields. For the volume mount exit and label anomaly exit this is the first block on the volume no matter what label type was requested except for BLP. The label anomaly exit might build a label in this area. For the file validation exit the label is HDR1, EOVS1 or EOF1. For the file start on volume exit and the file end on volume exit no label is available because OPEN, CLOSE, EOVS sometimes does not have one. For example this might be because it processed user labels or it wrote a message to the operator.
60 (X'3C')	4	TEPMLLEN	Length of the block that was read. Zero means either that no data was read because of an I/O error or it means that a tape mark was read.
64 (X'40')	4	TEPMTEP	Address of function-specific parameter list
68 (X'44')	4	TEPMSENSE	Address of sense bytes 0 and 1 from an IOB. If X'10FE', then the system was not able to obtain sense bytes.
72 (X'48')	6	TEPMMTVOL	Mounted volume serial
78 (X'4E')	6	TEPMEXVOL	External volume serial
84 (X'54')	2	TEPMTDSI	TDSI (tape dataset info) from JFCB
86 (X'56')	2		Reserved
88 (X'58')	4	TEPMVOL1	Address of original VOL1 label. Initialized when OPEN or EOVS issues a loadpoint read for volume verification.
92 (X'5C')	4	TEPMHDR1	Address of original HDR1 of first data set on the volume. Initialized when OPEN or EOVS issues a loadpoint read for volume verification.

Tape Exits

Table 15. Open, Close, EOVS Main Parameter List. (continued)

Offset	Length or Bit Pattern	Name	Description
96 (X'60')	8	TEPMBLKS	Block size value
104 (X'68')	4	TEPMCAPM	Media capacity (MB) of the mounted volume on device type 3490 and higher tape drive technologies.
108 (X'6C')	4	TEPMCAPP	Reserved for future partition capacity. Currently same value as TEPMCAPM.
112 (X'70')	12	TEPMWWID	WORM World Wide Volume id
124 (X'7C')	2	TEPMWMC	WORM write mount count

Passing Information Between Exits

The parameter lists have no provision for an exit to pass information, such as the address of a work area, to another exit invocation. Your exit can pass information to another of your exits by calling IEANTCR to create a name/token pair. In another exit call IEANTRT to retrieve the information and IEANTDL to delete the information. See *z/OS V2R1.0 MVS Authorized Assembler Services Reference EDT-IXG*, SA23-1373.

You choose a 16-byte name for your 16 bytes of information. For example, you might choose a 12-byte constant and the 4-byte UCB address for the name. It is better not to choose a task level name because any of the exits can be called in various tasks. To avoid the possibility of permanently lost storage, use a home address space name.

Remember that the UCB address in TEPMUCB might be duplicated in another address space and represent a different UCB and device in the other address space.

Remember also that the device might be closed, varied offline and become undefined. In that case, a system-level name/token pair would be lost until IPL unless a device is defined and happens to get a UCB at the same virtual address. It is recommended that you delete your name/token pair in the last exit that uses it.

Open, Close, and EOVS Return Codes

If an exit gives an unsupported return code, the system writes a message that displays the name of the exit and the invalid return code. The system then abends the job.

Label Anomaly Exit (IFG019LA)

The system calls this exit when it has found one or more certain unusual conditions on a tape. With the dummy version of this exit most of these conditions cause OPEN or EOVS to go to the label editor routine or to issue ABEND (possibly after calling the user's DCB abend exit). The label editor routine is documented in "Volume Label Verification and Volume Label Editor Routines" on page 108. IBM recommends using the label anomaly exit instead of a label editor routine for the reasons stated in the label editor sections.

The label anomaly exit will receive a UCB address from TEPMUCB in IFGTEP, from DEBUCBA and from TIOEFSRT. All three sources will allow a 31-bit UCB address. TEPMICB will sometimes be an uncaptured 31-bit address. If the DEB31UCB bit is on, the UCB address and modeset byte will be different as

described in IEZDEB. If they use the DCBTIOT field to find the TIOT entry address, they should be changed to use TEPMDSAB to point to the DSAB, which points to the TIOT entry or XTIOT.

These are the situations under which the system calls a label editor routine and the label anomaly exit:

- **Label type conflict.** User opening for OUTPUT or OUTIN and the requested label type (SL, AL, NL, NSL) differs from the actual label type. If the exit gives return code 4 and turned off this anomaly bit and the requested type is SL or AL, then the exit has built a volume label in EBCDIC in the supplied area. OCE will verify that it begins with VOL1. The requested label type is in the JFCB. The exit can determine the actual label type by examining the first four bytes of the area to which TEPMLABEL points. It is in the main parameter list. The area is from the first block on the tape after load point. If it is not "VOL1", then the tape is not labeled or it has nonstandard labels. If it is "VOL1", then the label is SL or AL. To determine which, the exit can test bit TEPMASCII in the main parameter list.
- **Density conflict.** User opening for OUTPUT, OUTIN, INOUT, OUTINX or EXTEND and the existing density differs from the requested density. The volume is mounted on a dual density drive. Return code 4 with this anomaly bit off means to use the requested density if writing file 1 or the existing density if writing a later file.
- **Volume serial conflict.** The user is opening for OUTPUT or OUTIN and the mounted volume serial differs from the requested volume serial. With return code 4 and this anomaly bit off this exit can supply a new volume label.
- **Label version conflict.** User opened for OUTPUT on an AL tape and the volume label is not for Version 3 or Version 4. With return code 4 and this anomaly bit off this exit can supply a new volume label.
- **Track conflict.** The tape cannot be read because of incompatibility between the tape and the drive, not because of some other I/O error. The exit can test the CSW status bytes and the sense bytes in the main parameter list. See TEPMSSENSE. One case is 36-track tape mounted on 18-track drive. TEPATRKC on indicates this condition. The volume serial number might have come from the sense bytes, in which case TEPMSYINV is on. A PARMLIB option controls what open, close, EOVS does. For example, if DEVSUPxx parameter VOLNSNS=YES is specified, the OPEN or EOVS label editor routines will rewrite the VOL1 label using the volume serial number obtained from the drive sense bytes. The LABAN exit can give permission to use the tape, which means that the system can destroy the labels without reading the labels. This means the exit is taking responsibility for such things as security and the files being expired. The exit can provide all the information to be written in the new volume label. The system will still call RACF for the volume but without the header label information. The IBM-supplied Label Editor routine, OMODVOL1 or EMODVOL1 will delete the RACF definition for the volume. The exit can bypass this delete of the RACF TAPEVOL profile when the system has set flag bit TEPABYRACF in byte TEPAFLAG3 indicating the bypass option is active. Setting flag bit TEPAXSKIP in byte TEPAFLAG3 when TEPABYRACF has been set by the system, and returning return code 4 results in bypassing the delete of the RACF TAPEVOL profile.
- **I/O error.** I/O error while reading volume label for output tape and RACF tape protection is not active. If the exit gives return code 4 with this anomaly bit off, the system tries to create a new label.

Tape Exits

Those conflicts can also be handled by OMODVOL1 and EMODVOL1. Any conflicts you do not handle in the label anomaly exit are passed to OMODVOL1 or EMODVOL1 to handle. The following are not supported by OMODVOL1 or EMODVOL1:

- **Unsupported cartridge length** Cartridge tape length exceeds IBM's maximum supported length for this drive. This call to the exit is for information only; the tape will be rejected even if the exit turns off the bit. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request.
- **Writing unsecure checkpoint** Writing a checkpoint to an unsecure tape, indicated by bit TEPACHKPT in byte TEPAFLAG1. Return code 8 from the exit means to reject the tape. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request. Return code 8 can also mean that the volume is not secure. This code is like a reply of "NO" to the messages.

Return code 4 from the exit with the bit still on will result in one of these messages to the operator:

```
IEC254D SHOULD jjj USE (ddn,uuu,serial) FOR CREATING A NEW  
CHECKPOINT DATA SET
```

```
IEC255D jjj IS (ddn,uuu,serial) A SECURE CHECKPOINT VOLUME
```

Return code 4 and the TEPACHKPT bit set off results in the system assuming the tape is secure. This is like a reply of "YES" to the messages. If you write a non-checkpoint data set as the first data set on a checkpoint secure volume, then bit TEPANOCKPT is set in the exit's parameter list. When the exit returns a return code of 4, and when bit TEPANOCKPT is still on and it is not an Automatic Tape Library (ATL), then the system issues a scratch volume WTOR IEC255D. The system writes an ATL scratch volume's HDR2 and bypasses WTOR IEC255D. If the exit resets the bit TEPANOCKPT, then the system assumes that the volume is not checkpoint secure, does not issue message IEC255D, and behaves as if the operator had replied "NO" to message IEC255D.

- **Overwriting ISO/ANSI user volume labels** User volume labels or ISO/ANSI Version 4 volume labels 2-9 are about to be overwritten.

Return code 4 with the bit on results in message IEC704A.

Return code 4 with the bit off results in the labels being overwritten.

Return code 8 means to reject the volume. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request.

- **Writing volume label** Volume label information is needed to write the label.

Return code 4 with the bit on results in message IEC704A.

Return code 4 with the bit off means that the exit has supplied the volume label. For volume serial number conflicts between the volume mounted and the volume requested, and for label type conflicts when an NL scratch volume is requested and a labelled tape is mounted, the volume serial number supplied by the exit will be used to either rewrite the volume label or to catalog the NL volume. In the latter case the system will not generate an Lnumber. In order for the label anomaly exit to supply a volume serial the following steps are required:

1. Reset TEPASERIAL (volume serial conflict) or TEPALTYPE (label type conflict) in byte TEPAFLAG1.
2. Set bit TEPMNEWLAB in byte TEPMFLAG6.
3. Provide valid volume serial number in field TEPMVOL.

See "Label Anomaly Exit (IFG019LA) Return Codes" on page 78.

Return code 8 means to reject the volume. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request.

- **Multivolume tape conditions** When reading an unexpected volume sequence number, a missing final volume, or a missing first volume (reading forward or backward) was encountered during multivolume tape processing. With return code C and the corresponding anomaly bit on, this exit issues a message and abends the job.

With DFSMSrmm, the missing or out of sequence conditions are normally resolved, which results in a complete volume list for the multivolume being processed. If you want to process only the original incomplete or out of sequence volume list, you can use a label anomaly exit to ensure the original volume list is used. The following example uses IFG019LA to ensure the original volume list is processed unaltered.

```

IFG019LA CSECT ,
IFG019LA AMODE 31
IFG019LA RMODE ANY
        SPACE 2
        SAVE (14,12)
        LR 12,15
        USING IFG019LA,12          addressibility
        SPACE 2
EXIT   DS 0H
        USING TEPM,1
        L 3,TEPMTEP
        USING TEPA,3
        TM TEPANMLY2,TEPASEQ      vol list out of seq
        BNO  CHKFML                no
        OI TEPAFLAG3,TEPAOUTSEQ   don't alter vollist
        B  EXITEXIT                exit
CHKFML  TM TEPANMLY2,TEPAFML      missing last volume ?
        BNO  CHKBML                no
        OI TEPAFLAG3,TEPARDFMLV   don't alter vollist
        B  EXITEXIT                exit
CHKBML  TM TEPANMLY2,TEPABML      rdback missing last
        BNO  CHKFMF                no
        OI TEPAFLAG3,TEPARDBMLV   don't alter vollist
        B  EXITEXIT                exit
CHKFMF  TM TEPANMLY2,TEPAFMF      missing first volume ?
        BNO  EXITEXIT                no
        OI TEPAFLAG3,TEPARDFMFV   don't alter vollist
EXITEXIT DS 0H
        DROP 3
        DROP 12
        L 14,12(,13)               restore return address
        LA 15,4                     set continue return code
        LM 1,12,24(13)             restore callers regs
        BR 14                       return
        SPACE 2
        IFGTEP MAIN,LABAN
        END

```

Figure 29. Example using label anomaly exit IFG019LA

For a particular OPEN or EOVS this exit can be called more than once for various reasons.

Label Anomaly Exit (IFG019LA) Function-Specific Parameter List

The following figure is the format of the function-specific parameter list for the Label Anomaly Exit. See Table 15 on page 67 for a description of the main parameter list.

Table 16. Label Anomaly Exit Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPA	Label anomaly exit parameter list
00 (X'00')	8	TEPAID	Control block identifier
08 (X'08')	4	TEPALEN	Length of parameter list
12 (X'0C')	1	TEPAVER	Version of parameter list (1)
13 (X'0D')	3		Reserved
16 (X'10')	1	TEPAFLAG1	Flags. Bits that tell the reason for the problem on the tape. More than one bit can be on. If the exit does not find any bit on that represents a problem it was designed to handle, then it should return with the return code that causes no action.
	1...	TEPALTYPE	Label type conflict
	.1..	TEPADENS	Density conflict
	..1.	TEPASERIAL	Volume serial conflict
	...1	TEPAVERS	Label version conflict
	.... 1...	TEPAIOE	I/O error while reading first block and RACF protection is not active
	.... .1..	TEPANCAP	Drive not capable, such as a 36-track tape on an 18-track drive
	.... ..1.	TEPALEN	Unsupported cartridge length
	.... ...1	TEPACHKPT	Writing a checkpoint to an unsecure volume
17 (X'11')	1	TEPAFLAG2	Flags. Bits that tell the reason for the problem on the tape. More than one bit can be on.
	1...	TEPAUSRVLAB	ISO/ANSI user volume labels or VOL 2-9 labels are about to be overwritten.
	.1..	TEPAVINFO	Volume label information is needed to write the volume label.
	..1.	TEPANOCKPT	Writing a non-checkpoint data set to checkpoint volume
	...1	TEPANINIT	Volume on a 3590 device is not formatted
	.... 1...	TEPAUCKPS	When on, instructs O/C/EOV to unconditionally resolve checkpoint conflicts on this scratch volume
	.... .1..	TEPAUCKPP	When on, instructs O/C/EOV to unconditionally resolve checkpoint conflicts on this private volume
	.... ..1.	TEPATRKC	Track conflict. A 36-track tape volume mounted on a 18-track only tape drive.

Table 16. Label Anomaly Exit Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
18 (X'12')	1	TEPAFLAG3	Flags. Bits that tell the reason for the problem on the tape. More than one bit can be on.
	1...	TEPABYRACF	Bypass RACF RACDELETE option is active.
	.1..	TEPAEXSKIP	When on, instructs O/C/EOV to not do RACDELETE.
	..1.	TEPAABEND	Job abends when return code is 8.
	...1	TEPAOUTSEQ	Unexpected tape volume sequence number – next volume to process has a sequence number that is not as expected based on the current volume's sequence number. Job abends with message IEC709I when return code is C.
	.... 1..	TEPARDFMLV	Last tape volume missing – processed last volume specified but it had an EOVS label, not an EOF label. Job abends with message IEC710I when return code is C.
	.... .1..	TEPARDBMLV	When reading backward, the last specified volume for the standard labeled data set is not the actual last volume because it does not end with an EOF label. Job abends with message IEC711I when return code is C.
	.... ..1.	TEPARDFMFV	First volume missing when reading forward – the first volume in the list does not begin with logical volume sequence number 1. Job abends with message IEC712I when return code is C.
.... ...1		Reserved	
19 (X'13')	1	TEPALVR	Current ISO/ANSI version of the tape
20 (X'14')	2	TEPACSWST	<p>“CSW” status bytes that the system received when reading the label. Unit exception will show if the system read a tape mark, and the length of the label will be zero. The I/O errors will show one of these:</p> <ul style="list-style-type: none"> • Drive incapable. (For example if it is a 36-track tape on an 18-track drive, then the system might still be able to move the actual volume serial from the sense bytes to the place in the input area, which will otherwise be blank.) If the system was not able to read the volume label because it is a 36-track tape on an 18-track drive, then the exit can give permission to rewrite the labels without getting all the volume label contents or reading the header labels. This means the exit is taking responsibility for the data sets being expired. The exit will provide the volume serial and the owner information. The system will still call RACF for the volume but without the header label information. • Data check • Other

Tape Exits

Table 16. Label Anomaly Exit Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
I 22 (X'16')	2	TEPANMLY	Preserved initial TEPAFLAG1, 2, and 3 values.
	1	TEPANMLY2	
	...1	TEPASEQ	IEC709I vols out of sequence
	.... 1..	TEPAFML	IEC710I read forward missing last volume
	.... .1..	TEPABML	IEC711I read backward missing last volume
	.... ..1.	TEPAFMF	IEC712I read forward missing first volume
	5	TEPANMLY3	
30 (X'1E')	4	TEPAVOLLST	Pointer to an optional volume list initialized by the exit. This is a list of the remaining volumes after the volume passed back from the exit in TEPMVOL, to the end of the multivolume data set being read. TEPMVOL contains the next volume in sequence to read in order to recover from an IEC709I, IEC710I, IEC711I or IEC712I condition. The exit selects a recovery option by returning a 04 return code, turning off the anomaly indicator in the parameter list, and supplying the next volume to read in TEPMVOL. This optional volume list ensures that all the remaining volumes will be processed in the same sequence order that they were created. This is an optional pointer to storage containing all zeros. The LABAN exit can initialize this storage with a list of the remaining volumes after the volume passed back from the exit in TEPMVOL, to the end or last volume of the multivolume data set being read. The exit does not need to indicate the end of the volume list. Instead a null volser (that is, with all zeros for six bytes) marks the end of the list.
34 (X'22')	6	TEPAPREVL	Volume serial of previous volume. Defined only if caller is EOV and the current volume is for the same DD statement as the previous volume.

Label Anomaly Exit (IFG019LA) Return Codes

Before OPEN or EOV goes to the label editor routine it calls the label anomaly exit. The exit's return code causes one of these actions:

Return Code

Description

- 4 The exit might have turned off any of the anomaly bits for the conditions that it has taken care of. If they now all are off for an input tape, then the system will accept the tape. If the system cannot overcome the anomaly in an output tape, then the system will reject the tape. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request.

If the exit returns with all the anomaly bits off and it is an output tape, then the system changes the tape to try to override the problem.

If the problem is that volume label information is needed to write the label, then the exit must supply the complete label in EBCDIC in the area that TEPMLABEL points to and set bit TEPMNEUWLAB in the main parameter list. The caller will do any necessary conversion to ASCII. If the

exit sets TEMPMNEWLAB on but it is not a valid volume label, then the system will write a message and not call the exit until IPL.

If the exit supplies the label or authorizes destruction of labels, the exit takes responsibility for security and expiration date processing.

If any anomaly bit remains on, then the system will call the label editor (OMODVOL1 or EMODVOL1) if the condition is one that the label editor is designed to handle. If the condition is one that the label editor is not designed to handle, then the result will be as stated in the description.

- 8 Reject the volume and do not call the label editor. This means to reject the tape if it is a nonspecific request or the conflict is "volume serial conflict" or to issue ABEND if it is a specific volume request.

If the job requests a specific volume and bit TEPAABEND is also set, the system abends the job.

- C The exit requests to abend the job for anomalies indicated by TEPAOUTSEQ, TEPARDFMLV, TEPARDBMLV, or TEPARDFMFV.

Note that return code 0 for this exit is not supported.

If neither the exit nor the label editor rejects the volume, then the system can call the exit more than once for the same volume, but for a different reason.

Volume Mount Exit

The volume mount exit has three functions. During a particular OPEN or EOV, this exit can be called for any or all of the following reasons:

- Verifying the volume (Verify that the mounted volume is acceptable.)
- Writing the volume label
- Processing volume security.

Each invocation of the exit is for only one of these reasons.

- Volume verification.

During the course of opening and processing a tape data set, OPEN and EOV calls the volume mount exit when OPEN or EOV is verifying that the correct volume was mounted. The OPEN option can be any valid option and the label type can be any (SL, SUL, AL, AUL, NL, LTM, BLP, NSL). The system has just mounted the tape. When the system is planning to write file one header labels, this exit is called once for label verification and once prior to rewriting the volume label. UCBTFL1 indicates the type of volume mounted.

For volume verification the exit can change the user's request to be for a different volume or to be a scratch request. Independent of this the exit can cause the mounted SL or AL volume to appear to have a different volume label of the same type or to be unlabeled. See the return code 0 description below.

When the exit is called, open or EOV is processing a tape volume mount that has been satisfied by an operator, an automated cartridge loader or a tape library dataserver. The system has not previously verified the volume.

The label anomaly exit or OMODVOL1 or EMODVOL1 handles any input or output error or other problems when reading the label. The error might have been that the tape is 36-track and was read on an 18-track drive. In this case, the sense bytes or label anomaly exit provided the volume serial number, since the real label is not available.

This call is before RACF is called (for RACHECK or RACDEF).

Label Anomaly Exit Return Codes

The volume mount exit uses the block ID that is supplied to it by the tape management system. When DFSMSrmm issues an OPEN, the exit writes the block ID that is associated with the data set into JFCB field, JFCRBIDO, and turns on JFCB bit, JFCPOSID. When DFSMSrmm issues a CLOSE, the exit writes the block ID that is associated with the data set into JFCB field, JFCRBIDC. The tape management system can be DFSMSrmm or a functionally equivalent product. The block ID is the one associated with the data set's HDR1 or EOF2 label. For information about how information is written into the JFCB see *z/OS DFSMS Using Magnetic Tapes*.

The following table shows results from the volume mount exit and OPEN or CLOSE processing. The results depend on the disposition that is specified by the program.

OPEN or CLOSE Processing Method	block ID	Volume Mount Exit	OPEN or CLOSE Processing
OPEN OUTPUT NEW	Associated with data set's HDR1 label	<ul style="list-style-type: none"> Writes block ID into JFCB field, JFCRBIDO Turns on JFCB bit, JFCPOSID 	CLOSE fast positions to block identified by block ID
OPEN OUTPUT MOD	Associated with data set's EOF2 label	<ul style="list-style-type: none"> Writes block ID into JFCB field, JFCPOSID Turns on JFCB bit, JFCPOSID 	<ul style="list-style-type: none"> OPEN fast positions to block identified by block ID OPEN positions tape in front of tape mark that precedes the data set's EOF1 label
OPEN OUTPUT OLD	Associated with data set's HDR1 label	<ul style="list-style-type: none"> Writes block ID into JFCB field, JFCRBIDO Turns on JFCB bit, JFCPOSID 	OPEN fast positions to data set's HDR1 label
OPEN INPUT	Associated with data set's HDR1 label	<ul style="list-style-type: none"> Writes block ID into JFCB field, JFCRBIDO Turns on JFCB bit, JFCPOSID 	OPEN fast positions to data set's HDR1 label
OPEN RDBACK	Associated with data set's EOF2 label	<ul style="list-style-type: none"> Writes block ID into JFCB field, JFCRBIDO Turns on JFCB bit, JFCPOSID 	OPEN fast positions tape in front of tape mark that precedes data set's EOF1 label
CLOSE OUTPUT	Associated with data set's EOF2 label	Writes block ID into JFCB field, JFCRBIDC	CLOSE passes control to DFSMSrmm File End on Volume Exit

- Volume write function.

The system is about to rewrite the volume label because the user is open for output to the first file. When the system is writing file one header labels, this

exit will be called once prior to label verification and once prior to rewriting the volume label. UCBTFL1 indicates the type of volume mounted.

If the request was for a scratch tape, the system has determined that the mounted tape is acceptable. If the request was for a specific tape, the system has determined that the mounted tape is the correct one.

- Volume security function.

The system has just issued the RACROUTE macro to check the user's authority to the volume. The caller of this exit has not tested the SAF return code which is in the exit's parameter list. The exit can change the results of the security processing. You can return details for the first tape data set on the volume. Subject to the DEVSUPxx TAPEAUTHF1 installation option, the tape data set details can be used through RACROUTE as an additional authorization check.

Note: Certain authorized programs can bypass issuing the RACROUTE macro which also bypasses calling this security function.

The volume mount exit will receive a UCB address from TEPMUCB in IFGTEP, from DEBUCBA and from TIOEFSRT. All three sources will allow a 31-bit UCB address. TEPMICB will sometimes be an uncaptured 31-bit address. If the DEB31UCB bit is on, the UCB address and modeset byte will be different as described in IEZDEB. If they use the DCBTIOT field to find the TIOT entry address, they should be changed to use TEPMDSAB to point to the DSAB, which points to the TIOT entry or XTIOT.

This exit does not replace any checking done by open or EOV but it can replace the SAF return code before open or EOV tests it.

Volume Mount Exit Function-Specific Parameter List

The following figure is the format of the function-specific parameter list for the Volume Mount Exit. See Table 15 on page 67 for a description of the main parameter list.

Table 17. Volume Mount Exit Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPO	Open, close, EOV tape exits volume mount parameter list
00 (X'00')	8	TEPOID	Control block identifier
08 (X'08')	4	TEPOLEN	Length of parameter list
12 (X'0C')	1	TEPOVER	Version of parameter list (1)
13 (X'0D')	3		Reserved

Label Anomaly Exit Return Codes

Table 17. Volume Mount Exit Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
16 (X'10')	1	TEPOFLAG1	Flags
	00..		Volume verification. Can be any open option.
	10..	TEPORDWRIT	Volume write function. Open option is not INPUT or RDBACK and the current application operation is a write.
	01..	TEPOSAAF	Volume security function. After call to SAF.
	001.	TEPOLBLED	Label anomaly and possibly tape label editor (OMODVOL1, EMODVOL1) has been called for this volume. Volume verification only. Can be any open option.
	0001	TEPOIOE	I/O error during load point read for volume verification.
	11..		Does not occur in current release
	.... 1...	TEPPSEUDO	Pseudo-volume label during the label read process
17 (X'11')	1	TEPOFLAG2	Flags
	1...	TEPORACF	Data set being created is protected by a RACF discrete profile.
	.1..	TEPOALFRC	ON - Exit can override the AL version level that will be used to write the label (only on if file 1, volume 1 and output). OFF - Version level cannot be overridden.
	..1.	TEPOEXFRC	ON - Exit has provided an AL version level to use (only valid if TEPOALFRC is on). OFF - exit has not provided an AL version level to use. Tape will be written in the version selected by OPEN.
	...1	TEPOALVER	ON - ISO/ANSI Version 4. OFF - ISO/ANSI Version 3.
	.... 1...	TEPOIGNORE	Expiration date is ignored
	.... .1..	TEPOHONOR	Expiration date is honored
	.... ..1.	TEPOINDEX	No cartridge loader indexing on the next scratch mount request in the OPEN or EOVS routines
	.... ...1	TEPOABEND	Job abend when the return code is 8
18 (X'12')	2	TEPOSAFRC	SAF/RACF return code
20 (X'14')	2	TEPOSAFRS	SAF/RACF reason code
22 (X'16')	44	TEPODSNF1	File 1 dsname to be returned by Volume Mount Exit and Volume Security Function. Used by O/C/EOV to authorize access to the first file on a volume when TAPEAUTHF1=YES is set.
66 (X'42')	2	TEPODS1FS	File 1 data set sequence number; corresponds to the JCL LABEL keyword data set sequence number.

Volume Mount Exit Return Codes

Return Code Description

- 0 Accept the volume except as otherwise described here. The following points apply if the exit is called for volume verification and gives return code 0:

- The exit can change the volume serial number in TEPMVOL in the main parameter list to a new volume serial. The system will update the JFCB or JFCB extension used during OPEN or EOV; the system also will update the SWA copy of the JFCB or JFCB extension unless the application program prevented it by turning on bit JFCNWRIT. This bit is honored during OPEN, not during EOV. The system will update the catalog if the catalog retrieved it or the user specified CATLG for the DD DISP=parameter.

The system will enqueue on the new volume serial. If the enqueue is successful, then the system will dequeue the original volume serial. If the enqueue fails, even if it is being owned by the same job, the system will reject the tape. The system then will reissue the original mount request. It can be a specific request or a nonspecific request.

- The exit can change the volume serial number in TEPMVOL in the main parameter list to be blanks. This converts it to a nonspecific request. This results in the system taking the same actions it would have taken if the exit had not been called except that if the request had been for a specific volume, the system will dequeue that volume serial.
- The exit can change the contents of the label that TEPMLABEL points to. We don't advise changing a reserved field in a label because IBM or a standards organization might define that field. Except for the checkpoint/restart and DDR functions, the system will treat the volume as having the changed volume label. (For those two functions the system currently reads the original labels.) If the volume serial in this changed label for this exit does not match TEPMVOL for a specific volume request, then the system will reject the volume.
- The exit can change the version of an AL volume to Version 3 or Version 4 if the system sets on bit TEPOALFRC in byte TEPOFLAG2. The system sets this bit on only if all of the following are true:
 1. it is during OPEN
 2. the OPEN option is OUTPUT or OUTIN
 3. the DD does not have DISP=MOD
 4. the file sequence number is 1
 5. the DD statement has AL coded on the LABEL parameter

To change the version, the exit sets on TEPOEXFRC in TEPOFLAG2 and changes the eightieth byte in the area that TEPMLABEL points to be the desired version level(3 or 4) .

- The exit can change the label type of the mounted volume to unlabeled by changing the first four bytes of the area to which TEPMLABEL points. If the exit changes the area from standard labeled or non-standard labeled to unlabeled, then the system will not process existing labels. This prevents testing the expiration date, testing for data set password protection, testing the ISO/ANSI access code (ACCODE) and testing whether the volume is a checkpoint volume.

Do not change this area to indicate the tape has SL or AL labels unless the tape actually does have that type of label.

- The exit can change TEPMVSEQ in the main parameter list. When a valid volume sequence is returned (for example, not exceeding the specific volume count in the JFCB), the system demounts the current volume and issues a mount request for the volume serial associated with the exit-supplied volume sequence.

Label Anomaly Exit Return Codes

- The exit can supply a volume serial number when processing non-SMS or SMS MTL (Manual Tape Library), nonspecific scratch NL/BLP output. The exit can also supply a volume serial number when processing SMS MTL nonspecific scratch SL/SL output when an NL volume is mounted. This will result in the system using the exit supplied volume serial number instead of generating an LNUMBER, or instead of issuing IEC519I during SMS MTL processing for a nonspecific scratch SL/AL volume when an NL volume is mounted. Prior to returning with RC00, the exit must supply a volume serial number in TEPMVOL in the main parameter list and set bit TEPMNEWLAB in byte TEPMFLAG6. Just as when an LNUMBER is generated, the system will continue to process as a nonspecific volume request.

Note: For SMS MTL, when the VOLM (Volume Mount Exit) Tape Installation Exit does not supply a volume serial, IEC519A is issued requesting the operator to reply with the external volume serial.

- If the exit was called for volume security, then TEPOSAFRC is to replace the SAF return code. The exit might have changed it to a valid SAF return code.
 - When TAPEAUTHF1=YES is set, TEPODSNF1 and TEPODS1FS are used by O/C/EOV to check authority to the first file on the volume. Refer to Table 17 on page 81 for field details.
- 4 Continue usual processing; the exit is not modifying anything.
- 8 Reject the volume. The exit should write a message with route code 3 and 11 to explain the reason for the rejection. This return code means to reject the tape whether it is a nonspecific volume request or a specific volume request. This return code is not valid when writing the volume label.

If the call was for the volume security function and the bit TEPOABEND is also set, the system abends the job.

File Validation Exit

If OPEN or EOV mounted a tape, then it has done all processing of an existing volume label before calling the file validation exit. If the call is for OPEN, the forward DCB merge has not been done and the DCB OPEN exit has not been called. If it is an SL or AL tape, OPEN or EOV has read the first 80 bytes of the header or trailer label (if reading backward) but has not examined it yet except to translate it from ASCII if the first four characters are ASCII, HDR1, EOV1, or EOF1. If open for output, then no writing has been done yet on the volume. If it is not SL or AL, then OPEN has not yet positioned the tape. This is so the exit can reject the tape if the user is trying to read past the last file or writing more than one file past the last file. This exit can verify that the specified 44-character data set name matches the tape management system's database.

This call is before RACDEF is called and after RACHECK.

This exit does not replace any checking done by OPEN or EOV except when the exit specifies that the operator is not to be asked about expiration dates on the volume and/or that password security processing should be bypassed during tape SL output processing to file sequence one.

The file validation exit will receive a UCB address from TEPMUCB in IFGTEP, from DEBUCBA and from TIOEFSRT. All three sources will allow a 31-bit UCB address but TIOEFSRT will contain zero if the actual UCB is above the line and

allocation did not capture the UCB address. TEPMUCB will sometimes be an uncaptured 31-bit address. If the DEB31UCB bit is on, the UCB address and modeset byte will be different as described in IEZDEB. It is best not to use the DCBTIOT field to find the TIOT entry address. This is because DCBTIOT will contain zeroes if the user program caused an XTIOT to be created instead of a TIOT entry. You always can use TEPMDSAB to point to the DSAB, which points to the TIOT entry or XTIOT.

File Validation Exit Function-Specific Parameter List

The following figure is the format of the function-specific parameter list for the File Validation Exit. See Table 15 on page 67 for a description of the main parameter list.

Table 18. File Validation Exit Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPV	Open, close, EOV tape exits file validation parameter list
00 (X'00')	8	TEPVID	Control block identifier
08 (X'08')	4	TEPVLEN	Length of parameter list
12 (X'0C')	1	TEPVVER	Version of parameter list (1)
13 (X'0D')	3		Reserved
16 (X'10')	1	TEPVFLAG1	Flags
	1... ..	TEPVIGNORE	Set to 0 by caller. If exit sets it on, then OPEN and EOV will ignore the expiration date for the file on the volume. Takes precedence over the next bit.
	.1.. ..	TEPVHONOR	Set to 0 by caller. If exit sets it on, then OPEN and EOV will honor the expiration dates for the file on the volume and not ask the operator if a date has not passed. This means that OPEN or EOV rejects the volume or issue ABEND.
	..1.	TEPVSCRATCH	Original volume requirement was nonspecific
	...1	TEPVBYSEC	Set to 0 by the caller. If all the following are true, then the caller will ignore password protection of the existing file: <ul style="list-style-type: none"> • OPEN option allows writing. If the caller is EOV, the last user operation was a write. • IBM standard label tape mounted • Either the caller is open and the file sequence number is one, or the caller is EOV. • The exit turned this bit on. <p>This bit is intended for use by an exit that can determine that password protection no longer applies. It does not affect SAF processing.</p>
	.... 1..	TEPVINDEX	No loader indexing on the next scratch mount request in the OPEN or EOV routines
	.... ..1.	TEPVABEND	Job abends when return code is 8
17 (X'11')	3		Reserved, set to zero

File Validation Exit Return Codes

Return Code	Description
0	Accept the volume unless the system finds a problem. The exit can set indicators in the parameter list (see Table 18 on page 85) that mean that the system is not to ask the operator about expiration dates.
4	The exit takes no responsibility and the system continues usual processing.
8	Volume is not acceptable for this request. This should be used only when the system would otherwise accept the volume. For example Open, close, EOV checks security. This condition can also mean that the volume is not acceptable on this system. The system rejects the volume with a standard message that does not indicate the reason. This means to reject the tape if it is a nonspecific request or to issue ABEND if it is a specific volume request. The exit should write an appropriate message. If bit TEPVABEND is also set, the system abends the job regardless of whether the volume request is specific or nonspecific.

File Start on Volume Exit

The system has read or written all file labels (as appropriate), has called all user and installation exits, issued RACDEF if needed and has positioned the tape for reading or writing user data. It is too late to reject the volume. OPEN or EOV has checked for most or all of the expected ABEND conditions.

No tape label is reliably available to this exit because user labels might have been processed. The exit is expected to gather data from other places.

The caller is OPEN or EOV. The exit is called for the beginning of the file on each volume.

The file start on volume exit will receive a UCB address from TEPMUCB in IFGTEP, from DEBUCBA and from TIOEFSRT. All three sources will allow a 31-bit UCB address. TEPMICB will sometimes be an uncaptured 31-bit address. If the DEB31UCB bit is on, the UCB address and modeset byte will be different as described in IEZDEB. If they use the DCBTIOT field to find the TIOT entry address, they should be changed to use TEPMDSAB to point to the DSAB, which points to the TIOT entry or XTIOT.

File Start on Volume Exit Function-Specific Parameter List

The following figure is the format of the function-specific parameter list for the File Start on Volume Exit. See Table 15 on page 67 for a description of the main parameter list.

Table 19. File Start on Volume Exit Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPS	File-start-on-volume exit parameter list
00 (X'00')	8	TEPSID	Control block identifier
08 (X'08')	4	TEPSLEN	Length of parameter list
12 (X'0C')	1	TEPSVER	Version of parameter list (1)
13 (X'0D')	2		Reserved

Table 19. File Start on Volume Exit Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
15 (X'0E')	1	TEPSSGTY	SMS storage group pool type. The value 1 means "general".
16 (X'10')	6	TEPSFIRST	Volume serial of the first volume for the data set if available
22 (X'16')	1	TEPSFLAG1	Flags
	1... ..	TEPSSCRTCH	Original volume was nonspecific
23 (X'17')	1	TEPSPARP	Media position (n). Represents the distance from beginning of the volume to start of the data set.
The following four fields are available only with DISP=NEW.			
24 (X'18')	4	TEPSSSTORG	Address of two-byte length of storage group name followed by name
28 (X'1C')	4	TEPSMGMTC	Address of two-byte length of management class name followed by name
32 (X'20')	4	TEPSSSTORC	Address of two-byte length of storage class name followed by name
36 (X'24')	4	TEPSDATAC	Address of two-byte length of data class name followed by name
40 (X'28')	6	TEPSPREVL	Volume serial of previous volume. Defined only if the caller is EOVS and the current volume is from the same DD statement as the previous volume.
46 (X'2E')	2		Reserved
48 (X'30')	4	TEPSBLKID	Address of the four-byte block identifier of the HDR1 label
52(X'34')	6	TEPSKBTRV	KB traversed from BOT.
58(X'3A')	2	TEPSMPOS	Media position decimal value n , representing the numerator in the fraction $n/65535$. This fraction represents the ratio of the distance from the beginning of the volume to the current position rounded down to the nearest $1/65535$ th.
60(X'3C')	3	TEPS4KBYT	Bytes written to the volume in 4K increments since volume mounted.

File Start on Volume Exit Return Code

Return Code	Description
0	Take usual action.

File End on Volume Exit

When a user is finishing using a data set on a volume, EOVS or CLOSE calls the file end on volume exit routine.

For input this exit is called from EOVS unless it is end of data or the labels are NSL and the user has specified in the DCB exit list that trailer label processing is to be deferred from EOVS to CLOSE. For output this exit is called from EOVS except for

Label Anomaly Exit Return Codes

the last volume in which case it is called from CLOSE. CLOSE TYPE=T results in this exit being called if the last user operation was a write. This causes CLOSE to write trailer labels but not close the DCB.

If the caller is EOV, then there might be an exit call later for the next volume for input or output or the next data set in the concatenation.

The exit caller has checked or written any trailer labels and disposed of the volume or is about to do so. The return code will not affect the system action. The call is to inform the tape management system which can gather statistics.

The file end on volume exit will receive a UCB address from TEPMUCB in IFGTEP, from DEBUCBA and from TIOEFSRT. All three sources will allow a 31-bit UCB address. TEPMICB will sometimes be an uncaptured 31-bit address. If the DEB31UCB bit is on, the UCB address and modeset byte will be different as described in IEZDEB. If they use the DCBTIOT field to find the TIOT entry address, they should be changed to use TEPMDSAB to point to the DSAB, which points to the TIOT entry or XTIOT.

File End on Volume Exit Function-Specific Parameter List

The following figure is the format of the function-specific parameter list for the File End on Volume Exit. See Table 15 on page 67 for a description of the main parameter list.

Table 20. File End on Volume Exit Function-Specific Parameter List

Offset	Length or Bit Pattern	Name	Description
00 (X'00')		TEPE	File-end-on-volume exit parameter list
00 (X'00')	8	TEPEID	Control block identifier
08 (X'08')	4	TEPELEN	Length of parameter list
12 (X'0C')	1	TEPEVER	Version of parameter list (1)
13 (X'0D')	3		Reserved
16 (X' 10')	4	TEPEBLKID	Address of the four-byte block identifier of the next HDR1 label after the trailer labels; it is initialized during the output process.
20 (X' 14')	1	TEPEPARP	Media position (n). Represents the distance from beginning of the volume to start of the data set.
21 (X' 15')	1	TEPEFLAG1	Flags
	1... ..	TEPELEFT	CLOSE disposition; end of file UCBFSC/UCBFSEQ incremented
	.1.. ..	TEPEFILES	File start on volume exit previously received control.
22 (X'16')	2		Reserved
24 (X'18')	4	TEPETBLK	Total block count across all volumes; initialized at EOV and CLOSE output
28 (X'1C')	4	TEPELSTB	Total of unsynchronized blocks that were written to the storage controller but an I/O error prevented them from being written to the medium. It includes tape marks.
32(X'20')	6	TEPEPREVL	Volume serial of previous volume. Defined only if caller is EOV and the current volume is for the same DD statement as the previous volume.

Table 20. File End on Volume Exit Function-Specific Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
38(X'26')	2	TEPEFSCT	Data set sequence number. This is the file number relative to the beginning of the current volume.
40(X'28')	2	TEPEFSEQ	Data set sequence count. This is the file number relative to the beginning of the aggregate of volumes. It matches the value in JFCBFLSQ in the JFCB. Field TEPMJFCB in the main parameter list points to the JFCB.
42(X'2A')	64	TEPEKEK1	KEK label 1
106(X'6A')	64	TEPEKEK2	KEK label 2
170(X'AA')	1	TEPEKCD1	Key encoding mechanism associated with KEK label 1: L - Label, H - Hash
171(X'AB')	1	TEPEKCD2	Key encoding mechanism associated with KEK label 2: L - Label, H - Hash
172(X'AC')	6	TEPEKBTRV	KB traversed from BOT.
180(X'B4')	3	TEPE4KBYT	Bytes written to the volume in 4K increments since volume mounted.
178(X'B2')	2	TEPEMPOS	Media position decimal value n , representing the numerator in the fraction $n/65535$. This fraction represents the ratio of the distance from the beginning of the volume to the current position rounded down to the nearest 1/65535th.

File End on Volume Return Code

Return Code	Description
0	Take usual action.

Nonstandard Labels

Nonstandard labels do not conform to IBM or ISO/ANSI standard label formats. You can design them and provide routines to write and process them. There are no requirements regarding their length, format, contents, and number, except that the first record on a BCD, EBCDIC, or ASCII tape cannot be a standard volume label.

Figure 30 on page 90 shows some examples of how you can organize tape volumes with nonstandard labels. Other variations are possible. Because your routines do the positioning, there are no special requirements for multivolume or multiple data set organizations. Your routines write all labels and tapemarks. If an operating system access method is used to retrieve the data, tapemarks should precede and follow the data set to indicate the end-of-data-set condition for forward and backward read operations.

Nonstandard labeled tapes are not supported in a library (either by the Tape Library Dataserver or by a manual library).

Label Anomaly Exit Return Codes

Example 1 - No Tapemarks

Nonstandard Label		Data Set		Nonstandard Label	
-------------------	--	----------	--	-------------------	--

Example 2 - Tapemarks Delimiting the Data Set

Nonstandard Label	TM	Data Set	TM	Nonstandard Label	
-------------------	----	----------	----	-------------------	--

Example 3 - Tapemarks Delimiting the Labels and the Data Set

TM	Nonstandard Label	TM	Data Set	TM	Nonstandard Label	TM	
----	-------------------	----	----------	----	-------------------	----	--

Figure 30. Examples of Tape Organizations with Nonstandard Labels

- **No Tapemarks:** This type of organization can be created by your nonstandard label processing routines, and read with the EXCP technique or BSAM. Do not use with QSAM because there is no tapemark to signal end-of-data.
- **Tapemarks Delimiting the Data Set:** This is the recommended organization. The tapemarks are written by your nonstandard label processing routine. When the tape is read by an operating system access method, the tapemark following the data set signals end-of-data for forward read operations, and the tapemark preceding the data set signals end-of-data for backward read operations.
- **Tapemarks Delimiting the Labels and the Data Set:** This is an expansion of the preceding organization. The operating system does not handle the additional tapemarks that precede and follow the labels. Instead, your nonstandard label processing routine writes and uses them.

Processing Nonstandard Labels

Generally, the nonstandard label processing routines:

- Must be read-only. You cannot store into the routine, nor can you use macro instructions that store into the routine.
- Are entered in the addressing mode that is determined by the AMODE option when they are link-edited.
- Must save the contents of registers 2 through 14 (in your own work area). Before returning control, your routine must restore the contents of these registers.
- Use the XCTL macro instruction (E-form) to exit from your routine and return control to a specific control program module. These modules differ depending on the control program routine from which control was received and the type of label processing being performed. Module names are shown in Table 21 for each SKC SKC control program routine and for each type of label processing routine.

Table 21. Control Program and Label Processing Routine Modules

Label Processing Routine	Control Program Routine	Control Program Module Name
Input Header	Open	IGG0190B
	EOV	IGG0550D
Input Trailer	EOV	IGG0550B
Output Header	Open	IGG0190R
	EOV	IGG0550H
Output Trailer	EOV	IGG0550F

Table 21. Control Program and Label Processing Routine Modules (continued)

Label Processing Routine	Control Program Routine	Control Program Module Name
	Close	IGG0200B
Restart Header	Restart	IGC0K05B

Use the GETMAIN or STORAGE macro instruction to obtain virtual storage for all your work areas, including areas used to read in or create a label. Use the FREEMAIN or STORAGE macro instruction to release this virtual storage.

Support for RACF protection of tape volumes might be a part of nonstandard label processing routines.

Input Header Label Routines (NSLOHDRI, NSLEHDRI)

When nonstandard labels are specified, the control program checks the input tape to ensure that the first record is not a standard volume label. If the first record contains the identifier VOL1 in the first 4 bytes, is recorded in EBCDIC, and is 80 bytes long, or it is recorded in ASCII and is 80 bytes long or more, a message from the control program rejects the tape and directs the operator to remove the current volume and mount the correct volume. The various error conditions that can occur during verification of the first record are explained under “Label Anomaly Exit (IFG019LA)” on page 72.

If the tape does not contain a standard volume label, the open or EOVS routine gives control to your routine for processing input header labels. Control comes from the open routine for the first or only volume of a data set, or for a concatenated data set with unlike characteristics. (Data sets with like characteristics can be processed correctly using the same DCB, IOB, and channel program. Any exception in processing makes the data sets unlike.) This is not the same as unlike attributes concatenation that is described in *z/OS V2R1.0 DFSMS Using Data Sets*. Control comes from the EOVS routine for the second and subsequent volumes of a data set, or for a concatenated data set with like characteristics. When your routine receives control, the tape has been rewound and is positioned at the inter-record gap preceding the nonstandard label.

Note: If the control program finds that the tape volume has been previously verified in the job, the tape has not been rewound.

If your routine determines that the wrong volume is mounted, you must place a 1 in the high-order bit position of the UCBDMCT field of the UCB, and return control to the control program. The control program then issues a message directing the operator to mount the correct volume. When the volume is mounted, the control program again checks the initial label on the tape before giving control to your routine.

Before returning control to the control program, your input header label routine must position the tape at the appropriate data set:

- For forward read operations, position the tape at the inter-record gap that precedes the initial record of the data set.
- For backward read operations, position the tape after the last record of the data set.

The modeset byte is moved from a 24-bit UCB address to a 31-bit UCB address if you request the XTIOU UCB NOCAPTURE option and the NON-VSAM_XTIOU

Label Anomaly Exit Return Codes

option is set to yes. OPEN, EOV, and CLOSE will always turn DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address.

Input Trailer Label Routines (NSLETRLI)

When a tapemark is encountered on an input tape, data management's EOV routine gives control to your routine for processing input trailer labels, except when:

- The force end-of-volume (FEOV) macro instruction is used to force an end-of-volume condition.
- At the end of the data set, the DCB exit list indicates deferred nonstandard input trailer label processing.

When your routine receives control, the tape is already positioned for label processing:

- For forward read operations, the tape is positioned immediately after the tapemark at the end of the data set.
- For backward read operations, the tape is positioned immediately before the tapemark at the beginning of the data set.

Your routine does not need to reposition the tape before returning control to the control program.

If additional volumes are specified in the JFCB the control program uses the next-specified volume serial number and performs volume switching. (You specify the volume serial numbers in forward sequence, regardless of whether the tapes are to be read forward or backward.) If the new volume is not already mounted, the control program issues a mount message to the operator. The new volume is then processed by the EOV routine and your input header label processing routine.

If another volume is not specified in the JFCB, the control program gives control to the user's end-of-data-set (EODAD) routine that is specified in the DCB. Subsequently, the processing program or the operating system closes the data set. When an input data set is closed, your output trailer label routine is given control. This allows you to position the tape if necessary. When an end-of-data-set condition occurs and the DCB exit list (EXLST) indicates deferred nonstandard input trailer label processing, the close routine passes control to your input trailer label routine before passing control to your output trailer label routine. The DCB exit list is described in *z/OS V2R1.0 DFSMS Using Data Sets*.

The modeset byte is moved from a 24-bit UCB address to a 31-bit UCB address if you request the XTIOU UCB NOCAPTURE option and the NON-VSAM_XTIOU option is set to yes. OPEN, EOV, and CLOSE will always turn DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address.

Output Header Label Routines (NSLOHDRO, NSLEHDRO)

When nonstandard labels are specified for output, the control program checks the tape to make sure that the existing first record is not a standard volume label. If the first record is 80 bytes long and contains the identifier VOL1 in the first 4 bytes, the tape is not accepted, as is. If an IBM standard label exists, it is overwritten with an IBM tapemark, if possible. If an ISO/ANSI standard label exists, the console operator must confirm that it can be destroyed. The various

error conditions that can occur during verification of the first record are explained under “Label Anomaly Exit (IFG019LA)” on page 72.

If the first record on the tape is not a standard volume label, the open or EOVS routine gives control to your routine for processing output header labels. Control comes from the open routine for the first or only volume of a data set. Control comes from the EOVS routine for the second and subsequent volumes of a data set. When your routine receives control, the tape has been positioned at the inter-record gap preceding the nonstandard label (the tape has been rewound). However, the tape is not rewound if the control program found that this volume has been previously verified during the job.

If your routine determines that the wrong volume is mounted, you must place a 1 in the high-order bit position of the UCBDMCT field of the UCB and return control to the control program. The control program then issues a message directing the operator to mount the correct volume. When the new volume is mounted, the control program again checks the initial label on the tape before giving control to your routine.

The volume serial number in the UCBVOLI field of the UCB and the volume serial number in the JFCB must be the same as on entry unless a request is made for a nonspecific volume. The control program recognizes a nonspecific request if the volume serial number requested in the JFCB is blank or SCRTCH. Then, UCBVOLI is set to Lxxxxx, where xxxxx is a 5-digit decimal number. The control program generates this volume serial number. It can be replaced in your NSL routine by the volume serial number present in the volume label read from the tape, or the volume serial number of the volume label written on the tape.

If NSLOHDRO or NSLEHDRO returns control to the control program for a nonspecific request and the UCBVOLI field of the UCB has been modified the control ENQ's on the volume serial number to affect volume integrity and places the volume serial number in the JFCB or JFCB extension. If some other technique is used to support nonspecific request the NSL routine must update the JFCB and ENQ on the volume serial number (system ENQ; major name; SYSZVOLS; minor name - 6-byte volume serial number; exclusive ENQ). If, after the control program's ENQ, the resource is unavailable (either the current task previously obtained the resource or some other task holds the resource), the volume is rejected.

Your routine does not need to reposition the tape before returning control to the control program.

When tapes are first received, they should be initialized with a tapemark or other record. If a blank tape is mounted for an output data set, it is read through and removed from its reel when the control program looks for an existing standard volume label.

OPEN, EOVS, and CLOSE will always turn the DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address. The modeset byte is moved from the DEBSDVM field to the DEBSDVMX field to enable 31-bit UCB addresses to be accommodated.

Output Trailer Label Routines (NSLETRLO, NSLCTRL0)

Your routine for writing output trailer labels receives control from data management's EOVS or close routines. The EOVS routine handles end-of-volume conditions (reflective strip or FEOVS macro instruction). The close routine handles end-of-data-set conditions (CLOSE macro instruction). When your routine receives control, the tape has been positioned at the inter-record gap following the last written data set record.

Your routine does not need to reposition before returning control to the control program.

Your output trailer label routine is also given control when input data sets are closed. This allows you to position the tapes if necessary.

OPEN, EOVS, and CLOSE will always turn the DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address. The modeset byte is moved from the DEBSDVM field to the DEBSDVMX field to enable 31 bit UCB addresses to be accommodated.

Data Recovery

Recovery routines are given control when an error occurs during open, and close and end-of-volume processing. They provide data recoverability in case of an error that results in abnormal termination of your task. Data recoverability works in conjunction with your output trailer label routines by writing a tapemark after the last data written to the tape. This indicates the end of the output data set, so that you can save the records written before the error occurred. The tapemark is only written if an unrecoverable error occurs before your output trailer label routines have received control. If the error occurs during or after the execution of your trailer label routines, no tape mark is written.

Installing Nonstandard Label Routines

Because they are type 4 SVC routines, nonstandard label processing routines must be included in the control program as part of LPALIB. This is done when the system is built. (You can also insert the routines after system build by link-editing them into LPALIB). See "Adding a New Exit" on page 4.

Member names for the first load module of each type of label processing routine are listed in Table 22. Member names for additional load modules must begin with the letters NSL or IGC.

Table 22. First Load Modules

Nonstandard Label Processing Routine	Control Program Routine	Member Name
Input Header	Open	NSLOHDRI
	EOVS	NSLEHDRI
Output Header	Open	NSLOHDRO
	EOVS	NSLEHDRO
Input Trailer	EOVS	NSLETRLI
Output Trailer	EOVS	NSLETRLO
	Close	NSLCTRL0

Writing Nonstandard Label Processing Routines

To use nonstandard labels for tape volumes you must:

- Create nonstandard label processing routines for input header trailer labels, input trailer labels, output header labels, and output trailer labels.
- Insert your routines into the link pack area (LPA) library (SYS1.LPALIB).
- Write NSL in the LABEL parameter of the DD statement at execution time.

Processing Tapes with Nonstandard Labels

Your appropriate nonstandard label processing routine is called when a data set is opened or closed or when an EOVS or end-of-data-set condition occurs. When your routine is finished, it must return to data management's open, close, EOVS, or restart routine, which then continues its normal processing. For input, the EOVS routine handles both EOVS and end-of-data-set conditions. For output, the EOVS routine handles the EOVS condition, and the close routine handles the end-of-data-set condition.

Your routines must provide for reading labels, processing labels, writing labels, writing tapemarks, identifying volumes, and positioning volumes. Your nonstandard label processing routines are responsible for setting the UCB file sequence (UCBFSEQ) and UCB file count (UCBFSCT) fields based upon the user's processing. The control program assumes that a tape with nonstandard labels is properly positioned upon completion of a nonstandard label processing routine.

If you want the control program to maintain a block count, your header label routines that receive control from open or EOVS must properly initialize the block count field of the DCB. Set DCBBLKCT to zero unless the data set is being extended when the OPEN option is EXTEND or OUTINX or when the OPEN option is OUTPUT or OUTIN and DISP=MOD is coded on the DD statement. If the data set is being extended, then set DCBBLKCT to the number of blocks currently in the file on the volume. On output, your trailer label routine can save the DCBBLKCT value in the label. On input, your trailer label routine can compare the DCBBLKCT with the block count in the label. To compare when using BSAM or QSAM without chained scheduling, your routines must adjust DCBBLKCT. If the access method is BSAM or QSAM and bit DCBCNCHS is off, then DCBIOBA points to an area containing a signed halfword to subtract from DCBBLKCT. The halfword is at offset +36 in the area.

When processing is completed, the control program handles volume disposition in accordance with the parameters of the DD statement. Your nonstandard label processing routines are responsible for any positioning specified by the OPEN or CLOSE macro instructions. To process a data set more than once in a job, or to handle multiple data set volumes, your routines must control the positioning. If you handle volume disposition in your nonstandard label processing routines, you must issue volume disposition messages to the console operator. Data management checks to see if your routine has handled disposition, and it bypasses disposition and message handling if volume disposition is verified. *Be extremely careful* when verifying a tape under one processing technique and then accessing the tape under a second (for example, changing from NSL to NL with a verified tape).

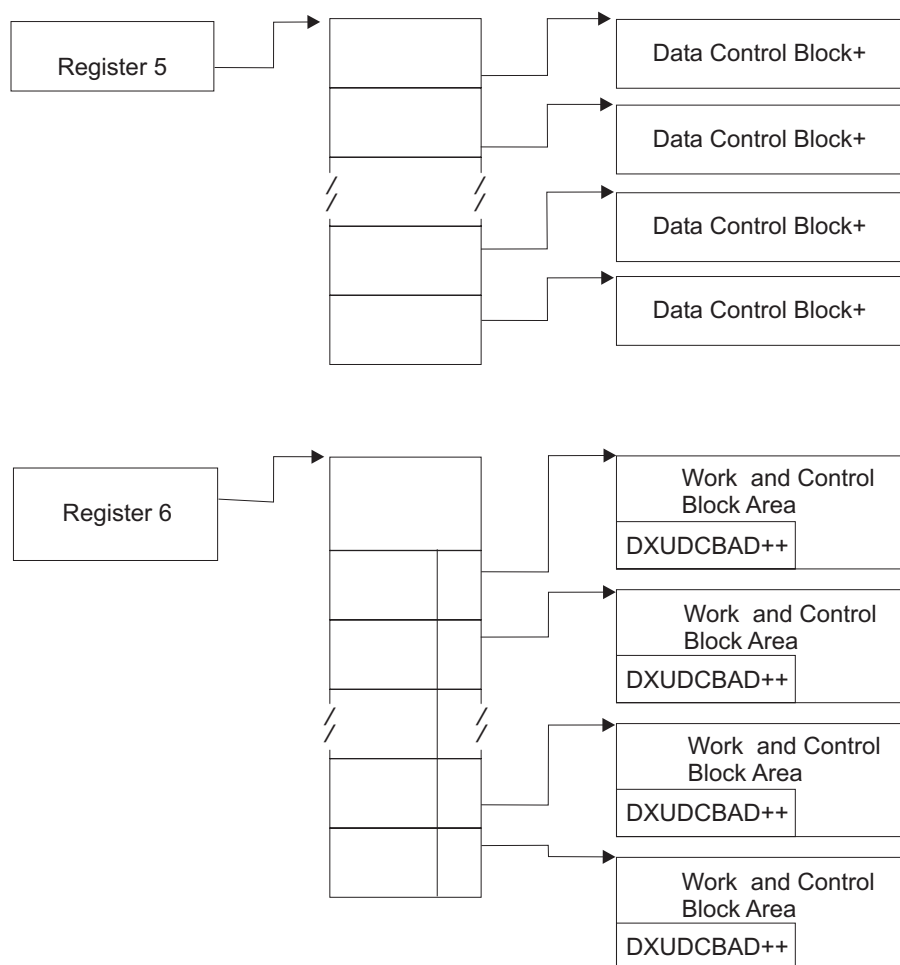
Program Functions

In processing nonstandard labels, the routines must perform many of the functions that the control program performs in processing standard labels. Use the EXCP (execute channel program) macro instruction to perform all input/output operations as reading labels, writing labels, and positioning volumes. Normally, to

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use EXCP you are required to build several control blocks in your work area. However, you can save coding effort and virtual storage space by using control blocks already established by the control program.

- Figure 31 shows the status of control information and pointers when your routine receives control from the open or close routine.
- When your routine receives control from the EOVS routine, register 2 contains the address of a DCB, and register 4 contains the the address of a combined work and control block area. The format of this area is shown in Figure 32 on page 97.
- The nonstandard label routines receive control in protect key zero.
- The DCB is copied into protected storage during open/close/EOVS processing. During open and close processing, register 5 points to a parameter list that contains the address of the DCB in protected storage. During EOVS processing, register 2 points to the DCB in protected storage. The address of the user's DCB is in the combined work and control block area at the label DXUDCBAD. If you want to change the DCB, both copies, the user's DCB and the DCB in protected storage must receive the same change.



+ This copy of the DCB is in protected storage

++ DXUDCBAD is the address of the user's DCB.

Figure 31. Status of Control Information and Pointers

Register 5 contains the starting address of a list of DCB addresses. Each DCB specified in the OPEN or CLOSE macro instruction has a 4-byte entry in the list. The DCBs to which the entries point are copies in protection key 5 storage. The list might also include one or more ACB addresses. The list, the DCBs, and any ACBs reside below the 16 MB line.

For each DCB specified in the OPEN or CLOSE macro instruction, a combined work and control block area is built unless OPEN or CLOSE has determined that the DCB or ACB cannot be processed. Register 6 contains the starting address of a table that contains an address for each work and control block area. The addresses of the areas are contained in the low-order 3 bytes of 8-byte entries. The list of 8-byte entries begins 32 bytes from the starting address on the table. The format of the combined work and control block area is shown in Figure 32.

Work Area (100 bytes)
Job File Control Block (JFCB) 176 bytes
Event Control Block (ECB) 4 bytes
Input Output Block (IOB) 40 bytes
Abbreviated Data Extent Block (DEB) 44 bytes
Abbreviated (DCB) 4 bytes
Channel Command Words (CCW) 48 bytes
Open/Close/EOV Internal Fields

Figure 32. Format of Combined Work and Control Block Area

Your nonstandard label processing routines can address each of the fields within the work and control block area. The IECDSECT macro instruction defines the symbolic names of all these fields. Write this macro instruction (with a null operand field and immediately preceded by a DSECT statement) in the list of

Label Anomaly Exit Return Codes

constants for each of your nonstandard label processing routines. Using the starting address of the work area as a base, you are able to address any field symbolically.

When your nonstandard label processing routine receives control from the close or EOVS routine, some of the information shown in the work area DEB is not the same as contained in the actual DEB. If you need actual DEB information at these times, you can get the address of the DEB from the DCBDEBAD field in the DCB.



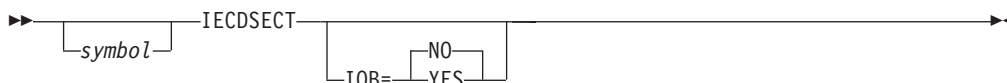
Figure 33. Status of Control Information and Pointers from the Control Program's Restart Routine

Register 9 contains the starting address of a 48-byte table entry. Five bytes from the starting address of this table entry, a 3-byte field (TABSEGAD) contains the starting address of a work and control block area that is associated with the data set.

Mapping the Common Open, Close, EOVS Work Area

The IECDSECT macro maps most of the main work area that is used by open, close, EOVS, access methods, and related components of the system. The general format of this area is described in Figure 32 on page 97.

The IECDSECT macro does not generate a DSECT statement. You should code a DSECT statement before calling IECDSECT. The format of the macro instruction is:



NO specifies that you do not want symbols for a 32-byte basic IOB generated in the work area. We recommend no.

YES specifies that you want symbols for a 32-byte basic IOB generated in the work area.

Flowcharts for Sample Routines

The following information illustrates flowcharts and logic of nonstandard label processing routines. The logic is shown separately for routines receiving control from the open, close, EOVS, or restart routines of the control program. Each block in each of the flowcharts is numbered; each number corresponds to an item in the lists of explanations that follow the figures.

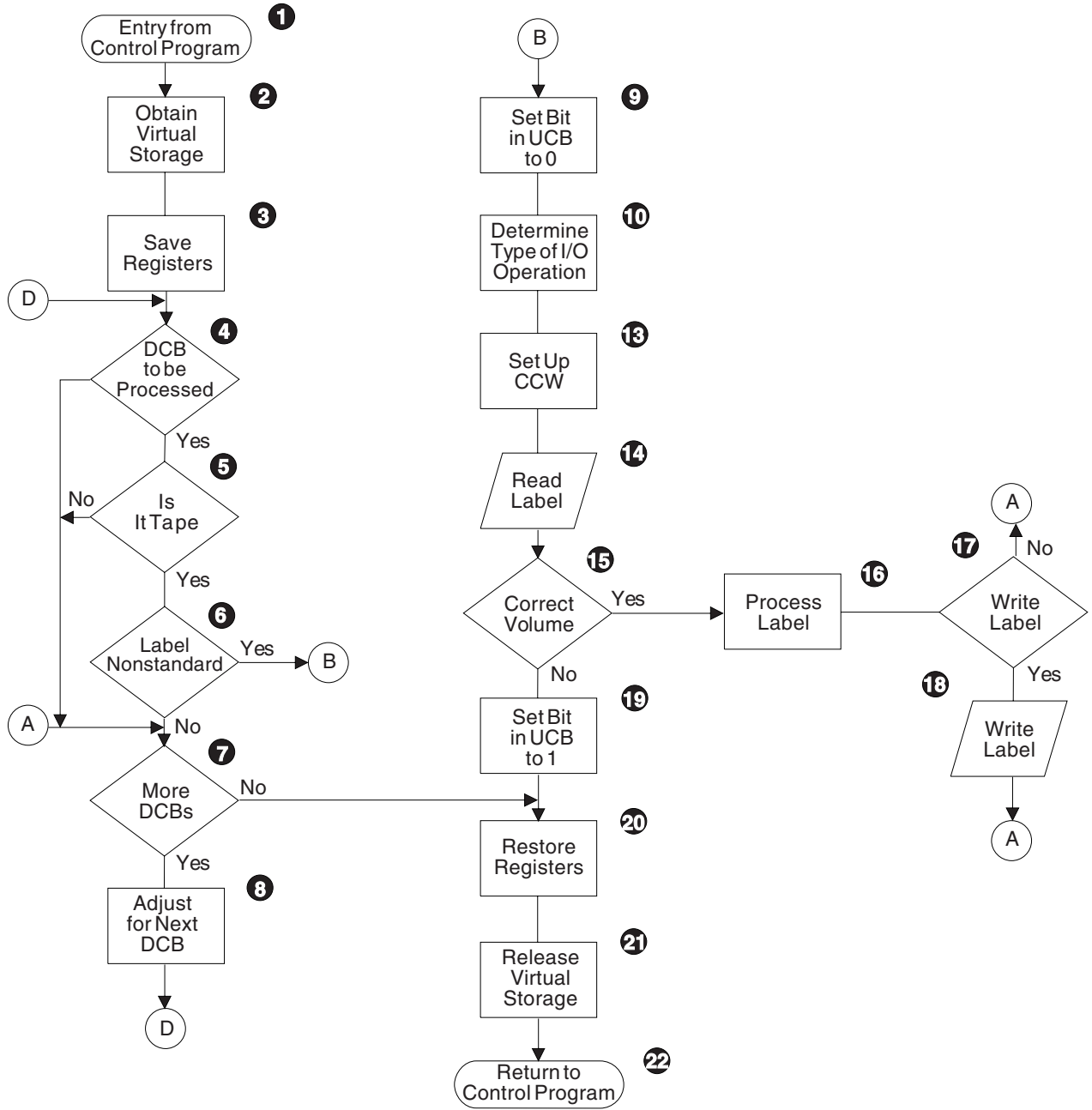


Figure 34. General Flow of a Nonstandard Label Processing Routine After Receiving Control from the Open Routine.

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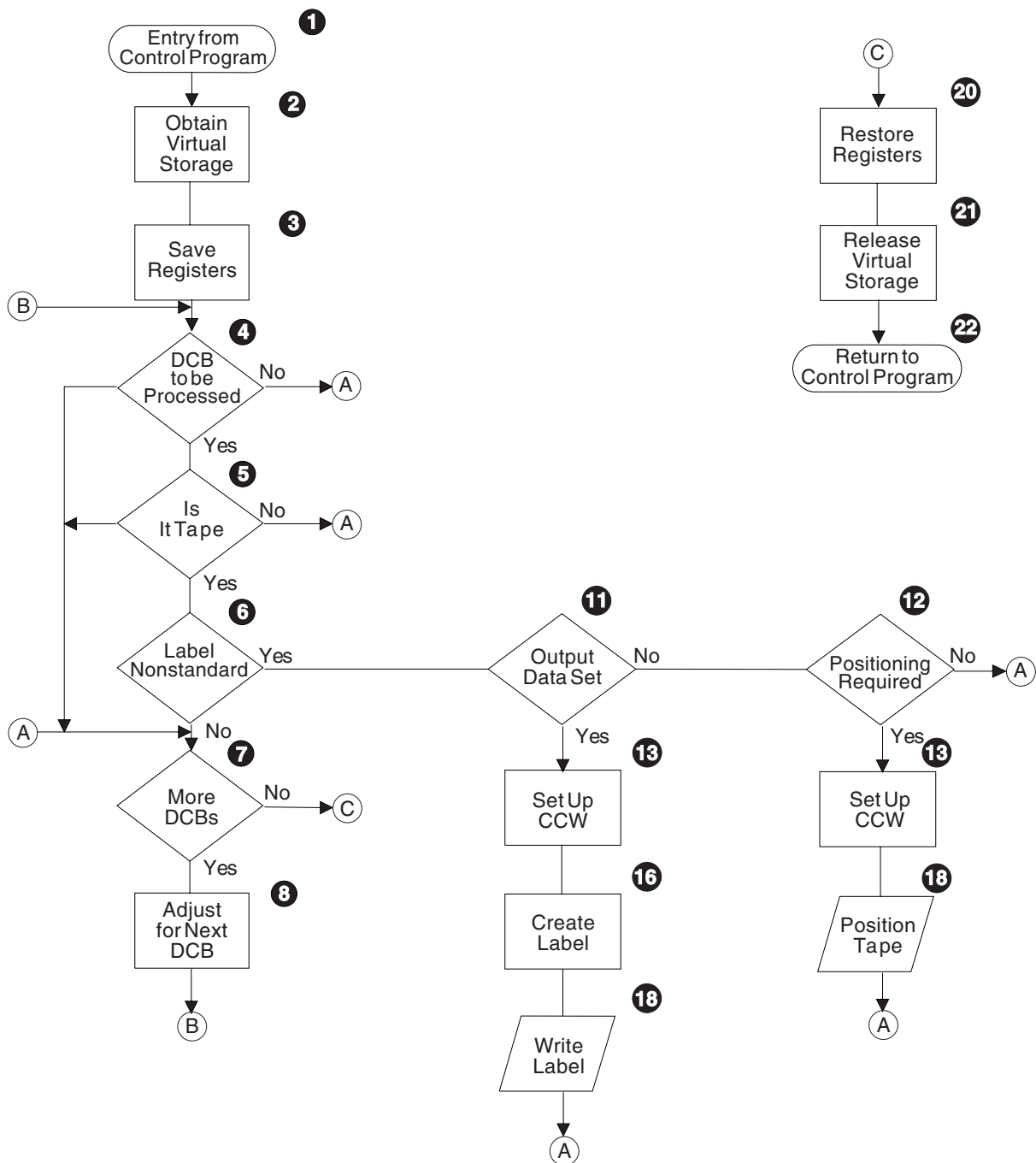


Figure 35. General Flow of a Nonstandard Label Processing Routine After Receiving Control from the Close Routine

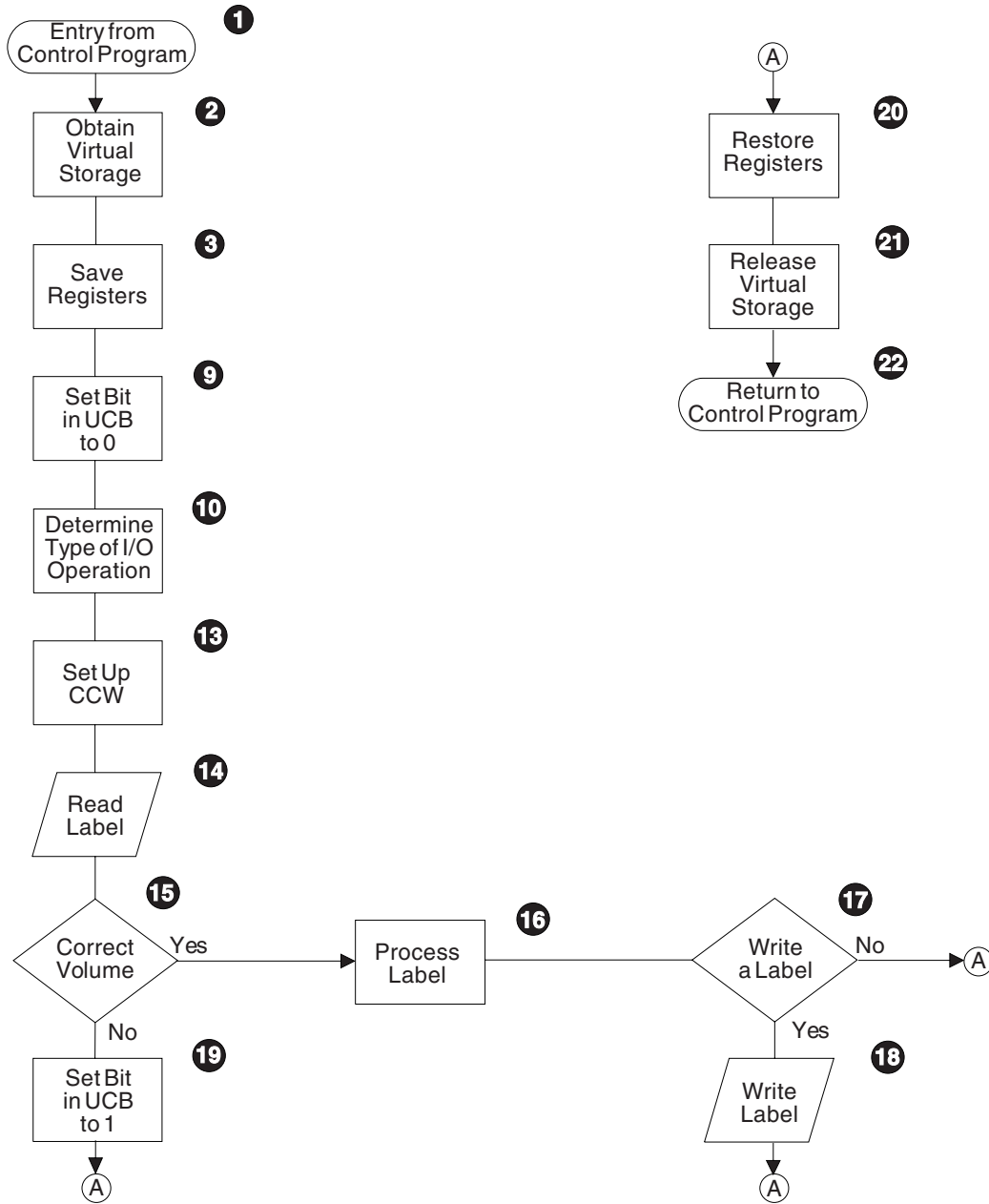


Figure 36. General Flow of a Nonstandard Label Processing Routine After Receiving Control from the EOVRoutine

Explanation of Logic Blocks-Figures Figure 34 on page 99, Figure 35 on page 100, and Figure 36

- 1 The entry is in the form of an XCTL macro instruction issued by the control program.
- 2 Use the GETMAIN or STORAGE macro instruction to obtain virtual storage.
- 3 Use the store multiple (STM) instruction and then set a register to point 32 bytes past register 6 as described in Figure 31 on page 96.
- 4 To locate the address of the DCB, use the contents of register 5 (Figure 31 on page 96

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on page 96). Set register 4 to the address of the work area pointed to by the table entry described in Figure 31 on page 96. (For EOVS, this register is already set.)

To determine if the DCB is to be processed, test bits 6 and 7 of the DCBOFLGS field of the DCB; if these bits are 1, the DCB is to be processed. (The symbolic names of all fields in the DCB are defined by the DCBD macro instruction.) The user's DCB is pointed to by the DXUDCBAD field on the combined work and control block area.

If a DCB in the CLOSE parameter list is not open at entry to CLOSE, it is not processed, and its entry is all zeros in the table pointed to by register 6 at entry.

- 5 To determine if a tape data set is being processed, test the UCB3TAPE field of the UCB; this bit is 1 for a tape data set. The symbolic names of all fields in the UCB are defined by the IEFUCBOB macro instruction. The address of the UCB is contained in the DXDEBUCB field of the DEB as defined by the IECDSECT macro instruction. Register 4 points to this IECDSECT area. (The IECDSECT macro is described in "Mapping the Common Open, Close, EOVS Work Area" on page 98.)
- 6 If nonstandard labels have been specified, the JFCBLTYP field of the JFCB has a hexadecimal 04.
- 7 The final DCB entry in the list of DCB addresses contains a 1 in its high-order bit position.
- 8 Add 4 to the contents of register 5; add 8 to the contents of the register set in Step 3.
- 9 Set the high-order bit to 0 in the UCBDMCT field of the UCB.
- 10 To determine the type of I/O operation specified in the OPEN macro instruction, check the bit configuration of the high-order byte of the DCB entry in the list of DCB addresses. The bit configuration for each type of I/O operation is shown below. (The high-order 4 bits correspond to the disposition of the data set; the low-order 4 bits correspond to the I/O operation itself. For example, the bit configuration x0110000 indicates a data set opened for input whose disposition is LEAVE.)

0	1	2	3	4	5	6	7	Bits
x	0	0	1	x	x	x	x	REREAD
x	0	1	1	x	x	x	x	LEAVE
x	0	0	0	x	x	x	x	Neither REREAD nor LEAVE
x	x	x	x	0	0	0	0	INPUT
x	x	x	x	1	1	1	1	OUTPUT or EXTEND
x	x	x	x	0	1	1	1	OUTIN or OUTINX
x	x	x	x	0	1	0	0	UPDAT
x	x	x	x	0	0	1	1	INOUT
x	x	x	x	0	0	0	1	RDBACK

- 11 If the high-order bit of the DCBOFLGS field of the DCB is 1, the data set mode is output; if this bit is 0, the data set mode is input. (The symbolic names of all fields in the DCB are defined by the DCBD macro instruction.)
- 12 You can position the tape if you have closed an input data set before all data has been read.

- 13 Move your CCW into the channel program area of the control program's work area. (The symbolic name of the first entry in the channel program area is DXCCW.) You can use the first six entries.
- 14 Issue an EXCP macro instruction specifying the address of the control program's IOB. (The symbolic name of the IOB is DXIOB.)
- 15 Techniques used to check for correct volume differ depending on the label formats used in the installation.
- 16 Label processing routines differ by label format.
- 17 Use this block for a write operation.
- 18 Issue an EXCP macro instruction specifying the address of the control program's IOB. (The symbolic name of the IOB is DXIOB.)

If the command is a rewind, use the compare and swap instructions to set the rewind-issued bit in the UCB (UCBREW) before issuing the EXCP.

If the command is a rewind-unload, use the compare and swap instructions to set the unit-not-ready bit in the UCB (UCBNRY) and zero out the UCB volume serial number field (UCBVOLI) after the channel program is complete.

- 19 Set the high-order bit to 1 in the UCBDMCT field of the UCB.
- 20 Use the load multiple (LM) instruction.
- 21 Use the FREEMAIN macro instruction to free the work area obtained in step 2.
- 22 Use the XCTL macro instruction, specifying the appropriate operand.

This coding sequence illustrates an exit from your routine. At entry to the module, register 4 contains the address of the control program's work area for a DCB. The code below represents a generic work area.

```

        USING      IECDSECT,4
        LR         1,SAVEBASE          put work area pointer in
*                                     register 1 for FREEMAIN
        LM         2,14,REGSAVE        restore caller registers
        FREEMAIN  R,LV=size,A=(1)
        BALR      15,0                 use 15 as temporary base
        USING     *,15
        MVC       0(8,6),MODNAME       module name to
*                                     open/close/EOV area
        LA        15,DXCCW12           use open work area
        XCTL      EPLOC=(6),SF=(E,(15))
MODNAME DC      C'IGGxxxxx'
```

Label Anomaly Exit Return Codes

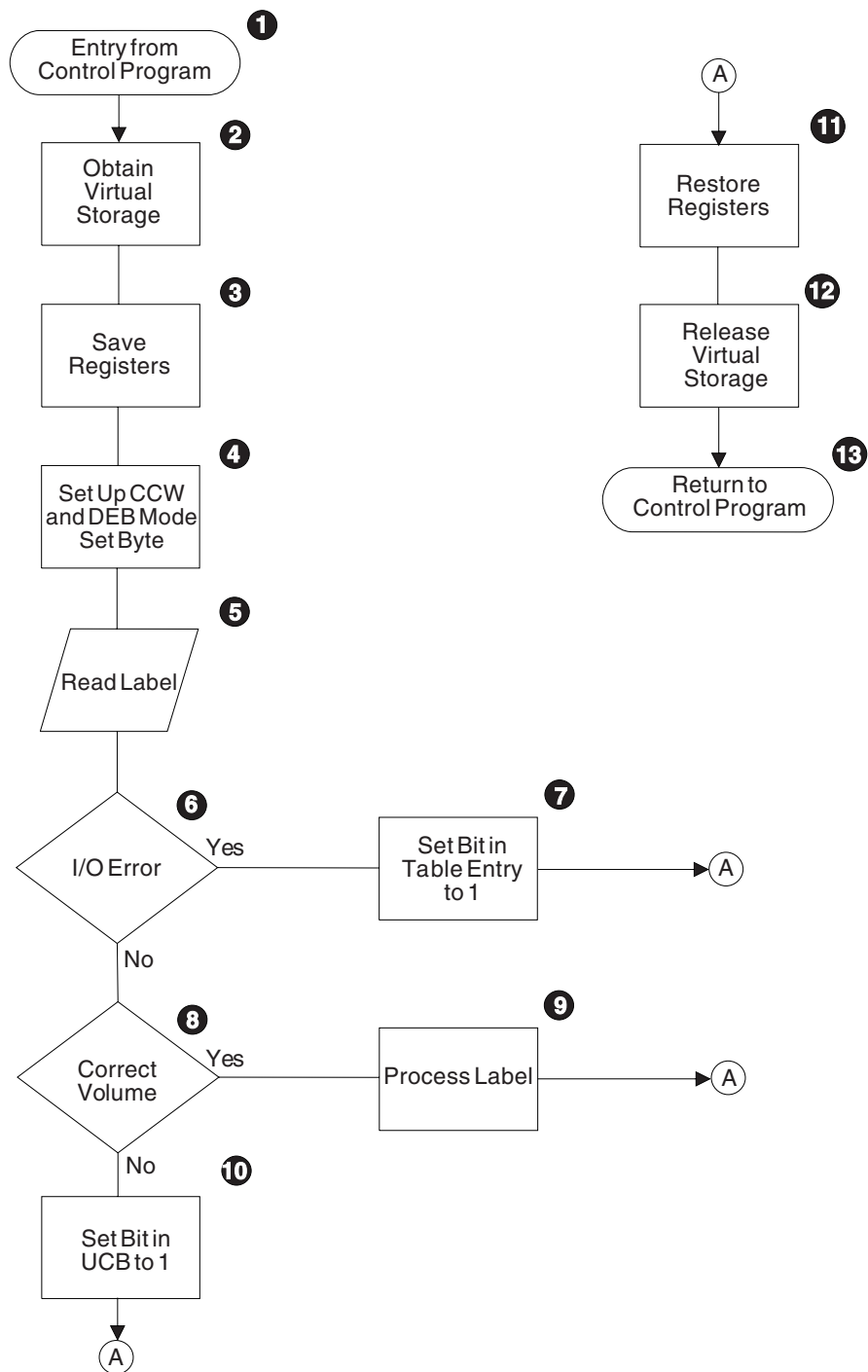


Figure 37. General Flow of a Nonstandard Label Processing Routine After Receiving Control from the Restart Routine

Explanation of Logic Blocks- Figure 37

- 1 The entry is in the form of an XCTL macro instruction issued by the control program.
- 2 Use the GETMAIN macro instruction to obtain virtual storage.
- 3 Use the store multiple (STM) instruction.

- 4 Move your CCW into the channel program area of the control program's work area. (The symbolic name of the first entry in the channel program area is RSCCW1.)

The control program provides the device modifier byte, RSDEBMOD, in the DEB portion of the restart work area. RSDEBMOD contains the mode-set command for the data portion of the tape. If your nonstandard labels are recorded in a mode different from the data, your NSL routine must set the device modifier byte (RSDEBMOD) to the density and recording technique of the labels. (See "Tape Characteristics" in *z/OS V2R1.0 DFSMS Using Magnetic Tapes*.)
- 5 Issue an EXCP macro instruction specifying the address of the control program's IOB. (The symbolic name of the IOB is RSIOB.)
- 6 Determine if an uncorrectable I/O error occurred. This can be any type of error that you do not want to accept.
- 7 Set the high-order bit to 1 in the TABTPLBL field of the table entry to indicate the I/O error.
- 8 Techniques used to check for correct volume differ depending on the label formats used in the installation. The volume serial number for the mounted volume is shown in the UCB.
- 9 Perform any necessary label processing and tape positioning.
- 10 Set the high-order bit to 1 in the UCBDMCT field of the UCB.
- 11 Use the load multiple (LM) instruction.
- 12 Use the FREEMAIN macro instruction to free the work area obtained in step 2.
- 13 Use the XCTL macro instruction. The following coding sequence illustrates an exit from your routine.

```

LR      1,SAVEBASE      put work area pointer in
                        register 1 for FREEMAIN
LM      2,14,REGSAVE    restore caller registers
FREEMAIN R,LV=size,A=(1)
BALR    15,0           use 15 as temporary base
USING   *,15
L       1,4(,9)        put pointer to restart
                        work area into register 1
MVC     128(8,1),MODNAME put module name in
                        restart work area
LA      15,120(,1)     set up XCTL
                        parameter pointers
LA      5,128(,1)      set up XCTL
                        parameter pointers
XCTL    EPLOC=(5),SF=(E,(15))
MODNAME DC      C'IGC0K05B'
```

Automatic Volume Recognition (AVR) Nonstandard Label Processing Routine (IEFXVNSL)

To allow the AVR option to process nonstandard magnetic tape labels, you must write a routine to supply AVR with information about them. Insert it into the control program replacing the IBM-supplied routine that causes AVR to reject tape volumes with non-standard labels. Your routine returns information to AVR that consists of a validity indication and the location within the nonstandard label of the volume serial number field.

Label Anomaly Exit Return Codes

OPEN, EOV, and CLOSE will always turn the DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address. The modeset byte is moved from the DEBSDVM field to the DEBSDVMX field to enable 31 bit UCB addresses to be accommodated.

Installing the AVR Nonstandard Label Routine

See “Replacing an Existing Exit” on page 3. Your routine must have an entry point name that matches the exit name. Your CSECT is linked together with certain system CSECTs into a single load module.

Writing the AVR Nonstandard Label Processing Routine

Your routine must:

- Determine if the label under consideration is a valid, nonstandard label as defined by your installation.
- Set general register 15 to zero if a valid label is detected, or to nonzero if the label is not recognizable. (A nonzero return causes AVR to unload the tape volume and issue an error message.)

Place the location of the volume serial number field within the label in an area provided by AVR when a valid label is detected. (The label, or the first part of it, is read into an 80-byte work area by AVR before your routine receives control; the location is defined within this work area. Also, before your routine receives control, AVR positions the tape at the inter-record gap after the nonstandard label.)

- Return control to AVR. Register 14 contains the return address. (The SAVE and RETURN macro instructions can be used in your routine.)

Your label processing routine receives control when the AVR routine cannot identify the first record on a magnetic tape volume as a standard label. The various error conditions that can occur during verification of the first record are explained under “Volume Label Verification and Volume Label Editor Routines” on page 108.

The format of your nonstandard labels must provide for a 6-byte volume serial number field within the first 80 bytes of the label. Otherwise, the volume serial number is read into the 80-byte internal work area. This does not restrict the overall nonstandard label format from being more or less than 80 bytes in length.

Your routine is called in 24-bit mode and must return in that mode. The name of your routine must be IEFXVNSL.

Registers on Entry to the AVR Exit Routine

Register

Contents

1	Address of AVR parameter list
2-12	Unpredictable
13	Address of a save area
14	Return address to the calling program
15	Address of the entry point to IEFXVNSL

When your routine receives control, the AVR routine has placed the nonstandard label in an 80-byte work area, and general register 1 contains the address of a 2-word area whose contents are as follows:

AVR Parameter List

Table 23. AVR-Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	Address of 80-byte work area that contains the nonstandard label.
04 (X'04')	4	Address of 4-byte area where you place the address of the volume serial number field within the nonstandard label.

NSL Volume Verification with Dynamic Device Reconfiguration (NSLREPOS)

If you use nonstandard tape labels and you want to use the dynamic device reconfiguration (DDR) option, you need an exit routine to perform volume verification.

When your NSLREPOS routine receives control from the DDR tape reposition routine, register 2 contains a pointer to an XCTL list. This list contains the module name to which you transfer control when you return control to DDR. Register 5 points to a buffer containing the first 48 bytes of a record of your label. The serial number of the volume against which verification is made is in the UCBVOL1 field of the UCB. Register 7 contains the UCB address.

If NSLREPOS gives return code 0, 12, or 16, the system's reposition routine repositions the tape. With a reel tape, this requires a count of the blocks from the labels or tape mark and this may depend on application program logic. With a cartridge tape, repositioning does not require a block count; the system uses a block identifier which is faster and more reliable.

Your NSLREPOS routine is not link-edited with any IBM-supplied routine. It resides in LPA and can have any valid combination of AMODE and RMODE. All the supplied areas reside below the 16MB line.

OPEN, EOVS, and CLOSE will always turn the DEB31UCB on in the work area to signify that DXDEBUCB is a 31-bit UCB address. Although the UCB address field will be four bytes, it typically will contain a three-byte address. The modeset byte is moved from the DEBSDVM field to the DEBSDVMX field to enable 31-bit UCB addresses to be accommodated.

Before returning control, your routine should put one of these codes into register 0:

Code Description

0 (X'00')

Volume verification is complete and a tapemark follows this label. Tape reposition routine positions the tape to that tapemark and clears the block count it has accumulated before it begins repositioning.

4 (X'04')

The NSLREPOS routine needs more information for volume verification.

Label Anomaly Exit Return Codes

When the tape reposition routine receives this code, it reads the first 48 characters of the next record into the buffer and returns control to NSLREPOS.

8 (X'08')

The wrong volume has been mounted. When the tape reposition routine receives this code, it sends a message to the operator explaining that the wrong volume has been mounted.

12 (X'0C')

Volume verification is complete and no tapemark follows this label. The tape reposition routine repositions the volume, using the block count it has accumulated.

16 (X'10')

Volume verification is complete and the tapemark following the label has already been reached, the tape reposition routine clears the block count it has accumulated and repositions the volume.

If NSLREPOS uses any registers other than register 0 or 14, the routine must save the registers in subpool 245 (using a GETMAIN macro) and store them in its own area before returning control to the tape reposition routine. When your NSLREPOS routine returns control to DDR, use this sequence:

```
LR      15,2  
XCTL   SF=(E,(15))
```

Volume Label Verification and Volume Label Editor Routines

(OMODVOL1, EMODVOL1)

If you state that an input or output tape has a standard label, the operating system checks for the standard volume label at the beginning of the tape. For ISO/ANSI tapes, the system checks for the correct version. If you specify that the tape has nonstandard labels or no labels, the system attempts to verify that the first record is not a standard volume label.

Because of conflicting label types or conflicting tape characteristics, various error conditions can occur during this verification of the first record. Under some error conditions, the tape is accepted for use. Under other error conditions, the tape is not accepted and the system issues another mount message. For certain other error conditions, the system gives control to a label anomaly exit and under certain conditions to a volume label editor routine. Your installation can use routines supplied by IBM or you can supply your own routines. The system calls the label anomaly exit, IFG019LA, before a possible call to a volume label editor routine. The type of anomaly and the actions taken by the label anomaly exit determine whether the system calls the volume label editor. IBM recommends using the label anomaly exit instead of the volume label editor because the label anomaly exit can handle more situations, its interface is cleaner and it is expected to be easier to write. IBM does not plan to enhance the label editor function.

The IBM-supplied volume label editor routines find the discrepancies between the requested tape and the mounted tape and, if necessary, pass control to the appropriate data management routine to create or destroy labels, as required. Installation-supplied routines can perform other functions.

Verification of First Record

The system reads the first record on the tape under the following conditions:

Label Anomaly Exit Return Codes

- If you use a single-density 9-track tape unit, the record is read in the density (800 bpi, 1600 bpi, or 6250 bpi) of the unit. If the record cannot be read, a unit check occurs.
- If you use a dual-density 9-track tape unit, the record is read in its existing density, provided that density is available on the unit. If the density is not available, or if the record is a 7-track record, a unit check occurs.
- If you use a 7-track tape unit, the first record is read in the density specified by the user and in the translate-on, even-parity mode. If the record is in another density or mode, or is a 9-track record, a unit check occurs. ISO and ANSI do not specify support of 7-track tape for information interchange.
- If you use a cartridge unit, the record is read in the density of the unit. If the record cannot be read, a unit check occurs.

Various error conditions can occur when the system verifies the initial record on a tape. The following figures illustrate system actions (when standard labels are specified, when nonstandard labels are specified, and when no labels are specified), resulting from these error conditions.

Label Anomaly Exit Return Codes

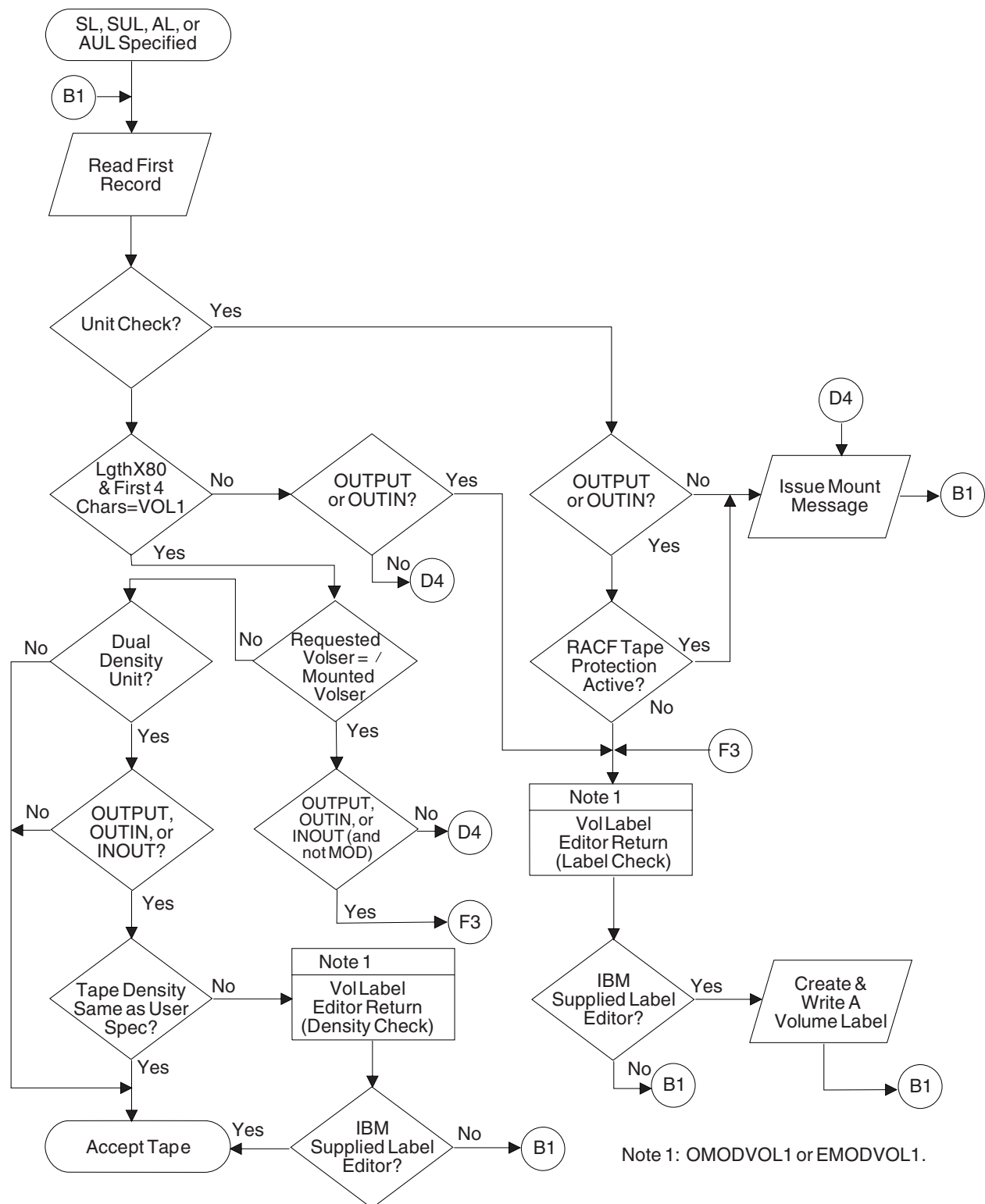


Figure 38. Verification of First Record When Standard Labels Are Specified

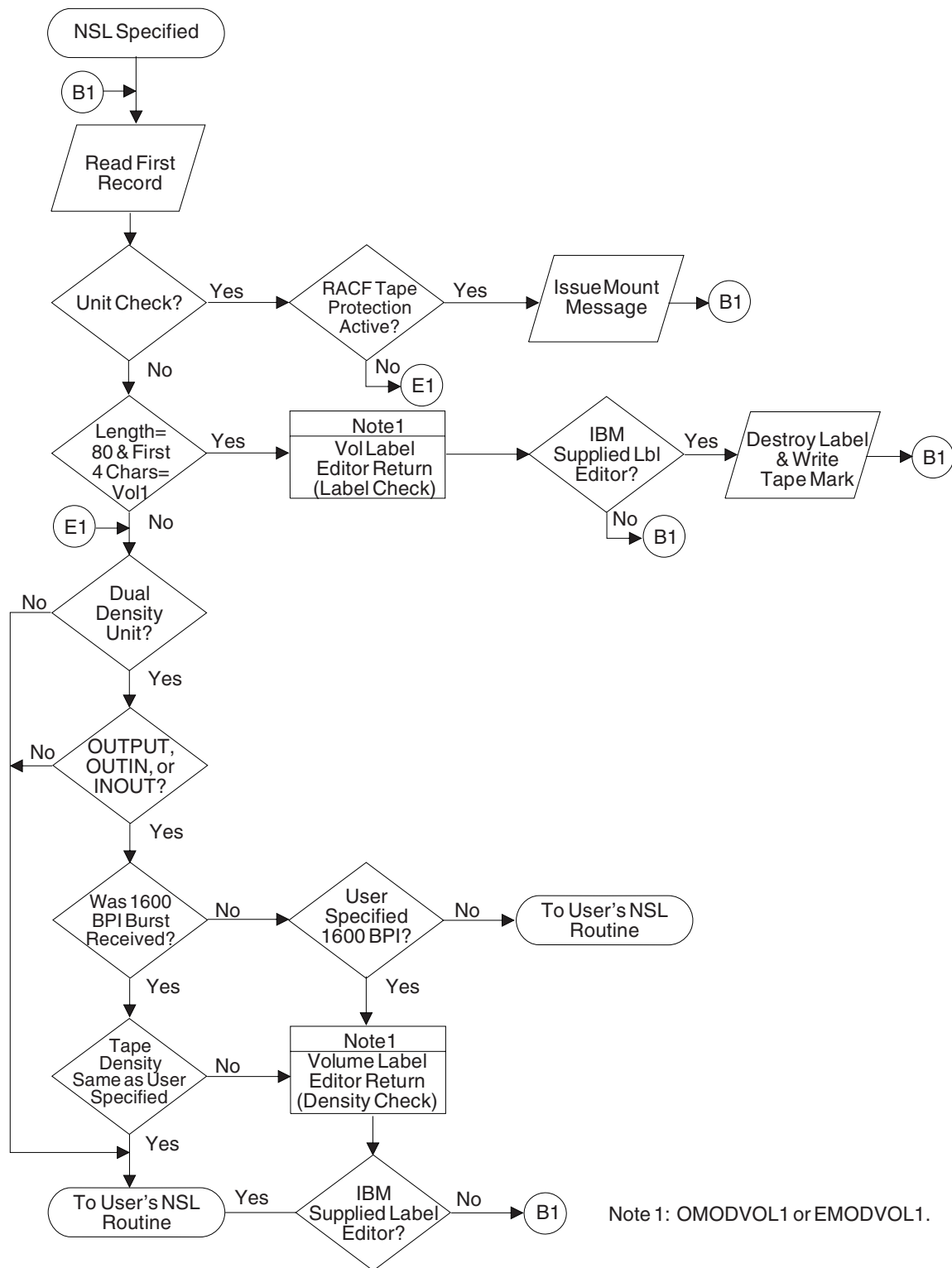


Figure 39. Verification of First Record When Nonstandard Labels Are Specified

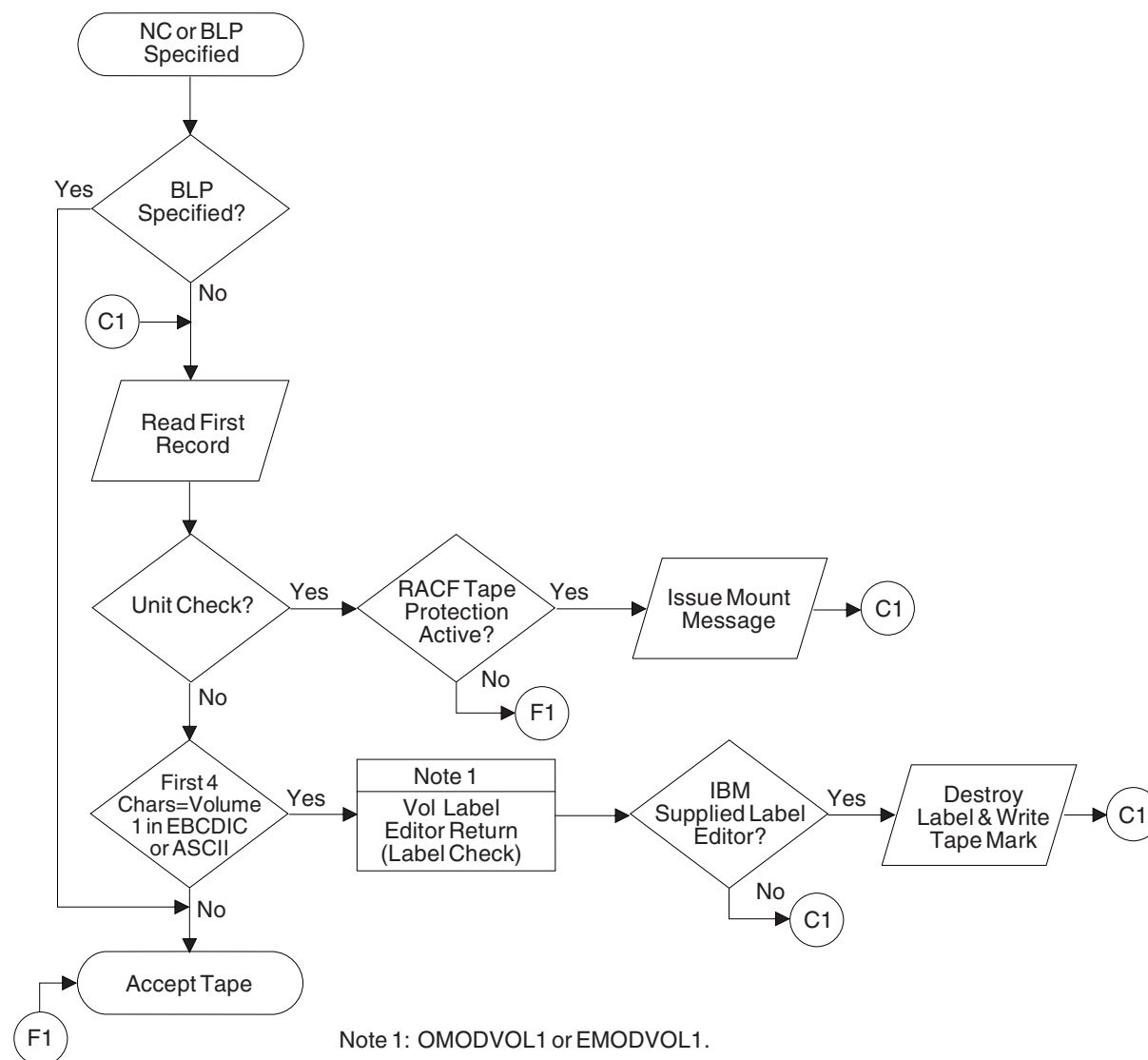


Figure 40. Verification of First Record When Unlabeled Tape Is Specified

Volume Label Editor Routines

When data sets are written on tape, data management's open or EOVS routine might detect these:

- **Label—Type Conflict.** Conflict between the label type specified by the user and the actual label type on the mounted output volume (OUTPUT or OUTIN).
- **Density Conflict.** Conflict between the recording density specified by the user and the actual density of the output volume (OUTPUT, OUTIN, or INOUT) mounted on a dual-density tape unit.
- **Volume Serial Conflict.** Conflict between the volume serial number specified by the user and the actual volume serial number on the mounted output volume (OUTPUT or OUTIN).
- **Label Version Conflict.** Conflict between the existing label version on the mounted output volume and ISO/ANSI Version 3 or Version 4 level that open

or EOVS want to use either by default or by using the force option in the VOLM (Volume Mount Tape Installation exit) or by the FORCE3 or FORCE4 parameter specified in the ALVERSION keyword of the DEVSUPxx Parmlib member.

- **Mode Conflict.** Conflict between the compaction mode specified by the user and the actual compaction mode of the mounted output volume (OUTPUT or OUTIN).
- **Track Conflict.** Conflict between the cartridge type of the mounted output volume and that of the drive (OUTPUT or OUTIN). The first block of the tape cartridge cannot be read. The system has reconstructed an SL or AL volume label from sense bytes. The first 11 bytes match the volume label. The rest of the 80 bytes are EBCDIC or ASCII blanks according to whether the first four bytes are EBCDIC or ASCII. If the label is in ASCII, OPEN or EOVS has translated it to EBCDIC.

If the internal volume serial number does not equal the external (optical) volume serial number, create the internal equal to the external in the volume label editor routines for nonspecific volume requests. When such conflicts occur, control is given to the volume label editor routines. The IBM-supplied editor routines determine whether the data management routines can resolve the conflict.

If the volume label editor routines accept a conflict while opening to the first data set on an ISO/ANSI Version 3 or Version 4 volume, the system enters RACF, checks the expiration date, and enters the file access exit before requesting permission from the operator to create a new VOL1 label (the volume access exit is entered prior to label—type conflict processing).

If a nonspecific volume request is made for a standard labeled tape, but the mounted volume does not have a standard label, data management issues a message to the operator requesting that either the volume serial number and owner information be supplied or, optionally, that the use of this tape volume be refused. If a specific volume request is made and the label format of the mounted volume does not match the format specified in the processing program, data management rejects the tape and issues a message to mount another volume. However, if a specific volume request is made for an SL tape and the mounted tape is unlabeled, data management gives the operator the option of labeling or rejecting the tape.

If a nonspecific volume request is made for a nonstandard labeled or unlabeled tape, but the mounted volume has a standard label, data management gives the operator the option to allow or refuse the use of the tape under the following conditions:

- The file sequence number is not greater than 1.
- The expiration date passed, or the operator allowed the use of the tape.
- The volume is neither password-protected nor RACF-protected, and the accessor is ALTER authorized.

If these conditions are not met, data management rejects the tape and issues a mount message. Data management follows the same procedure if the conditions are met, but the operator refuses the use of the tape.

If the operator accepts the tape, data management destroys the volume label by overlaying it with a tapemark. It deletes the RACF definition of the volume if it was found to be RACF defined and the user is ALTER authorized. Even if the password is known, a password-protected tape that is not RACF defined is not converted to NL or NSL.

Label Anomaly Exit Return Codes

For dual-density tapes with standard labels, data management rewrites the labels in the density specified when an output request is made to the first data set on a volume. When an output request is made to other than the first data set, the labels are rewritten in the density specified in the existing labels.

If the existing ISO/ANSI label is not Version 3 or Version 4, during an output request to the first data set on the volume, the volume label editor routines provide an option allowing the label to be rewritten to conform to Version 3 or Version 4 standards. The WTOR message processing installation exit can be used to provide label information for the new Version 3 or Version 4 label instead of requiring the operator to supply it through a WTOR message (see “WTO/WTOR Message Processing Facility Installation Exit (IEAVMXIT)” on page 126). If a version conflict is detected for an output request to other than the first data set, the volume is unconditionally rejected by open/EOV after issuing an IEC512I LBL STD “VRSN” error message.

You can replace the IBM-supplied editor routines with your routines to resolve the conflict. Your editor routines can:

- Resolve label and density type conflicts by writing labels, by overwriting labels with a tapemark, and by performing write operations to set the correct density on a dual-density tape device.
- Reset the appropriate system control blocks (in effect, change the program specifications) to agree with the label type and/or density of the currently mounted volume.
- Provide a combination of these actions, including removing the volume under certain conditions.

There are two IBM-supplied editor routines. One gets control from the open routine for handling the first or only volume of a data set. The other gets control from the EOV routine for handling the second and subsequent volumes of a multivolume data set. You can replace either or both of these routines.

Installing Your Own Label Editor Routines

See “Replacing an Existing Exit” on page 3. For OMODVOL1, code IFG0193C on the ++MOD statement. For EMODVOL1, code IFG0553C on the ++MOD statement.

Note: OMODVOL1 and EMODVOL1 are aliases.

Your label editor routines can reside above or below the 16MB line.

Writing Volume Label Editor Routines

Your editor routines must conform to the same general programming conventions as the nonstandard label processing routines discussed under “Processing Nonstandard Labels” on page 90, for size, design, register usage, entry points, and work areas. As discussed under “Nonstandard Labels” on page 89, you must use the EXCP macro instruction to perform needed input/output operations.

You must name the first (or only) module of your routines as follows:

IFG0193C

The editor routine associated with open

IFG0553C

The editor routine associated with EOV

If your editor routines have more than one load module, names for the additional modules must begin with the prefix OMODVOL for the open routine, or EMODVOL for the EOVS routine.

DFSMSrmm makes use of the OMODVOL1 and EMODVOL1 routines. DFSMSrmm changes the flow of control so that DFSMSrmm code is entered before OMODVOL1 and EMODVOL1 are entered.

With tape cartridges, the open and EOVS routines normally use EXCP appendages when processing labels. For the duration of the open or EOVS, they normally save labels in virtual storage buffers to improve performance by avoiding an unnecessary change of direction on the tape. The EXCP appendages simulate most types of channel programs that read. For channel programs that they do not simulate, they move the tape to the point where your routine expects the tape to be and then allow the channel program to run. This simulation improves performance.

If your routine does I/O, it should use the DCB that is in the work area. Do not substitute or modify the DEB appendage vector table.

Program Functions

Table 24 on page 116 presents the conditions under which the open or EOVS routines transfer control to your editor routines. Each condition suggests what your routine can do to permit processing of the current volume to continue. The first two conditions (density—type conflicts) arise only when the tape volume is mounted on a dual-density tape device.

General flowcharts of editor routines are shown in Figure 41 on page 118 and Figure 42 on page 119. The logic is shown separately for routines that receive control from the open or EOVS routine of the control program. Each block in each of the flowcharts is numbered; each number corresponds to an item in the lists of explanations that follow the figures. Other points to note are:

- The logic in the flowcharts is oriented toward resolving the label and density—type conflicts by altering the characteristics of the mounted volume.
- Figure 42 on page 119 (the EOVS editor routine) does not contain logic blocks corresponding to blocks 5, 18, and 19 in Figure 41 on page 118 (the open editor routine). These blocks represent functions that you must program only when receiving control from the open routine. You must test all the DCBs defined by the OPEN macro instruction before returning control to the open routine. When you receive control from the EOVS routine, there is only one DCB to process.
- If you do not support expiration date and protection checking on nonstandard label volumes, or maintain such checking on standard label volumes, you need not implement the functions of logic blocks 6 through 14 in the flowcharts.
- The DCB is copied into protected storage during open, close, or EOVS processing. During open processing, register 7 points to a parameter list that contains the addresses of the DCBs in protected storage. During EOVS processing, register 2 points to the DCB in protected storage. The address of the user's DCB is in the open, close, EOVS work area at the label DXUDCBAD. If the DCB is to be changed, both copies must receive the same change.

Label Anomaly Exit Return Codes

Table 24. Editor Routine Entry Conditions from the Open and EOJ Routine

Program Specification	Mounted Volume Characteristics	Transfer Conditions	Possible Editor Routine Action
SL or AL	NSL or NL ¹	Label—Type Conflict ²	Write a standard volume label. (See Figure 41 on page 118: blocks 15, 15A, and 16. If you support protection and retention date checking on NSL volumes, see block 6.)
NSL or NL	SL ³ or AL ⁴	Label—Type Conflict	Overwrite standard label with tapemark, for example, cancel. (See Figure 41 on page 118: blocks 15, 15A, and 16.) Depending on whether NL or NSL is specified by the program, open or EOJ either positions tape (NL) or transfers control to your nonstandard label routines (NSL).
AL	SL	Label—Type Conflict	Overwrite an IBM standard label with a Version 3 or Version 4 VOL1 label.
SL	AL ⁴	Label—Type Conflict	Overwrite ISO/ANSI label with an IBM standard label.
AL or SL	AL ⁴ or SL	Density Conflict	Overwrite the existing standard label with the requested standard label. The first write from load point sets the recording density on a dual-density device. (See Figure 41 on page 118 or Figure 42 on page 119: blocks 15B, 16, and explanation.)
NSL	NSL or NL with different density	Density Conflict	Write a tapemark to set density. The program specification NSL gives control to your nonstandard label routines after return to Open or EOJ. (See Figure 41 on page 118: blocks 15, 15B, and 16. If your installation supports protection and retention date checking on NSL volumes, see block 6.)
AL or SL	AL or SL	Volume Serial Conflict	Overwrite volume label with requested volume serial number.
AL	AL ⁴	Version Coexistence Conflict	Overwrite an ASCII label with a Version 3 or Version 4 label (first file output only).
Compacted or non-compacted mode	Opposite of mode specified	Mode Conflict	No action taken.
Cartridge	36-track cartridge mounted on an 18-track drive	Track Conflict	Overwrite existing volume label so that it is compatible with drive.

Legend:

AL ISO/ANSI standard volume label
SL IBM standard volume label
NSL Nonstandard volume label
NL No volume label

Notes:

1. If the volume is mounted on a dual-density device, a density condition might also exist. The write operation corrects this.
2. When SL is specified, a label—type conflict might also indicate that the system could not recognize the first record because of a unit check condition.

Label Anomaly Exit Return Codes

3. If NL is specified, no density check is performed. For NL volumes, tape is positioned at load point and recording density is set by the first write command.
4. The open and EOVS routines position the tape at load point before transferring control to the editor routines.

Label Anomaly Exit Return Codes

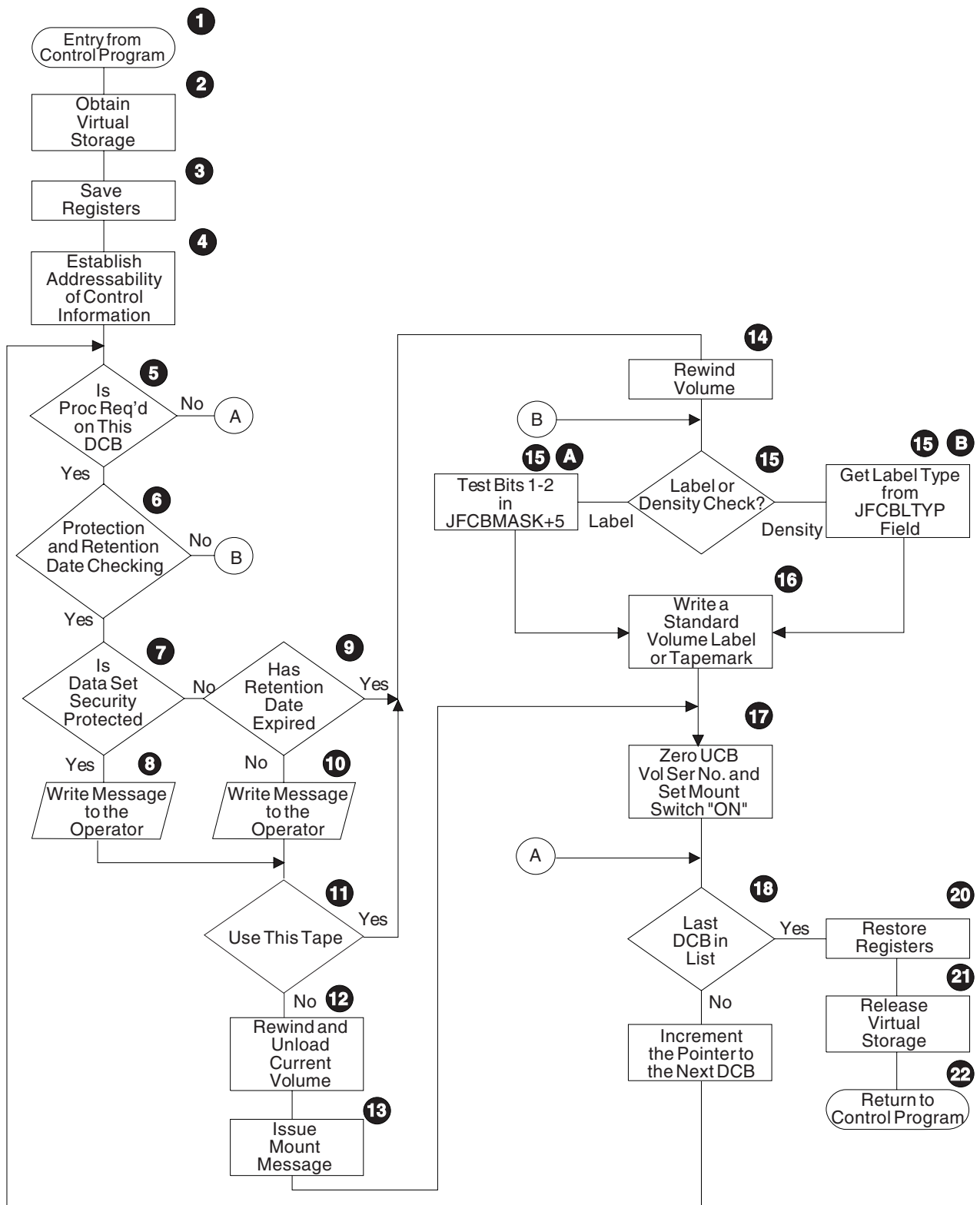


Figure 41. General Flow of an Editor Routine after Receiving Control from the Open Routine

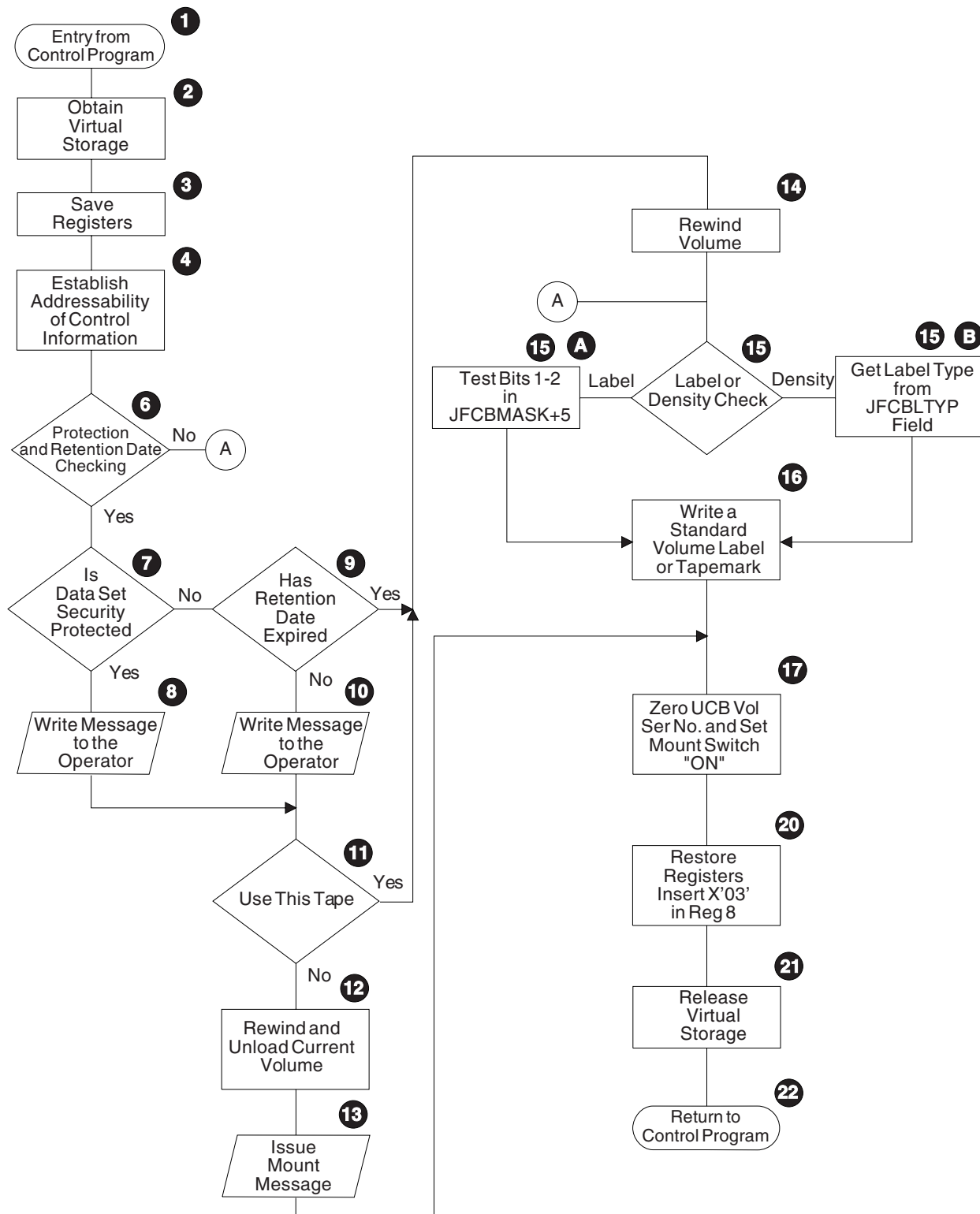


Figure 42. General Flow of an Editor Routine after Receiving Control from the EOVRoutine

Explanation of Logic Blocks-Figures Figure 41 on page 118 and Figure 42

- 1 Your exception routine receives control from the open or EOVRoutines of the control program.

Label Anomaly Exit Return Codes

- 2 Use the GETMAIN macro instruction. The virtual storage you get must contain all your work areas, including those used to read in a label or write a label.
- 3 Use the store multiple (STM) instruction.
- 4 Figure 31 on page 96 provides the information you need to establish addressability of the DCB address list and work and control block area for each DCB defined by the OPEN macro instruction.

When you receive control from the EOV routine, general register 2 contains the address of the DCB for the data set, and general register 4 contains the address of the work and control block area associated with the DCB.

The IECDSECT macro instruction (described in “Mapping the Common Open, Close, EOV Work Area” on page 98) symbolically defines the fields of the work and control block area (see Figure 32 on page 97).

Also, address the UCB for the device on which the tape volume is mounted. You can get the address of the UCB from the DXDEBUCEB field of the DEB defined by the IECDSECT macro instruction. The IEFUCBOB macro instruction defines the fields of the unit control block.

- 5 Bit configurations in the byte addressed by JFCBMASK+5 indicate whether label—type conflicts or density conflicts have occurred and, in the case of a label—type conflict, the condition that caused the conflict. Now test bits 0 and 3. If either bit is set to 1, processing is required. However, if bits 6 and 7 of DCBOFLGS are set to 0, you should discontinue processing. When bit 6 (lock bit) is 0, the control program cannot open the DCB. When bit 7 (busy bit) is 0, the DCB is already being processed or is already open.

The field JFCBMASK is defined by the IECDSECT macro instruction. Bit settings in the byte at JFCBMASK+5 are defined as:

Bits	Setting	Meaning
0	1	Label—type conflict has occurred.
1	1	Standard label (SL or AL) specified; no label/nonstandard label on mounted volume. If JFCBAL (AL label requested) is set and UCCBBSTR is set in the UCB (ASCII tape is mounted), an ISO/ANSI version conflict has occurred, and a valid Version 3 or Version 4 volume label must be created.
2	1	No label (NL) or nonstandard label (NSL) specified; standard label (AL or SL) on mounted volume.
3	1	Density conflict
4	1	Track conflict. The system has reconstructed a volume label from sense bytes.
5	1	See step 12
6-7		Reserved for future use

- 6 If your installation supports a protection and retention date scheme involving nonstandard labels, or if you want to maintain retention date and protection checking on standard labels, you must incorporate code in your editor routines to check for protection and retention date expiration.

To check, you must read the first record and determine the label type.

For I/O, move your CCWs into the channel program field of the work and control block area. (The symbolic name for the first entry in this field is DXCCW.) Then, issue an EXCP macro instruction specifying the address of

the control program's IOB. (The symbolic name for the IOB is DXIOB.) These fields (DXCCW, DXIOB) are defined by the IECDSECT macro instruction. There are 12 CCW locations in the DXCCW field. There are 12 CCW locations in the DXCCW field. You can only use the first six locations.

- 7 To check the retention date or protection fields in a standard label, you must read the data set header 1 record into a work area. The format of the nonstandard label you define determines how you access those fields in the nonstandard label. Step 6 provides directions for handling the I/O operation.
- 8 Write a message to the operator stating that the volume is protected and asking if it is to be used.
- 9 Repeat step 7.
- 10 Write a message to the operator that the expiration date for the mounted volume has not elapsed and to determine if it is to be used.
- 11 If the volume is to be used, continue processing to resolve label or density conditions.
- 12 Rewind and unload the currently mounted volume. Step 6 provides directions for handling the I/O operation. When you issue the rewind and unload command, you must turn on the UCB not-ready bit (UCBFL2) after the ECB has been posted. If you want the open or EOVS mount verification routines to handle the mounting or removing on volume verification, set bit 4 (X'08') of JFCBMASK+5 in the open or EOVS work area and go to block 22 to return to open or EOVS. Subsequent volume level errors cause the label editor routines to be reentered.
- 13 Write a message to the operator requesting removing of the current volume and mounting of a new volume. You can get the 4-digit device number (in binary) from the UCBCHAN field of the UCB. Step 6 provides directions for handling the I/O operation.
- 14 If a new volume is to be mounted, repeat step 6.
- 15 Test bit 3 of the byte at JFCBMASK+5. If set to 1, control was received as a result of a density conflict.
Test bit 0 of the byte at JFCBMASK+5. If set to 1, control was received as the result of a label—type conflict.
 - a If control was received as the result of a label—type conflict, test bits 1 and 2 of the byte at JFCBMASK+5. See step 5.
 - b If control is received as the result of a density conflict, use the JFCBLTYP field in the JFCB to determine the type of label in the program. A X'04' indicates a NSL has been specified; a X'02' indicates a standard label has been specified.
- 16 When you correct a density conflict or label—type conflict condition, and the program specifies an NSL, record the tape whether the open or EOVS routines interpret as a nonstandard label or no label. For example, it does not contain VOL1 in the first four bytes of the record. The easiest way to do this is to write a tapemark. Upon return to open or EOVS and reverification of the label, the specification for label type and density will have been met. If you've specified NSL, OPEN or EOVS transfers control to your nonstandard label routines. If you've specified NSL, it positions the tape for writing.

Label Anomaly Exit Return Codes

You must supply information for the label identifier, the label number, and the volume serial number fields, and record the balance of the label as blanks.

Enter VOL in the label identifier field, a 1 in the label number field, and a 6-character serial number in the volume serial number field. To ensure that two or more tape volumes carrying the same serial number are not produced, write to the operator at this point for assignment of a serial number.

Data set header labels 1 and 2 are constructed by the open or EOVS routine after control is returned to them.

Note: At this point, you can change the control block settings to conform to the characteristics of the tape volume mounted (that is, reset the label type field in the JFCB to conform with the type of label on the volume mounted and change the density field in the DCB to the density of the tape mounted).

- 17 The symbolic name for the volume serial number field in the UCB is UCBVOLI. The mount switch is the high-order bit of the field named UCBDMCT in the UCB. These fields are defined by the IEFUCBOB macro instruction. Perform an exclusive OR (XC) operation on the UCBVOLI field with itself and perform an OR (OI) operation on the UCBDMCT field with X'80'. This causes the mount verification routines to bypass further label processing and reverify the tape without an intervening removal.
- 18 When receiving control from the open routine, you must process the entire DCB list. The last entry in the list can be recognized by a 1 in bit 0 of the first byte in the entry.
- 19 You increase the pointer to the DCB address list by 4 bytes. You must also increase the pointer to the work and control block area for each DCB. You increase this pointer by 8 bytes.
- 20 Use the load multiple (LM) instruction.
- 21 Use the FREEMAIN macro instruction.
- 22 Return control to the open or EOVS routine using the following code:

```
MVC    0(L'IDRETURN,6),IDRETURN
XCTL  EPLOC=(6),SF=(E,DXCCW12)
IDRETURN DC    CL8'nnnnnnnn' Name of return routine
```

nnnnnnnn is the name of the routine to return to. In OMODVOL1 the name is IGG0190A. In EMODVOL1 the name is IGG0550P.

Return From To Module

OMODVOL1
IGG0190A (Open)

EMODVOL1
IGG0550P (EOVS)

Note: Open and EOVS rewind the volume upon receiving control from OMODVOL1 or EMODVOL1.

ISO/ANSI Version 3 and Version 4 Installation Exits (IFG0193G)

Four installation exits are provided, as defaults, for ISO/ANSI Version 3 and Version 4 volumes:

1. Label validation
2. Label validation suppression
3. Volume access
4. File access.

A fifth installation exit, MPF for WTO/WTOR, can be written (or modified, if one has already been written) by your installation to convert ISO/ANSI pre-Version 3 to Version 3 or Version 4 labels (see “WTO/WTOR Message Processing Facility Installation Exit (IEAVMXIT)” on page 126).

All the default installation exit routines are supplied in a module containing a single CSECT (IFG0193G, alias IFG0553G), in SYS1.LPALIB. A copy of the source code for the module is contained in member ANSIEEXIT of SYS1.SAMPLIB.

The default routines, except the validation suppression exit, reject the volume. They run in a privileged (supervisor) state and can be modified or replaced to perform I/O (such as overwriting a label), change system control blocks, and mount or remove volumes.

The return code from the exits can be modified to request continued processing. However, in cases in which the label—validation exit is entered and the routine has not been modified to correct certain errors, the results can be unpredictable. The prologue of the source code for the exits, in SYS1.SAMPLIB, gives additional details on modifying the exits.

A parameter list, mapped by the macro IECIEPRM, is passed to the exit routines. The same parameter list is passed to the RACF installation exits if a volume is RACF protected and the VOL1 access code is uppercase A through Z for ISO/ANSI Version 3 tapes. In addition to uppercase A through Z, ISO/ANSI Version 4 tapes also allows special characters !*"%&'()+,-./:;<=>?_ and numeric 0–9.

Return codes from the Version 3 and Version 4 exits are returned in the IECIEXRC field of the parameter list. Return codes from the RACF exits are returned in register 15. Return codes from the Version 3 or Version 4 and RACF exits are not the same.

Neither the Version 3 or Version 4 nor RACF installation exits should alter any of the parameter list fields, except IECIEXRC or IECIEUSR.

An important extension to the parameter list is the UCB tape class extension. It contains such items as the volume access code (UCBCXACC), owner identification (UCBCXOWN), and ISO/ANSI version (UCBCXVER). The address of the appropriate UCB is maintained in the parameter list.

If you replace any of the IBM-supplied exit routines with your own routines, follow the programming conventions described under “Processing Nonstandard Labels” on page 90, except that return must be by way of a BR 14 instruction.

In addition, your routines cannot use the DCB parameter list to process any DCB other than the current entry, because the DCBs are not synchronized during Version 3 exit processing.

Label Anomaly Exit Return Codes

MODESET to key 0 to alter protected control blocks (such as the UCB). Always restore the original key at entry immediately after you make any alterations to key 0 storage; this minimizes risk of inadvertent data destruction.

Label Validation Exit

The label validation exit is entered during open or EOV if an invalid label condition is detected, and label validation has not been suppressed. Invalid conditions include unsupported characters, incorrect field alignment, unsupported values (for example, RECFM=U, block size greater than 2048 for Version 3, or a zero generation number), invalid label sequence, asymmetrical labels, invalid expiration date sequence for Version 3, and duplicate data set names for Version 3.

Input to the exit is the address of the exit parameter list containing the type of exit being run, the type and location of the error, and an address for the label in error.

Except for duplicate data set name checking, label validation occurs only at tape load point (beginning-of-volume label group) and at the requested data set position (beginning-of-data-set label group); only duplicate name checking occurs during positioning to the requested data set.

Trailer labels produced by the system are not validated during close or EOV for the old volume. Thus, an input data set read in a forward direction is processed during close/EOV even if it is followed by an invalid trailer label. If the same data set is read backward, the invalid label is detected during open or EOV for the new volume, and causes the label validation exit to be entered.

Because modifications to an existing data set can result in non-symmetrical trailer labels, these open options cause the label validation exit to be entered for Version 3:

- Open for OUTPUT or OUTIN with DISP=MOD.
- Open for INOUT, EXTEND, or OUTINX.
- Open for an EXCP DCB (OUTPUT/OUTIN) that does not contain at least a 4-word device-dependent area for maintaining a block count.

If you have generalized library subroutine programs that use the INOUT option, but you are using a tape for input only, you can avoid entering the exit by coding LABEL=(,AL,,IN) on the JCL DD statement.

The label validation exit can either continue processing a volume or reject it, issuing one of the following return codes:

Return Code

	Description
X'00'	Continue processing volume
X'04'	Reject volume (set by the IBM-supplied exit)

To identify the condition that is not valid, an IEC512I LBL STD message is issued to the operator. For a rejected volume, an abend code message is also issued.

Entry to the label validation exit is tracked in the UCB. This serves as an audit trail if the exit forces continuation for a condition that is not valid, but the condition causes an abend in subsequent processing. The system does not rewrite labels after return from the label validation exit. To correct a label, you must write a label

validation exit. If certain errors are not corrected, they cause unpredictable results when the volume is processed by a return code of zero from the label validation exit. They are:

- Incorrect sequencing
- Unsupported characters
- Incorrect field alignment
- Some unsupported values (RECFM=U, block size greater than 2048 for Version 3, and a zero generation number are processed by the system).

If an error is corrected by a return code of zero from the label validation exit, the resulting volume might not meet the specifications of Version 3 or Version 4 standards, and therefore requires agreement between interchange parties.

Label Validation Suppression Exit

The validation suppression exit lets you suppress label validation. It is entered during open or EOV if:

- volume security checking has been suppressed or
- the volume label accessibility field contains an ASCII space character or
- for Version 3 tapes, RACF accepts a volume and the accessibility field does not contain an uppercase letter from A through Z or
- for Version 4 tapes, RACF accepts a volume and the accessibility field does not contain an uppercase letter from A through Z or one of the special characters !*"%'()+,.-./:;<=>?_ or a numeric 0 through 9.

Label validation can also be suppressed by the volume access exit. If you suppress label validation, the resulting volume might not meet the specifications of Version 3 or Version 4 standards, and therefore would require agreement between interchange parties.

Volume Access Exit

The volume access exit is entered during open or EOV if a volume is not RACF-protected and the accessibility field in the volume label contains:

- an ASCII uppercase letter from A through Z for Version 3 tapes or
- an ASCII uppercase letter from A through Z, a numeric 0 through 9, or special characters !*"%'()+,.-./:;<=>?_ for Version 4 tapes.

The exit is bypassed if security checking has been suppressed (as indicated in the Program Properties Table).

The exit can accept or reject the volume and can suppress label validation, issuing one of these return codes:

Return Code

	Description
X'00'	Use volume
X'04'	Reject volume (set by IBM-supplied exit)

Suppress label validation by setting the high-order bit of the return code in the field named CONTROL in the source module ANSIEXIT (for example, a return code of 80 would indicate to use the volume and suppress validation). This bit is acted on every time the exit returns to the system.

Label Anomaly Exit Return Codes

The volume access exit is used only when the label validation suppression exit is not used.

File Access Exit

The file access exit is entered after positioning to a requested data set if the volume is not RACF protected and if the accessibility field in the HDR1 label contains:

- an ASCII uppercase letter from A through Z for Version 3 tapes or
- an ASCII uppercase letter from A through Z, a numeric 0 through 9, or special characters !*"%'()+,.-/;<=>?_ for Version 4 tapes.

The exit is also entered when a data set is written to an output volume if the first character of the JCL ACCODE keyword is one of the characters listed in the previous paragraph for a Version 3 or Version 4 tape.

The exit can either accept the data set or reject the volume, issuing one of the following return codes:

Return Code

	Description
X'00'	Use data set
X'04'	Reject volume (set by IBM-supplied exit)

The file access exit can reject a volume that was accepted earlier by the volume access exit.

WTO/WTOR Message Processing Facility Installation Exit (IEAVMXIT)

For ISO/ANSI tape volumes, DFSMSdftp only supports output to ISO/ANSI Version 3 or Version 4 and input from either ISO/ANSI Version 1, Version 3 or Version 4. If a label version conflict is detected during an output request to the first data set on a volume, the WTOR message IEC704A C is issued to the installation operator to get information for rewriting the volume label as a Version 3 or Version 4 label. If you do not want the operator to provide the label information (volume serial number, owner identification, and volume access code), you can use the WTO/WTOR message processing facility to intercept message IEC704A C and provide this information.

The name of the general purpose WTO/WTOR message processing installation exit is IEAVMXIT. You can use this installation exit or a message-specific installation exit routine (one that you specify on the USEREXIT parameter in the MPFLSTxx member of SYS1.PARMLIB) to process WTOR message IEC704A.

IECIEPRM Parameter List

The parameters passed to a Version 3 or Version 4 installation exit during label processing vary slightly among different types of exits. These differences, are noted in the "Description" column in Table 25 on page 127. The parameter list is passed to the exit as an address in general purpose register 1; it is 32 bytes in length and is mapped by macro IECIEPRM beginning at DSECT IECIEPRM. Parameter fields not available to a particular exit are set to zero. The only fields allowed to be altered by an exit are the return code (IECIEXRC) and the user area (IECIEUSR); changing any other field has an unpredictable effect on system processing. A flag in the parameter list indicates which type of exit was entered.

Label Anomaly Exit Return Codes

Table 25. ISO/ANSI Version 3 or Version 4 Exit Parameter List. All fields apply to all four exits unless otherwise stated in description.

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	4	IECIEID	Parameter list identifier (APRM)
04 (X'04')	4	IECIESIZ	Length of IECIEPRM
08 (X'08')	4		Reserved
12 (X'12')	1	IECIEFL1	Exit flags
EXACTLY ONE OF THE FOLLOWING FOUR BITS IS ON FOR EACH CALL			
	1...	IECIEVAL	Entry is Validity Check
	.1..	IECIEVAE	Entry is Volume Access
	..1. ...	IECIEFAE	Entry is File Access
	...1	IECIEVSP	Entry is Validation Suppression
	.... 1..	IECIEWRT	Label will be written (WRITE)
	.... .1.	IECIEEOV	EOV in process
13 (X'13')	1	IECIEERR	Validation error type (valid only for label validation exit)
	1...	IECIEVRS	Version coexistence conflict ¹
	.1..	IECIEUNK	Unsupported or unknown value
	..1.	IECIEADJ	Invalid field alignment
	...1	IECIESEQ	Label sequence error
	.... 1..	IECIEDUP	Duplicate file name
	.... .1.	IECIECHR	Invalid character type
	.... ..1.	IECIEEXPR	Invalid expiration date
	.... ...1	IECIESYM	Symmetry conflict ²
14 (X'14')	1	IECIEPOS	Starting character position in label examined ³ (Valid only for label validation exit)
15 (X'15')	1	IECIEXRC	Return code from exit processing. Set by exit.
	1...	IECIESUP	Suppress label validation ⁵
	.000 0000	IECIERC0	Accept volume
	.000 0100	IECIERC4	Reject volume (ignored for VSP Exit)
16 (X'16')	1	IECIEJAC	User-requested file accessibility code.
17 (X'17')	2		Reserved
19 (X'19')	1	IECIEDCB	Copy of open parmlist options (4 low order bits)
	.... ..1.	IECIEOUT	Bit on for OUTPUT, OUTIN
	X'0E'	IECIEIN	These are bits off for INPUT, RDBACK
20 (X'20')	4	IECIELBL	Address of label being processed ⁷
24 (X'24')	4	IECIEUCB	Address of UCB for volume will be a 24 bit actual or captured address ⁸
28 (X'28')	4	IECIEUSR	User area. Set to zero by the system before the first call. Set by exit for use on later calls.
32 (X'32')	0	IECIEND	End of exit parameter list

Notes:

Label Anomaly Exit Return Codes

1. "Version" error is set for the open, close, EOV message routine for internal use, and the volume is unconditionally rejected.
2. A symmetry conflict results from a condition that produces non-matching or asymmetrical labels framing a file, and/or inconsistent file structure.
3. The first character position is offset 0, the second position is offset 1, and so forth.
4. A return code of 4 is set by the IBM-supplied exits. This causes a volume to be rejected. The exception is the validation suppression exit, which always sets a return code of zero in the IBM-supplied exits (although the system always unconditionally accepts a volume after execution of the validation suppression exit). IECIEXRC is ignored by open or EOV when control returns from RACF.
5. IECIESUP is recognized any time the volume access exit returns to the system, when RACF returns to the system after it was passed the parameter list, or when the validation suppression exit returns to the system.
6. The file accessibility code in IECIEJAC is only valid when Write Mode (IECIEWRT) was set on by the caller of the file access exit. This code comes from ACCODE (A-Z) or LABEL (password, 1 or 3) parameters from the user job step (blank, if none). If bit IECIEWRT is set and the value in IECIEJAC is valid as a file accessibility code, then IECIEJAC will be written in the file label when the exit returns.
7. For volume access exit and file access exit, the label area contains the accessibility code from tape. When the label area is not available to the exit, IECIELBL is zero. Binary zeros indicate data in the label that is not available to an exit. The volume accessibility code is always available in the UCB tape class extension at UCBCXACC (for ISO/ANSI) when an ISO/ANSI volume has been opened and not removed.
8. The UCB tape class extension for ISO/ANSI volumes contain the VOL1 label standard version number, the VOL1 owner identification, and the VOL1 accessibility code. The extension can be addressed by the following sequence:

```
LR    R1,xxx                GET UCB ADDRESS
IOSCMXR ,                  GET COMMON EXTENSION ADDRESS
USING UCBCMEXT,R1
L     Rx,UCBCLEXT          GET CLASS EXTENSION ADDRESS
DROP  R1
USING IECUCBCX,Rx         IECUCBCX MAPPING
```

Note that the UCB tape class extension might reside above the 16 MB line.

You can use the base UCB to access the serial number for the mounted volume (in UCBVOLI).

UCB Tape Class Extension-IECUCBCX

The tape class extension area generated for a UCB is addressed by UCBCLEXT in the UCB common extension. It contains zeros at IPL, and is set to zeros whenever the volume label is ready to be verified and processed for accessibility (as in open, or next volume for EOV). The class extension holds volume label data across opens when there is no intervening volume label reverification (as is true after CLOSE LEAVE and another OPEN in the same job step). The UCBCX DSECT in the IECUCBCX macro maps the tape class extension area. If you use this DSECT to map the area, you get the version of the tape class extension area that you need. To see other fields for diagnosis purposes, go to *z/OS MVS Data Areas* in the z/OS Internet Library: at <http://www.ibm.com/systems/z/os/zos/bkserv/>.

The UCB tape class extension can reside above the 16 MB line, so your code should execute in 31-bit mode.

Table 26. UCB Tape Class Extension Data Area

Offset	Length, Bit Pattern or Value	Name	Description
8 (X'8')	1	UCBCXACC	VOL1 Access code from label
10 (X'A')	1	UCBCXVER	VOL1 Label-standard version
	"3"	UCBCXV3	Version 3
	"4"	UCBCXV4	Version 4
12 (X'C')	14	UCBCXOWN	VOL1 owner identification

Label Anomaly Exit Return Codes

Chapter 4. Pre-ACS Installation Exit IGDACSXT

The pre-ACS routine exit (IGDACSXT) enables a tape management system to influence ACS routine construct selection. Through this interface, four new read-only variables can be set by your tape management system and then used in ACS routine processing:

- Pool name (&MSPOOL)
- Policy name (&MSPOLICY)
- Destination name (&MSPDEST)
- User parameter information (&MSPARM)

Prior to invoking the ACS routines, the exit is called via dynamic exit services, providing an opportunity for the tape management system to set the tape-management related read-only variables.

Note: DFSMSrmm does not use this exit. An equivalent interface exists.

The dynamic exit service is described under CSVDYNEX in *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN*. It allows you to define multiple exit routines simultaneously to one exit.

Customers use their tape management system as a repository for movement rules of tape data sets to vaults or backup centers. In the allocation process, with a system-managed tape library, and especially with a VTS, the choice of a storage group needs to be influenced by whether or not the tape stays in the computing center or goes outside. For environments with multiple system-managed tape libraries and complex vaulting requirements, allocation to a particular library or VTS should be matched to the vaulting requirements of the data sets being allocated. Because this information is already available within the tape management system, this exit provides a way to make this information accessible to the ACS routines.

Allowing the tape management system's logic to more directly support tape allocation under SMS will avoid redundancy and duplication of effort. These same variables can also replace most of the filter lists currently used by customers using the IBM Tape Mount Management methodology. Though the pre-ACS routine exit is not limited to the usage described here, this is one of the ways in which this exit may be used by a tape management system.

If installation exit module IGDACSXT abends, SMS ignores the exit call and continues processing.

Installing the Pre-ACS Exit Routine

See "Adding a New Exit" on page 4.

Characteristics of the Pre-ACS Installation Exit

The pre-ACS installation exit must:

- Handle multiple requests (reentrant)
- Have AMODE 31
- Have RMODE ANY

The exit routine is given control in task mode and protect key zero with no locks held and 31-bit addressing mode. It must not operate in cross-memory mode.

Registers on Entry to the Pre-ACS Exit Routine

When the pre-ACS exit gets control, the general-purpose registers have the following content:

Register	Contents
0	Not applicable
1	Address of the parameter list mapped by IGDACERO.
2-12	Not applicable
13	Address of register save area
14	Caller's return address
15	Address of the exit's entry point

Note: Because this routine is called before ACS routines, some variables, such as Data Class, will not have been set. JCL parameter values should be available.

Registers on Return from the Pre-ACS Exit Routine

When you return from the pre-ACS installation exit routine, register contents must be as follows:

Register	Contents
0	Contains a reason code, if any
1-14	Same as on entry to your exit routine
15	No predefined reason codes and return codes are provided.

Chapter 5. Automatic Class Selection (ACS) Installation Exits

Each automatic class selection (ACS) routine, except the one for storage group, has an ACS installation exit that lets you write exit routines for additional capabilities. The exit routines you write are processed when the corresponding ACS routine is called.

The ACS installation exits reside in SYS1.LPALIB and are listed in Table 27. ACS routines are part of system-managed storage and are described in *z/OS DFSMSdfp Storage Administration*.

Table 27. ACS Replaceable Modules

Module Name	Description	When Available
IGDACSDC	Data class exit	After the data class ACS routine has executed
IGDACSSC	Storage class exit	After the storage class ACS routine has executed
IGDACSMC	Management class exit	After the management class ACS routine has executed

ACS routines and ACS installation exit routines can perform many of the same functions. Wherever possible, use ACS routines because, compared with ACS installation exit routines, they are relatively easy to write, maintain, and modify. You do not need to re-IPL the system after you create or modify ACS routines; because ACS exit routines reside in SYS1.LPALIB, you must re-IPL after you change them. However, only the ACS installation exit routines can be used to:

- Call other programs.
- Call other subsystems.
- Write SMF records.
- Write GTF trace records.
- Take SVC dumps.
- Maintain large, easily searched tables of information in storage.

ACS services allow an installation-written exit routine to take control after the ACS routine has processed. An ACS installation exit routine can override any values assigned by the ACS routine and can return messages to the batch job, started task, or TSO/E user.

An ACS installation exit routine can recall an ACS routine one time to determine a new value for an SMS class. This new value can be assigned to a data set or be used for comparison with the original value assigned in step 1, Table 28 on page 135. Use the ACS interface routine to invoke an ACS routine. The parameter list that is passed to your exit routine, as shown in Figure 43 on page 137, contains a field (ACSPACS) that points to the ACS interface routine.

Installing the ACS Exit Routine

You can write routines for any or all of the ACS installation exits. You receive a CSV003I message for each ACS installation exit routine that does not exist in SYS1.LPALIB. The message does not represent an error unless you have written a routine for that ACS installation exit and ensured that it resides in SYS1.LPALIB. See “Adding a New Exit” on page 4.

Characteristics of the ACS Installation Exits

In general, the routines you write for the ACS installation exits must:

- Handle multiple requests (reentrant)
- Reside in SYS1.LPALIB
- Have AMODE 31
- Have RMODE ANY
- Be written in Assembler H or High-Level Assembler.

The exit routines are given control in task mode and protect key zero with no locks held and 31-bit addressing mode. They must not operate in cross-memory mode.

When writing an ACS installation exit routine, you should only reference data that is explicitly passed, because too many different environments can invoke an ACS installation exit. An ACS routine should not issue a dynamic allocation request, because a dynamic allocation request can invoke an ACS exit. During the course of allocation, the ACS routine or exit can be entered multiple times.

Linkage is with standard MVS linkage conventions.

Understanding the Automatic Class Selection Process

The system processes that result in the invocation of ACS routines are:

- Allocation of new data sets that are eligible to be SMS-managed.
 - Restriction:** The data class routine can also be executed for data sets that are not eligible to be system-managed. However, if the ACS routine detects a data set that is not eligible to be system-managed, the following should occur:
 - If a data class is specified, it should be assigned to that data set.
 - If a storage class or management class is specified, the allocation should fail followed by an error message.
- Conversion of SMS volumes and data sets
- DFSMSHsm recall and recover
- DFSMSdss COPY, RESTORE, and CONVERTV commands
- Access method services ALLOCATE, DEFINE, and IMPORT commands
- Object access method (OAM) STORE, CHANGE, and CTRANS.

Table 28 on page 135 summarizes what happens to each of the SMS constructs when automatic class selection takes place.

Table 28. Automatic Class Selection Process

Step	Action										
1	Assign data class:										
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Call data class ACS routine, if it exists, to assign a data class.</td> </tr> <tr> <td>B</td> <td>Call data class ACS installation exit. See note.</td> </tr> <tr> <td>C</td> <td>Validate data class name. ACS services ensures that the name assigned is for a defined data class.</td> </tr> </tbody> </table>	Step	Action	A	Call data class ACS routine, if it exists, to assign a data class.	B	Call data class ACS installation exit. See note.	C	Validate data class name. ACS services ensures that the name assigned is for a defined data class.		
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B	Call data class ACS installation exit. See note.										
C	Validate data class name. ACS services ensures that the name assigned is for a defined data class.										
2	Assign storage class:										
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Call storage class ACS routine to assign a storage class</td> </tr> <tr> <td>B</td> <td>Call storage class ACS installation exit. See note.</td> </tr> <tr> <td>C</td> <td>Validate storage class name. ACS services ensures that the name assigned is for a defined storage class.</td> </tr> <tr> <td>D</td> <td>Check user's authority to determine if she or he is allowed to use the storage class.</td> </tr> </tbody> </table>	Step	Action	A	Call storage class ACS routine to assign a storage class	B	Call storage class ACS installation exit. See note.	C	Validate storage class name. ACS services ensures that the name assigned is for a defined storage class.	D	Check user's authority to determine if she or he is allowed to use the storage class.
Step	Action										
A	Call storage class ACS routine to assign a storage class										
B	Call storage class ACS installation exit. See note.										
C	Validate storage class name. ACS services ensures that the name assigned is for a defined storage class.										
D	Check user's authority to determine if she or he is allowed to use the storage class.										
If no storage class is assigned in the previous step, the following steps are not taken:											
3	Assign management class										
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Call management class routine to assign a management class.</td> </tr> <tr> <td>B</td> <td>Call management class ACS installation exit. See note.</td> </tr> <tr> <td>C</td> <td>Validate management class name. ACS services ensures that the name assigned is for a defined management class.</td> </tr> <tr> <td>D</td> <td>Check user's authority to determine if she or he is allowed to use the management class.</td> </tr> </tbody> </table>	Step	Action	A	Call management class routine to assign a management class.	B	Call management class ACS installation exit. See note.	C	Validate management class name. ACS services ensures that the name assigned is for a defined management class.	D	Check user's authority to determine if she or he is allowed to use the management class.
Step	Action										
A	Call management class routine to assign a management class.										
B	Call management class ACS installation exit. See note.										
C	Validate management class name. ACS services ensures that the name assigned is for a defined management class.										
D	Check user's authority to determine if she or he is allowed to use the management class.										
4	Assign storage group										
	<table border="1"> <thead> <tr> <th>Step</th> <th>Action</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>Call storage group ACS routine to assign a storage group.</td> </tr> <tr> <td>B</td> <td>Validate the storage group name. ACS services ensures that the name assigned is for a defined storage group.</td> </tr> </tbody> </table>	Step	Action	A	Call storage group ACS routine to assign a storage group.	B	Validate the storage group name. ACS services ensures that the name assigned is for a defined storage group.				
Step	Action										
A	Call storage group ACS routine to assign a storage group.										
B	Validate the storage group name. ACS services ensures that the name assigned is for a defined storage group.										
<p>Note: The ACS installation exit routines can override the class assignments made in the ACS routine. Also, ACS installation exit routines can alter the input to ACS routines and recall them one time. The installation exit is not recalled when it recalls the ACS routine.</p>											

Recovery Environment for ACS Exit Routines

SMS establishes a recovery environment for the ACS installation exits by issuing an ESTAE before invoking them. ACS installation exit errors occur when:

- The SMS ESTAE exit covering the exit is entered.
- The ACS exit returns an invalid return code.
- The ACS exit returns return code 16.

If any of these errors occur,

- An output message describes the error.
- An SVC dump is taken, SYS1.LOGREC error recording is done, and the failing ACS exit is marked not valid.

ACS Exits

- The failed ACS exit is not recalled until the SMS address space is restarted. The SMS address space can be restarted with an IPL, or by issuing the SET SMS command if the SMS address space has been ended and not automatically restarted.

Registers on Entry to the ACS Exit Routines

When your routine gets control, the general-purpose registers have the following content:

Register	Contents
0	Not applicable
1	Address of a fullword that contains the address of the parameter list mapped by IGDACSPM.
2-12	Not applicable
13	Address of register save area
14	Caller's return address
15	Address of the exit's entry point

Using the ACS Exits Parameter Lists

Figure 43 on page 137 illustrates the parameter structure for the ACS installation exits. A 4 KB work area exists on a doubleword boundary for each ACS installation exit. You can use this work area to satisfy the reentrant requirement. The following macros map the parameters that are passed to each ACS installation exit:

IGDACERO

Maps the read-only variables that the ACS exit can reference when selecting an SMS class.

IGDACERW

Maps the read-write variables that the ACS exit can set when selecting an SMS class.

IGDACSPM

Describes the parameter list for an ACS installation exit.

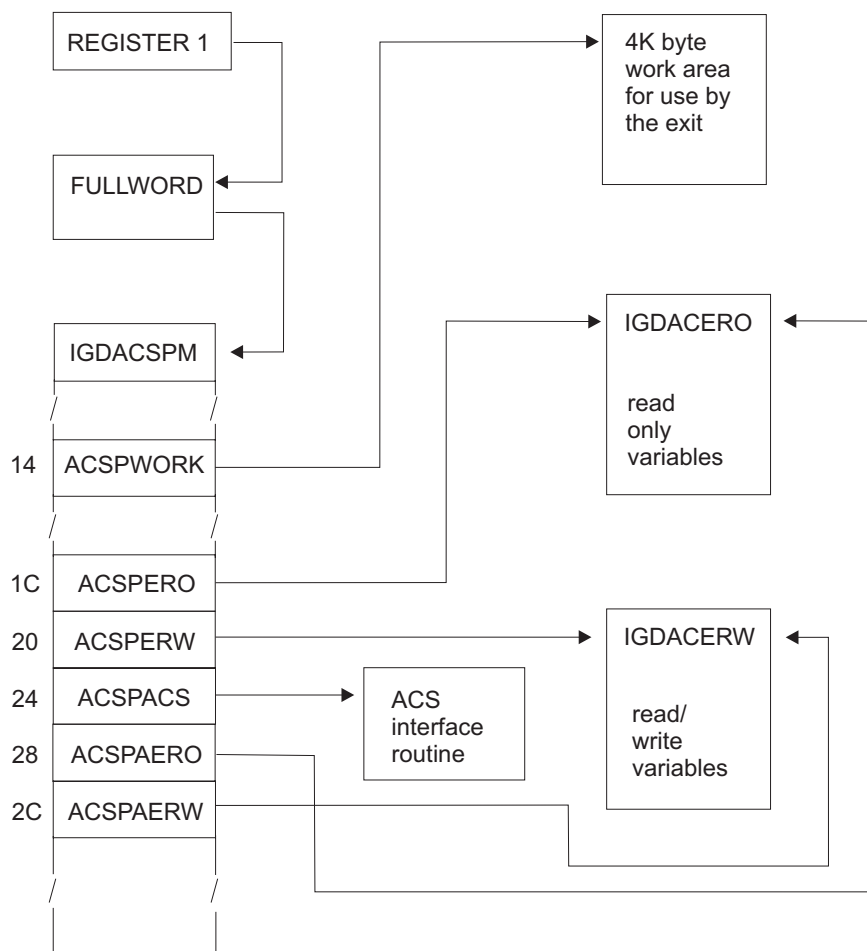


Figure 43. Parameter Structure for the ACS Installation Exits. This figure shows the control block structure upon entry into the exit. All offsets are in hexadecimal.

Assigning Classes

When entering an ACS installation exit, ACSPERW points to a list of read-write variables which are mapped by IGDACERW. Initially the list of read-write variables contains the original value for the SMS class that was assigned in the ACS routine. To assign an SMS class from an ACS installation exit, your routine must, in IGDACERW:

- Set the ACERWNCS field to one. This field specifies the number of SMS classes to be assigned. The valid values for this field are zero and one. Initially, it contains a length value based on the logic in the local ACS routine. If more than one SMS class is returned, only the first is accepted.
- Set the ACERWVLN field to the actual length of the SMS class name. Trailing zeros and blanks should not be included in the length. Initially, this field contains the length value of the SMS class being passed from the local ACS routine.
- Set the ACERWVAL field to the name of the SMS class being assigned. Initially, this field contains the SMS class value passed from the local ACS routine.

ACS Exits

To assign a null value to an SMS class, you must set the ACERWNCS field to one and the ACERWVLN field to zero. The ACERWVAL field is then ignored. If you do not want to assign a class, set both the ACERWNCS and ACERWVLN fields to zero.

Returning Messages

An ACS installation exit routine can return a series of messages to the batch job, started task, or TSO/E user. To return messages, set the value in ACERWNMG equal to the number of messages you want returned and place the text of the messages in ACERWMSG. ACERWMSG can hold up to six messages that must be 110 bytes long. Pad messages with blanks if needed.

If your ACS installation exit routine invokes the ACS interface routine, then the ACS routine might have created messages by issuing the WRITE statement. The system retains those messages in ACERWMSG and sets ACERWNMG equal to the number of messages. The system has not written them yet. After the ACS installation exit routine ends, the messages will be written along with any messages that the ACS installation exit routine adds. Your routine should not overlay messages that are already in ACERWMSG.

Invoking ACS Interface Routine from an Exit

Your ACS installation exit routine can use the ACS interface routine to call an ACS routine. The ACSPACS field shown in Figure 43 on page 137 contains the address of an ACS interface routine that calls the corresponding ACS routine for the SMS class being selected. If the ACSPACS field contains a zero, then no ACS routine exists for the SMS class. The return code is in register 15. If it is nonzero, the reason code is found in register 0.

Linkage is that of standard MVS linkage conventions. Figure 44 on page 139 illustrates the parameter structure for the ACS interface routine. The parameter list for the ACS interface routine, ACSPACSP, is imbedded within the parameter list that is passed to the exit. ACERWVLN and ACERWVAL fields zero.

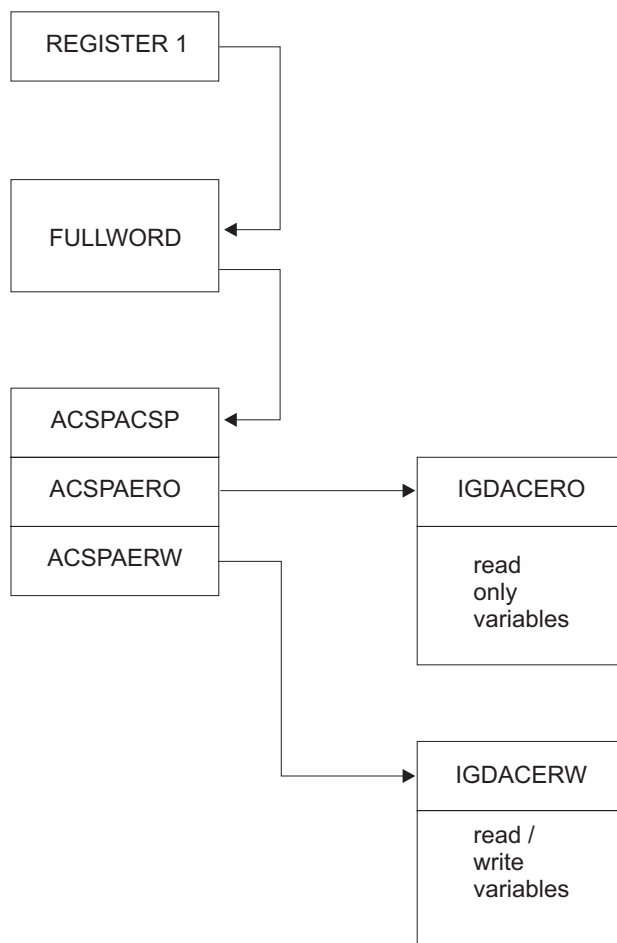


Figure 44. Parameter Structure for the ACS Interface Routine. This figure shows the control block structure for calling the ACS interface routine from the installation exit.

ACSPACSP contains the following fields:

ACSPAERO

Points to a list of variables mapped by IGDACERO that are read-only variables used by the ACS interface routine. Initially, ACSPAERO points to the same list of read-only variables as ACSPERO. You can modify the passed variables pointed to by ACSPAERO and call the ACS routine. Or you can write the ACS exit routine to create an entirely new list of read-only variables for the ACS interface routine and point to them with ACSPAERO before calling the ACS routine.

ACSPAERW

Points to a list of read-write variables mapped by IGDACERW and used by the ACS interface routine. Initially, ACSPAERW contains the same value as ACSPERW, which is a pointer to a list of read-write variables that contain the original value for the SMS class that was assigned in the ACS routine.

You can call the ACS routine without changing the value in ACSPAERW. When the ACS routine runs, it replaces the values in the list pointed to by ACSPAERW with new values for the SMS class derived by the ACS routine and any messages generated by the ACS routine.

When your ACS installation exit routine returns control to ACS services, the SMS class contained in the list pointed to by ACSPERW is assigned to the data

ACS Exits

set. Because ACSPERW and ACSPAERW are pointing to the same list, the class that is assigned to the data set is the new class that is created when your exit routine calls the ACS routine. However, if the new class is to be used as the input class by the ACS routine, then it must be copied into the corresponding field in ACSPAERO from ACSPAERW.

You can also write your ACS exit routine to create an entirely new list of read-write variables and point to them with ACSPAERW before calling the ACS routine. After the ACS routine runs, the read-write variable list pointed to by ACSPAERW contains the new values derived by the ACS routine. The read-write variable list pointed to by ACSPERW contains the original values that are assigned by the ACS routines. By creating a new read-write variable list in your exit routine, and then calling the ACS routine, you can compare the original values, pointed to by ACSPERW, with the new values, pointed to by ACSPAERW.

If you create a new list of read-write variables and call the ACS routine, and you want to have the new values that are pointed to by ACSPAERW used to assign a class, *you must copy the new values into the original list of variables*, pointed to by ACSPERW. If you omit this copying step, the new values are *not* used to assign a class.

A zero in the ACERWNCS field upon return from the ACS routine indicates there is a null value for the SMS class. To assign a null value to the SMS class, you must set the ACERWNCS field to one and leave the ACERWVLN and ACERWVAL fields zero.

ACS Installation Exits Parameter List (IGDACSPM)

Table 29 shows the parameter list for the ACS installation exits. The parameter list is mapped by the IGDACSPM macro.

Table 29. ACS Installation Exit Parameter List (IGDACSPM)

Offset	Length or Bit Pattern	Name	Description
00 (X'00')	52	ACSPM	ACS parameter list
00 (X'00')	8	ACSPID	Control block ID='IGDACSPM' (character)
08 (X'08')	2	ACSPLEN	ACSP control block length (signed)
10 (X'A')	2	ACSPVER	Control block version (binary)
12(X'C')	4	ACSPACEE	ACEE pointer
16 (X'10')	4		Reserved
20 (X'14')	4	ACSPWORK	Pointer to a work area for the exit
24 (X'18')	4	ACSPWLEN	Length of work area
28 (X'1C')	4	ACSPERO	Pointer to read-only variables mapped by IGDACERO
32 (X'20')	4	ACSPERW	Pointer to read-write variables mapped by IGDACERW
36 (X'24')	4	ACSPACS	Pointer to interface routine for calling the ACS routines. If this field is zero, then no ACS routine exists for the current SMS class.
40 (X'28')	12	ACSPACSP	Parameters for ACS routines
40 (X'28')	4	ACSPAERO	Pointer to read-only variables initially set to ACSPERO
44 (X'2C')	4	ACSPAERW	Pointer to read-write variables, initially set to ACSPERW
48 (X'30')	4	ACSPATOK	Token for use by ACS interface routine (do not modify)

Read-Only Variables Parameter List (IGDACERO)

Table 30 shows the parameter list for the read-only variables that is mapped by the IGDACERO macro. For additional information about read-only variables, see *z/OS DFSMSdfp Storage Administration*.

Table 30. Read-Only Variables (IGDACERO)

Offset	Length or Value	Name	Description
0 (X'0')	1524	ACERO	Read-only variables parameter list
0 (X'0')	8	ACEROID	Control block ID contains the value "ACERO"
8 (X'8')	2	ACEROLEN	Length of control block
10 (X'A')	2	ACEROVER	Control block version number
	0	ACEROV	Version 0
12 (X'C')	4	ACEROSIZ	Primary or actual size of data set in KB
16 (X'10')	4	ACEROMSZ	Maximum size of data set in KB
20 (X'14')	8	ACEROUNT	Unit name (character)
28 (X'1C')	8	ACEROMVG	MSS volume group name (character)
36 (X'24')	8	ACEROAPP	Application ID (RACF) (character)
44 (X'2C')	8	ACERODSO	Data set owner (RACF) (character)
52 (X'34')	8	ACEROUSR	User (RACF) (character)
60 (X'3C')	8	ACEROGRP	Group (RACF) (character)
68 (X'44')	4	ACERODSG	Data set organization (unsigned binary). Can be one of the following:
	0	ACERONUL	Null
	1	ACEROPS	PS-physical sequential
	2	ACEROPO	PO-Partitioned
	3	ACEROVS	VS-/VSAM Organization
	4	ACERODA	DA-Direct Organization (BDAM)
	5	ACEROEXC	Extended Data Format, preferred
	6	ACEROEXR	Extended Data Format, required
72 (X'48')	4	ACERORCG	Record organization. Can be one of the following:
	0	ACERONUL	
	1	ACEROKS	VSAM key-sequenced data set
	2	ACEROES	VSAM entry-sequenced data set
	3	ACERORR	VSAM Relative-record data set
	4	ACEROLS	VSAM linear data set
76 (X'4C')	4	ACERODST	Data Set Type. Can be one of the following:
	0	ACERONUL	Null
	1	ACEROGDS	One generation data set of a generation data group
	2	ACEROPRM	Standard permanent data sets
	3	ACEROTMP	Temporary data sets

ACS Exits

Table 30. Read-Only Variables (IGDACERO) (continued)

Offset	Length or Value	Name	Description
80 (X'50')	4	ACEROXMD	Execution mode. Can be one of the following:
	0	ACERONUL	Null
	1	ACEROBCH	Batch execution mode
	2	ACEROTSO	TSO execution mode
	3	ACEROTSK	Started task
84 (X'54')	8	ACEROJOB	Job name
92 (X'5C')	8	ACERODD	Ddname
100 (X'64')	8	ACEROPGM	Program name
108 (X'6C')	4	ACEROEXP	Expiration date (YYYYDDDF) in packed decimal
112 (X'70')	4	ACERORTP	Retention period days (binary)
116 (X'74')	1		Reserved
117 (X'75')	3	ACERODIR	Directory blocks from JCL
244 (X'F4')	8	ACEROENV	Environment. One of the following values or you can set your own in the exit. (Values are padded on the right with blanks).
	STORE	ACEROSTE	OSMI store environment
	CHANGE	ACEROCHE	OSMI change environment
	CTRANS	ACEROCTE	OSMC class transition environment
	RECALL	ACERORCL	Data set recall operations
	RECOVER	ACERORCV	Data set recover operations
	CONVERT	ACEROCNV	Data set convert in place operations
	ALLOC	ACEROALC	New data set allocations (default)
	ALLOCTST	ACEROTST	New data set allocations in the ACS Allocation Test environment
252 (X'FC')	32	ACERODDC	Default data class (from RACF)
252 (X'FC')	2	ACERODDL	Length of the default data class name
254 (X'FE')	30	ACERODDV	Name of the default data class
284 (X'11C')	32	ACERODSC	Default storage class (from RACF)
284 (X'11C')	2	ACERODSL	Length of the default storage class name
286 (X'11E')	30	ACERODSV	Name of the default storage class
316 (X'13C')	32	ACERODMC	Default management class (from RACF)
316 (X'13C')	2	ACERODML	Length of the default management class name
318 (X'13E')	30	ACERODMV	Name of the default management class
348 (X'15C')	80		Reserved
428 (X'1AC')	32	ACERODC	Data class input only. Output returned in IGDACERW.
428 (X'1AC')	2	ACERODCL	Length of DATACLAS variable
430 (X'1AE')	30	ACERODCV	Value of DATACLAS variable
460 (X'1CC')	32	ACEROSC	Storage class input only. Output returned in IGDACERW.
460 (X'1CC')	2	ACEROSCL	Length of STORCLAS variable
462 (X'1CE')	30	ACEROSCV	Value of STORCLAS variable
492 (X'1EC')	32	ACEROMC	Management class input only. Output returned in IGDACERW.

Table 30. Read-Only Variables (IGDACERO) (continued)

Offset	Length or Value	Name	Description
492 (X'1EC')	2	ACEROMCL	Length of MGMTCLAS variable
494 (X'1EE')	30	ACEROMCV	Value of MGMTCLAS variable
524 (X'20C')	44	ACERODSN	Data set name
568 (X'238')	8	ACEROGEN	Generation number
576 (X'240')	4	ACERODNT	Data Set name type. Can be one of the following:
	0	ACERONUL	
	1	ACEROLIB	LIBRARY (PDSE)
	2	ACEROPDS	PDS (partitioned data set)
	3	ACEROHFS	HFS (hierarchical file system data set)
	4	ACEROPIP	PIPE (pipe)
	5	ACEROEXR	EXR (Extended format required)
	6	ACEROEXC	EXC (Extended format preferred)
	7	ACEROBAS	BASIC (not extended or large format)
	8	ACEROLRG	LARGE (large format sequential data set)
580 (X'244')	257	ACEROJAC	Job account information
580 (X'244')	1	ACEROJNM	Number of fields in the account data
581 (X'245')	256	ACEROJFL	Job account data. Each field contains the length of the field followed by data.
837 (X'345')	7		Reserved
844 (X'34C')	257	ACEROSAC	Step account information
844 (X'34C')	1	ACEROSNM	Number of fields in the account data
845 (X'34D')	256	ACEROSFL	Step account data. Each field contains the length of the field followed by data.
1101 (X'44D')	7		Reserved
1108 (X'454')	2	ACERONVL	Number of volume serial numbers (up to 59)
1110 (X'456')	6	ACEROVOL	Array of volume serial numbers (up to 59)
1464 (X'5B8')	8		Reserved
1472 (X'5C0')	44	ACEROMEM	Member name
1516 (X'5EC')	44	ACEROCDs	Name of model data set for cluster
1560 (X'44')	44	ACEROIDS	Name of model data set for index
1604 (X'644')	44	ACERODDS	Name of model data set for data
1648 (X'670')	4	ACEROFNO	Tape file sequence number

ACS Exits

Table 30. Read-Only Variables (IGDACERO) (continued)

Offset	Length or Value	Name	Description
1652 (X'674')	4	ACEROLBL	Tape label type. Possible values are:
	1	ACERONL	Unlabeled
	2	ACEROSL	IBM standard
	3	ACEROAL	ISO/ANSI standard
	4	ACERONSL	Non-standard
	5	ACEROSUL	IBM standard user
	6	ACEROAUL	ISO/ANSI standard user
	7	ACEROBLP	Bypass label processing
8	ACEROLTM	Leading tape mark (unlabeled)	
1656 (X'678')	8	ACEROTLB	Tape library name
1664 (X'680')	8		Reserved
1672 (X'688')	2	ACEROPOL	Length of pool name (ACEROPOV).
1674 (X'68A')	30	ACEROPOV	Tape pool name — allows your tape management system to pass a tape pool name to the ACS routine.
1704 (X'6A8')	44	ACEROMSD	Follows the rules for TSO data set names although each qualifier is a tape management destination.
1748 (X'6D4')	8	ACEROPCY	Single variable, ISPF naming convention
1756 (X'6DC')	1	ACEROMFN	Number of fields in ACEROMFL
1757 (X'6DD')	256	ACEROMFL	Multi-field variable in external user exit routine — repetitive fields of 1 byte length field in one byte hexadecimal followed by value of the field in character text. (for example: X'05"value"X'02')
2013 (X'7DD')	15		Reserved

Read-Write Variables (IGDACERW)

Table 31 shows the parameter list for read-write variables that is mapped by the IGDACERW macro.

Table 31. Read-Write Variables Parameter List (IGDACERW)

Offset	Length or Bit Pattern	Name	Description
0 (X'0')	1172	ACERW	Read-write variables parameter list
0 (X'0')	8	ACERWID	Control block ID contains the value "ACERW"
8 (X'8')	2	ACERWLEN	Length of control block
10 (X'A')		ACERWVER	Control block version
2	0	ACERWV	Version number (0)
12 (X'C')	4	ACERWNCS	Number of class selection return variables that follow (up to 15)
16 (X'10')	32	ACERWCSV	First class selection variable returned
16 (X'10')	2	ACERWVLN	Length of first value
18 (X'12')	30	ACERWVAL	Value of first returned variable
48 (X'30')	448		Up to 14 more class selection return variables
496 (X'1F0')	2		Reserved

Table 31. Read-Write Variables Parameter List (IGDACERW) (continued)

Offset	Length or Bit Pattern	Name	Description
498 (X'1F2')	2	ACERWNMG	Number of messages that follow (up to 6)
500 (X'1F4')	660	ACERWMSG	Area for up to 6 messages generated by execution of ACS routine write statements
500 (X'1F4')	110	ACERWTXT	Text of first message
1160 (X'488')	12		Reserved

Registers on Return from an ACS Installation Exit Routine

When you return to ACS services from your ACS installation exit routine, register contents must be as follows:

Register

Contents

- 0 Contains a reason code, if any
- 1-14 Same as on entry to your exit routine
- 15 A return code

ACS Return and Reason Codes

Your ACS exit routine can put a reason code in register 0. You determine the reason codes and their meanings. When your exit routine passes back a return code of X'04' in register 15, the reason code your exit routine placed in register 0 appears in the text of message IGD1001I.

The ACS exit routine must end with a return code in register 15 that indicates what action is to be taken upon return from the exit. The return codes and their meanings are as follows:

Code Description

00 (X'00')

Indicates processing completed normally, and that you want the SMS class that the ACS installation exit returns to be used.

04 (X'04')

Indicates that you want the job or the dynamic allocation request to be failed, and that register 0 contains the relevant reason code.

16 (X'10')

Indicates that the ACS exit contains at least one error. You want it to be placed in disabled wait until the SMS address space is restarted.

Any other return code represents an error.

If the ACS routine is recalled by an ACS exit routine, the return code from the ACS routine needs to be propagated through the ACS exit if the allocation is to be failed. The exit routine needs to set the return code to X'04'.

Your ACS exit routine can put a reason code in register 0. You determine the reason codes and their meanings. When your exit routine passes back a return code of X'04' in register 15, the reason code your exit routine placed in register 0 appears in the text of message IGD1001I.

Example of the ACS Installation Exit Routine

The ACS installation exit routine in Figure 45 re-invokes the storage class ACS routine and writes two messages.

```

                TITLE 'SAMPLE STORAGE CLASS INSTALLATION EXIT'
IGDACSSC CSECT ,
IGDACSSC AMODE 31                Must run in 31-bit mode
IGDACSSC RMODE ANY                Should have an RMODE of ANY
                USING *,15
                B    PROLOG
                DC   AL1(17)        Length of string that follows
                DC   C'IGDACSSC &SYSDATE' For save area trace in dump
PROLOG  STM   14,12,12(13)        Standard entry linkage
                L    PARMLIST,0(R1)  Establish addressability to
                USING ACSPMD,PARMLIST  exit parameter list
                L    WORKBASE,ACSPWORK  Establish addressability to
                USING WORKAREA,WORKBASE  work area
                LA   11,SAVEAREA      Standard save area chaining
                ST   13,4(11)         Point new save area to caller's
                ST   11,8(13)         Point caller's save area to ours
                LR   13,11            Establish new save area

                LR   12,15            Load base register
                DROP 15              Drop addressability
                USING IGDACSSC,12
                LA   TOADDR,STARTWK   Set up to clear the work area
                LA   TOLEN,CLEARLEN    Following the save area
                LA   FROMLEN,0         Set length of source (null)
                MVCL TOADDR,FROMADDR   Clear work area
*
* Set up access to read-only variables.
                L    ERO,ACSPAERO
                USING ACERO,ERO        Anchor read-only variables
*
* Set up access to read-write variables.
                L    ERW,ACSPERW
                USING ACERW,ERW        Anchor read/write variables
                MVC  ACERWVAL(L'BLANK8),BLANK8
*
* Invoke ACS routine. Note that it may put messages in ACERWTXT.
                LA   SERVICEP,ACSPACSP  Parameter list for ACS routine
                ST   SERVICEP,ACSPARM    Use standard MVS linkage
                LA   R1,ACSPARM          conventions
                L    15,ACSPACS          Load address of ACS interface rtn
                BASR 14,15              Call STORCLAS selection routine
*
* Return message indicating exit was entered.

```

Figure 45. Sample Storage Class ACS Installation Exit Routine Part 1 of 3

```

        LA    R1,MESSAGE1          Set address of message to write
        BAS  R14,WRITE            Call subroutine to return message
*
* If the ACS routine returned a null value, we need to do some resets.
MVC    SCNAME(8),ACERWVAL        Prime area for message 2
CLC    ACERWNCS,=F'0'           Is number of constructs = 0?
BNE    CONTINUE                 If ACS rtn set it, no change
MVC    ACERWNCS,=F'1'           Set number of constructs = 1
MVC    ACERWVLN,=H'0'           Set length of value
MVC    SCNAME,NULLSC           Update area for message 2
*
* Build a message indicating a storage class was assigned.
CONTINUE EQU *
        MVC  MSG2AOUT,MSG2A
        MVC  MSG2BOUT,MSG2B
        MVC  PAD,BLANK75
        LA   R1,MESSAGE2          Set address of message to write
        BAS  R14,WRITE            Call subroutine to return message
*
RETURN  EQU *
        L    13,4(13)             Point to caller's save area
        LM   14,12,12(13)        Restore most of caller's registers
        LA   15,0                 Set return code
        BR   14                   Return to caller of exit routine
*
* Subroutine to add a message to those to be printed. At entry to this
* routine R1 points to a 110-byte message.
WRITE   LH   WORKREG,ACERWNMG     Get number of existing messages
        LA   R0,1(,WORKREG)      Increment counter of messages
        CH   R0,=H'6'            Compare to max number of messages
        BHR  14                   Return if no more messages allowed
        STH  R0,ACERWNMG         Set new number of existing messages
        MH   WORKREG,=Y(L'ACERWTXT) Multiply number by length of each
        LA   WORKREG,ACERWTXT(WORKREG) Point to appropriate msg area
        MVC  0(L'ACERWTXT,WORKREG),0(R1) Move new message
        BR   14
*****
* The documented size of the area containing the work area is 4096
* bytes. If this routine were to store even one byte past its end,
* there probably would be a disaster. The following is a trap to
* cause an assembly error if the length of the DSECT exceeds 4096.
* The value of the expression must not exceed 15.
*****
        BR   ((WORKLEN-1)/4096)+15  Asm error if DSECT too long
*

```

Figure 46. Sample Storage Class ACS Installation Exit Routine Part 2 of 3

```

*****
*                               Start of constant area
MESSAGE1 DC    CL110'SORAGE CLASS INSTALLATION EXIT ENTERED'
MSG2A    DC    CL14'SORAGE CLASS '
MSG2B    DC    CL13' WAS ASSIGNED'
NULLSC   DC    CL8' *NULL* '      Indicate no storage class
BLANK75  DC    CL75' '
BLANK8   EQU   BLANK75,8          For clearing message insert
*
* Map of dynamic storage used by this routine. Supplied by caller.
WORKAREA DSECT ,
SAVEAREA DS    CL72              Standard save area
STARTWK  EQU   *                  Start of non-save area stuff
ACSPARM  DS    F                  Pointer to ACS parameters
MESSAGE2 DS    0CL110            Message to issue so that
MSG2AOUT DS    CL14              user knows we assigned a
SCNAME   DS    CL8               storage class
MSG2BOUT DS    CL13
PAD      DS    CL75
*
CLEARLEN EQU   *-STARTWK         Length to clear
WORKLEN  EQU   *-WORKAREA        Amount of 4K area that we are using
* Register names.
R0       EQU   0                 Register 0
R1       EQU   1                 Register 1
WORKREG  EQU   2                 Work register
TOADDR   EQU   2                 Register for MVCL destination addr
TOLEN    EQU   3                 Register for MVCL destination length
ERO      EQU   3                 Address of IGDACERO
FROMADDR EQU   4                 Register for MVCL source
ERW      EQU   4                 Address of IGDACERW
FROMLEN  EQU   5                 Register for MVCL source length
SERVICE EQU   6                 Address of parameters for service
WORKBASE EQU   7                 Address of work area
PARMLIST EQU   8                 Address of exit parameter list
*
IGDACSPM IGDACSPM               Map exit parameter list (ACSPMD)
IGDACERO IGDACERO               Map read-only variables (ACERO)
IGDACERW IGDACERW               Map read/write variables (ACERW)
END     IGDACSSC

```

Figure 47. Sample Storage Class ACS Installation Exit Routine Part 3 of 3

Chapter 6. DFSMSHsm Installation Exits

You can use DFSMSHsm installation exits to customize DFSMSHsm processing.

The DFSMSHsm installation exits fall into two categories: exits that support basic DFSMSHsm functions and exits that support DFSMSHsm ABARS functions. This topic describes only the exits that support the **basic** DFSMSHsm functions. For information about the DFSMSHsm ABARS installation exits, see Chapter 7, “DFSMSHsm ABARS Installation Exits,” on page 199.

Note: If you use the REXX language to code installation exits, you should either code your REXX processing so that it is serially reusable or alternatively establish a separate environment control table for each task. This is because the REXX language has a 'single threaded appearance', which can cause problems if it is used in exits that are taken from multitasked functions.

Table 32 lists the installation exits that support the basic DFSMSHsm functions.

Table 32. DFSMSHsm Installation Exits

Module Name	Description	When Available	See Topic
ARCADEXT	Data set deletion exit	During data set deletion or data set retirement. Not called for SMS-managed data sets.	“ARCADEXT: Data Set Deletion Installation Exit” on page 154
ARCBDEXT	Data set backup exit	During volume backup, when a data set fulfills the selection criteria. Also during command backup of individual data sets.	“ARCBDEXT: Data Set Backup Installation Exit” on page 156
ARCCBEXT	Control data set backup exit	After DFSMSHsm creates backup copies of the control data sets.	“ARCCBEXT: Control Data Set Backup Installation Exit” on page 161
ARCCDEXT	Data set reblock exit	During recall or recovery processing	“ARCCDEXT: Data Set Reblock Installation Exit” on page 163
ARCINEXT	Initialization exit	After DFSMSHsm startup, before functional subtasks become active.	“ARCINEXT: Initialization Installation Exit” on page 165
ARCMDEXT	Space management exit	When a data set fulfills the selection criteria for the level 0 volume being managed, but before the data set migrates or transitions	“ARCMDEXT: Space Management Exit” on page 167
ARCMMEXT	Second-level migration data set exit	When a command or automatic selection process selects to migrate an already migrated data set.	“ARCMMEXT: Second Level Migration Data Set Installation Exit” on page 173
ARCMVEXT	Space management volume exit	After DFSMSHsm completes processing at level 0 volume during volume space management.	“ARCMVEXT: Space Management Volume Installation Exit” on page 175

DFSMSHsm Exits

Table 32. DFSMSHsm Installation Exits (continued)

Module Name	Description	When Available	See Topic
ARCRDEXT	Recall exit	During recall of non-SMS-managed data sets. Not called for SMS-managed data sets.	"ARCRDEXT: Recall Installation Exit" on page 176
ARCRPEXT	Return-priority exit	Before a recall, delete, or recover (data set or volume) request is queued.	"ARCRPEXT: Return-Priority Installation Exit" on page 182
ARCSAEXT	Space management and backup exit	Once for each data set processed during volume space management or backup.	"ARCSAEXT: Space Management and Backup Installation Exit" on page 188
ARCSDEXT	Shutdown exit	After DFSMSHsm has received a shutdown command, or is shutting itself down because of some unanticipated condition.	"ARCSDEXT: Shutdown Installation Exit" on page 191
ARCTDEXT	Tape data set exit	When an output tape data set is opened during backup, migration, recycle, or tape copy processing.	"ARCTDEXT: Tape Data Set Installation Exit" on page 192
ARCTEEXT	Tape-ejected exit	When an input tape is required for recall, data set or volume recovery, data set or volume restore, or volume recycle processing.	"ARCTEEXT: Tape-Ejected Installation Exit" on page 192
ARCTVEXT	Tape volume exit	When a DFSMSHsm-owned tape no longer contains valid data, and therefore becomes empty. This exit also supports tapes used in ABARS processing. See "ARCTVEXT: Tape Volume Installation Exit" on page 209 for more information.	"ARCTVEXT: Tape Volume Installation Exit" on page 194

Using DFSMSHsm Installation Exits

This topic contains information that is common to all installation exits supporting the basic DFSMSHsm functions. See Chapter 7, "DFSMSHsm ABARS Installation Exits," on page 199 for information specific to the installation exits supporting the DFSMSHsm ABARS functions.

Installing DFSMSHsm Exits

To use a DFSMSHsm installation exit, you must link edit the exit into a load library, such as SYS1.LINKLIB. To request that DFSMSHsm use the exit, issue the SETSYS EXITON command. If there are different versions of the exits that you want to use with different DFSMSHsm hosts in an MVS image, you have at least the following two options:

- Define each startup procedure using a STEPLIB that consists of 1) a library that contains exits that are unique to that procedure, followed by 2) a library that contains DFSMSdss and other modules (including other exits) that are common to all hosts.
- Design each exit such that it determines the ASCB address for the address space in which it is running, and then scans the QCT's linked list of DFSMSHsm host entries for the DFSMSHsm host that is running under that ASCB. See "ARCINEXT: Initialization Installation Exit" on page 165.

Normally, you can activate DFSMSHsm installation exits during DFSMSHsm startup by including the SETSYS EXITON command in the DFSMSHsm startup PARMLIB member. However, you can also activate an inactive exit or dynamically refresh an active exit, even while DFSMSHsm is running, by link-editing the desired version of the exit into a load library and then issuing the SETSYS EXITON command. The SETSYS EXITON command causes DFSMSHsm to reload the exit using the standard search sequence.

The ARCINEXT, ARCSDEXT, and ARCRPEXT exits, whether link-edited in 24-bit or 31-bit mode, are each passed parameters that are in 31-bit storage (above the 16MB line).

See "Adding a New Exit" on page 4.

Replacing DFSMSHsm Exits

The sequence for replacing each DFSMSHsm exit presented in this topic is always the same:

1. Issue the SETSYS EXITOFF command to deactivate the active exit.
2. Link-edit the replacement exit code into the proper library in the LNKLST concatenation (job or step libraries).
3. Refresh the library lookaside (LLA).
4. Issue the SETSYS EXITON command to activate the replacement exit.

Writing DFSMSHsm Exits

With DFSMSHsm installation exits, you can tailor DFSMSHsm functions and associate them with other space management activities. As you write exits, remember that they run as if they were DFSMSHsm code. Therefore, it is recommended that you routinely incorporate the following considerations whenever you write installation exits:

- Keep supervisor services such as I/O to a minimum.
- Schedule for another time any processes that extend the elapsed time of automatic primary space management (for example, defragmentation of a DASD volume).
- Write all exits supporting the DFSMSHsm basic functions as reentrant, with the exception of the two following exits. Writing exits as reentrant removes the rewrite requirement should the functions calling the exits become capable of concurrent processing by multiple tasks. You don't need to code the following exits as reentrant:
 - ARCINEXT (the initialization exit)
 - ARCSDEXT (the shutdown exit)

DFSMSHsm Exits

- Be aware that the recall exit is called in a system performing JES3 setup. The exit is called for migrated non-SMS-managed data sets during the JES3 converter-interpreter locate routine and is, therefore, in a critical system performance path.

Also always remember that DFSMSHsm installation exits:

- Run enabled for interrupts.
- Run in problem program state.
- Run in either the DFSMSHsm primary address space or the ABARS secondary address space (ARCTVEXT exit).
- Have pageable storage.
- Are protected by ESTAE.
- Are entered in the standard address space protection key of 8. Control must return in the same key as at entry.
- Execute in an authorized program facility (APF) authorized address space. As with all subroutines, do *not* link edit installation exits with APF authorization.

Special Considerations

In coding exit routines for DFSMSHsm, you might sometimes find it useful to refer to a portion of a DFSMSHsm data area. For descriptions and formats of general use DFSMSHsm data areas, see *z/OS DFSMSHsm Diagnosis*. That book provides descriptions of fields in the data areas, the meaning and use of those fields, and the offsets and the byte and bit patterns for the fields. Data area cross-reference information follows the description of each record.

DFSMSHsm uses subpools, which it shares within its subtasks, through the SHSPL parameter of the ATTACH macro. The subpools are 1, 6, 7, 10, 11, 12, 13, and 78. When you write exit routines or modify DFSMSHsm and that code requires GETMAIN processing from one of these subpools, the FREEMAIN request must ask for the amount of storage requested by the GETMAIN and not a complete subpool FREEMAIN.

Registers on Entry to DFSMSHsm Installation Exits

Before the exit is called, the contents of the registers are:

Register	Contents
0	Not applicable
1	Address of input parameters
2–12	Not applicable
13	Address of register save area
14	Caller's return address
15	Address of exit entry point

Registers on Return from DFSMSHsm Installation Exits

Before the exit routine ends, the contents of the registers are:

Register	Contents
0	Not applicable
1–14	Restored to contents at entry
15	Not applicable

Calling DFSMSHsm Installation Exits

The DFSMSHsm installation exits must be accessible by the LOAD macro and must communicate with the standard MVS linkage for registers. “Registers on Entry to DFSMSHsm Installation Exits” on page 152 and “Registers on Return from DFSMSHsm Installation Exits” on page 152 describe standard MVS linkage with which DFSMSHsm complies. The exits must save and restore registers. DFSMSHsm does not place return codes in the registers; it includes them as parameters in the parameter list for exits that provide return codes. An installation exit cannot issue the DFSMSHsm supervisor call instruction (SVC).

DFSMSHsm calls each of its exits in the addressing mode in which they were link edited (either 24-bit mode or 31-bit mode), except for the ARCTVEXT exit, which must be in 24-bit mode.

Because DFSMSHsm responds differently to abends that occur for different exits, the actions DFSMSHsm takes are described for each exit. Generally, when an exit abends, DFSMSHsm issues a HOLD on the function, writes a message, and does not call the exit again until either a DFSMSHsm RELEASE command releases the function or a SETSYS command requests the function.

The exit parameter list contains pointers to the information described in the discussion of each individual exit. It points to copies of the information unless specifically stated otherwise.

The exits are ESTAE protected. They are not subject to TRAP commands. If an exit abends and you require a dump for problem determination, see the *z/OS DFSMSHsm Diagnosis*.

Table 33 lists the hex values for exits that do selective processing based on the device type DFSMSHsm is processing.

Table 33. Hexadecimal Values for UCB Device Types

UCB Device Type	
Unit Name	Third and Fourth Bytes (Note 1)
3380	X'200E'
3390	X'200F'
3420	X'8003'
3423	X'8082'
3480	X'8080' (Note 2)
3480X	X'8080' (Note 2)
3490	X'8081'
3590-1	X'8083'
9345	X'2004'

Note:

1. The logical device names for some tape devices are different from their physical device names. 3480XF tape devices are identified with 3480X in the JCL; therefore, specify 3480X in the JCL whenever you identify 3480XF tape devices to DFSMSHsm.
2. A tape device supports improved data recording capability whenever the 04 bit is on in the second byte of the four-byte UCB device-type code.

Creating User-Defined Messages

Message numbers ARC9000 through ARC9299 have been set aside for use by DFSMSHsm installation exits, either as samples supplied by DFSMSHsm or messages written by customers. For an explanation of these messages, customers have to locate the issuing exit or any user-created documentation for that exit.

Message numbers ARC9000 through ARC9199 are intended for use specifically for the ARCRPEXT exit. The ARCRPEXT installation exit can pass messages back to DFSMSHsm, and DFSMSHsm writes these messages in the migration or backup activity log. User messages issued by other DFSMSHsm installation exits are generally write-to-operator (WTO) messages.

ARCADEXT: Data Set Deletion Installation Exit

You can use the data set deletion exit (ARCADEXT) to exclude data sets on level 0 volumes or on migration volumes from being processed during data set deletion (DBA-delete by age processing) or data set retirement (DBU-delete if backed up processing) for non-SMS-managed data sets.

Characteristics of the ARCADEXT Exit

The ARCADEXT installation exit receives control after DFSMSHsm confirms that a data set has not been referred to in the number of days specified for the deletion. Checks for other criteria depend on whether the processing is for a level 0 volume or a migration volume.

- If DFSMSHsm is retiring data sets on a level 0 volume (DBU processing), ARCADEXT is called *before* DFSMSHsm determines that a current backup version exists. If DFSMSHsm is deleting data sets on a level 0 volume (DBA processing), ARCADEXT is called regardless of the expiration date. Although the exit is called before all criteria are met, DFSMSHsm does not scratch a data set unless all criteria are met.
- If DFSMSHsm is retiring data sets on a migration volume (DBU processing), ARCADEXT is called *after* DFSMSHsm confirms that the data set has either expired or has a backup version.

The ARCADEXT routine must be reentrant.

Recovering from an Abend of ARCADEXT Processing

If the data set deletion exit abends, DFSMSHsm

- Does not delete the data set
- Stops processing the volume
- Holds migration
- Issues messages ARC0004I, ARC0535I, and ARC0734I with a return code of 54 and records them in the migration activity log

DFSMSHsm does not disable the exit. Analyze the cause of the abend and determine if it is repeatable. If it is, issue the SETSYS EXITOFF(AD) command to disable the ARCADEXT exit before you release space management.

ARCADEXT Parameter List

Register 1 contains the address of the ARCADEXT parameter list as shown in Table 34 on page 155.

Table 34. ARCADEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	<p>The address of the 140-byte VTOC entry of the data set about to be deleted or retired.</p> <p>If a non-VSAM data set is being deleted or retired from a level 0 volume, this data area contains the real VTOC entry of the data set. If a VSAM data set is being deleted or retired from a level 0 volume, this data area contains the real VTOC entry of the base data object with the base cluster name contained in the first 44 bytes.</p> <p>If a data set is being deleted or retired from a migration volume (DASD or tape), this data area contains a dummy VTOC entry of the data set containing only the following valid fields:</p> <ul style="list-style-type: none"> Data set name (base cluster name if VSAM) Data set organization Data set indicators (DS1DSIND) Data set creation date Data set expiration date Data set last referred to date Data set block size (non-VSAM) Data set key length (non-VSAM) Data set record format (non-VSAM) <p>The last-referred-to date field can be the same as the creation date if the data set did not have a last-referred-to date when it migrated.</p> <p>The last-referred-to date contains the last update date if a VSAM data set with a last update date is being retired.</p>
04 (X'04')	4	<p>The address of a 6-byte data area.</p> <p>If a data set is being deleted or retired from a level 0 volume, this data area contains the volume serial number of the level 0 volume. If a data set is being deleted or retired from a migration volume, this data area contains the volume serial number of the original level 0 volume that the data set was on before it migrated.</p>
08 (X'08')	4	<p>The address of a fullword binary area containing the approximate size of the data set in units of 1024 bytes.</p> <p>The size is the space available to be allocated for the user's data set. Note: Data set size is based on a 2KB blocking factor for any DASD. This field is only an estimate of size. If the data set is blocked with a factor other than 2048 bytes, available space can be larger or smaller.</p>
12 (X'0C')	4	<p>The address of a 4-byte data area with only the first 3 bits defined. The bits are:</p> <ul style="list-style-type: none"> 0... This data set is being retired. 1... This data set is being deleted. .0.. The next bit does not contain valid information about the type of volume DFSMShsm is processing. .1.. The next bit contains valid information about the type of volume DFSMShsm is processing. ..0. A level 0 volume is being processed. ..1. A migration volume is being processed.
16 (X'10')	4	<p>The address of a fullword binary return code.</p>

ARCADEXT Return Codes

The following list contains the ARCADEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 16 of the parameter list.

Return Code

Description

00 (X'00')

Scratch this data set.

04 (X'04')

Do not scratch this data set.

ARCBDEXT: Data Set Backup Installation Exit

You can use the data set backup exit (ARCBDEXT) to perform the following tasks:

- To prevent DFSMSHsm from backing up selected data sets whenever volume backup processes the level 0 volumes on which the data sets reside.
- To exclude non-SMS-managed data sets from backup as an alternative to using the ALTERDS command.

This technique is effective for excluding large numbers of non-system-managed data sets from backup. For example, you can design the exit to make decisions based on data in the data set VTOC entry by selecting data sets based on part of the data set qualifier.

- To prevent compaction of a data set during volume backup to tape, DASD, or both, whenever you have previously specified one of the following commands:
 - SETSYS COMPACT(TAPEBACKUP)
 - SETSYS COMPACT(DASDBACKUP)
 - SETSYS COMPACT(ALL)
 - SETSYS ZCOMPRESS(TAPEBACKUP(YES))
 - SETSYS ZCOMPRESS(DASDBACKUP(YES))
 - SETSYS ZCOMPRESS(ALL)
- To direct DFSMSHsm as to whether serialization should, or should not, be attempted before backing up the current data set, and whether a backup should be performed if serialization has been attempted but fails.
- To specify a RETAIN_DAYS value for the backup of a given data set

Characteristics of the ARCBDEXT Exit

The ARCBDEXT installation exit, called during volume backup processing, receives control after DFSMSHsm determines that a data set should be backed up but before DFSMSHsm backs it up. It also receives control during the backup of individual data sets through the BACKDS and HBACKDS commands and during the backup of migrated data sets.

A RETAIN_DAYS value may be returned by the exit for the data set. If a RETAIN_DAYS value was also specified on the BACKDS/HBACKDS command, then the value specified on the command will be used. If a value greater than 50000 (other than 99999) is returned by the exit, it will be interpreted as 50000. A decimal value of 99999 will indicate that the backup version should never expire. If a value less than zero is returned by the exit, it will be interpreted as zero.

The data set backup exit is called for both system- and non-system-managed data sets that are eligible for backup. A flag (DS1SMSFG) in the data set VTOC entry indicates whether the data set being processed is system-managed.

Note: Do not use the ARCBDEXT installation exit to override management class parameters for a data set. However, you can use it to change the compaction rules for system-managed data sets.

The ARCBDEXT routine must be reentrant.

Recovering from an Abend of ARCBDEXT Processing

If the data set backup exit abends, DFSMSHsm

- Does not back up the data set
- Stops processing the volume
- Holds backup
- Issues messages ARC0734I and ARC0004I and records them in the backup activity log

DFSMSHsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the ARCBDEXT exit by issuing the SETSYS EXITOFF(BD) command before releasing backup.

Systems constrained for virtual storage can abend. If your system is abending, consider calling ARCSAEXT, the space management and volume exit, to do some of the work done by the ARCBDEXT exit. You save space because the ARCSAEXT exit does not build work elements for data sets it eliminates from processing and because the exit is taken before DFSMSHsm performs all data set eligibility tests.

ARCBDEXT Parameter List

Register 1 contains the address of the ARCBDEXT parameter list as shown in Table 35.

Table 35. ARCBDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	<p>The address of the 140-byte VTOC entry of the data set about to be backed up. The first 44 bytes are the data set name. The contents of the format1 DSCB and how to code the IECSDL1 mapping macro are described in <i>z/OS DFSMSdfp Advanced Services</i>. Exceptions to the data set VTOC entry include the following:</p> <ul style="list-style-type: none"> • For system-managed VSAM data sets, the data set VTOC entry is that of the data object with the base cluster name contained in the first 44 bytes. • For non-system-managed VSAM data sets cataloged in an integrated category facility catalog, a dummy data set VTOC entry is provided containing the base cluster name, data set organization, the change bit (DS1DSCHA), the date the data set was last referred to, creation date, and expiration date. • For non-system-managed VSAM data sets not cataloged in an integrated catalog facility catalog, a dummy data set VTOC entry is provided containing the base cluster name and the data set organization. • For migrated data sets (being backed up), the data set VTOC entry that is provided contains only the following valid fields: <ul style="list-style-type: none"> – Data set name (base cluster name for VSAM data sets) – Data set organization – Data set indicators (DS1DSIND) – Data set creation date – Data set expiration date – Data set last-referred-to date – Data set record format (non-VSAM)

DFSMSHsm Exits

Table 35. ARCBDEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
04 (X'04')	4	The address of a 6-byte data area containing the volume serial number of the volume being backed up. If DFSMSHsm is backing up an individual data set, the data area contains the serial number of the volume the data set currently resides on. If DFSMSHsm is backup up a migrated data set, the data area contains the serial number of the original level 0 volume on which the data set resided before it migrated.
08 (X'08')	4	The address of an area with the data set size and other environmental data, as show in Table 36.
12 (X'C')	4	The address of a fullword binary return code.

ARCBDEXT—Input Data Structure

The third word of “ARCBDEXT Parameter List” on page 157 points to the address of the area described in Table 36 and Table 37 on page 159.

Table 36. ARCBDEXT Input Data Structure -- Input Data Structure for Volume Backup Requests

Offset	Length or Bit Pattern	Description
00 (X'00')	4	Approximate size of the data set, in units of 1024 bytes.
04 (X'04')	8	Identifies the level of parameter list and data structure. If there is a value other than '*EXPAND1' at this offset, then this and subsequent fields are not part of the structure.
12 (X'0C')	1	Data set status: 1... Data set is a backup-while-open (BWO) candidate. .1.. Reserved. ..1. RETAINDDAYS value set by exit. ..0. RETAINDDAYS value not set by exit. 0... Data set is not a BWO candidate.

Table 36. ARCBDEXT Input Data Structure -- Input Data Structure for Volume Backup Requests (continued)

Offset	Length or Bit Pattern	Description
13 (X'0D')	1	<p>Directions for backing up a data set in use (decimal value):</p> <p>0 = Try to serialize and back up, but fail if data set is in use. This value is established by the command:</p> <p>SETSYS BACKUP - (INUSE(RETRY(N))).</p> <p>1 (output only) = Try to serialize, but back up even if data set is in use.</p> <p>2 (output only) = Back up without trying to serialize first.</p> <p>10 = Try to serialize, but if data set is in use, schedule a retry for which serialization is REQUIRED. This value is established by the command:</p> <p>SETSYS BACKUP(INUSE(RETRY(Y) SERIALIZATION(REQUIRED))).</p> <p>11 = Try to serialize, but if data set is in use, schedule a retry for which serialization is PREFERRED. This value is established by the command:</p> <p>SETSYS BACKUP(INUSE(RETRY(Y) SERIALIZATION(PREFERRED))).</p> <p>Note: Field INUSE serves both as input to and output from ARCBDEXT. The input is derived from SETSYS parameters, but the exit can change the field contents to other valid values. On return from the exit:</p> <ul style="list-style-type: none"> • If the return code indicates “do not back up,” field INUSE is ignored. • If INUSE does not contain one of the defined values, it is treated as 0. • For a BWO candidate, any value other than 0 or 10 is treated as 0.
14 (X'0E')	2	Length of management-class name in the following field. If this field is zero, there is no associated management class.
16 (X'10')	30	Management-class name associated with the data set.
46 (X'2E')	2	Reserved.
48 (X'30')	4	RETAINDDAYS value.

Table 37. ARCBDEXT Input Data Structure (continued) -- Input Data Structure for Individual Data Set Backup Command Requests

Offset	Length or Bit Pattern	Description
04 (X'04')	8	Identifies the level of parameter list and data structure. If there is a value other than '*EXPAND2' at this offset, then this and subsequent fields are not part of the structure.
12 (X'0C')	2	<p>Data set status:</p> <p>1... Data set is a backup-while-open (BWO) candidate.</p> <p>..1. RETAINDDAYS value set by exit.</p> <p>..0. RETAINDDAYS value not set by exit.</p> <p>0... Data set is not a BWO candidate.</p> <p>..1. Backup is the result of data set backup command.</p> <p>..0. Backup is not the result of data set backup command. Backup is the result of retry from volume request due to an INUSE failure.</p>
14 (X'0E')	2	Reserved.

DFSMSHsm Exits

Table 37. ARCBDEXT Input Data Structure (continued) -- Input Data Structure for Individual Data Set Backup Command Requests (continued)

Offset	Length or Bit Pattern	Description
16 (X'10')	4	RETAINDDAYS value.

Table 38. ARCBDEXT Input Data Structure (continued) -- Input Data Structure for Autobackup Stage 3

Offset	Length or Bit Pattern	Description
04 (X'04')	8	Identifies the level of parameter list and data structure. If there is a value other than '*EXPAND3' at this offset, then this and subsequent fields are not part of the structure.
12 (X'0C')	2	Data set status: 1... Reserved. .1.. Reserved. ..1. RETAINDDAYS value set by exit. ..0. RETAINDDAYS value not set by exit.
14 (X'0E')	2	Reserved.
16 (X'10')	4	RETAINDDAYS value.

ARCBDEXT Return Codes

The following list contains the ARCBDEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 of the parameter list.

Return Code Description

00 (X'00')

DFSMSHsm backs up and (optionally) compacts the data set. DFSMSHsm sets the RETAINDDAYS value for the given data set if specified by the exit.

04 (X'04')

For level 0 volumes, DFSMSHsm backs up but does not compact the data set even if the data compaction option is active. This return code has no effect when DFSMSHsm is backing up migrated volumes. DFSMSHsm sets the RETAINDDAYS value for the given data set if specified by the exit.

08 (X'08')

For level 0 volumes, DFSMSHsm does not back up the data set but does turn off the update flag in the data set's VTOC entry. DFSMSHsm does not set a RETAINDDAYS value.

For migrated data sets, DFSMSHsm does not back up the data set. DFSMSHsm does not set a RETAINDDAYS value.

12 (X'0C')

For level 0 volumes, DFSMSHsm does not back up the data set and does not turn off the update flag in the data set's VTOC entry.

For migrated data sets, DFSMSHsm does not back up the data set.

ARCCBEXT: Control Data Set Backup Installation Exit

You can use the control data set backup exit (ARCCBEXT) to perform the following tasks:

- Identify the data mover that backed up the control data sets and the journal.
- Merge all tape backup copies onto fewer tapes.
- Define RACF profiles to protect the tapes that contain the backup versions.
- Ensure control data set integrity by scheduling a job to examine the structural consistency of the control data sets. You can import the backed up data sets to temporary or renamed data sets, and then call the IDCAMS EXAMINE command to ensure that the control data sets are structurally consistent.
- Improve performance by scheduling a job to copy the control data sets and journal from DASD to tape. First, back up your control data sets and journal to DASD in parallel. Later, with this exit, copy your control data sets and journal from DASD to tape.
- Save the list of volume serial numbers that are associated with each backup data set. You can also get a list of volume serial numbers by calling catalog services (outside of the exit) because the backup data sets are cataloged by DFSMSHsm when it finishes the backup.

Always perform the batch-type exit functions, such as copying data sets, within a batch environment. To run the exit functions in a batch environment, you must open an internal reader and submit JCL to the internal reader. You can then build the JCL with the data passed by the control data set backup function.

Characteristics of the ARCCBEXT Exit

The ARCCBEXT installation exit receives control after DFSMSHsm creates backup copies of the control data sets.

The ARCCBEXT routine should be reentrant.

Recovering from an Abend of ARCCBEXT Processing

If the control data set backup exit abends, DFSMSHsm

- Disables the exit
- Issues message ARC0502I and records it in the command activity log.

Analyze the exit to determine if the abend is repeatable. If it is, replace the broken exit with a version that has been fixed. Reenable the exit with the steps described in “Installing DFSMSHsm Exits” on page 150.

ARCCBEXT Parameter List

Register 1 contains the address of the ARCCBEXT parameter list as shown in Table 39.

Table 39. ARCCBEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a fullword binary area containing one of the following: <ul style="list-style-type: none"> 0 The exit was called during automatic backup. 4 The exit was called by the BACKVOL command.
04 (X'04')	4	The address of a 44-byte area containing the name of the journal backup data set ⁽¹⁾

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Table 39. ARCCBEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
08 (X'08')	4	The address of a list of volume serial numbers indicating which volumes the journal backup data set is on ^(1 and 2)
12 (X'0C')	4	The address of a 44-byte area containing the name of the migration control data set (MCDS) backup data set ⁽¹⁾
16 (X'10')	4	The address of a list of volume serial numbers indicating which volumes the MCDS backup data set is on ^(1 and 2)
20 (X'14')	4	The address of a 44-byte area containing the name of the backup control data set (BCDS) backup data set ⁽¹⁾
24 (X'18')	4	The address of a list of volume serial numbers indicating which volumes the BCDS backup data set is on ^(1 and 2)
28 (X'1C')	4	The address of a 44-byte area containing the name of the offline control data set (OCDS) backup data set ⁽¹⁾
32 (X'20')	4	The address of a list of volume serial numbers indicating which volumes the OCDS backup data set is on ^(1 and 2)
36 (X'24')	4	The address of a 4-byte area with only bits in the first byte defined. The bits are: .0.. DFSMSHsm backed up the control data sets .1.. DFSMSdss backed up the control data sets. ..0. The MCDS backup was successful. ..1. The MCDS backup was unsuccessful. ...0 The BCDS backup was successful. ...1 The BCDS backup was unsuccessful. 0... The OCDS backup was successful. 1... The OCDS backup was unsuccessful. .... .0.. The journal backup was successful. .... .1.. The journal backup was unsuccessful. .... ..0. Neither the MCDS nor the BCDS has been split. .... ..1. Either, or both, the MCDS and BCDS have been split into a multicluster control data set.
40 (X'28')	4	The address of a 44-byte area containing the name of the MCDS2 backup data set ^(1 and 3)
44 (X'2C')	4	The address of a list of volume serial numbers indicating which volumes the MCDS2 backup data set is on ^(1, 2, and 3)
48 (X'30')	4	The address of a 44-byte area containing the name of the MCDS3 backup data set ^(1 and 3)
52 (X'34')	4	The address of a list of volume serial numbers indicating which volumes the MCDS3 backup data set is on ^(1, 2, and 3)
56 (X'38')	4	The address of a 44-byte area containing the name of the MCDS4 backup data set ^(1 and 3)
60 (X'3C')	4	The address of a list of volume serial numbers indicating which volumes the MCDS4 backup data set is on ^(1, 2, and 3)
64 (X'40')	4	The address of a 44-byte area containing the name of the BCDS2 backup data set ^(1 and 3)

Table 39. ARCCBEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
68 (X'44')	4	The address of a list of volume serial numbers indicating which volumes the BCDS2 backup data set is on ^(1, 2, and 3)
72 (X'48')	4	The address of a 44-byte area containing the name of the BCDS3 backup data set ^(1 and 3)
76 (X'4C')	4	The address of to a list of volume serial numbers indicating which volumes the BCDS3 backup data set is on ^(1, 2, and 3)
80 (X'50')	4	The address of a 44-byte area containing the name of the BCDS4 backup data set ^(1 and 3)
84 (X'54')	4	The address of a list of volume serial numbers indicating which volumes the BCDS4 backup data set is on ^(1, 2, and 3)

Note:

1. If the exit passes a value of 0 for the address of the backup data set name or the list of volumes, DFSMSHsm did not back up that data set.
2. The area pointed to by the address of the list of volume serial numbers is:
 - A halfword binary area containing the number of volume serial numbers in the list.
 - A list of volume serial numbers and generic unit names. Each volume serial number is followed by the generic name of the tape unit on which the volume was written. Each volume serial number is 6 bytes long, and each unit name is 8 bytes long.
3. This parameter is passed only for multicluster control data sets.

ARCCDEXT: Data Set Reblock Installation Exit

The data set reblock exit (ARCCDEXT) can reblock recalled or recovered data sets as they move from a source DASD to a target DASD. You can use the ARCCDEXT exit to allow the system either to specify a block size for these data sets using a DFSMSdss mover or to specify the block size yourself using a DFSMSHsm mover. You can only use the ARCCDEXT exit to respond with a yes or no answer to the question: "Should this data set be reblocked?" In most cases, system-determined block size can block data sets and there is no reason to reblock them. You can use the ARCCDEXT exit, however, to prevent exception, block-size dependent data sets from accidentally being reblocked. Reblocking can allow more data to be stored on each DASD track or cause better performance with any device.

Characteristics of the ARCCDEXT Exit

The ARCCDEXT installation exit is called during recall or recovery processing when all of the following are true:

- The recalled or recovered data set is sequential.
- The SETSYS CONVERSION(REBLOCKTOANY) command has been specified.
- The system reblockable indicator in the data set VTOC entry is off.

ARCCDEXT is called for both system- and non-system-managed data sets that are eligible for DFSMSHsm-controlled reblocking. A flag (DS1SMSFG) in the data set VTOC entry indicates the type of data set being processed.

After the DFSMSHsm data set reblock exit has been called, DFSMSHsm checks the parameter list to determine if you requested reblocking. If DFSMSdss is the data mover for recall or recovery and DFSMSHsm determines that you have requested reblocking, DFSMSHsm tells DFSMSdss to reblock the data set subject to its

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ADRREBLK exit. The DFSMSdss ADRREBLK exit is preloaded with a default that allows the system to determine the blocksize. You can override the system-determined block size by specifying a different blocksize in the ADRREBLK exit. Although ADRREBLK can be coded to specify an explicit blocksize, it is recommended that you use the default implementation (system-determined block size for the optimal block size value).

Changing the ADRREBLK exit affects all jobs that invoke DFSMSdss restore.

For detailed information about the DFSMSdss ADRREBLK exit, see “Reblock Installation Exit Routine (ADRREBLK)” on page 232.

The ARCCDEXT routine must be reentrant.

Recovering from an Abend of ARCCDEXT Processing

If the data set reblock exit abends:

- No reblocking occurs
- DFSMSHsm disables the exit
- DFSMSHsm issues message ARC0004I and records it in the migration activity log (for recall) or in the backup activity log (for recovery)
- The recall does not end in error
- DFSMSHsm does not hold any functions

Analyze the exit to determine if the abend is repeatable. If it is, replace the broken exit with a version that has been fixed. Reenable the exit with the steps described in “Installing DFSMSHsm Exits” on page 150.

ARCCDEXT Parameter List

Register 1 contains the address of the ARCCDEXT parameter list as shown in Table 40.

Table 40. ARCCDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of the 140-byte VTOC entry of the data set about to be reblocked. The first 44 bytes are the data set name.
04 (X'04')	4	The address of a 7-byte area. The first 6 bytes contain the volume serial number of the volume the data set was migrated from or backed up from. Byte 7 contains a data mover flag in bit 0 that indicates the data mover that was used. 0... If bit 0 of byte 7 is set to 0, DFSMSHsm has moved the data. 1... If bit 0 of byte 7 is set to 1, DFSMSdss has moved the data.
08 (X'08')	4	The address of a fullword binary area containing the approximate size of the data set in units of 1024 bytes. The size is that of the space required to recall or recover the data set.

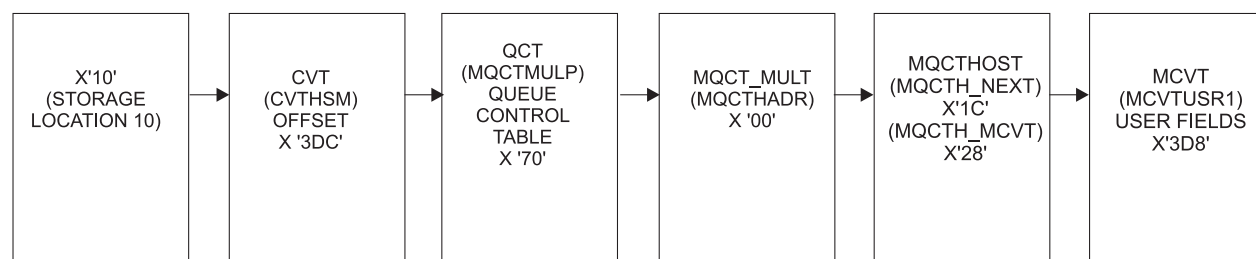
Table 40. ARCCDEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
12 (X'0C')	4	<p>The address of a fullword binary area containing one of three values that determine the block size DFSMSHsm uses if the data set is reblocked. The DFSMSDss mover always passes a value of zero, which directs the system to calculate the block size for a data set. The DFSMSHsm mover passes a value that offers greater track utilization on the target device (the largest acceptable block size nearest to 6144) or it passes the current block size.</p> <p>You can change this variable and use a different value. If you return a value greater than 32 760 or less than the record size, DFSMSHsm uses the value passed to the exit. If DFSMSDss is the data mover, the value in this field is ignored.</p>
16 (X'10')	4	<p>The address of a fullword binary return code for the exit to set to zero to cause DFSMSHsm to reblock the data set, or nonzero if DFSMSHsm should not reblock the data set during recall or recovery.</p>

ARCINEXT: Initialization Installation Exit

The initialization exit (ARCINEXT) can perform tasks of your choosing before returning to DFSMSHsm during DFSMSHsm startup time. For example, the exit can open and read a data set containing installation control records for building tables. The address of the tables can be stored in the installation-reserved fields of the MCVT control block. These tables can contain information required by other installation exits.

To find an MCVT, the exit uses the field MQCTHADR as a pointer to a linked list of elements, each of which (MQCTHOST) represents one DFSMSHsm host in some address space with its own MCVT. (The last element in this list has binary zeros in its MQCTH_NEXT field.) To access the proper MCVT, subsequent installation exits need to search the chain starting at MQCTHADR for the element with MQCTH_ASCB that points to the current address space control block. MQCTH_MCVT in that element points to the proper MCVT with its user fields. Subsequent installation exits can refer to these user fields in the MCVT control block by the following method:



Note: The sample code ARCTPEXT that is found in SYS1.SAMPLIB(ARCTPEXT) scans the linked list of host elements for the proper MCVT pointer.

Attention: Do not attempt to invoke ARCINEXT exit to start DFSMS Optimizer, because Optimizer is already started (depending on the level of DFSMSOpt).

Characteristics of the ARCINEXT Exit

The ARCINEXT installation exit receives control after the DFSMSHsm startup PARMLIB member (ARCCMDxx) is processed, but before the functional subtasks become active.

The installation-reserved fields are the only fields in the MCVT control block that you are allowed to change. All other fields are reserved for IBM's use and are subject to change.

All parameters passed to ARCINEXT are located above the 16 MB line and have 31-bit addresses. If your ARCINEXT runs in AMODE 24, you can use the following example to switch to 31-bit mode before referring to 31-bit parameters from a 24-bit location:

```
MODE31 LA 15,**+10      GET 31-BIT TARGET ADDRESS
      0 15,=X'80000000'  SET AMODE 31 IN ADDRESS
      BSM 0,15          BRANCH INTO 31-BIT AMODE
```

Note: Before issuing the instructions in the preceding example, your program's base register should have a 31-bit address. If the program is running in 24-bit mode, byte 0 must contain zeros. Do not load the register with a BALR instruction while in 24-bit mode, as it sets inappropriate bits in byte 0. Instead, use LR or BASR instructions.

You can use the following example to switch back to 24-bit mode after referring to the 31-bit parameters.

```
*SWITCH TO 24 BIT ADDRESSING
MODE24 LA 15,**+6      GET TARGET ADDRESS
      BSM 0,15          ENTER 24 BIT MODE
```

This code is intended for use in RMODE 24. When used by RMODE 24 code, the AMODE can be either 24 or 31 before running either piece of switching code. The end result is the addressing mode indicated.

If ARCINEXT is link-edited in AMODE 31, then no change is needed.

Recovering from an Abend of ARCINEXT Processing

If the initialization exit abends:

- DFSMSHsm issues message ARC0004I along with the abend code from the system diagnostic work area
- DFSMSHsm continues processing

ARCINEXT Parameter List

Register 1 contains the address of the ARCINEXT parameter list as shown in Table 41.

Table 41. ARCINEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of the MCVT control block.
04 (X'04')	4	The address of a fullword binary return code field. This field is not used by DFSMSHsm. There are no return codes for this exit.

MCVT User-Reserved Fields for Use with the ARCINEXT Exit

Table 42 describes the MCVT user-reserved fields for use with the ARCINEXT installation exit.

Table 42. MCVT User-Reserved Fields. These areas are repositories for user-provided information to be used by other exits and programs. (for use with the ARCINEXT installation exit)

Offset	Length or Bit Pattern	Description
984 (X'3D8')	4	The address of a fullword binary area (MCVTUSR1) in the MCVT control block.
988 (X'3DC')	4	The address of a fullword binary area (MCVTUSR2) in the MCVT control block.
992 (X'3E0')	4	The address of a fullword binary area (MCVTUSR3) in the MCVT control block.
996 (X'3E4')	4	The address of a fullword binary area (MCVTUSR4) in the MCVT control block.

ARCMDEXT: Space Management Exit

You can use the space management exit (ARCMDEXT) to perform the following tasks:

- Prevent selected data sets from migration or class transition from level 0 volumes during volume migration processing, even when the data sets fulfill the selection criteria. For example, with this exit you could prevent migration of a large number of non-system-managed data sets instead of having to issue SETMIG command for each of the data sets.

For system-managed data sets whose management classes fulfill the migration selection criteria, you can use this exit to override the management class. Though this is not recommended, some users find that overriding the management class eliminates the introduction of many more management classes for these exception data sets.

Table 43 shows the rules governing migration versus class transition, based on eligibility and the return code from ARCMDEXT.

Table 43. Rules for migration versus class transition, based on eligibility and return code from ARCMDEXT

Eligibility Status	RC=0 (Allow Migration)	RC=8 (Disable Migration)	RC=52 (Disable Migration and Class Transition)
Eligible for migration only	Migration	Data set processing fails with RC=45, reason 92	Data set processing fails with RC=45, reason 92
Eligible for migration and class transition	Migration	Class transition	Data set processing fails with RC=45, reason 92
Eligible for class transition only	Class transition	Class transition	Data set processing fails with RC=45, reason 92

- Override a data set condition called “in need of backup,” which can prevent a data set from migrating to tape. A data set needs to be backed up if no current backup version exists and if the data set resides either on a non-system-managed volume or is a system-managed data set for which auto-backup is requested.

Use caution, however, because if you use this exit to migrate the data set to tape, the data set will not be backed up by DFSMSHsm.

- Prevent compaction of a data set during volume migration if you have previously specified one of the following:
 - SETSYS COMPACT(TAPEMIGRATE)
 - SETSYS COMPACT(DASDMIGRATE)
 - SETSYS COMPACT(ALL)
 - SETSYS ZCOMPRESS(TAPEMIGRATE(YES))
 - SETSYS ZCOMPRESS(DASDMIGRATE(YES))
 - SETSYS ZCOMPRESS(ALL)
- Override the target device type selection and route the data set to a tape migration level 2 volume. For system-managed data sets, it is easier to define a management class that migrates data sets from level 0 user volumes directly to level 2 migration volumes.
- Control which data sets are eligible for reconnection when you specify either the SETSYS TAPEMIGRATION(RECONNECT(ALL)) command or the SETSYS TAPEMIGRATION(RECONNECT(ML2DIRECTEDONLY)) command. These data sets remain eligible for normal migration when the ARCMDEXT exit does not allow reconnection.
- Indicate that the number of days that a data set is eligible for migration is passed in the input data structure. For system-managed data sets, eligibility age is based on the PRIMARY DAYS NON-USAGE management class attribute. For non-system-managed data sets, eligibility age is based on the number of days that are specified in the MIGRATE subparameter of either the ADDVOL PRIMARY command or the MIGRATE VOLUME command.

Note: Eligibility age fields may contain a negative value for both system-managed and non-system managed data sets that are processed for extent reduction and for system-managed data sets whose management class value is overridden by the DAYS(0) parameter of the MIGRATE VOLUME command. A negative value represents the number of days until the data set becomes eligible for normal migration.

- Delay certain checkpointed data sets (for MVS or IMS™) from migrating from level 0 volumes until the need for restart has passed.

If a system-managed, physical-sequential data set is open during a checkpoint and is moved after that checkpoint, the program cannot restart from that checkpoint. This is true even for data sets that were only being read. A flag (DS1CPOIT) in the data set entry of the VTOC, indicates if a checkpoint was taken while the data set was open.

When an application program takes a checkpoint, the system records information about the status of that program in a checkpoint data set. This information includes the location on disk or tape where the application is currently reading or writing each open data set. If a data set that is open at the time of the checkpoint is moved to another location before the restart, you cannot restart the application from the checkpoint because the location-dependent information recorded by checkpoint/restart is no longer valid.

There are several system functions (for example, DFSMSHsm) that might automatically move a data set without the owner specifically requesting it. To ensure that all checkpointed data sets remain available for restart, the checkpoint function sets the unmovable attribute for each SMS-managed sequential data set

that is open during the checkpoint. An exception is the data set containing the actual recorded checkpoint information (the checkpoint data set), which does not require the unmovable attribute.

You can move checkpointed data sets when you no longer need them to perform a restart. DFSMSHsm and DFSMSdss FORCECP(days) allow you to use operations such as migrate, copy, or defrag to move an SMS-managed sequential data set based on a number of days since the last access. DFSMSHsm recall and DFSMSdss restore and copy are operations that turn off the unmovable attribute for the target data set.

- If the DS1CPOIT bit is on (set to 1), the ARCMDEXT exit allows migration only if an installation-determined number of days have passed since the data set was last referred to. You can modify the field name, MGC_CHKPOINT_DAYS, by issuing the following patch command:

```
PATCH .MGCB.+70 X'03' VERIFY(.MGCB.+70 X'05') /* change to 3 */
```

For more information about the checkpointed data set patch command, refer to *z/OS DFSMSHsm Implementation and Customization Guide*.

Characteristics of the ARCMDEXT Exit

The ARCMDEXT installation exit receives control whenever a data set fulfills the selection criteria for the level 0 volume being managed, but before the data set migrates or transitions. It is called when DFSMSHsm processes a level 0 volume or an individual data set through any of the following:

- HMIGRATE command
- MIGRATE command
- Automatic primary space management
- Interval migration
- On-demand migration
- Class transitions

The input data structure provides flags that identify the type of volume migration function under which the exit was invoked.

This exit is called for both system- and non-system-managed data sets that are eligible for migration or extent reduction. A flag (DS1SMSFG) in the data set VTOC entry indicates whether the data set is system managed. For multivolume data sets, the exit is called for only the first volume. For system-managed data sets, the input data structure provides the associated management class.

An indicator in the ARCMDEXT parameter list indicates that this invocation is for a data set migrating by way of a data set command, not by way of a volume migration.

This exit is not called for data sets moving between migration volumes.

You must write ARCMDEXT to be reentrant.

Recovering from an Abend of ARCMDEXT Processing

If the space management exit abends, DFSMSHsm:

- Does not migrate the data set
- Stops processing the volume
- Holds migration

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- Issues messages ARC0004I, ARC0535I, and ARC0734I with a return code of 54 and records them in the migration activity log

DFSMSHsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the ARCMDEXT exit before releasing space management.

ARCMDEXT Parameter List

Register 1 contains the address of the ARCMDEXT parameter list as shown in Table 44.

Table 44. ARCMDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 140-byte VTOC entry of the data set about to be migrated. If a non-VSAM data set is being migrated, this 140-byte area contains the real data set VTOC entry. If a VSAM data set is being migrated, the 140-byte area contains the real VTOC entry of the base data object with the base cluster name contained in the first 44 bytes.
04 (X'04')	4	The address of 6-byte volume serial number of the level 0 volume being migrated.
08 (X'08')	4	The address of the input data structure that contains the data set size, management class name, input flags, including the reconnection eligibility flag.
12 (X'0C')	4	The address of a fullword binary return code.

ARCMDEXT—Input Data Structure

The third word of Table 44 points to the address of the area that is described in Table 45.

Table 45. ARCMDEXT Input Data Structure

Offset	Length or Bit Pattern	Description
00 (X'00')	4	Approximate allocated size of the data set, in units of 1024 bytes. For multivolume data sets, this is the size of the data set across all volumes on which it resides. The size calculation is based on a 2KB blocking factor for any given DASD. The calculation gives only an estimate of the size. If your data sets use a blocking factor other than 2048 bytes, the space allocated for your data set might be larger or smaller than is needed.
04 (X'04')	8	Identifies the level of parameter list and data structure. If there is a value other than 'EXPAND1' at this offset, then this and subsequent fields are not part of the structure.

Table 45. ARCMDEXT Input Data Structure (continued)

Offset	Length or Bit Pattern	Description
12 (X'0C')	2	<p>First byte – input flags:</p> <p>1... Data set is a candidate for reconnection.</p> <p>0... Data set is not a candidate for reconnection.</p> <p>.1... Data set is being processed for extent reduction.</p> <p>.0.. Data set is not being processed for extent reduction.</p> <p>..1. Interval migration is in progress.</p> <p>..0. Interval migration is not in progress.</p> <p>...1 Primary space management is in progress.</p> <p>...0 Primary space management is not in progress.</p> <p>... 1... The Days(0) parameter was specified on the MIGRATE command.</p> <p>... 0... The Days(0) parameter was not specified on the MIGRATE command.</p> <p>... .1.. The CONVERT parameter was specified on the MIGRATE command.</p> <p>... .0.. The CONVERT parameter was not specified on the MIGRATE command.</p> <p>... ..1. The migration eligibility age field at offset X'2E' in the input data structure is valid.</p> <p>... ..0. The migration eligibility age field at offset X'2E' in the input data structure is not valid.</p> <p>... ...1 Migration is a result of a migrate data set command.</p> <p>... ...0 Migration is not a result of a migrate data set command.</p> <p>Second byte – input flags:</p> <p>1... On-demand migration is in progress.</p> <p>0... On-demand migration is not in progress.</p> <p>.xxx xxxx Reserved</p>
14 (X'0E')	2	Length of management class name in the following field. If this field is zero, there is no associated management class.
16 (X'10')	30	Management class name associated with the data set.
46 (X'2E')	2	Number of days since the data set became eligible for migration. This field can contain a negative value if DAYS(0) is specified on the MIGRATE volume command for an SMS-managed volume and for SMS and non-SMS data sets being processed for extent reduction. In both cases, the negative value represents the number of days until the data set is eligible for migration, under the normal criteria.

ARCMDEXT Return Codes

The following list contains the ARCMDEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 of the parameter list.

DFSMSHsm Exits

Return Code	Description
00 (X'00')	<p>DFSMSHsm migrates this data set to the target device type that DFSMSHsm has selected. DFSMSHsm can also reconnect this data set if it meets all reconnection eligibility requirements and if one of the following is true:</p> <ul style="list-style-type: none">• DFSMSHsm has selected a target device type of ML2 tape• DFSMSHsm has selected a target device type of ML1 DASD and the SETSYS TAPEMIGRATION(RECONNECT(ALL)) command has been specified. <p>DFSMSHsm neither migrates the data set to tape nor reconnects it, if it needs to be backed up. If the data set migrates, it is compacted according to the DFSMSHsm compaction option.</p>
04 (X'04')	<p>DFSMSHsm migrates this data set to the target device type DFSMSHsm has selected. For data sets migrating to tape, DFSMSHsm does not migrate the data set if it needs to be backed up. If the data set migrates, DFSMSHsm does not compact it.</p>
08 (X'08')	<p>DFSMSHsm does not migrate this data set.</p>
12 (X'0C')	<p>DFSMSHsm migrates this data set to the target device type DFSMSHsm has selected. For data sets migrating to tape, DFSMSHsm need not check to see that a data set has been backed up. If the data set migrates, it is compacted according to the DFSMSHsm compaction option.</p>
16 (X'10')	<p>DFSMSHsm migrates this data set to the target device type that DFSMSHsm has selected. For data sets migrating to tape, DFSMSHsm need not check to see that the data set has been backed up. If the data set migrates, DFSMSHsm does not compact it.</p>
20 (X'14')	<p>DFSMSHsm migrates this data set to tape regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm does not migrate the data set, if the data set needs to be backed up. If the data set migrates, it is compacted according to the DFSMSHsm compaction options.</p>
24 (X'18')	<p>DFSMSHsm migrates this data set to tape regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm does not migrate the data set, if the data set needs to be backed up. If the data set migrates, DFSMSHsm does not compact it.</p>
28 (X'1C')	<p>DFSMSHsm migrates this data set to tape regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm need not check to see that the data set has been backed up. If the data set migrates, it is compacted according to DFSMSHsm compaction options.</p>
32 (X'20')	<p>DFSMSHsm migrates this data set to tape regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm need not check to see that a data set has been backed up. If the data set migrates, DFSMSHsm does not compact it.</p>
36 (X'24')	<p>DFSMSHsm migrates this data set to DASD regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm need not check to see that the data set has been backed up. If the data set migrates, it is compacted according to DFSMSHsm compaction options.</p>
40 (X'28')	<p>DFSMSHsm migrates this data set to DASD regardless of the type of target device that DFSMSHsm has selected. DFSMSHsm need not check to see that the data set has been backed up. If the data set migrates, DFSMSHsm does not compact it.</p>
44 (X'2C')	<p>DFSMSHsm does not attempt to reconnect this data set, but to migrate it to the target device that DFSMSHsm has selected. For data sets migrating to tape, DFSMSHsm does not migrate the data set if it needs to be backed up. If the data set migrates, it is compacted according to the DFSMSHsm compaction options.</p>

Return Code	Description
48 (X'30')	DFSMSHsm attempts to reconnect this data set, even if DFSMSHsm would otherwise migrate it to ML1 DASD. DFSMSHsm does not reconnect the data set if it needs to be backed up. If the reconnection attempt fails, the data set remains eligible for normal migration, as if a return code of 00 had been specified.
52 (X'34')	DFSMSHsm does not perform class transition (or migration) for this data set.

Note:

1. When the SETSYS TAPEMIGRATION(RECONNECT) command allows reconnection, use RC44 to exclude individual data sets from being reconnected.
2. When the SETSYS TAPEMIGRATION(RECONNECT(ML2DRECTEDONLY)) command generally restricts reconnection to those data sets eligible for direct migration to ML2 tape, use RC48 to allow individual data sets to be reconnected.
3. Nonzero return codes other than 48 disallow reconnection, even for those data sets that are identified as reconnectable.

Table 46 is a summary of return code actions.

Table 46. Summary of Return Codes for the Space Management Exit (ARCMDEXT). A checkmark indicates applicable actions set by the return codes.

Return Code	Migrate to DASD	Migrate to Tape	Migrate if in Need of Backup	Compactable
0 (X'00')	X	X		X
4 (X'04')	X	X		
8 (X'08')				
12 (X'0C')	X	X	X	X
16 (X'10')	X	X	X	
20 (X'14')		X		X
24 (X'18')		X		
28 (X'1C')		X	X	X
32 (X'20')		X	X	
36 (X'24')	X			X
40 (X'28')	X			
44 (X'2C')	X	X		X
48 (X'30')		X		X
52 (X'34')				

ARCMDEXT: Second Level Migration Data Set Installation Exit

The second-level migration data set exit (ARCMDEXT) provides additional control over the following types of data set migrations:

- Level 1 to level 1
- Level 1 to level 2
- Level 2 to level 2

Characteristics of the ARCMTEXT Exit

The ARCMTEXT installation exit receives control when a process, including command migration of a single data set, selects to migrate an already migrated data set.

This exit is called for both system- and non-system-managed data sets that are eligible to migrate from a migration volume. A flag in the MCD record (MCDSMSFG) is passed to the exit indicating whether the data set is system-managed. Contrast this exit with the ARCMDEXT, which is used when data sets are migrated from a level 0 (user) volume.

Parameters passed to ARCMTEXT can be located above or below the 16 MB line and have 31-bit or 24-bit addresses. In order to handle both cases, the ARCMTEXT should be link-edited with AMODE 31.

Recovering from an Abend of ARCMTEXT Processing

If the second-level migration exit abends, DFSMSHsm

- Does not migrate the data set
- Stops its present migration processing
- Holds migration
- Issues message ARC0004I to the system console

DFSMSHsm does not disable the exit. Analyze the cause of the abend and determine if it is repeatable. If it is, disable the ARCMTEXT exit by issuing the SETSYS EXITOFF(MM) command before releasing migration.

ARCMTEXT Parameter List

Register 1 contains the address of the ARCMTEXT parameter list as shown in Table 47.

Table 47. ARCMTEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of the address of a copy of the MCD data set record, which contains information such as whether the migration copy is an SDSP data set (MCDFSDP). For information about the MCD record, see <i>z/OS DFSMSHsm Diagnosis</i> .
04 (X'04')	4	The address of a fullword binary area containing the number of days since the data set was last referred to on a level 0 volume.
08 (X'08')	4	The address of a 4-byte area with only bits in the first byte defined. The bits are: 0... Level 1 to level 2 migration is to DASD. 1... Level 1 to level 2 migration is to tape. .0.. The target volume is a level 2 volume. .1.. The target volume is a level 1 volume. ..0. The FREEVOL...AGE(0) command was not specified. ..1. The FREEVOL...AGE(0) command was specified. ...0 Migration is not a result of a migrate data set command. ...1 Migration is a result of a migrate data set command.
12 (X'0C')	4	The address of a fullword binary area for the return code.

ARCMTEXT Return Codes

The following list contains the ARCMTEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 of the parameter list.

Return Code	Description
00 (X'00')	Migrate this data set.
04 (X'04')	Do not migrate this data set.

ARCMTEXT: Space Management Volume Installation Exit

You can use the space management volume exit (ARCMTEXT) to record volumes that need defragmentation or to schedule related activity, such as a DFSMSDss job.

Characteristics of the ARCMTEXT Exit

The ARCMTEXT installation exit receives control after DFSMSHsm completes processing a level 0 volume during volume space management. It is called for system- and non-system-managed level 0 volumes, but is not called for level 1 or level 2 migration volumes.

Volume space management occurs:

- During the automatic primary space management window
- During interval migration
- When a MIGRATE VOLUME command is issued

Therefore, this exit can be called any time during a 24-hour processing day. If the processing defined by this exit must be confined to the automatic primary space management window, determine the time that you want to call the exit.

Remember that it is your responsibility to allocate and serialize the volumes passed to this exit.

You must write ARCMTEXT to be reentrant.

Recovering from an Abend of ARCMTEXT Processing

If the space management volume exit abends, DFSMSHsm:

- Disables the exit
- Issues message ARC0502I and records it in the migration activity log

Analyze the exit to determine if the abend is repeatable. If it is, replace the broken exit routine with a version that has been fixed. Reenable the exit with the steps described in "Installing DFSMSHsm Exits" on page 150.

ARCMTEXT Parameter List

Register 1 contains the address of the ARCMTEXT parameter list as shown in Table 48.

Table 48. ARCMTEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 6-byte volume serial number of the volume that DFSMSHsm space management has just processed.

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Table 48. ARCMVEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
04 (X'04')	4	The address of a 4-byte UCBTYP field at offset X'10' in the UCB of the volume that DFSMSHsm space management has just processed. This is the device type.
08 (X'08')	4	The address of a fullword binary fragmentation index of the volume that DFSMSHsm has just processed. The value is calculated after data sets are migrated or deleted. The index value is a number between 0 and 1000 where 0 represents an unfragmented volume and 1000 represents a totally fragmented pack.

ARCRDEXT: Recall Installation Exit

You can use the recall exit (ARCRDEXT) to select a recall target volume from a pool of primary volumes you have identified, or you can use it to select the recall target volume from the general volume pool. You can also write the exit to select volumes in a different order from that of recall target volumes provided by the system. The system returns a maximum of five recall target volumes to the exit.

This exit is called only for non-system-managed data sets. In a common recall queue environment, this exit is invoked only by the processing host.

Characteristics of the ARCRDEXT Exit

The ARCRDEXT installation exit receives control in a JES3 environment at converter or interpreter time for jobs going through converter or interpreter setup. For other jobs in either a JES2 or JES3 environment, the ARCRDEXT exit receives control just before DFSMSHsm recalls the data set. This exit is not used for recall to a specific volume.

When the ARCRDEXT exit receives control, it accesses a candidate list of volumes in the general pool or in a pool you designate. This list contains recall target volumes selected by the system. You can override the order of the candidate list of volumes and place your choices in the target volume choice list.

This exit is called only for non-system-managed data sets.

ARCRDEXT Parameter List

Register 1 contains the address of the ARCRDEXT parameter list as shown in Table 49.

Table 49. ARCRDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of the MCD record. This is a copy of the MCD record that contains information about the data set being recalled. See <i>z/OS DFSMSHsm Diagnosis</i> for the content of this record.
04 (X'04')	4	The address of a candidate list containing the number of volume serial numbers with like attributes or the eligible volumes in a user-defined pool.
08 (X'08')	4	The address of a fullword binary area containing the approximate allocated size of the data sets in units of 1024 bytes. The size is the amount of space required to recall the data set.

Table 49. ARCRDTEXT Parameter List (continued)

Offset	Length or Bit Pattern	Description
12 (X'0C')	4	<p>The address of the choice list (see Figure 49 on page 181).</p> <p>The choice list is a set of numbers that represent the position of volume serials in the target volume candidate list to which DFSMSHsm can recall data sets. The installation exit places the choice of volumes on the list. The format of the list is an array of fullword binary fields.</p>

Building Recall Exit Lists

When selecting and prioritizing target volumes for recalled data sets, the recall exit builds three lists related to candidate volumes:

- Target volume candidate list
- Target volume choice list
- Target volume unlike attribute array list

Figure 48 on page 178 shows the recall exit parameter list and the three associated recall target volume lists.

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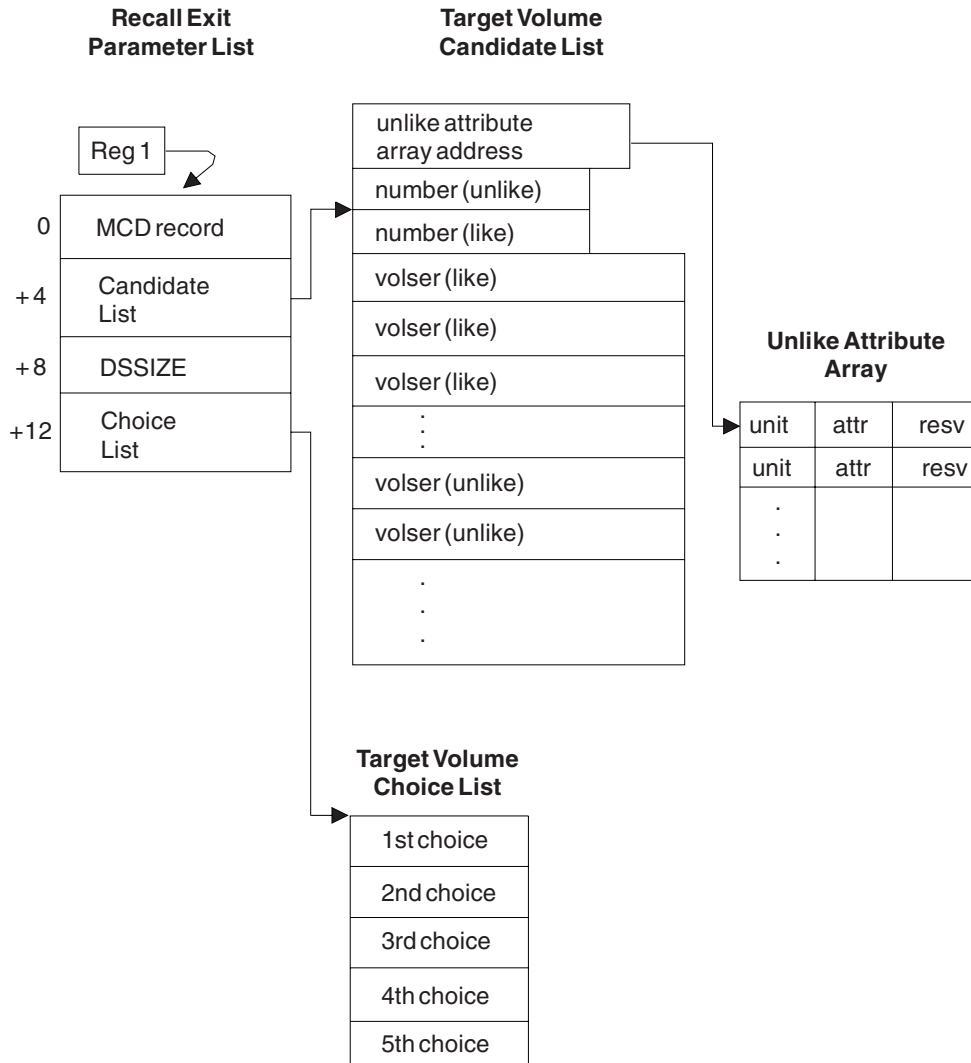


Figure 48. Recall Target Volume Data Structures

As described in Table 50, the target volume candidate list has the following four components:

- Unlike attribute array address
- Number (unlike)
- Number (like)
- Volume serial (like) or volume serial (unlike)

Table 50. Target Volume Candidate List

Offset	Length or Bit Pattern	Description
-6	4	Unlike attribute array address The address of an array containing entries corresponding to candidate volumes with unlike DFSMSHsm attributes
-2	2	Number (unlike) A halfword binary number indicating the number of volume serial numbers for unlike volumes in the candidate list

Table 50. Target Volume Candidate List (continued)

Offset	Length or Bit Pattern	Description
0	2	Number (like) A halfword binary number indicating the number of volume serial numbers for like volumes in the candidate list
2	6	Volume serial (like) A 6-byte candidate volume serial number.
8	6	Volume serial (like) A 6-byte candidate volume serial number.
14	6	Volume serial (like) An array of 6-byte candidate volume serial number.
20	6	Volume serial (like) Each entry is a 6-byte candidate volume serial number.
(See note)	6	Volume serial (unlike) A 6-byte candidate volume serial number.
(See note)	6	Volume serial (unlike) A 6-byte candidate volume serial number.
(See note)	6	Volume serial (unlike) Each entry is a 6-byte candidate volume serial number.

Note: The offset of the first unlike volume serial number is $2 + 6 \times$ the number of like volume serials; each subsequent offset is 6 greater.

The contents of the target volume candidate list differs according to the way pools of target volumes are established and the subparameters of the SETSYS RECALL command. Details about volume pools can be found in the *z/OS DFSMSHsm Storage Administration*. Data sets are recalled to one of three target volume categories:

- Volumes associated with a user-defined pool of volumes
- Volumes with like source and target volume attributes
- Volumes with unlike source and target volume attributes

ARCRDTEXT Unlike Attribute Array

The unlike attribute array contains entries for each candidate volume in the candidate volume list with unlike attributes. Each entry indicates the attributes of the volume and the volume's unit type.

Table 51 shows the fields and offsets for an unlike attribute array list entry.

Table 51. Unlike Attribute Array List Entry

Offset	Length or Bit Pattern	Description
00 (X'00')	4	A 4-byte area containing the UCB device type.

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Table 51. Unlike Attribute Array List Entry (continued)

Offset	Length or Bit Pattern	Description
04 (X'04')	1	A 1-byte DFSMSHsm volume attribute flag. The bits are: 1... AUTOMIGRATION is specified on some processing units. 0... NOAUTOMIGRATION is specified on some processing units. .1. AUTOBACKUP is specified on some processing units. .0. NOAUTOBACKUP is specified on all processing units. ..1. BACKUPDEVICECATEGORY with TAPE or DASD is specified on the ADDVOL command. (The next bit indicates the keyword that was specified.) ..0. BACKUPDEVICECATEGORY(NONE) is specified on the ADDVOL command. ...1 BACKUPDEVICECATEGORY(TAPE) is specified on the ADDVOL command. ...0 BACKUPDEVICECATEGORY(DASD) is specified on the ADDVOL command.
05 (X'05')	3	Reserved.

Recalling Data Sets to Target Volumes Associated with User-Defined Pools: If the data set being recalled is associated with a user-defined pool:

- The first two components (unlike attribute array address and the number of unlike volumes) are not meaningful and are set to zero because there is no unlike attribute array.
- The third component (number of like volumes) gives the total number of volumes in the candidate list.
- The array of 6-byte volume serial numbers consists of eligible volumes in descending order of available free space. The volumes are not segregated by like or unlike attributes.
- The information found under “Recalling Data Sets to Target Volumes with Unlike Attributes” and “Recalling Data Sets to Target Volumes with Like Attributes” does not apply to user-defined pools.

Recalling Data Sets to Target Volumes with Unlike Attributes: If you specify SETSYS RECALL(ANYSSTORAGEVOLUME(UNLIKE)) or SETSYS RECALL(PRIVATEVOLUME(UNLIKE)), the candidate list contains all eligible volumes with available space in the following order:

1. Volumes with like attributes sorted by the most available free space.
2. Volumes with unlike attributes sorted in the following order:
 - a. Volumes with matching backup attributes and nonmatching space management attributes sorted by the most available free space.
 - b. Volumes with nonmatching backup attributes sorted by the most available free space.

Recalling Data Sets to Target Volumes with Like Attributes: If you specify SETSYS RECALL(ANYSSTORAGEVOLUME(LIKE)) or SETSYS RECALL(PRIVATEVOLUME(LIKE)), the candidate list contains only volumes with like attributes, sorted by the most available free space.

Overriding the System's Volume Priority: The recall target choice list is an array of five fullword binary fields into which the installation exit returns the choices for recall target volumes. You can write the exit to override the system's priority order for the target volumes by specifying the position of the desired volume in the recall target choice list.

Example: Specifying Choices for Recall Target Volumes:

The recall target choice list is numbered 1 through *n* where:

$$\text{unlike} + \text{like} = n$$

Indicate a maximum of five volumes in priority order that you want the recall to attempt. Figure 49 is an example of a recall target choice list that could have been derived from the target volume candidate list in Figure 48 on page 178.

Example: Target Volume Choice List Results:

$$2 + 4 = 6$$

where:

2 is the number of volumes with unlike attributes

4 is the number of volumes with like attributes

6 is the sum of volumes with unlike and like attributes

Target Volume Candidate List	Target Volume Choice List	
2 (unlike)	1	volserA (like)
4 (like)	3	volserC (like)
A (like)	5	volserE (unlike)
B (like)		
C (like)		
D (like)		
E (unlike)		
F (unlike)		

Figure 49. Recall Target Volume Choice Lists

A zero in the first choice position indicates that you have not made a selection and you want DFSMSHsm to make its own selection. If some choices are valid, any choices that are not valid are ignored. A choice that is not valid is a number greater than the size of the candidate list or a negative number. Message ARC0316I is written to the migration activity log to indicate that a choice is not valid, and has been returned. If none of the five choices are valid, the recall fails.

Recovering from an Abend of ARCRDTEXT Processing

If the recall exit abends, DFSMSHsm

- Does not recall the data set
- Holds undirected recalls
- Does not hold directed recalls
- Issues message ARC0004I and records it in the migration activity log
- Stops returning volumes to JES3 for setup, and JES3 setups that refer to migrated data sets end in error

DFSMSHsm does not disable the exit. Analyze the cause of the abend and determine if it is repeatable. If it is, disable the ARCRDTEXT exit by issuing the SETSYS EXITOFF(RD) command before releasing recall and JES3 setup.

ARCRPEXT: Return-Priority Installation Exit

The return-priority exit (ARCRPEXT) is taken as each delete, recall, or recover request [in the form of a management work element (MWE)] is about to be queued on one of DFSMSHsm's functional subtask queues for processing. Also, this exit can be used to prevent this processing. For a recall request, this exit is invoked by the host initiating the recall.

You can use the return-priority exit in the following ways:

- To set a priority (ranging from 0 to 100, where 100 is highest priority) for each request for which the user is waiting for results (WAIT type).
- To set a priority (ranging from 0 to 100) for each request for which the user is *not* waiting for results (NOWAIT type).

DFSMSHsm “primes” the priority field with either a default priority of 50 or the priority (for a data set recover request that is initiated from a volume recover request) that was assigned earlier to the initiating volume recover request. DFSMSHsm then queues the nonpurged requests for work in priority order. A priority less than 0 is treated as 0; a priority greater than 100 is treated as 100. DFSMSHsm queues two requests of the same type with the same priority in FIFO (first-in, first-out) order.

For recall and delete requests, “priority order” on the recall queue means:

- WAIT requests are queued before NOWAIT requests
- Priorities of WAIT requests are relative to other WAIT requests
- Priorities of NOWAIT requests are relative to other NOWAIT requests after WAIT requests:
 - NOWAIT requests (if any) with a relative priority of **50** are interleaved by the user ID of the submitter with other NOWAIT requests of priority 50
 - NOWAIT requests with a relative priority **greater than 50** are queued before those with a priority of 50, without interleaving
 - NOWAIT requests with a relative priority **less than 50** are queued after those with a priority of 50, without interleaving

You can assign priority values other than 50 for those NOWAIT requests that you do not want interleaved by user ID.

Note: *Interleave* means that the new MWE is placed on the queue so that if it is the *n*th request on the queue from that user ID, it follows all *n*th requests for any other user IDs, but precedes all *n*+1 requests from any other user IDs. All *n*th requests are put on the queue in FIFO order.

For **data set recover** requests, “priority order” on the data set recover queue means:

- WAIT requests are queued before NOWAIT requests
- Priorities of WAIT requests are relative to other WAIT requests
- Priorities of NOWAIT requests are relative to other NOWAIT requests, *after* WAIT requests

For **volume recover** requests, “priority order” on the volume recover queue means:

- WAIT requests are queued before NOWAIT requests
- Priorities of WAIT requests are relative to other WAIT requests
- Priorities of NOWAIT requests are relative to other NOWAIT requests, *after* WAIT requests.

- To manage the EATTR parameter of the recalled data set. If the return code is set to RC4, the data set will be recalled with EATTR=OPT parameter. This does *not* guarantee that allocation will go to the extended addressing space (EAS) of an extended address volume (EAV), but having the EATTR=OPT does allow the data set to be EAS eligible.
- To direct DFSMSHsm to enable extent-reduction recalls to a volume other than the original volume.
 - When MWEFEXT is set to 1, the recall is for extent reduction. Then you can use ARCRPEXT to set a bit in the output data structure. This bit indicates that the recall of the data set is permitted to select a level 0 volume other than the volume from which the data set has migrated.
 - When the data set is SMS managed, DFSMSHsm uses the ACS routines for volume selection. For non-SMS managed data sets, DFSMSHsm uses standard non-SMS volume selection.
- To purge a request. Note: there might be negative consequences from purging the recall requests. In some cases this can cause failures in applications or JCL that expect the data set to be recalled in order to complete an allocation request. Do not purge the request unless you fully understand how purging the recall request will affect the issuer of the request.
- To construct messages for a DFSMSHsm activity log concerning the request.

The method of installing the exit means that you can activate and deactivate it dynamically. If the exit is not currently active or if it encounters an abend, DFSMSHsm assigns a default priority of **50** to each recall, delete, and recover request being queued.

Characteristics of the ARCRPEXT Exit

The ARCRPEXT installation exit receives control after DFSMSHsm has received a request to delete or to recall a data set, or a request to recover a data set or volume, but before the MWE for such a request has been queued for the appropriate functional subtask.

For a recall request from tape, DFSMSHsm is normally able to flag that fact in the input data structure and flag that the device-type flag is valid. For a recall request from DASD, the MCD record is not read. Thus the device-type flag is not guaranteed to be valid, but the device type is nearly always DASD, even though the device type is flagged invalid (0).

For a recover request, if a data set or volume is being restored from a dump or a data set is being recovered, DFSMSHsm is able to set the proper device-type flag in

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the input data structure, with an indication that the device type is valid. For an MWE to recover (not restore) a volume, the device-type flag cannot be considered valid.

This exit is called for both system- and non-system-managed data sets.

Note: Do not confuse this exit with the data set deletion exit ARCADEXT or the recall exit ARCRDTEXT.

The ARCRPEXT routine must be reentrant.

Recovering from an Abend of ARCRPEXT Processing

If the return-priority exit abends when invoked for a *delete* or *recall* request, DFSMSHsm:

- Assigns a priority of **50** to the request
- Does *not* set EATTR=OPT parameter for the recalled data set
- Queues the request for processing
- Issues message ARC0504I with the abend code and records it in the migration activity log
- Disables the exit for delete and recall requests, or, if the exit previously abended when invoked for a recover request, disables the exit fully

If the return-priority exit abends when invoked for a *recover* request, DFSMSHsm:

- Assigns a priority of **50** to the request
- Queues the request for processing
- Issues message ARC0504I with the abend code and records it in the backup activity log
- Disables the exit for recover requests, or, if the exit previously abended when invoked for a delete or recall request, disables the exit fully

In either case, analyze the cause of the abend to determine if it is repeatable. If it is, replace the broken exit routine by following the procedure described in “Replacing DFSMSHsm Exits” on page 151.

ARCRPEXT Parameter List

Register 1 contains the address of the ARCRPEXT parameter list as shown in Table 52.

Table 52. ARCRPEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of data describing the request and the environment of its issuer.
04 (X'04')	4	The address of the actual management work element (MWE) representing the request, not a copy. For information about the MWE, see <i>z/OS DFSMSHsm Diagnosis</i> .
08 (X'08')	4	The address of an area to contain the results of the exit's feedback.

ARCRPEXT—Input Data Structure

The first word of “ARCRPEXT Parameter List” points to the area described in Table 53 on page 185.

Table 53. ARCRPEXT Input Data Structure

Offset	Length or Bit Pattern	Description
00 (X'00')	8	An identifier ('RPEXT001') of the level of interface to ARCRPEXT.
08 (X'08')	2	Type of request in the MWE: 1 (Recall) 2 (Delete) 3 (Recover)
10 (X'0A')	00..	Request issued by the operator or generated by DFSMSHsm.
	01..	Request issued from batch environment.
	10..	Request issued from interactive (TSO) environment.
	11..	Request issued from TMP (TSO background job) environment.
	..00	Reserved value.
	..01	Recovering a data set.
	..10	Restoring a volume from a dump (no incremental backups involved).
	..11	Recovering a volume from incremental backups (possibly involving a volume restore).
	.... 1...	Issuer is waiting for results.
	.... 0...	Nonwait request.
	.... .1..	Data coming from tape.
	.... .0..	Data coming from DASD.
	.... ..1.	Device-type flag (above) is valid.
	.... ..0.	Device-type flag (above) is not applicable.
	.... ...1	Data set recovery is initiated by volume command processing.
	.... ...0	Data set recovery is initiated by data set command processing.
11 (X'0B')	1	Reserved.
12 (X'0C')	8	User ID from the MWE. (An '*' in the first or second character identifies an internal user ID generated by DFSMSHsm.)
20 (X'14')	44	Data set name, if the request is for a data set; otherwise, first byte is binary 0.
64 (X'40')	6	Volume serial number, if the request is (1) to recover or restore a volume, or (2) a data set recover initiated by a command to recover this volume (bit 7 of offset 10 is 1). Otherwise, first byte is binary 0.

ARCRPEXT—Output Data Structure

The third word of "ARCRPEXT Parameter List" on page 184 points to the area described in Table 54.

Table 54. ARCRPEXT Output Data Structure

Offset	Length or Bit Pattern	Description
00 (X'00')	4	Binary return code from exit ARCRPEXT. See "ARCRPEXT Return Codes" on page 187.

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Table 54. ARCRPEXT Output Data Structure (continued)

Offset	Length or Bit Pattern	Description
04 (X'04')	1	A flag byte containing the following bits: 0... Use default priority for NOWAIT requests. 1... Use priority at offset 06 for NOWAIT requests (if return code does not request a purge). .0.. Default - no change to DFSMSHsm processing. .1.. Do not force extent-reduction recall to the original source volume. ..xx xxxx Reserved.
05(X'05')	1	Reserved.
06 (X'06')	2	Desired binary priority for the request. DFSMSHsm initializes this field with either a default value of 50 or the priority value (for a data set recover request initiated from a volume recover request) propagated from the initiating volume request.
08 (X'08')	4	Address of an area where your exit can construct messages for DFSMSHsm to write to the pertinent activity log. See "ARCRPEXT Message Area."

ARCRPEXT Message Area

Whether your exit has DFSMSHsm continue with a request or purge it, the exit has the option of constructing up to five messages for DFSMSHsm to write. Messages are written to the migration activity log for delete or recall requests and to the backup activity log for recover requests.

Table 55. ARCRPEXT Message Area

Offset	Length or Bit Pattern	Description
00 (X'00')	1	Number of messages (5) which can be built. (Set by DFSMSHsm before invoking the exit.)
01 (X'01')	1	Number of characters in MESSAGE1 text following.
02 (X'02')	121	Area for text of MESSAGE1.
123 (X'7B')	1	Number of characters in MESSAGE2 text following.
124 (X'7C')	121	Area for text of MESSAGE2.
245 (X'F5')	1	Number of characters in MESSAGE3 text following.
246 (X'F6')	121	Area for text of MESSAGE3.
367 (X'16F')	1	Number of characters in MESSAGE4 text following.
368 (X'170')	121	Area for text of MESSAGE4.
489 (X'1E9')	1	Number of characters in MESSAGE5 text following.
490 (X'1EA')	121	Area for text of MESSAGE5.

Before passing control to the exit, DFSMSHsm initializes each length field to binary 0 and each MESSAGE n field to blanks. When the exit returns control, DFSMSHsm checks for messages, in the sequence MESSAGE1 through MESSAGE5. In each case, if the length field is nonzero, DFSMSHsm treats the next byte as an ANSI printer control character and writes the following (maximum of 120) bytes as a message.

It is recommended that you use the following format for messages (although it is not enforced). The following message IDs are reserved for customer use:

- ARC90XX-Recall or delete request
- ARC91XX-Recover request

where "XX" is a two-digit number from 00 to 99.

Table 56. ARCRPEXT Suggested Message Format

Offset	Length or Bit Pattern	Description
00 (X'00')	1	ANSI-defined printer control characters (if not one of the following values, DFSMSHsm substitutes a blank). Before printing the message: Blank = Space 1 line 0 = Space 2 lines - = Space 3 lines 1 = Skip to line 1 on new page
01 (X'01')	8	Time of day, in the form HH:MM:SS (unpacked from the contents of register zero returned by macro TIME DEC).
09 (X'09')	2	Two blank characters for spacing.
11 (X'0B')	8	Date, in the form YY/MM/DD.
19 (X'13')	2	Two blank characters for spacing.
21 (X'15')	7	Message identifier: ARC90XX or ARC91XX
28 (X'1C')	1	Message type: I
29 (X'1D')	1	Blank character for spacing.
30 (X'1E')	91	Message content.

ARCRPEXT Return Codes

The following are the ARCRPEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 00 of the output data structure found in Table 54 on page 185.

Return Code

Description

00 (X'00')

DFSMSHsm queues the request, using the priority value (if a WAIT-type request, or if a NOWAIT-type request which indicates that a priority value is to be used) returned in the output data structure.

04 (X'04')

DFSMSHsm recalls the data set with EATTR=OPT parameter.

08 (X'08')

DFSMSHsm does not queue the request, but purges it without further processing.

Any other value

DFSMSHsm treats the value like a return code of 00.

ARCSAEXT: Space Management and Backup Installation Exit

You can use the space management and backup installation exit (ARCSAEXT) instead of the ARCADEXT, ARCBDEXT, or ARCMDEXT exits when any of those exits is constrained for virtual storage. Space is saved because ARCSAEXT does not build work elements for data sets it eliminates and because the exit is taken before DFSMShsm performs any data set eligibility tests.

Characteristics of the ARCSAEXT Exit

The ARCSAEXT installation exit receives control once for each data set processed during volume space management or backup. As data sets are migrated and backed up, the VTOC entry for each data set that DFSMShsm processes is copied into a VTOC copy data set. The VTOC copy data set contains selected information from the DASD volume that DFSMShsm is backing up or migrating.

DFSMShsm calls this exit for system- and non-system-managed data sets. A flag in the data set VTOC entry (DS1SMSDS) is passed to the exit, indicating whether the data set is system managed. DFSMShsm provides different parameter lists for system- and non-system-managed data sets.

Note: This exit can be passed list and utility DSCBs, but the DSCBs are not placed in the VTOC copy data set because these data sets are not backed up or migrated. For more information about list and utility data sets, see *z/OS DFSMShsm Storage Administration*.

The ARCSAEXT exit is not called for any of the following data set VTOC entries:

- ICF catalogs
- CVOLs
- VTOCs
- VTOC indexes
- VVDSs

For integrated catalogs, the exit is called for backup, but not for space management.

The ARCSAEXT routine must be reentrant.

Recovering from an Abend of ARCSAEXT Processing

If the space management and backup exit abends, DFSMShsm:

- Does not process the data set
- Stops processing the volume
- Holds the function (backup or migration)
- Issues message ARC0004I to the system console

DFSMShsm does not disable the exit. Analyze the cause of the abnormal end to determine if it is repeatable. If it is, disable the ARCSAEXT exit by issuing the SETSYS EXITOFF(SA) command before releasing the held function (backup or migration).

ARCSAEXT Parameter List for Non-System-Managed Data Sets

Register 1 contains the address of the ARCSAEXT parameter list for non-system-managed data sets as shown in Table 57 on page 189.

Table 57. ARCSAEXT Parameter List for Non-System-Managed Data Sets

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 140-byte area containing the data set VTOC entry being processed.
04 (X'04')	4	The address of a 6-byte area containing the volume serial number being processed.
08 (X'08')	4	The address of a flag byte containing the following bits: 1... The process is migration. .1. The process is delete if backed up (DBU). ..1. The process is delete by age (DBA). ...1 The process is backup.
12 (X'0C')	4	The address of a fullword binary return code. See "ARCSAEXT Return Codes" on page 190.

ARCSAEXT Parameter List for System-Managed Data Sets

Register 1 contains the address of the ARCSAEXT parameter list for system-managed data sets as shown in Table 58.

Table 58. ARCSAEXT Parameter List (System-Managed Data Sets)

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 140-byte area containing the data set VTOC entry being processed. If the data set VTOC entry cannot be found for an system-managed data set, the address of an area representing the data set VTOC entry is passed to the exit. The following fields are the only ones set in the pseudo data set VTOC entry: <ul style="list-style-type: none"> • Data set name (DS1DSNAM) • Format-1 identifier (DS1FMTID) • SMS indicator (DS1SMSDS) • VSAM indicator (DS1ORGAM)
04 (X'04')	4	The address of a 6-byte area containing the volume serial number being processed.
08 (X'08')	4	The address of a data set and processing information area, containing information described in "ARCSAEXT—Data Set and Processing Information Area."
12 (X'0C')	4	The address of a fullword binary return code field. See "ARCSAEXT Return Codes" on page 190.

ARCSAEXT—Data Set and Processing Information Area

The address at offset 8 of the parameter list points to the address of the 164-byte data set and processing information area in Table 59 on page 190. This data area applies only to system-managed data sets.

DFSMSHsm Exits

Table 59. ARCSAEXT Data Set and Processing Information Area

Offset	Length or Bit Pattern	Description
00 (X'00')	<ul style="list-style-type: none"> • 1... • .1.. • ..1. • ...1 	<ul style="list-style-type: none"> • The process is migration. • The process is delete if backed up (DBU). • The process is delete by age (DBA). • The process is backup.
01 (X'01')	3	Reserved.
04 (X'04')	1 flag byte: <ul style="list-style-type: none"> • 1... • .1.. • ..1. • ...1 • 1.. •1.. •1. 	<ul style="list-style-type: none"> • The data set does not have a data set VTOC entry. • The data set does not have a VVR entry. • The data set has a duplicate VVR entry. • This is the data component of a VSAM data set. • This is the index component of a VSAM data set. • This is an alternate index of a VSAM data set. • This is an alternate index with the upgrade attribute.
5 (X'05')	1 flag byte: <ul style="list-style-type: none"> • 1... • .1.. • ..1. • ...1 • 1.. •1.. •1. •1 	<ul style="list-style-type: none"> • This is a VSAM key-sequenced data set. • This is a VSAM entry-sequenced data set. • This is a VSAM relative-record data set. • This is a VSAM linear data set. • This is a generation data set. • This is a VSAM key-range data set. • This is the first segment of a VSAM key-range data set. • This is a temporary data set.
6 (X'06')	2	Reserved.
8 (X'08')	<ul style="list-style-type: none"> • 1 • H • M • N 	Status of a generation data set (character). Active generation data set. Rolled-off generation data set. Deferred generation data set.
9 (X'09')	1	Reserved.
10 (X'0A')	2	Length of the base cluster name.
12 (X'0C')	44	Base cluster name.
56 (X'38')	2	Length of the management class name.
58 (X'3A')	30	Management class name.
88 (X'58')	2	Length of the storage class name.
90 (X'5A')	30	Storage class name.
120 (X'74')	2	Length of the data class name.
122 (X'76')	30	Data class name.
152 (X'98')	8	Last backup date (microsecond clock format).

ARCSAEXT Return Codes

The following are the ARCSAEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 on the parameter list.

Return Code	Description
-------------	-------------

00 (X'00')

DFSMSHsm processes this data set for space management or backup.

04 (X'04')

DFSMSHsm does not process this data set for space management or for backup. For backup, DFSMSHsm includes this data set in the VTOC copy data set. For more information about VTOC copy data sets, see *z/OS DFSMSHsm Storage Administration*.

08 (X'08')

DFSMSHsm does not back up this data set. DFSMSHsm does not include this data set in the VTOC copy data set during normal processing. This return code is not defined for space management processing.

ARCSDEXT: Shutdown Installation Exit

The shutdown exit (ARCSDEXT) can perform the tasks of your choosing whenever DFSMSHsm is shutting down. Typically, such an exit would be used in tandem with the initialization exit (ARCINEXT). Data accumulated in tables obtained by ARCINEXT can be retrieved and processed and the table areas freed.

Characteristics of the ARCSDEXT Exit

The ARCSDEXT installation exit receives control just before DFSMSHsm terminates its functional subtasks.

As with the initialization exit, the installation-reserved fields are the only fields in the MCVT record that you are allowed to change. All other fields are reserved for IBM's use and are subject to change.

All parameters passed to ARCSDEXT are located above the 16 MB line and have 31-bit addresses. You should link-edit ARCSDEXT in AMODE 31.

Recovering from an Abend of ARCSDEXT Processing

If the shutdown exit abends:

- DFSMSHsm issues message ARC0004I along with the abend code from the system diagnostic work area (SDWA).
- DFSMSHsm continues shutting down

ARCSDEXT Parameter List

Register 1 contains the address of the ARCSDEXT parameter list as shown in Table 60.

Table 60. ARCSDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The pointer to the ADDRESS of the 140-byte area containing the data set VTOC entry being processed.
04 (X'04')	4	The address of a fullword binary return-code field. DFSMSHsm does not use this field.

MCVT User-Reserved Fields (for use with the ARCINEXT and ARCSDEXT Exits)

Table 42 on page 167 illustrates the MCVT user-reserved fields for use with the ARCINEXT and ARCSDEXT installation exits.

ARCTDEXT: Tape Data Set Installation Exit

You can use the tape data set exit (ARCTDEXT) to change the expiration date (JFCBXPDT field) on backup or migration tapes to a date other than 99365.

Characteristics of the ARCTDEXT Exit

The ARCTDEXT installation exit receives control when an output tape data set is opened during backup, migration, recycle, or tape copy processing, and the tape security option is either expiration date (EXPIRATION) or expiration date including password-protected data sets (EXPIRATIONINCLUDE).

You must write ARCTDEXT to be reentrant.

Recovering from an Abend of ARCTDEXT Processing

If the tape data set exit abends, DFSMSHsm:

- Stops processing the data set
- Stops processing the volume
- Holds the function
- Issues message ARC0004I

DFSMSHsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the ARCTDEXT exit by issuing the SETSYS EXITOFF(TD) command before releasing space management.

ARCTDEXT Parameter List

Register 1 contains the address of the ARCTDEXT parameter list as shown in Table 61.

Table 61. ARCTDEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 176-byte copy of the job file control block to be sent to the open routine.

ARCTEEXT: Tape-Ejected Installation Exit

You can use the tape-ejected exit (ARCTEEXT) to dynamically insert nonlibrary DFSMSHsm tapes in a library, as needed. This allows installations to run with a smaller tape library and have the choice of allocating tapes outside the library or dynamically re-inserting tapes that were previously ejected from the library. These actions can be done without causing jobs to fail or adversely affecting other DFSMSHsm activity. This exit gains control at a point before code that supports the TAPEINPUTPROMPT function is processed.

ARCTEEXT is called if DFSMSHsm determines that not all of the required tapes are in a single Automated Tape Library (ATL) or Manual Tape Library (MTL), or when one or more tapes is outside of a library. This gives the installation the opportunity to insert tapes into a library or tell DFSMSHsm to allocate the tape drives that are outside of a library or to fail the allocation request.

Characteristics of the ARCTEEXT Exit

The ARCTEEXT installation exit receives control after DFSMSHsm confirms that the tapes needed during the following DFSMSHsm functions are not in a library:

- **Recalling** data sets from migration level 2 tape volumes
- **Recovering** data sets or volumes from backup tape volumes
- **Restoring** data sets or volumes from dump tape volumes
- **Recycling** migration level 2 or backup tape volumes

The ARCTEEXT routine must be reentrant and can be either 24-bit mode or 31-bit mode.

Recovering from an Abend of ARCTEEXT Processing

If the tape-ejected exit abends, DFSMSHsm:

- Issues message ARC0502I
- Disables the exit
- Continues processing as if the exit were set off

Analyze the cause of the abend to determine if the exit is likely to abend again. If it is, replace the broken exit routine with a version that has been fixed, before you invoke the exit again. Reenable the exit with the steps described in “Installing DFSMSHsm Exits” on page 150.

User-Created Messages

Message numbers ARC9000 through ARC9299 have been set aside for use by DFSMSHsm installation exits, either as samples supplied by DFSMSHsm or messages written by customers. See “Creating User-Defined Messages” on page 154.

ARCTEEXT Parameter List

Register 1 contains the address of the ARCTEEXT parameter list as shown in Table 62.

Table 62. ARCTEEXT Parameter List

Offset	Length or Bit Pattern	Description
00(X'00')	4	<p>The address of a 4-byte data area containing flags that indicate the function being processed and the type of tapes needed.</p> <p>Byte 0 of the 4-byte data area contains the following bits:</p> <p>1... Data set recovery function.</p> <p>.1. Volume recovery function.</p> <p>..1. Data set recall function.</p> <p>...1 Volume recycle function.</p> <p>... 1... Data set restore function.</p> <p>.... .1. Volume restore function.</p> <p>Byte 1 of the 4-byte data area contains the following bits:</p> <p>1... Migration level 2 tape volume.</p> <p>.1. Backup tape volume.</p> <p>..1. Dump tape volume.</p>
04(X'04')	4	The address of a 2-byte count field followed by 6-byte volume serials needed to process this function. The count field contains the number of volumes needed.
08(X'08')	4	The address of a fullword binary return code described in “ARCTEEXT Return Codes” on page 194.

ARCTEEXT Return Codes

The following list contains the ARCTEEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 08 on the parameter list.

Return Code

Description

00 (X'00')

The tape volumes do not remain in a library and are not intended to be in a library.

DFSMSHsm again validates that the needed tapes are not located in a library, or that the needed tapes are all located within a single library. If the tapes are not in a library, DFSMSHsm allocates a tape drive that is not associated with a library. If the tapes are all in a single library, DFSMSHsm allocates a tape drive associated with that library.

This exit will not be reinvoked for this tape drive allocation.

04 (X'04')

The tape volumes have now been moved by the customer into a library.

DFSMSHsm again validates that all needed tapes are located within a single library. If the tapes are not all in a single library, DFSMSHsm reinvokes this exit until they all are, or until the return code from this exit is something other than 04 (X'04').

08 (X'08')

The request fails without an allocation.

ARCTVEXT: Tape Volume Installation Exit

The tape volume exit (ARCTVEXT) lets a tape management system know that DFSMSHsm is releasing ownership of a DFSMSHsm tape.

Attention: DFSMS/MVS DFSMSHsm Version 1 Release 4 and subsequent releases no longer use the ARCTVEXT exit to communicate with DFSMSrmm. Invoke the ARCTVEXT exit only if you are using another tape management product.

Characteristics of the ARCTVEXT Exit

The ARCTVEXT installation exit receives control during the following situations:

- DFSMSHsm tape deletion processing.

The ARCTVEXT exit receives control either when all valid data is removed from a tape, or when a RECYCLE FORCE command is issued. All valid data is removed after a backup or migration tape is recycled, after a dump tape has its contents deleted, or when the DELVOL PURGE command is used. This exit is called for each tape, regardless of whether the SCRATCHTAPE or HSMTAPE option is specified for the SETSYS TAPEDELETION command. If you jointly manage your tapes with a tape management system other than DFSMSrmm, you can write the exit routine to inform the tape management system that the tape no longer contains valid DFSMSHsm data. (Users of DFSMSrmm do not need this exit because the equivalent DFSMSHsm/DFSMSrmm interface is always invoked.)

If an alternate tape exists for a tape that is being deleted, both the alternate tape and the original tape are deleted by a single call to delete the original tape.

- Backup of the control data sets and journal if the SETSYS CDSVERSIONBACKUP command has been specified.
This exit is called after DFSMSHsm uncatalogs the oldest backup version. The exit is called separately for each tape associated with the version being rolled off.
- Tape replace processing when an original tape is replaced by an alternate tape. The ARCTVEXT exit releases the original tape.
- Tape copy processing if a failure occurs after the alternate tape is mounted.
- EXPIREBV command processing when the EXPIREBV command is issued for ABARSVERSIONS.
This exit is called after DFSMSHsm successfully deletes each ABACKUP output file associated with the ABARS version being expired. The exit is called separately for each tape volume associated with the files being deleted as part of the expiration process. The exit is called without alternate volumes.
- ABACKUP or ARECOVER roll-off processing.
This exit is called before DFSMSHsm backs up or recovers an aggregate if DFSMSHsm determines that one or more of the oldest ABARS version records should be rolled off. The exit is called separately for each tape associated with the files belonging to the version being rolled off.
- ABACKUP processing when a failure occurs.
During ABACKUP cleanup processing, this exit is called separately for each tape associated with each ABACKUP output file being deleted during the cleanup process.

The tape volume exit does not receive control when tapes are being marked unavailable by DFSMSHsm.

You must write ARCTVEXT to be reentrant.

Recovering from an Abend of ARCTVEXT Processing

If the tape volume exit abends, DFSMSHsm:

- Disables the exit.
- Issues message ARC0502I and records it in the log for the function DFSMSHsm has been performing.
If the tape volume exit abends during ABACKUP cleanup processing, DFSMSHsm issues message ARC6187E and holds ABACKUP processing after cleanup has been completed.

Analyze the exit to determine if the abend is repeatable. If it is, replace the broken exit with a version that has been fixed. Reenable the exit with the steps described in “Installing DFSMSHsm Exits” on page 150.

ARCTVEXT Parameter List

Table 63 on page 196 shows that register 1 contains the address of the ARCTVEXT parameter list.

Note: If there is an alternate volume, there are three addresses in the parameter list; if there is no alternate volume, there are only two addresses in the parameter list. The high order bit of the second address distinguishes between these two options.

DFSMSHsm Exits

Table 63. ARCTVEXT Parameter List

Offset	Length or Bit Pattern	Description
0 (X'00')	4	The address of an 8-byte area (see Table 64), where the first 6 bytes contain the volume serial number of the volume having no valid data, followed by a 2-byte field.
4 (X'04')	4	The address of a fullword binary return code described in "ARCTVEXT Return Codes" on page 197. If the high order bit is 1, then there is no alternate volume and the parameter list is 8 bytes long. If the high order bit is 0 and the address at offset 8 is nonzero, then there is an alternate volume and the parameter list is 12 bytes long.
8 (X'08')	4	The address of an 8-byte area (see Table 64), where the first 6 bytes contain the volume serial number of the alternate volume that has no valid data, followed by a 2-byte field.

ARCTVEXT Data Area

The parameter list points to the address of the 8-byte ARCTVEXT data area as shown in Table 64.

Table 64. ARCTVEXT Data Area

Offset	Length or Bit Pattern	Description
00 (X'00')	6	The volume serial number of the tape with no valid data.
06 (X'06')	1	A flag field containing the following: 1... The tape is being purged. This pattern is always set for alternate volumes. 0... The tape is being unassigned or reassigned. .1.. The data sets on this tape have been expiration-date protected by DFSMSHsm. Tapes with expiration-date-protected data sets might need to be reinitialized when they are purged from DFSMSHsm control. ..1. The data sets on this tape have been password protected by DFSMSHsm. Tapes with password-protected data sets might need to be reinitialized when they are purged from DFSMSHsm control.

Table 64. ARCTVEXT Data Area (continued)

Offset	Length or Bit Pattern	Description
07 (X'07')	1	A flag byte containing the following: 00.. Reserved. 01.. The SETSYS TAPEDELETION option has not been specified. This pattern is not set for alternate volumes. 10.. The SETSYS TAPEDELETION(SCRATCHTAPE) option has been specified or is the default for this category of DFSMSHsm tape. 11.. The SETSYS TAPEDELETION(HSMTAPE) option has been specified or is the default for this category of DFSMSHsm tape. ..1. This is a TAPECOPY request to delete only the duplex alternate tape. ...x Reserved. 0000 Reserved. 0001 This is a migration tape or migration alternate tape. 0010 This is a backup tape or backup alternate tape. 0011 This is a dump tape. This pattern is not set for alternate tapes. 0100 This is a CDS backup tape. This pattern is not set for alternate tapes. 0101 This is an ABARS output tape. This pattern is not set for alternate tapes.

ARCTVEXT Return Codes

The following list contains the ARCTVEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 08 of the parameter list.

Return Code	Description
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00 (X'00')	ARCTVEXT exit processed normally.
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04 (X'04')	ARCTVEXT exit processed abnormally. The exit is not called again until the problem is resolved.
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If the exit is called during ABACKUP failure processing and the exit returns a code of 4, the exit is disabled for the currently active ABARS secondary address space.

Chapter 7. DFSMSHsm ABARS Installation Exits

You can use DFSMSHsm ABARS installation exits to customize DFSMSHsm ABARS processing.

The DFSMSHsm installation exits fall into two categories: exits that support basic DFSMSHsm functions and exits that support DFSMSHsm ABARS functions. This topic describes only the exits that support the DFSMSHsm ABARS functions. For information about the DFSMSHsm installation exits that support basic DFSMSHsm functions, see Chapter 6, “DFSMSHsm Installation Exits,” on page 149.

Table 65 lists the DFSMSHsm ABARS exits.

Table 65. ABARS Installation Exits

Module Name	Description	When Available	Where to Look
ARCBEXT	ABARS backup error exit	During aggregate backup.	“ARCBEXT: ABARS Backup Error Installation Exit” on page 202
ARCCREXT	ABARS data set conflict resolution exit	During aggregate recovery verification when an INCLUDE data set to be recovered has the same name as a data set already existing at the aggregate recovery site.	“ARCCREXT: ABARS Conflict Resolution In Installation Exits” on page 204
ARCEDEXT	ABARS expiration date exit	Prior to allocation of an ABACKUP output file.	“ARCEDEXT: ABARS Expiration Date Installation Exit” on page 206
ARCM2EXT	ABARS migration level 2 data set exit	During aggregate backup when a data set on a migration level 2 volume is to be backed up.	“ARCM2EXT: ABARS Migration Level 2 Data Set Installation Exit” on page 207
ARCSKEXT	ABARS data set skip exit	During aggregate recovery for each data set being restored.	“ARCSKEXT: ABARS Data Set Skip Installation Exit” on page 208
ARCTVEXT	ABARS tape volume exit	When a DFSMSHsm-owned ABARS tape no longer contains valid data, and therefore becomes empty. This exit also supports non-ABARS, DFSMSHsm-owned tapes. See Chapter 6, “DFSMSHsm Installation Exits,” on page 149, “Characteristics of the ARCTVEXT Exit” on page 194 for more information.	“ARCTVEXT: Tape Volume Installation Exit” on page 209

Using DFSMSHsm ABARS Exits

This section contains information that is common to all DFSMSHsm ABARS installation exits.

Installing DFSMSHsm ABARS Exits

The ABARS exits are loaded at the startup of the DFSMSHsm ABARS secondary secondary address space, if the EXITON parameter is specified for the ABARS exits associated with ABACKUP or ARECOVER functions. The ARCBEEEXT, ARCM2EXT, ARCEDEXT, and ARCTVEXT exits are associated with the ABACKUP function and the ARCCREXT, ARCSKEXT, and ARCTVEXT exits are associated with the ARECOVER function.

The ARCTVEXT exit must run in 24-bit addressing mode below the 16MB line.

The ABARS exits receive control in 31-bit mode, but all passed parameters are in 24-bit storage.

See “Adding a New Exit” on page 4.

Writing DFSMSHsm ABARS Exits

You can tailor DFSMSHsm ABARS functions with the DFSMSHsm ABARS installation exits. As you write exits, remember that they run as if they were DFSMSHsm code. Therefore, it is recommended that you routinely incorporate the following considerations whenever you write ABARS installation exits:

- Keep supervisor services such as I/O to a minimum.
- It is not necessary to write the ABARS installation exits as reentrant, with the exception of ARCTVEXT (ABARS tape volume exit).

Also always remember that DFSMSHsm installation exits:

- Run enabled for interrupts.
- Run in problem program state.
- Run in either the DFSMSHsm primary address space or the ABARS secondary address space.
- Have pageable storage.
- Are protected by ESTAE.
- Are entered in the standard address space protection key of 8. Control must return in the same key as at entry.
- Execute in an authorized program facility (APF) authorized address space.

Note: Since your load modules are not intended to be job step tasks, do not link edit them with APF authorization (AC=1). Doing so would be an unnecessary risk to system integrity and security.

Replacing ABARS Exits

The ABARS exits are unlike the other DFSMSHsm exits because they are not dynamically loaded and unloaded when the SETSYS EXITON and SETSYS EXITOFF commands are specified. Instead, ABARS exits are loaded when the ABARS secondary address space is initialized if the SETSYS EXITON command has been specified.

To replace an ABARS exit:

1. Link-edit the new version of the exit and place it in the appropriate link library.
2. Issue the F LLA,REFRESH command.
3. Issue the SETSYS EXITON command for the ABARS exit you want to call during ABARS processing.
4. Issue the ABARS ABACKUP or ARECOVER command.

The new exit will be loaded and called by ABARS processing.

When the SETSYS EXITOFF command is issued for an exit that is active, the exit is no longer called, but it is not unloaded. When the SETSYS EXITON command is specified for an exit that is not active, the exit is not loaded or called until an ABARS command causes a secondary address space to be initialized.

Registers on Entry to DFSMSHsm ABARS Installation Exits

Before the exit is called, the contents of the registers are:

Register	Contents
0	Not applicable
1	Address of input parameters
2–12	Not applicable
13	Address of register save area
14	Caller's return address
15	Address of exit entry point

Registers on Return from DFSMSHsm ABARS Installation Exits

Before the exit routine ends, the contents of the registers are:

Register	Contents
0	Not applicable
1–14	Restored to contents at entry
15	Not applicable

Calling DFSMSHsm ABARS Installation Exits

The DFSMSHsm ABARS installation exits must be accessible by the LOAD macro and must communicate with the standard MVS linkage for registers. "Registers on Entry to DFSMSHsm ABARS Installation Exits" and "Registers on Return from DFSMSHsm ABARS Installation Exits" describe standard MVS linkage with which DFSMSHsm complies. The exits must save and restore registers. DFSMSHsm does not place return codes in the registers; it includes them as parameters in the parameter list for exits that provide return codes. An installation exit cannot issue the DFSMSHsm supervisor call instruction (SVC).

Each exit parameter list contains pointers to the information described in the discussion of each individual exit. It points to copies of the information unless specifically stated otherwise.

Because DFSMSHsm responds differently to abends that occur for different exits, the actions DFSMSHsm takes are described for each exit. Generally, when an exit abends, DFSMSHsm issues a HOLD on the function, writes a message, and does not call the exit again until either a DFSMSHsm RELEASE command releases the function or a SETSYS command requests the function.

DFSMSHsm ABARS Exits

If an exit abends and you require a dump for problem determination, see *z/OS DFSMSHsm Diagnosis*. Exits are not subject to TRAP commands.

Table 66 lists the hex values for exits that do selective processing based on the device type DFSMSHsm is processing.

Table 66. Hexadecimal Values for UCB Device Types

Unit Name	UCB Device Type Third and Fourth Bytes (Note 1)
3380	X'200E'
3390	X'200F'
3420	X'8003'
3423	X'8082'
3480	X'8080' (Note 2)
3480X	X'8080' (Note 2)
3490	X'8081'
3590-1	X'8083'
9345	X'2004'

Note:

1. The logical device names for some tape devices are different from their physical device names. 3480XF tape devices are identified with 3480X in the JCL; therefore, specify 3480X in the JCL when identifying 3480XF tape devices to DFSMSHsm.
2. A tape device supports improved data recording capability if the 04 bit is on in the second byte of the four-byte UCB device-type code.

Creating User-Defined Messages

Message numbers ARC9000 through ARC9299 have been set aside for use by DFSMSHsm installation exits, either as samples supplied by DFSMSHsm or messages written by customers. For an explanation of these messages, customers have to locate the issuing exit or any user-created documentation for that exit.

The ARCRPEXT installation exit is able to pass messages back to DFSMSHsm, and DFSMSHsm writes these messages in the migration or backup activity log. Message numbers ARC9000 through ARC9199 are intended for use specifically for the ARCRPEXT exit. User messages issued by other DFSMSHsm installation exits would generally be write-to-operator (WTO) messages.

ARCBEEEXT: ABARS Backup Error Installation Exit

You can use the ABARS backup error exit to skip any data set associated with an I/O error, SDSP allocation error, data set noncataloged error, error during DFSMSDss dump processing, or an error enqueueing the ARCDNS resource, so that the data set is not backed up. This allows aggregate backup to complete without ending early should any of these errors occur.

Characteristics of the ARCBEEEXT Exit

The ABARS backup error exit receives control during aggregate backup processing, after verification has completed successfully, when:

- An error occurs reading a data set, including a DFSMSHsm control data set (CDS)
- An error occurs in allocating an small data set packing (SDSP) data set

- An error occurs while DFSMSdss is dumping level 0 DASD data sets in the INCLUDE list
- An uncataloged data set is encountered in the selection data set
- A data set fails serialization when ABARS is attempting to enqueue on the major name of ARCDSN and the minor name consisting of a data set name

A distinction is made between CDS I/O errors, non-CDS I/O errors, and SDSP allocation errors.

Recovering from an Abend of ARCBEEEXT Processing

If the ABARS backup error exit abends, DFSMSHsm:

- Fails aggregate backup
- Holds aggregate backup
- Issues message ARC6187E and records it in the ABARS activity log

DFSMSHsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the exit by issuing the SETSYS EXITOFF(BE) command before releasing and restarting the aggregate backup task.

ARCBEEEXT Parameter List

Register 1 contains the address of the ARCBEEEXT parameter list as shown in Table 67.

Table 67. ARCBEEEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of 44-byte area containing the name of the data set that encountered the error.
04 (X'04')	4	The address of a 4-byte flag field that shows the error type the data set encountered. The bits are: 1... This is a non-CDS I/O error. .1.. This is a CDS I/O error. ..1. This is an SDSP allocation error. ...1 Data set not cataloged. 1... Data set failed serialization. .... .1.. Data set failed DFSMSdss dump processing.
08 (X'08')	4	The address of a fullword binary return code field.

ARCBEEEXT Return Codes

The following list contains the ARCBEEEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 08 of the parameter list.

Return Code

Description

0 (X'00')

The aggregate backup fails.

4 (X'04')

Do not back up this data set. Continue the backup with the next data set.

ARCCREXT: ABARS Conflict Resolution In Installation Exits

You can use the ABARS conflict resolution exit to resolve like-named data set conflicts by failing the recovery, skipping the data set, replacing the existing data set, or renaming the data set.

Characteristics of the ARCCREXT Exit

The ABARS conflict resolution exit receives control during aggregate recovery verification when an INCLUDE data set to be recovered has the same name as a data set already existing at the aggregate recovery site. The ARCCREXT exit is called after ARCSKEXT.

Table 68 shows the possible decisions you can make concerning the ARCCREXT installation exit and the procedures needed to inform DFSMSHsm of your decision.

Table 68. Possible Results of ARCCREXT Processing

IF YOU WANT TO	THEN
Stop the aggregate recover	Place return code 0 in the return code area of the parameter list.
Skip the data set in conflict	Place return code 4 in the return code area of the parameter list.
Replace the existing data set with the data set being recovered	Place return code 8 in the return code area of the parameter list.
Rename the data set being recovered	Perform the following steps: <ol style="list-style-type: none"> Put the new name in the area pointed to by the parameter list at offset 04. Pad the name on the right with blanks. You cannot rename a migrated VSAM data set. If you try, DFSMSHsm skips the recovery of the VSAM data set. Migrated non-VSAM data sets can be renamed if only the high-level qualifier of the data set name is changed. Using this exit to rename more than just the data set's high-level qualifier causes an error (message ARC6325E) and the data set will not be processed during ARECOVER. Place return code 12 in the return code area of the parameter list.

The disposition you specify for a data set in this installation exit takes precedence over subsequent processing. A data set is replaced or renamed, if specified, regardless of whether the ARECOVER REPLACE command is specified.

Recovering from an Abend of ARCCREXT Processing

If the ABARS conflict resolution exit abends, DFSMSHsm:

- Fails aggregate recovery
- Holds aggregate recovery
- Issues message ARC6187E and records it in the ABARS activity log

DFSMShsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the exit by issuing the SETSYS EXITOFF(CR) command before releasing and restarting aggregate recovery.

ARCCREXT Parameter List

Register 1 contains the address of the ARCCREXT parameter list as shown in Table 69.

Table 69. ARCCREXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 44-byte area containing the real name of the data set about to be recovered.
04 (X'04')	4	The address of a 44-byte area containing the name that you want replace the existing data set name with (you specify a return code of 12). You must pad the name on the right with blanks to total 44 characters.
08 (X'08')	4	The address of a 1-byte flag field containing the following: 1... The allowable limit of 256 renamed data sets has been reached. .1. The allowable limit has not been reached. ..1. The recovery will be processed as a DFSMSDss restore. ...1 This is a migrated data set. 1... This is a VSAM data set. .... .1. An existing GDG base name has been encountered. When this bit is set to '1' (on), the GDG base name is passed in the DSNAME field. If you want to recover associated GDSs using the existing GDG base, ensure that you code a return code of '8' for the exit's return code. If you code any other return code, the ARECOVER command fails unless the command is issued with the REPLACE parameter. 1. This data set naming conflict occurs when you attempt to restore an ICF User Catalog.
12 (X'0C')	4	The address of a fullword binary return code.
16 (X'10')	4	The address of a 1-byte flag field containing the following: 1... The data set is from the INCLUDE list. .1. The data set is from the ACCOMPANY list. ..1. The data set is from the ALLOCATE list.

ARCCREXT Return Codes

The following list contains the ARCCREXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 of the parameter list.

Return Code

Description

0 (X'00')

The aggregate recovery fails.

4 (X'04')

Aggregate recovery does not recover the data set, but skips to the next data set to be processed.

8 (X'08')

Aggregate recovery replaces the existing data set at the recovery site with the like-named data set being recovered.

12 (X'0C')

Aggregate recovery renames the data set being recovered. You must specify the new name in the parameter list.

16(X'10')

Aggregate recovery renames the existing data set at the recovery site with the returned new high-level qualifier before recovery. The source data set is recovered with the original name. This action is comparable to the DATASETCONFLICT RENAMETARGET(level) parameter.

ARCEDEXT: ABARS Expiration Date Installation Exit

You can use the ABARS expiration date exit to modify the expiration date for ABARS ABACKUP output tapes. Aggregate backup processing sets the expiration date of aggregate (ABACKUP) output tapes to 99365 as a default. If you want to modify the expiration date for the ABACKUP tapes, you must override the default expiration date by using the ARCEDEXT installation exit.

Characteristics of the ARCEDEXT Exit

You do not need to write the ARCEDEXT to be reentrant.

The expiration date is expressed in packed decimal hex digits X'0cyyddd f ', where:

Variable

Description

<i>0c</i>	The century: If C is 0, the year is 19 <i>yy</i> If C is 1, the year is 20 <i>yy</i>
<i>yy</i>	The last two digits in the year.
<i>ddd</i>	The Julian day (1–366)
<i>f</i>	The sign digit

For example, January 1, 1996 would be represented as X'0096001F'. January 1, 2010 would be represented as X'0110001F'.

Recovering from an Abend of ARCEDEXT Processing

If the ABARS expiration date exit abends, DFSMSHsm:

- Fails the aggregate backup
- Holds the aggregate backup processing
- Issues message ARC6187E and records it in the ABARS activity log

DFSMSHsm does not disable the exit. Analyze the exit to determine if the abend is repeatable. If it is, disable the exit by issuing the SETSYS EXITOFF(ED) command before releasing aggregate backup.

ARCEDEXT Parameter List

Table 70 on page 207 shows that register 1 contains the address of the ARCEDEXT parameter list.

Table 70. ARCEDEXT Parameter List

Offset	Length or Bit Pattern	Description
0 (X'00')	4	The address of a 44-byte area containing the name of the aggregate backup file being processed.
4 (X'04')	4	The address of a fullword packed decimal field containing the expiration date for the aggregate backup file. On input to the exit, the field is primed with a value of X'0099365F'. The exit can alter this value to indicate a new retention period or date. If the ABACKUP command is issued to back up an aggregate group defined in a pre-DFSMS/MVS 1.1.0 environment, the expiration date or retention period is passed in this field. The next field indicates whether an expiration date or retention period is being passed.
8 (X'08')	4	The address of a 4-byte field of flags. The first bit indicates whether the exit is being passed a retention period or an expiration date. 1... Indicates that a retention period is being passed to the exit. 0... Indicates that an expiration date is being passed to the exit.
12 (X'0C')	4	The address of a fullword binary return code.

ARCEDEXT Return Codes

The following list contains the ARCEDEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 12 of the parameter list.

Return Code

Description

0 (X'00')

You have not altered the expiration period.

4 (X'04')

You have altered the expiration period.

ARCM2EXT: ABARS Migration Level 2 Data Set Installation Exit

You can use the ABARS migration level 2 data set exit to skip any or all data sets residing on migration level 2 volumes so they are not backed up.

Characteristics of the ARCM2EXT Exit

The ABARS migration level 2 data set exit receives control during aggregate backup (after verification has completed successfully) when a data set on an migration level 2 volume is to be backed up.

Recovering from an Abend of ARCM2EXT Processing

If the ABARS migration level 2 data set exit abends, DFSMSHsm:

- Fails aggregate backup
- Holds aggregate backup processing
- Issues message ARC6187E and records it in the ABARS activity log

DFSMSHsm does not disable the exit. Analyze the abend to determine if it is repeatable. If it is, disable the ARCM2EXT exit by issuing the SETSYS EXITOFF(M2) command before releasing aggregate backup.

ARCM2EXT Parameter List

Register 1 contains the address of the ARCM2EXT parameter list as shown in Table 71.

Table 71. ARCM2EXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 44-byte area containing the name of the migration level 2 data set about to be backed up.
04 (X'04')	4	The address of a fullword binary area containing the UCB device type (from the UCBTYP field of the UCB) of the device containing the data set. See Table 66 on page 202
08 (X'08')	4	The address of a fullword binary return code.

ARCM2EXT Return Codes

The following list contains the ARCM2EXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 08 of the parameter list.

Return Code

Description

00 (X'00')

Permit aggregate backup to back up this data set.

04 (X'04')

Do not permit aggregate backup to back up this data set.

ARCSKEXT: ABARS Data Set Skip Installation Exit

You can use the ABARS data set skip exit to skip any data set so that it is not recovered.

Characteristics of the ARCSKEXT Exit

The ARCSKEXT exit receives control during aggregate recovery (during verification) after DFSMSHsm determines that the data set should be recovered, but before actual recovery. This exit is called before the ARCCREXT exit and prior to any data set conflict resolution processing.

When a data set has been renamed, ARCSKEXT is called twice if either the ARECOVERNEWNAMELEVEL or ARECOVERNEWNAMEALL parameter is specified on the ARECOVER command. ARCSKEXT is first called with the original data set name; if it is not skipped and the return code from the exit is 0, it is called again with the new data set name that resulted from the rename action.

Recovering from an Abend of ARCSKEXT Processing

If the ABARS data set skip exit abends, DFSMSHsm:

- Fails aggregate recovery
- Holds aggregate recovery processing
- Issues message ARC6187E and records it in the ABARS activity log

DFSMSHsm does not disable the exit. Analyze the cause of the abend to determine if it is repeatable. If it is, disable the exit by issuing the SETSYS EXITOFF(SK) command before releasing and restarting the aggregate recovery task.

ARCSKEXT Parameter List

Register 1 contains the address of the ARCSKEXT parameter list as shown in Table 72.

Table 72. ARCSKEXT Parameter List

Offset	Length or Bit Pattern	Description
00 (X'00')	4	The address of a 44-byte area containing the name of the data set about to be recovered.
04 (X'04')	4	The address of a fullword binary return code.

ARCSKEXT Return Codes

The following list contains the ARCSKEXT return codes. You must put one of these codes, in binary, into the area pointed to at offset 04 of the parameter list.

Return Code

Description

00 (X'00')

Permit aggregate recovery to recover this data set.

04 (X'04')

Have aggregate recovery skip this data set.

ARCTVEXT: Tape Volume Installation Exit

You can use the tape volume exit to let a tape management system know that DFSMShsm is releasing ownership of a DFSMShsm tape.

Attention: ARCTVEXT exit is not required to communicate with DFSMSrmm. Invoke the ARCTVEXT exit only if you are using another tape management product.

The ARCTVEXT exit is used for both ABARS and non-ABARS DFSMShsm-owned tapes. You can find a description of this exit in Chapter 6, "DFSMShsm Installation Exits," on page 149, under "ARCTVEXT: Tape Volume Installation Exit" on page 194.

Note: Many tape management product vendors provide their own version of this exit.

Chapter 8. DFSMSdss Installation Exits

This topic explains how you can customize DFSMSdss by writing exit routines. DFSMSdss exits routines are:

Table 73 describes the DSS Installation Exits.

Table 73. DSS Installation Exits

Module Name	Description	When Available
ADRDYEXT _EXIT1	DFSMSdss Dynamic Exit	
ADRUPSWD	Authorization Exit Routine	Volume level and data set level
ADRUENQ	Enqueue Exit Routine	
ADRUIXIT	Options Exit Routine	When DFSMSdss is invoked and also before the processing of each task.
ADRREBLK	Reblock Exit Routine	See “Reblock Installation Exit Routine (ADRREBLK)” on page 232.

Installing and Replacing DFSMSdss Installation Exit Routines

See “Replacing an Existing Exit” on page 3. Your routine must have an entry point name that matches the exit name. Your CSECT is linked together with certain system CSECTs into a single load module.

Characteristics of DFSMSdss Installation Exit Routines

All DFSMSdss Installation Exits are called:

- In 31-bit addressing mode
- With authorized program facility (APF) authorization (if DFSMSdss is APF-authorized), and
- In key 8 problem state.

The exits are intended for use only by system programmers who must use caution with APF authorization. As with all subroutines, do *not* link edit installation exits with APF authorization.

DFSMSdss installation exits must:

- Observe standard register save and restore functions
- Be written in reentrant code
- Be link-edited with the DFSMSdss load module, ADRDSSU
- Restore the execution environment (31-bit addressing mode, key 8, problem state) before returning to DFSMSdss.

DFSMSdss Dynamic Exit (ADRDYEXT_EXIT1)

The ADRDYEXT_EXIT1 dynamic exit uses the dynamic exits service, CSVDYNEX, which is described in *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN*. Using this service, the ADRDYEXT_EXIT1 dynamic exit has been defined to allow multiple exit routines to be invoked, to process the functions that the dynamic exit supports. The ADRDYEXT_EXIT1 dynamic exit will support functions related to data set notification related events. This includes:

- Closing allocated file systems. An exit routine will gain control to determine if any action needs to be taken for a data set for which serialization cannot be performed because the data set was allocated and the SMS management class for class transition specified USEREXIT to indicate that the dynamic exit should be invoked.

Using this facility, the system provides a dummy exit routine, ADRDYX01, which is defined to be called when the ADRDYEXT_EXIT1 dynamic exit routine is invoked by the system. A sample version of this dummy exit routine is provided in the SAMPLIB as member ADRDYXS1. This exit routine can be replaced with installation code, or installations can associate their own exit routines with this dynamic exit. For more details, see the “Adding an Exit Routine to an Exit” chapter in *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN*.

Each defined exit routine to the ADRDYEXT_EXIT1 dynamic exit will be called when the dynamic exit is called by the system. Since the dynamic exits facility allows multiple exit routines to be simultaneously defined to a single exit, coordination of processing between these exit routines is necessary.

Characteristics of the DFSMSdss Dynamic Exit, ADRDYEXT_EXIT1

All DFSMSdss exit routines connected to ADRDYEXT_EXIT1 are called:

- In 31-bit addressing mode
- With authorized program facility (APF) authorization (if DFSMSdss is APF-authorized)
- In key 8 problem state.

They also must:

- Observe standard register save and restore functions
- Be written in reentrant code
- Restore the execution environment (31-bit addressing mode, key 8, problem state) before returning to DFSMSdss.

The parameter list and save area passed to the exit routines resides in fetch protected, key 0 storage.

Registers on Entry to ADRDYEXT_EXIT1

The registers on entry to the ADRDYEXT_EXIT1 exit routine contain:

Register

Contents

- | | |
|----|---|
| 1 | Address of the parameter list passed to each exit routine |
| 13 | Address of an 18-word save area |

- 14 Return address
- 15 Address of the entry point to the called exit routine

ADDRDYEXT_EXIT1 Parameter List

Register 1 contains the address of the exit routine parameter list as shown in Table 74, with a storage protect key of 8. You can use the ADRDEX01 mapping macro to map this parameter list.

Table 74. ADDRDYEXT_EXIT1 Parameter List

Offset	Length or Bit Pattern	Description																																								
00 (X'00')	8	The EBCDIC 'ADRDEX01' ID.																																								
08 (X'08')	2	The length of the parameter list, which is set to 48 bytes.																																								
10 (X'0A')	1	The function code, as follows: <table border="0"> <tr> <td style="text-align: right;">Value</td> <td>Meaning</td> </tr> <tr> <td style="text-align: right;">X'01'</td> <td>The request is to process open data sets. A class transition could not be performed because DFSMSdss could not serialize on the data set and the SMS management class ACS routine for class transition specified that an EXIT should be invoked.</td> </tr> </table>	Value	Meaning	X'01'	The request is to process open data sets. A class transition could not be performed because DFSMSdss could not serialize on the data set and the SMS management class ACS routine for class transition specified that an EXIT should be invoked.																																				
Value	Meaning																																									
X'01'	The request is to process open data sets. A class transition could not be performed because DFSMSdss could not serialize on the data set and the SMS management class ACS routine for class transition specified that an EXIT should be invoked.																																									
11 (X'0B')	1	The function code extension. For function code X'01', processing of open data sets, the function extension codes are: <table border="0"> <tr> <td style="text-align: right;">Value</td> <td>Meaning</td> </tr> <tr> <td style="text-align: right;">X'01'</td> <td>The call is to close an open data set</td> </tr> <tr> <td style="text-align: right;">X'02'</td> <td>The call is to open a closed data set</td> </tr> </table>	Value	Meaning	X'01'	The call is to close an open data set	X'02'	The call is to open a closed data set																																		
Value	Meaning																																									
X'01'	The call is to close an open data set																																									
X'02'	The call is to open a closed data set																																									
12 (X'0C')	4	Flags set to describe the DSS being performed, as follows: <ul style="list-style-type: none"> • Byte 0: <table border="0"> <tr> <td style="text-align: right;">Bit</td> <td>Meaning</td> </tr> <tr> <td style="text-align: right;">0</td> <td>DEFRAG OPERATION</td> </tr> <tr> <td style="text-align: right;">1</td> <td>COPY OPERATION</td> </tr> <tr> <td style="text-align: right;">2</td> <td>RESTORE OPERATION</td> </tr> <tr> <td style="text-align: right;">3</td> <td>DUMP OPERATION</td> </tr> <tr> <td style="text-align: right;">4</td> <td>PRINT OPERATION</td> </tr> <tr> <td style="text-align: right;">5</td> <td>COPYDUMP OPERATION</td> </tr> <tr> <td style="text-align: right;">6</td> <td>NEWALLOC OPERATION</td> </tr> <tr> <td style="text-align: right;">7</td> <td>COMPRESS OPERATION</td> </tr> </table> • Byte 1: <table border="0"> <tr> <td style="text-align: right;">Bit</td> <td>Meaning</td> </tr> <tr> <td style="text-align: right;">0</td> <td>RELEASE OPERATION</td> </tr> <tr> <td style="text-align: right;">1</td> <td>CONVERT VOLUME OPERATION</td> </tr> <tr> <td style="text-align: right;">2</td> <td>BUILDSA OPERATION</td> </tr> <tr> <td style="text-align: right;">3</td> <td>DEFRAG CONSOLIDATE</td> </tr> <tr> <td style="text-align: right;">4</td> <td>CGCREATED OPERATION</td> </tr> <tr> <td style="text-align: right;">5</td> <td>CONSOLID OPERATION</td> </tr> <tr> <td style="text-align: right;">6</td> <td>RESERVED</td> </tr> <tr> <td style="text-align: right;">7</td> <td>RESERVED</td> </tr> </table> • Byte 2: <table border="0"> <tr> <td style="text-align: right;">Bit</td> <td>Meaning</td> </tr> <tr> <td style="text-align: right;">0</td> <td>INPUT DSN IS VSAM</td> </tr> </table> • Byte 3 is unused. 	Bit	Meaning	0	DEFRAG OPERATION	1	COPY OPERATION	2	RESTORE OPERATION	3	DUMP OPERATION	4	PRINT OPERATION	5	COPYDUMP OPERATION	6	NEWALLOC OPERATION	7	COMPRESS OPERATION	Bit	Meaning	0	RELEASE OPERATION	1	CONVERT VOLUME OPERATION	2	BUILDSA OPERATION	3	DEFRAG CONSOLIDATE	4	CGCREATED OPERATION	5	CONSOLID OPERATION	6	RESERVED	7	RESERVED	Bit	Meaning	0	INPUT DSN IS VSAM
Bit	Meaning																																									
0	DEFRAG OPERATION																																									
1	COPY OPERATION																																									
2	RESTORE OPERATION																																									
3	DUMP OPERATION																																									
4	PRINT OPERATION																																									
5	COPYDUMP OPERATION																																									
6	NEWALLOC OPERATION																																									
7	COMPRESS OPERATION																																									
Bit	Meaning																																									
0	RELEASE OPERATION																																									
1	CONVERT VOLUME OPERATION																																									
2	BUILDSA OPERATION																																									
3	DEFRAG CONSOLIDATE																																									
4	CGCREATED OPERATION																																									
5	CONSOLID OPERATION																																									
6	RESERVED																																									
7	RESERVED																																									
Bit	Meaning																																									
0	INPUT DSN IS VSAM																																									
16 (X'10')	4	The address on entry of a the data set name to be processed.																																								
20 (X'14')	4	The address on entry of the 44-byte name of the integrated catalog facility catalog in which the data set is cataloged.																																								

DFSMSDss Exits

Table 74. *ADDRDYEXT_EXIT1 Parameter List (continued)*

Offset	Length or Bit Pattern	Description
24 (X'18')	4	The address of the volume serial number.
28 (X'1C')	4	The address of an 18-byte area that defines who holds the data set enqueue. In order, this includes: <ul style="list-style-type: none">• The 2-byte ASID of the ENQ requester• The 8-byte job name of the ENQ requester• The 8-byte system name of the ENQ requester.

Registers on Return from ADDRDYEXT_EXIT1

The registers on return from the ADDRDYEXT_EXIT1 exit routine contain:

Register

Contents

- | | |
|----|--|
| 0 | Possible diagnostic code set by the exit routine |
| 15 | Return code |

ADDRDYEXT_EXIT1 Return Codes

For function code X'01', the return codes are defined as follows:

Return Code

Description

- | | |
|------------|---|
| 00 (X'00') | The data set was not processed by the exit routine. For a call to close an open data set, this return code indicates that the call to open the data set is not necessary. This return code indicates that no further action is required by DFSMSDss. |
| 04 (X'04') | The data set was processed successfully by the exit routine. The data set was closed for a call to close an open data set and opened for a call to open a data set. For a call to close an open data set, this return code indicates that DFSMSDss will move the data set and that the dynamic exit will be called to open the closed data set. |
| 08 (X'08') | The data set was processed by the exit routine, but completed in error. A diagnostic code as set by the exit routine could be placed in register zero. This return codes indicates that no further action is required by DFSMSDss. |

Authorization Installation Exit Routine (ADRUPSWD)

DFSMSDss supports authorization checking of password- and RACF-protected data sets and volumes. DFSMSDss provides an exit routine to allow you to control or override the authorization checks (RACE, password, or operator) done by DFSMSDss.

The ADRUPSWD exit is not called if any of the following is true:

- DFSMSDss is APF-authorized (when DFSMSDss is called by an APF-authorized program or invoked from an APF-authorized library using JCL) and NOPASS is specified on the PPT statement in the SCHEDxx parmlib member. The PPT statement defines the program properties table.
- The user has the proper level of RACF DASDVOL authority.
- For DEFRAG or CONSOLIDATE, if a RACF DASDVOL profile exists for the volume that is being processed. If the DASDVOL profile exists at all, either it

allows the volume to be accessed (so there is no need to call the exit), or it causes the DEFRAG or CONSOLIDATE task to fail with a 913 abend (so DFSMSdss cannot call the exit).

Otherwise, the exit routine supplied with DFSMSdss causes DFSMSdss to perform the following processing:

- Not relocate protected data sets for which you do not have read access during DEFRAG or CONSOLIDATE. You must supply a password for each protected data set.
- Check authorization at the data set level for all functions and CONVERTV.

Note: DASDVOL is not supported for system-managed volumes.

If a data set is protected by using both RACF and a password, only RACF checking is done. Authorization for password-protected non-VSAM data sets is checked by comparing the user-supplied password to that in the PASSWORD data set. Authorization for VSAM data sets is also checked. The authorization check for VSAM data sets not cataloged in the integrated catalog facility catalog fails if the data set has more than 16 extents.

You can use the authorization exit to bypass authorization checking and improve DFSMSdss performance. However, there is a trade-off between security and performance.

Installation-Supplied Authorization Exit Routine

You can write an exit routine to bypass authorization checking for both non-VSAM and VSAM data sets. The name of the routine must be ADRUPSWD. This routine is not given control for a COPYDUMP or CONVERTV operation.

The routine gets control at two levels: the volume level and the data set level (except for DEFRAG or CONSOLIDATE, which is given control at the volume level only). Control is always given at the volume level first, unless the data set is being renamed during a RESTORE operation. During RESTORE with a renamed data set, a data set level check is done against the source data on the dump tape first, and then a volume level check is done against the target volume. This is then followed by a data set level check against the target data set. A description of the two levels follows.

At the **volume level**, for DUMP, COPY, PRINT, and RESTORE, you can determine if the user is allowed to proceed with the function. During DEFRAG or CONSOLIDATE, you can determine if protected data sets can be relocated. This exit is not called for each data set when performing full volume operations.

Your installation authorization exit routine can do one of the following:

- End the operation.
- Request processing without authorization checking at the data set level.
- Request that the installation authorization exit be entered at the data set level.

At the **data set level**, the routine is given control during DUMP, COPY, PRINT, RESTORE, COMPRESS, and RELEASE only if the authorization exit routine instructs DFSMSdss to check authorization at the data set level. However, the routine is not given control at this level during DEFRAG or CONSOLIDATE. At the data set level, you can:

- End processing of the volume.
- End processing of the current data set.
- Bypass authorization checking of the current data set.
- Have DFSMSdss check authorization for the current data set.
- For the previous three options, you can specify whether or not the exit routine is entered for subsequent data sets.

Registers on Entry to the ADRUPSWD Exit

Register

	Contents
1	Address of the ADRUPSWD parameter list
13	Address of an 18-word save area
14	Return address
15	Address of the entry point to ADRUPSWD

Register 1 contains the address of the ADRUPSWD parameter list. You can use the ADRUPB mapping macro to map this parameter list (see Table 75 on page 217). The four word parameter list includes:

First word

For a volume (fourth word, byte 2, bit 0 is on), this field is zero. For a VSAM data set not cataloged in the integrated catalog facility, or for a non-VSAM data set (fourth word, byte 2, bits 0 and 1 are off), this is a pointer to the Format 1 DSCB for the protected data set. (For the Format 1 DSCB description, see *z/OS DFSMSdss Advanced Services*.) For a VSAM data set cataloged in the integrated catalog facility (fourth word, byte 2, bit 0 is off and bit 1 is on), this is a pointer to the 44-byte name of the protected VSAM cluster.

Second word

For a volume (fourth word, byte 2, bit 0 is on), or for a VSAM data set not cataloged in the integrated catalog facility, or for a non-VSAM data set (fourth word, byte 2, bits 0 and 1 are off), this field is zero. For a VSAM data set cataloged in the integrated catalog facility (fourth word, byte 2, bit 0 is off and bit 1 is on), this is a pointer to the 44-byte name of the integrated catalog facility catalog in which the protected VSAM cluster is cataloged.

Third word

Pointer to the volume serial number.

Fourth word

Flags are set as follows:

Byte 0

Bit	Meaning
0	End of the parameter list. This is always set to 1.
1	Set to 1 if read access is required on the volume. Set to 0 if write access is required.
2	Set to 1 for a DUMP operation.
3	Set to 1 for a RESTORE operation.
4	Set to 1 for a COPY operation.
5	Set to 1 for a PRINT operation.
6	Set to 1 for a DEFRAG operation.
7	Set to 1 for a COMPRESS operation.

Byte 1

- Bit Meaning**
- 0 Set to 1 for DEFRAG, PRINT, DUMP, or RESTORE for a data set operation.
 - 1 Set to 1 for a full-volume DUMP, RESTORE, or COPY operation.
 - 2 Set to 1 for a tracks DUMP, RESTORE, COPY, or PRINT operation.
 - 3 Set to 1 for a RELEASE operation.
 - 4 to 7 Reserved.

Byte 2

- Bit Meaning**
- 0 Set to 1 for volume level entry. Set to 0 for data set-level entry.
 - 1 Set to 1 for a VSAM data set cataloged in the integrated catalog facility. Set to 0 for all other data sets.

Byte 3 Reserved.

ADRUPB Parameter List

Table 75. ADRUPB Parameter List

Offset	Length or Bit Pattern	Name	Description
0 (X'0')	16	ADRUPB	
0 (X'0')	4	UPDSCBAD	0 if UPIND = 1. FORMAT 1 DSCB address if both UPIND and UPVSMDAT = 0. Address of 44-byte cluster name if UPIND = 0 and UPVSMDAT = 1.
4 (X'4')	4	UPCATP	Address of 44 byte catalog name if UPVSMDAT = 1.
8 (X'8')	4	UPUCBVSA	UCB volume serial number address
12 (X'C')	1	UPFLG1	Flag byte 1
	1... ..	UPEOL	End of list indicator. Always 1.
	.1.. ..	UPFRTO	1 = source volume, 0 = destination volume.
	..1.	UPDUMP	1 = DUMP function
	...1	UPREST	1 = RESTORE function
	.... 1...	UPCOPY	1 = COPY function
	.... .1..	UPPRINT	1 = PRINT function
	.... ..1.	UPDEFRAG	1 = DEFRAG function
	.... ...1	UPCOMPR	1 = COMPRESS function
13 (X'D')	1	UPFLG2	Flag byte 2
	1... ..	UPDSN	1 = data set operation
	.1.. ..	UPFULL	1 = full volume operation
	..1.	UPPART	1 = partial volume operation
	...1	UPRLSE	1 = RELEASE function
	.... 1...	UPBLDSA	1 = BUILD SA IPL(DASD)
	.... .1..	UPCGCR	1 = CGCREATED
	.... ..1.	UPCONS	1 = CONSOLIDATE
14 (X'E')	1	UPFLG3	Flag byte 3
	1... ..	UPIND	1 = volume level check, 0 = data set level check
	.1.. ..	UPVSMDAT	1 = cluster and catalog names passed
15 (X'F')	1	UPFLG4	Flag byte 4 reserved

DFSMSdss Exits

Table 75. ADRUPB Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
16 (X'10')			Force word alignment

Registers on Return from the ADRUPSWD Exit

Your ADRUPSWD routine should issue a return code in register 15 to indicate the course of action for further processing by DFSMSdss.

ADRUPSWD Return Codes

The return codes, in decimal, and their meanings are shown in Table 76.

Note: The authorization installation exits routine supplied with DFSMSdss passes a return code of 12.

The first time ADRUPSWD is entered, the volume serial number address is passed. If check the passwords and have ADRDSSU return to you for each data set, on the next entry the DSNNAME address is also passed.

Return Codes for Volume Level Entry: The codes listed in Table 76 are valid for all functions except COPYDUMP and CONVERTV.

Table 76. Return Codes for Volume Level Entry

Return Code	End Processing for Volume?	Data Set Level Checks Required?	Should ADRUPSWD be Entered at Data Set Level?
0	No	No	No
8	No	Yes	Yes
12	No	Yes	No
20	Yes	-	-

Notes:

For DEFRAG or CONSOLIDATE:

- If a nonzero return code less than or equal to 12 is returned, all data sets on the volume are to be checked for authorization.
- A nonzero return code greater than 12 ends the function.
- If any data sets are protected and you do not have DASDVOL authority, a return code of 20 ends the function.

For all other functions: The function is ended with message ADR402E-15 if ADRUPSWD returns a return code other than those return codes listed for Volume Level Entry.

Return Codes for Data Set Level Entry: The codes listed in Table 77 are valid for all functions except DEFRAG, CONSOLIDATE, and COPYDUMP.

Table 77. Return Codes for Data Set Level Entry

Return Code	End Processing for Volume?	End Processing of Data Set?	Perform Authorization Checking for Data Set?	Should ADRUPSWD be Entered Again?
0	No	No	No	No
4	No	No	No	Yes
8	No	No	Yes	Yes

Table 77. Return Codes for Data Set Level Entry (continued)

Return Code	End Processing for Volume?	End Processing of Data Set?	Perform Authorization Checking for Data Set?	Should ADRUPSWD be Entered Again?
12	No	No	Yes	No
16	No	Yes	-	Yes
20	Yes	-	-	-

Example of the ADRUPSWD Exit

This exit sets the return code to zero, which results in all data set authorization checks being bypassed.

Note: Use Figure 50 as a learning aid. It is not guaranteed to run on a particular system without some modification.

```

*****
* ADRUPSWD USER EXIT. *
* SETS RETURN CODE TO 0 INDICATING THAT DATA SET *
* AUTHORIZATION CHECKS WILL NOT BE PERFORMED. *
*****
ADRUPSWD CSECT
ADRUPSWD AMODE 31
ADRUPSWD RMODE 24
      STM 14,12,12(13)      SAVE REGS IN PREVIOUS SAVEAREA
      LR 12,15              ESTABLISH BASE REGISTER
      USING ADRUPSWD,12    SET ADDRESSABILITY TO THE EXIT
      LM 14,12,12(13)      RESTORE OTHER REGISTERS
      LA 15,0              SET RETURN CODE TO 0
      BR 14                RETURN
      END
    
```

Figure 50. Sample Listing of ADRUPSWD

Enqueue Installation Exit Routine (ADRUENQ)

The enqueue installation exits routine that is supplied with DFSMSdss passes a return code of zero. This causes DFSMSdss to do the following:

- For a full or tracks COPY or DUMP or tracks PRINT, enqueues the VTOC during the entire operation
- For a physical data set DUMP enqueues the VTOC during the entire DUMP

Restriction: The enqueue installation exit routine is not called during COMPRESS, CONVERTV, data set COPY, COPYDUMP, DEFRAG, CONSOLIDATE, logical data set DUMP, data set PRINT, or RELEASE processing.

You can use this exit to cause DFSMSdss to enqueue the VTOC only for the duration of the VTOC access. If you do not enqueue the VTOC for the entire operation, you can improve performance and decrease the chance of deadlock. However, there is a trade-off. With the improved performance and reduced chance of deadlock, there is also decreased data integrity.

Installation-Supplied Enqueue Exit Routine

To access a volume while it is being dumped, either by another job under the control of a second initiator or by another processor in a shared DASD environment, you can write an exit routine to enqueue the VTOC only until it is processed.

The name of the routine must be ADRUENQ.

Registers on Entry to the ADRUENQ Exit

Register

Contents

- | | |
|----|---------------------------------------|
| 1 | Address of the ADRUENQ parameter list |
| 13 | Address of an 18-word save area |
| 14 | Return address |
| 15 | Address of the entry point to ADRUENQ |

ADRUENQ Parameter List

Register 1 contains the address of the ADRUENQ parameter list. You can use the ADRUNQB mapping macro to map this parameter list (see Table 78).

The first word of the parameter list is a pointer to the volume serial field for the volume being dumped. The second word of the parameter list contains flags that are set as follows:

Byte 0 Bit

Meaning

- | | |
|---|---|
| 0 | End of the parameter list. This is always set to 1. |
| 1 | Reserved. |
| 2 | Set to 1 for a DUMP operation |
| 3 | Reserved. |
| 4 | Set to 1 for a COPY operation. |
| 5 | Set to 1 for a PRINT operation. |
| 6 | Reserved. |
| 7 | Reserved. |

Byte 1 Bit

Meaning

- | | |
|--------|---|
| 0 | Set to 1 for a data set operation. |
| 1 | Set to 1 for a full volume DUMP or COPY operation. |
| 2 | Set to 1 for a tracks DUMP, COPY, or PRINT operation. |
| 3 to 7 | Reserved. |

Byte 2 Bit

Meaning

- | | |
|-----|---|
| 0 | Set to 1 if TOLERATE(ENQFAILURE) is used. |
| 1-7 | Reserved. |

Byte 3 Reserved.

Table 78. ADRUNQB Parameter List

Offset	Length or Bit Pattern	Name	Description
0 (X'0')	8	ADRUNQB	
0 (X'0')	4	UNUCBVSA	UCB volume serial number address

Table 78. ADRUNQB Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
4 (X'4')	1	UNFLG1	Flag byte 0
	1... ..	UNEOL	End of list indicator, always 1
	.x.. ..		Reserved
	..1.	UNDUMP	1 = DUMP operation
	...X		Reserved
	.... 1...	UNCOPY	1 = COPY operation
	.... .1..	UNPRINT	1 = PRINT operation
	.... ..XX		Reserved
5 (X'5')	1	UNFLG2	Flag byte 1
	1... ..	UNDSN	1 = data set operation
	.1..	UNFULL	1 = full volume operation
	..1.	UNPART	1 = partial volume operation
	...X xxxx		Reserved
6 (X'6')	1	UNFLG3	Flag byte 2
	1... ..	UNTOLNQF	1 = TOLERATE(ENQFAILURE) specified
7 (X'7')	1		Reserved

Registers on Return from the ADRUENQ Exit

Your ADRUENQ routine should issue a return code in register 15 to indicate the course of action for further processing by DFSMSDss.

ADRUENQ Return Codes

Return Code

Description

- | | |
|---|--|
| 0 | Enqueue on the volume being dumped or copied for the duration of the operation. |
| 4 | Enqueue on the volume being dumped or copied only for the duration of VTOC access. |

Example of the ADRUENQ Exit

This exit sets the return code to four, which results in the volume only being enqueued for the duration of the VTOC access during dump and copy operations.

Note: Use Figure 51 on page 222 as a learning aid. It is not guaranteed to run on a particular system without some modification.

DFSMSdss Exits

```
*****
* ADRUENQ USER EXIT. *
* SETS RETURN CODE TO 4 INDICATING THAT THE VOLUME *
* WILL ONLY BE ENQUEUED FOR THE DURATION OF THE *
* VTOC ACCESS FOR DUMP AND COPY OPERATIONS. *
*****
ADRUENQ CSECT
ADRUENQ AMODE 31
ADRUENQ RMODE 24
        STM 14,12,12(13)      SAVE REGS IN PREVIOUS SAVEAREA
        USING ADRUENQ,15      SET ADDRESSABILITY TO THE EXIT
        LM 14,12,12(13)      RESTORE OTHER REGISTERS
        LA 15,4                SET RETURN CODE TO 4
        BR 14                  RETURN
        END
```

Figure 51. Sample Listing of ADRUENQ

Options Installation Exit Routine (ADRUIXIT)

The options installation exits routine can control certain DFSMSdss tasks or change some defaults or specified options. It is given control when DFSMSdss is invoked and also before the processing of each task. During initial entry, it can specify where the I/O and application interface buffers are to reside, change the default SERIAL mode to PARALLEL, and request that RACF class checking be bypassed. It can specify to fall back to the EXCP support for DUMP output, RESTORE input, and COPYDUMP. When entered for each task, the routine can change the options, defaults, or values.

During a DEFRAG or CONSOLIDATE, an extent of a protected data set is relocated, and the old extent is cleared (written over with zeros) for security. This adds time to the DEFRAG and CONSOLIDATE process. You can prevent the clearing of the old extent with the options installation exits. If your exit sets the UFOERASE bit to zero, it prevents clearing an old extent.

The exit routine can force the DUMP function to end if a write error occurs on any of the output copies. This is done by setting bit UFOIACPY on. The default is to continue to produce as many error-free output copies as possible.

When you are doing full volume or tracks COPY or RESTORE and the VTOC index on the target volume must be rebuilt, the exit can control whether or not ICKDSF is invoked to rebuild the VTOC index. Invoking ICKDSF from DFSMSdss can cause deadlock problems. If this happens, the exit can set UFOBLDIX to zero, and the VTOC index can be rebuilt manually by calling ICKDSF.

DFSMSdss uses the system authorization facility (SAF) interface to ensure that RACF at the 1.8.1 level or above is installed and active. If you are using a RACF-equivalent program that does not set the same level of information that DFSMSdss checks for, you can notify DFSMSdss that SAF with a RACF-equivalent program is installed by setting bit UFSAFOK on.

The exit routine supplied with DFSMSdss does not change any defaults, options, or values.

There are three categories of keywords that the installation enqueue exit routine can change:

- **Simple keywords with no subparameters:** The exit can set or reset the option. For example, the exit can force use of the CATALOG option or force the DELETE option not to be used.

This category includes the following commands: ALLEXCP, CATALOG, CICSVRBACKUP, COMPRESS, CONCURRENT, COPYVOLID, DELETE, DUMPCONDITIONING, DYNALLOC, FCNOCOPY, FCWITHDRAW, FORCE, NULLMGMTCLAS, NULLSTORCLAS, PURGE, REPLACE, REPLACEUNCONDITIONAL, RACFLOG, RESET, SERIAL, PARALLEL, SHARE, SPHERE, UNCATALOG, VALIDATE, and WRITECHECK.

Note: Although the exit can override NULLSTORCLAS and NULLMGMTCLAS, it cannot affect the STORCLAS or MGMTCLAS keywords. That is, it cannot change NULLSTORCLAS to STORCLAS(*x*).

- **Keywords with one or more subparameters having a limited number of values:** The exit can control the values of the subparameters. For example, the exit can force OPTIMIZE(4) to be used on all full volume dumps.

This category includes the following commands: DEBUG(FRMSG(MINIMAL | SUMMARIZED | DETAILED)), FASTREPLICATION(REQUIRED | PREFERRED | NONE), FORCECP(*mmm*), FRAGMENTATIONINDEX(*n*), MINSECQTY(*n*), MINTRACKSUNUSED(*n*), OPTIMIZE(*n*), PROCESS(SYS1), PROCESS(UNDEF), READIOPACING(*n*), SELECTMULTI(ALL | ANY | FIRST), TOLERATE(ENQFAILURE), TGTALLOC(*x*), VOLCOUNT(* | N(*mm*) | SRC | ANY), and WAIT(*n,m*).

- **Keywords with a subparameter having many possible values, including one specific value:** The exit can either override the keyword entirely or use the one specific value. For example, the exit can force no reblocking to occur by overriding the REBLOCK keyword, or it can cause all eligible data sets to be reblocked by forcing REBLOCK(*). The exit cannot specify a data set name list with the REBLOCK keyword.

This category includes the following commands: ALLDATA(*), REBLOCK(*), and RECATALOG(*).

Note: The exit cannot set conflicting options. For example, setting CONCURRENT and DELETE is an error.

You can use this exit to stop DFSMSdss functions. Then you can force the use of your own options and controls.

Installation-Supplied Options Exit Routine

You can write an exit routine to override certain defaults and user-specified parameters in DFSMSdss commands. The name of the routine must be ADRUIXIT. It must be written in reentrant code.

Registers on Entry to the ADRUIXIT Exit

Register

Contents

1	Address of the ADRUIXIT parameter list
13	Address of an 18-word save area
14	Return address
15	Address of the entry point to ADRUIXIT

ADRUFO Parameter List

Register 1 contains the address of the ADRUFO parameter list. You can use the ADRUFO mapping macro to map the parameter list. These sections are shown in Table 79.

UFOHDR

contains information describing the type of entry and, for a function entry, details of the function to be scheduled. It also contains an offset to UFOFUNCT or UFOPARM and the addresses of UFOVOL for input and UFOVOL for output.

UFOFUNCT

contains information about the function to be scheduled and which ones can be altered by this exit routine. The bits are described in the parameter list. It is created for the function entry.

UFOPARM

contains bits that can be set to change defaults or override commands. The bits are described in the parameter list. It is created for the PARM change entry.

UFOVOL

is an array of entries describing the volumes used for input and output for the specific function commands.

Table 79. ADRUFO Parameter List

Offset	Length or Bit Pattern	Name	Description
0 (X'0')	24	ADRUF0B	
0 (X'0')	24	UFOHDR	Header of ADRUFO parameter list
0 (X'0')	4	UFID	Identifier: EBCDIC "UFO"
4 (X'4')	2	UFLEN	Length of parameter list
6 (X'6')	2	UFBDOFF	Offset to UFOFUNCT or UFOPARM
8 (X'8')	4	UFVOLI@	Address of input volume list or 0
12 (X'C')	4	UFVOLO@	Address of output Volume list or 0
16 (X'10')	2	UFFUNCT	Function being performed X'0000' = parameter change entry
16 (X'10')	1	UFFUNCT1	Function byte one
	1...	UFFUDEF	1 = DEFrag operation
	.1.	UFFUCOPY	1 = COPY operation
	..1.	UFFUREST	1 = RESTORE operation
	...1	UFFUDUMP	1 = DUMP operation
	.... 1...	UFFUPRT	1 = PRINT operation
	.... .1..	UFFUCPYD	1 = COPYDUMP operation
	.... ..x.		Reserved
	.... ...1	UFFUCOMP	1 = COMPRESS operation

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
17 (X'11')	1	UFFUNCT2	Function byte two
	1...	UFFURLSE	1 = RELEASE operation
	.1.	UFFUCONV	1 = CONVERTV operation
	..1.	UFFUBLSA	1 = BUILDSA operation
	...x		Reserved
	.... 1...	UFFUCGCR	1 = CGCREATED operation
	.... .1..	UFFUCONS	1 = CONSOLIDATE operation
	.... ..xx		Reserved
18 (X'12')	1	UFFIND	Functional indicators
	1...	UFFIFULL	1 = full volume request (DUMP, RESTORE, COPY, DEFRAG, and CONSOLIDATE)
	.1.	UFFIPART	1 = partial request (DUMP, RESTORE, COPY, DEFRAG, and PRINT)
	..1.	UFFIFILT	1 = request by filter/data set name (DUMP, RESTORE, and PRINT)
	...1	UFFIPRTV	1 = print VTOC
	.... 1...	UFFLOGCL	1 = logical processing for COPY, DUMP, or RELEASE - either no input volumes are specified, (catalog filtering), or one of the following is specified: LOGINDDNAME, LOGINDYNAM, LOGDDNAME, LOGDYNAM.
	.... .xxx		Reserved
19 (X'13')	1	UFAIFLGS	Application interface flags
	1...	UFAIINV	1 = invoked by application interface
	.1.	UFUIMAL	1 = UIM not to be given control Note: See the Application Programming Interface in the <i>z/OS DFSMSdfp Storage Administration</i> .
	..1.	UFUIMCH	1 = do not allow ADRUIM to modify options, values
	...1	UFSTOP	1 = do not schedule task
	.... 1...	UFSYSIN	1 = SYSIN or alternate is not present. Allowed if UFAIINV is ON and UFUIMAL is OFF.
	.... .1..	UFSYSPR	1 = SYSPRINT or alternate is not present. Allowed if UFAIINV is ON and UFUIMAL is OFF.
	.... ..1.	UFNOIN	1 = no input tape (only for RESTORE)
	.... ...1	UFNOOUT	1 = no output tape (only for DUMP)

DFSMSdss Exits

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
20 (X'14')	1	UFFLAGS	Flags
	1... ..	UFBYFCCK	1 = bypass facility class checks if user is APF-authorized and requests RACF bypass
	.1.. ..	UFSAFOK	1 = OK to use the SAF interface at the highest supported level
	..1.	UFFREWCL	1 = rewind on close
	...1	UFIGCTNN	1 = ignore catalog entries for new named data set, valid only for logical dump
	.... 1...	UFFCFRRT	1 = retry FlashCopy without fast reverse restore
	.... .1..	UFBYFRVF	1 = bypass verification during fast reverse restore
	.... ..xx		Reserved
21 (X'15')	3		Reserved
24 (X'18')			Force word alignment
0 (X'0')	48	UFOFUNCT	List of options for function. Pointed to by the address of UFOHDR and UFBDYOFF. Present if any bits are ON in UFFUNCT.
0 (X'0')	1	UFO1FLGS	First set of option flags.
	1... ..	UFO1COMP	1 = COMPRESS (DUMP)
	.1..	UFO1CVOL	1 = COPYVOLID (RESTORE and COPY)
	..1.	UFO1PURG	1 = purge (DUMP, COPY and RESTORE)
	...1	UFO1RESE	1 = reset change bit (DUMP)
	.... 1...	UFO1WRCK	1 = WRITECHECK
	.... .1..	UFO1ALD	1 = ALLDATA
	.... ..1.	UFO1ALDL	1 = ALLDATA(LIST). 0 = ALLDATA(*). Valid only if UFO1ALD = 1. Bit might not be set ON by the exit but might be reset to change ALLDATA(LIST) to ALLDATA(*)
.... ...1	UFO1ALLE	1 = ALLEXCP	
1 (X'1')	1	UFO2FLGS	Second set of option flags
	1... ..	UFO2DYNQ	0 = use ENQ to hold data set. 1 = use DYNALOC to hold data set (DUMP, DEFRAG, PRINT, and RESTORE)
	.1..	UFO2ENQE	1 = ENQ exclusive (DUMP, RESTORE, and PRINT)
	..1.	UFO2ENQS	1 = ENQ shared if exclude fails (DUMP, RESTORE, and PRINT)
	...1	UFO2ENQN	1 = do not ENQ if exclude and share fail (DUMP, RESTORE, and PRINT)
	.... 1...	UFO2DEL	1 = delete after data set DUMP or COPY
	.... .1..	UFO2CTLG	1 = catalog data sets during a data set RESTORE, COPY
	.... .1..	UFO2RECT	1 = recatalog data sets during a data set RESTORE, COPY
	.... ..1.	UFO2UNC	1 = uncatalog data sets after a data set DUMP, COPY
	.... ...1	UFO2VLD	1 = validate: dump the VSAM indexed data set in new format (logical data set dump)

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
2 (X'2')	1	UFDUOPTM	Optimize value (1, 2, 3, or 4)
3 (X'3')	1	UFOINSOP	Installation options
	1...	UFOERASE	1 = erase DASD tracks
	.1..	UFOIACPY	1 = DUMP must produce all output copies or none at all
	..1.	UFOBLDIX	1 = invoke ICKDSF to rebuild VTOC index
	...1	UFORACLG	RACFLOG = YES specified or force RACF logging
	.... 1...	UFOBK32K	Tape block size 32K could be specified in the JCL as DCB=BLKSIZE=32760
	.... .1..	UFOARBA	1 = AUTORELBLKA specified
	.... ..1.	UFOMKMV	1 = MAKEMULTI specified
	.... ...1	UFOFLEAV	1 = close leave flag
4 (X'4')	4	UFOFRAGI	FRAGMENTATION INDEX(DEFRAG) 9,90,900=900, 09=90, 009=9
8 (X'8')	1	UFOVCFLG	VOLCOUNT flags
	1...	UFOVCCUR	1 = VOLCOUNT(*)
	.1..	UFOVCSRC	1 = VOLCOUNT(SRC)
	..1.	UFOVCNUM	1 = VOLCOUNT(N(nn))
	...1	UFOVCANY	1 = VOLCOUNT(ANY)
	.... 1...	UFOSMALL	1 = SELECTMULTI(ALL)
	.... .1..	UFOSMANY	1 = SELECTMULTI(ANY)
	.... ..1.	UFOSM1ST	1 = SELECTMULTI(FIRST)
.... ...1	UFOCPFRC	1 = dump/copy checkpointed data sets (see UFOCPDAY)	
9 (X'9')	1	UFOVCVAL	Binary number of volumes to use when UFOVCNUM is set
10 (X'A')	1	UFOCPDAY	Binary number of days for FORCECP keyword (see UFOCPFRC)
11 (X'B')	1		Reserved
12 (X'C')	4	UFOMNSQT	Minimum secondary allocation quantity
16 (X'10')	4	UFOMNTUS	Minimum unused tracks RELEASEUNUSED, CHANGEALLOC
20 (X'14')	1	UFO3FLGS	Third option flag byte
	1...	UFO3FORC	1 = force unmovables on COPY, RESTORE
	.1..	UFO3REPL	1 = replace (DATASET COPY, RESTORE)
	..1.	UFOFRBLK	1 = force reblocking of data sets (COPY, RESTORE)
	...1	UFODRBLK	1 = disable reblocking of data sets (COPY, RESTORE)
	.... 1...	UFOALLMU	1 = search ALLMULTI
	.... .1..	UFOSPHER	1 = perform sphere processing
	.... ..1.	UFONOSMS	1 = NULLSTORCLAS specified
	.... ...1	UFONMGMT	1 = NULLMGMTCLAS specified

DFSMSdss Exits

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
21 (X'15')	1	UFOWAITS	Wait time in seconds between RESERVE and ENQ retries (all)
22 (X'16')	1	UFOWAITR	Number of retries on reserve or ENQ failures (all commands)
23 (X'17')	1	UFOTGTAL	TGTALLOC flags
	1...	UFOTGTCY	1 = cylinder
	.1.	UFOTGTTR	1 = track
	..1.	UFOTGTBL	1 = block
	...1 ...	UFOTGTSR	1 = source
	... xxxx		Reserved
24 (X'18')	1	UFOPROCK	Process options
	1...	UFOPRUND	1 = process UNDEFDSORG
	.1.	UFOPRSYS	1 = process SYS1
	..xx xxxx		Reserved
25 (X'19')	1	UFO4FLGS	Fourth options flag byte
	1...	UFOT0REQ	Concurrent copy requested
	.1.	UFODCOND	DUMPCONDITIONING
	..1.	UFOCVRBK	CICSVRBACKUP
	...1 ...	UFOFCNC	FLASHCOPY NOCOPY
	... 1...	UFOFCWD	FLASHCOPY WITHDRAW
	... .1.	UFOFC2PP	FLASHCOPY to PPRC Primary allowed
	... ..1.	UFOFCN2C	FCNOCOPYTOCOPY
	... ...1	UFOFCFRZ	FCCGFREEZE
26 (X'1A')	2	UFORIOPC	Read I/O pacing
28 (X'1C')	1	UFO5FLGS	Fifth options flag byte
	1...	UFOFRREQ	FASTREPLICATION(REQUIRED)
	.1.	UFOFRPRF	FASTREPLICATION(PREFERRED)
	..1.	UFOFRNO	FASTREPLICATION(NONE)
	...1 ...	UFO5REPU	REPLACEUNCONDITIONAL
	... 1...	UFOFCINC	FCINCREMENTAL
	... .1.	UFOFCINL	FCINCREMENTALLAST
	... ..1.	UFOFCVFR	FCINCRVERIFY (REVERSE)
	... ...1	UFOFCVFN	FCINCRVERIFY (NOREVERSE)

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
29 (X'1D')	1	UFO6FLGS	Sixth options flags bytes
	1...	UFOFRMSM	FRMSG(MINIMAL)
	.1.	UFOFRMSS	FRMSG(SUMMARIZED)
	..1.	UFOFRMSD	FRMSG(DETAILED)
	...1	UFOHCOMP	HWCOMPRESS
	.... 1...	UFODBTRC	DEBUG(TRACE)
	.... .1..	UFODBSMS	DEBUG(SMSMSG)
	.... ..1.	UFOFCVfy	Force FCCGVERIFY termination on first error
	.... ...x	*	Reserved
30 (X'1E')	1	UFOFCWTS	Wait time in seconds between queries for background copy completion
31 (X'1F')	1	UFOFCWTR	Number of additional queries for background copy completion
32 (X'20')	1	UFO7FLGS	Seventh options flags byte
	1... ..	UFOFCSEF	FCSETGTOK (FAILRELATION)
	.x.		Reserved
	..1.	UFO7CCAR	CONCURRENT(ANYREQ)
	...1	UFO7CCVR	CONCURRENT(VIRTUALREQ)
	.... 1...	UFO7CCCR	CONCURRENT(CACHEREQ)
	.... .1..	UFO7CCAP	CONCURRENT(ANYPREF)
	.... ..1.	UFO7CCVP	CONCURRENT(VIRTUALPREF)
	.... ...1	UFO7CCCP	CONCURRENT(CACHEPREF)
33 (X'21')	1	UFO8FLGS	Eighth options flags byte
	1...	UFOPMREQ	FCTOPPRPRIMARY(PRESMIRREQ)
	.1.	UFOPMPRE	FCTOPPRPRIMARY(PRESMIRPREF)
	..1.	UFOPMNON	FCTOPPRPRIMARY(PRESMIRNONE)
	...1	UFOFCFRR	FCFASTREVERSESTORE
	.... 1...	UFOFCFVR	FCFULLVOLUMERELATION
	.... .1..	UFO8RESY	Force RESET(YES) on RESTORE
	.... ..1.	UFO8RESN	Force RESET(NO) on RESTORE
	.... ...1	UFO8RESD	Force RESET(DUMP) on RESTORE
34 (X'22')	2	UFOMAXTM	Number of minutes for DEFRAG or CONSOLIDATE to execute before quiescing processing
36 (X'24')	1	UFO9FLGS	Ninth options flags byte
	1...	UFOBRCLK	BCSRECOVER(LOCK)
	.1.	UFOBRCSU	BCSRECOVER(SUSPEND)
	..1.	UFOZCNON	ZCOMPRESS(NONE)
	...1	UFOZCPRE	ZCOMPRESS(PREFERRED)
	.... 1...	UFOZCREQ	ZCOMPRESS(REQUIRED)
	.... .xxx	*	Reserved

DFSMSdss Exits

Table 79. ADRUFO Parameter List (continued)

Offset	Length or Bit Pattern	Name	Description
48 (X'30')			Force word alignment
0 (X'0')	32	UFOPARM	EXEC PARM option list. Pointed to by the address of UFOHDR and UFBDYOFF. Present if all bits are OFF in UFFUNCT.
0 (X'0')	1	UFSEPAR	Serial / parallel
	1...	UFFORSER	1 = force to serial
	.1..	UFDEFPAR	1 = default to parallel. Ignored if UFFORSER is 1.
	..xx xxxx		Reserved
1 (X'1')	1	UFXAFLAG	Control flags for XA mode.
	1...	UFXABUFF	1 = I/O buffer above 16M required
	.1..	UFAI31B	1 = AI buffer above 16M required
	..1.	UFPZB64R	1 = I/O buffer backed anywhere in 64-bit real storage request
	...x xxxx		Reserved
2 (X'2')	8	UFWKUNIT	WORKUNIT parameter
10 (X'A')	6	UFWKVOL	WORKVOL parameter
16 (X'10')	1	UFOPFLG1	FLAG BYTE 1
	1...	UFOUEXCP	DEBUG(FRMSG(MINIMAL))
	..xxx xxxx		Reserved
17 (X'11')	1	UFOMXTSK	Max Parallel Tasks
18 (X'12')	14		Reserved
32 (X'20')			Force word alignment
0 (X'0')		UFOVOL	Volume list header. Pointed to by UFVOLI@ and UFVOLO@.
0 (X'0')	4	UFOVHDR	Header
0 (X'0')	2	UFOVCNT	Count of volume list entries
2 (X'2')	2		Reserved
4 (X'4')	20	UFOVENT	Volume list entry
4 (X'4')	4	UFOVUCB@	Address of UCB or 0
8 (X'8')	8	UFODDNAM	DDNAME or blank
16 (X'10')	6	UFOVOLID	Volume serial number or 0
22 (X'16')	2		Reserved

Registers on Return from the ADRUIXIT Exit

Your ADRUIXIT routine should issue a return code in register 15 to indicate the course of action for further processing by DFSMSdss.

ADRUIXIT Return Codes

Return Code

Return Code	Description
0	No changes were made by this exit routine.
4	The parameter list has been modified.
8	Do not schedule this function (valid only for function command entry).

This exit is entered for the following reasons only, during processing of DFSMSDss:

- During program initialization. This is called the *PARM change* entry. (The UFFUNCT field contains all zeros.)
- Just before scheduling a function command. This is called the *function* entry. (The function type is indicated by the UFFUNCT field.)

Example of the ADRUIXIT Exit

This exit performs different actions, depending on the type of entry.

For a PARM change entry, this exit sets the return code to zero, indicating that the parameter list has not been modified and that DFSMSDss is to proceed normally.

For a function entry, this exit sets the return code to four, indicating that the parameter list has been modified. The exit also turns on the UFO1RESE and UFOSM1ST bits, which override the specification of the RESET and SELECTMULTI keywords, respectively. Both RESET processing and SELECTMULTI(FIRST) processing will be performed.

Note: Use Figure 52 on page 232 as a learning aid. It is not guaranteed to run on a particular system without some modification.

DFSMSDss Exits

```
*****
*
* Module Name      = ADRUIXIT
*
* Descriptive Name = DFSMSdss Installation-Wide Exit Routine
*
* Function         = Controls certain DFSMSDss tasks or changes
*                   some defaults or specified options.
*
*
* Function Entry   = Sets return code to 4 indicating the parameter
*                   list has been modified. Turns on the UFO1RESE
*                   and UFO1M1ST flags.
*
*
* Parm Change Entry = Sets return code to 0 indicating the parameter
*                   list has not been modified.
*
*
*****
*
ADRUIXIT CSECT
ADRUIXIT AMODE 31
ADRUIXIT RMODE 24
        STM 14,12,12(13)      Save registers
        USING ADRUIXIT,15    Addressability to ADRUIXIT
        USING ADRUFOB,1      Addressability to ADRUFOB
        SR 2,2                Zero register 2
        CH 2,UFFUNCT         Check entry type
        BNE FUNCENT          Branch to function entry
        SR 3,3                Parm change entry, save RC 0
        B FINISH             Finished
FUNCENT LH 2,UFBYOFF         Get offset to UFOFUNCT
        AR 2,1                Calculate address of UFOFUNCT
        USING UFOFUNCT,2     Addressability to UFOFUNCT
        OI UFO1FLGS,UFO1RESE Turn on UFO1RESE (reset) bit
        NI UFOVCFLG,X'FF'-(UFO1SMALL+UFO1SMANY+UFO1SM1ST)
        OI UFOVCFLG,UFO1M1ST Turn on UFO1M1ST bit
        LA 3,4                Save return code 4
        DROP 1                Done using 1 for ADRUFOB
        DROP 2                Done using 2 for UFOFUNCT
        DROP 15               Done using 15 for ADRUIXIT
FINISH  LR 15,3               Set return code
        L 14,12(,13)          Restore register 14
        LM 0,12,20(13)        Restore registers 0 thru 12
        BR 14                 Return
        ADRUFOB               Include ADRUFOB control block
        END
```

Figure 52. Sample Listing of ADRUIXIT

Reblock Installation Exit Routine (ADRREBLK)

You can use this exit to verify or change block size. The reblock installation exits can set a reblockable indicator that causes the data set to be automatically reblocked when the data set is copied by DFSMSDss or another program.

Installation-Supplied ADRREBLK Exit Routine

The reblock installation exits routine gets control when a sequential or partitioned data set is being processed during a data set COPY or RESTORE if either:

- You specify REBLOCK(dsn [...]) in the COPY or RESTORE statement, the options installation exits routine (ADRUIXIT) does not override it, and the data set being copied meets the filtering criteria passed in the REBLOCK sublist (fully- or partially-qualified data set names), or

- The options installation exits routine forces all data set COPY or RESTORE functions to use the reblock installation exits routine.

Notes:

- The reblock installation exits is not given control for RECFM=U data sets. However, PDS load module data sets are reblocked, if requested, by IEBCOPY COPYMOD.
- The reblock installation exit will *not* be called when processing a zEDC format SAM data set.

The installation options exit routine cannot change the REBLOCK sublist (fully or partially qualified data set names), but:

- It can prevent DFSMSdss from reblocking if you specified REBLOCK(dsn [...]).
- It can force DFSMSdss to reblock all sequential or partitioned data sets being copied (equivalent to REBLOCK(**)).
- If the reblockable indicator is on in the data set's Format-1 DSCB (DS1REBLK), DFSMSdss automatically reblocks the data set to a system-determined block size. This indicator is on if the system determined a block size when the data set was created. The reblock installation exits routine is not called.

The reblock installation exits routine supplied with DFSMSdss passes a return code of zero, which allows DFSMSdss to select a block size.

You can replace the DFSMSdss-supplied exit routine to override the DFSMSdss-selected block size. If the exit routine passes an invalid block size, the data set is not processed and message ADR453E is issued.

The name of the reblock installation exits routine must be ADRREBLK.

Registers on Entry to the ADRREBLK Exit

Register

Contents

- 1 Address of the ADRREBLK parameter list
- 13 Address of an 18-word save area
- 14 Return address
- 15 Address of the entry point to ADRREBLK

ADRRBLKB Parameter List

Register 1 contains the address of the ADRRBLKB parameter list. You can use the ADRRBLKB mapping macro to map this parameter list. These sections are shown in Table 80 on page 234.

First word

Pointer to a 140-byte work area that has the Format 1 DSCB from the first volume. See *z/OS DFSMSdfp Advanced Services* for the Format 1 DSCB description. If it is a sequential extended-format data set, the block size in the sixth word of the parameter list excludes the 32-byte suffix.

Second word

Pointer to the 6-byte volume serial number of the input volume. For a multivolume data set, this volume serial number is for the first input volume.

Third word

Pointer to the 4-byte device type field of the input volume. This is in the same format as the UCBTYP field in the UCB.

DFSMSdss Exits

Fourth word

Pointer to the 6-byte volume serial number of the output volume. For a data set that spans multiple output volumes, the serial number is for the first volume.

Fifth word

Pointer to the 4-byte device type field of the output volume. Its format is similar to that for the input volume.

Sixth word

The high-order bit (bit 0) is on to indicate the end of the parameter list. If bit 1 is on, the system calculated the optimum block size for the target data set. If bit 1 is off, DFSMSdss calculated the block size. If bit 2 is off, the request is COPY, if bit 2 is on the request is RESTORE.

Bytes 2 and 3 of the sixth word contain the block size selected by DFSMSdss for the data set on the output volume. This field is in fixed binary.

Table 80. ADRRBLKB Parameter List

Offset	Length or Bit Pattern	Name	Description
0 (X'0')	24	ADRRBLKB	
0 (X'0')	4	RBDSCB@	Pointer to Format 1 DSCB
4 (X'4')	4	RBIVOL@	Pointer to input volume serial number
8 (X'8')	4	RBIDEV@	Pointer to input device type
12 (X'C')	4	RBOVOL@	Pointer to output volume serial number
16 (X'10')	4	RBODEV@	Pointer to output device type
20 (X'14')	1	RBEND	Last word in parameter list
	1... ..	RBENDLST	End of parameter list
	.1.. ..	RBDASDCS	0 = DFSMSdss calculates 1 = System calculates
	..1.	RBRSTCPY	1 = called for RESTORE. 0 = called for COPY
	...x xxxx		Reserved
21 (X'15')	1		Reserved
22 (X'16')	2	RBLKSIZE	Selected block size

Registers on Return from the ADRREBLK Exit

Your ADRREBLK routine should issue a return code in register 15 to indicate the course of action for further processing by DFSMSdss.

ADRREBLK Return Codes

Return Code

Description

- 0 Block size not changed. Use the DFSMSdss-selected block size.
- 4 Block size has been changed by the exit; the new block size is indicated in last 2 bytes of word 6 of the parameter list.
- 8 Use the input block size (do not reblock).
- 12 System determined block size is used. In addition, the reblockable indicator in the Format 1 DSCB (DS1REBLK) is turned on.

Example of the ADRREBLK Exit

This exit sets the return code to eight, which results in reblock processing being bypassed.

Note: Use Figure 53 as a learning aid. It is not guaranteed to run on a particular system without some modification.

```

*****
* ADRREBLK USER EXIT.                               *
* SETS RETURN CODE TO 8 INDICATING THAT REBLOCKING *
* SHOULD NOT BE PERFORMED.                         *
*****
ADRREBLK CSECT
ADRREBLK AMODE 31
ADRREBLK RMODE 24
          STM  14,12,12(13)      SAVE REGS IN PREVIOUS SAVEAREA
          LR   12,15            ESTABLISH BASE REGISTER
          USING ADRREBLK,12     SET ADDRESSABILITY TO THE EXIT
          LM   14,12,12(13)    RESTORE OTHER REGISTERS
          LA   15,8            SET RETURN CODE TO 8
          BR   14              RETURN
          END

```

Figure 53. Sample Listing of ADRREBLK

Chapter 9. IEHINITT Dynamic Exits

This chapter describes the setup, use, and invocation of exits associated with the IEHINITT utility.

Introduction

IEHINITT is a system utility used to place volume label sets onto any number of magnetic tapes mounted on one or more tape units. The IEHINITT Utility supports the REKEY function. You can use the REKEY function to replace the key label structure that is stored on a tape cartridge with a new key label structure. For details, see “The Re-keying Exit” on page 244.

These exits use the dynamic exits service, CSVVDYNEX, which is currently described in *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN*. By means of this facility a single exit, IEHINITT_EXIT has been defined for the INITT function, with two associated exit points, a pre-label and a post-label. For the REKEY function, a separate exit REKEY_EXIT has been defined with only one exit point, a re-keying exit point.

Using this same facility, installations can associate their own exit routines with these exits. See chapter ‘Adding an Exit Routine to an Exit’ in the *z/OS MVS Programming: Authorized Assembler Services Reference ALE-DYN* book for details. The Dynamic Exits Facility allows multiple exit routines to be simultaneously defined to a single exit and, as such, coordination of processing between these exit routines is critical.

As mentioned above, there are two exits points defined for the single exit IEHINITT_EXIT:

- The pre-label exit is invoked just prior to issuance of the labelling I/O. The intent of this exit is to allow the installation to indicate whether labelling of the volume is to occur, and, to a degree, the values which are to be used in doing the labelling.
- The post-label exit is invoked just after the issuance of the labelling I/O has or would have occurred. The intent of the post-label exit is to inform the installation exit routines of the results of the labelling request and associated pre-label exit processing.

The **same exit routine** is called at each exit point. This means that the exit must determine whether it is being entered for Pre or Post Label exit processing. A flag is set in the parameter list passed to the exit routine to indicate which exit point called the exit routine.

Although the Dynamic Exit Services Facility allows a degree of specification on order of call, that specification applies only to the last routine associated with an exit. So, in fact, there is no means of ensuring the order of call of routines. Therefore, all existing exit routines are always called for both Pre and Post label processing.

Exceptions to this rule:

- The Dynamic Exits Service itself fails for any reason:

- If a failure occurs during pre-label processing, no more pre-label exit routines will be called and the volume will not be labeled. The post-label exit routine will be called.
- If a failure occurs during post-label processing, no more post-label exit routines will be called.
- A failure occurs during internal processing not related to Dynamic Exits Services
- If a failure occurs before calling pre-label exit routines:
 - The pre-label exit routines will not be called
 - Labelling I/O will not take place
 - Post-label exit routines will be called
- If the operator replies S(kip) to message IEC701D:
 - No volume label will be read
 - Pre-label exit routines will not be called
 - post-label exit routines will be called

General Programming Considerations

- The exit routines run in Key 5, with APF authorization. As with all subroutines, do not link edit installation exits with APF authorization.
- They are required to be AMODE 31
- The parameter list passed to the exit routines resides in non fetch protected, key 5 storage
- Although the service will not enforce reentrancy, it is recommended that the routine be reentrant

The Pre-Label Exit

Overview

The pre-label exit is taken just before labelling I/O is to occur. The intent of the pre-label exit is to allow the installation to indicate whether labelling I/O is to be issued, and, to a degree, the values which are to be used in labelling.

Registers on Entry

Register	Contents
1	address of the parameter list, INXPLIST, which is mapped by the IEHUEXIT macro
13	address of standard 72-byte save area
14	return address of the caller
15	entry point address of exit routine

Note: The 72 byte save area is provided solely for exit routines that expect to be able to save the registers on entry. Its contents are not used by the Dynamic Exits Service facility nor by IEHINITT.

Registers on Exit

There is no requirement to return any values in registers from the exit routines, so it is not necessary to restore any registers on exit from the exit routine.

There is a requirement to return a return and reason code. A default of 4 ('no vote') is primed in the parameter list on entry to the exit routine and need not be changed if not appropriate. If updating the return and reason codes is appropriate the fields to be changed are:

- INXRC, which contains the exit routine return code
- INXRSN, which contains the exit routine reason code

Return and Reason Code Values

The exit routines can indicate one of four return codes and one of two reason codes associated with return code 8.

Return Code	Reason Code	Meaning
0	0	Label the tape.
4	0	I don't care.
8	0	Do not label the tape.
8	4	Don't label this tape, mount a new tape and label it.

- **Return code 0 notes:**

When return code 0 is returned by the exit routine, the following fields, which contain values to be used in labelling the volume, may be modified:

- INXRQVOL, volume serial number
- INXRQOWN, owner ID
- INXRQACC, access code

Changes to any other fields are ignored.

- **Return code 4 notes:** The exit routine return code is set to a value of 4 before each exit routine is called.

Changes to any fields are ignored.

- **Return code 8, Reason code 0 notes:**

It is important to note that once a no label indication is set, there is no way to override it. The volume will not be labeled.

Changes to any fields are ignored.

- **Return code 8, Reason code 4 notes:**

When this return code and reason code is returned, the value in INXRQVOL must be changed. A mount for the volume indicated in this field is issued. All subsequent pre-label exit routines are passed the original volume serial, not the remount volume serial.

The post-label exit routines are not called for this volume.

When the remount is successfully processed and the actual volume is mounted, the pre-label exit routines are called again and the volume serial that has been passed into the exit routines is now the new volume serial.

Changes to any other fields are ignored.

Summary of Information Passed to the Pre-Label Exit Routines

The address of a parameter list mapped by macro IEHUEXIT is passed to the exit routines in Register 1. Some of the information in this parameter list can be changed and returned to IEHINITT for processing. Please review the macro for details on field names and values. Some of the fields passed in are:

- A one byte hex value indicating the function for which the routine is being invoked.

Currently only pre-label and post-label functions are defined. A subfunction byte is passed in, but is not currently defined for this function.

- 4 bytes of flags that indicate the status of data passed into the routine.

A variety of conditions concerning the result of attempting to read the existing labels on the volume are indicated here. Flags are set for such things as whether the labels were successfully read, whether the VOL1 label information passed in was constructed from sense information when allowed by VOLNSNS specification in the active DEVSUPxx PARMLIB member, whether an I/O error was encountered when trying to read the labels, in addition to other conditions. All exit routines should see the same flag settings in these bytes.

- 4 bytes of flags that indicate the cumulative results of processing the exit routines and any reasons for not labelling the volume.

There are a variety of reasons that a volume will not be labeled. Things such as:

- A failure in the CSVDYNEX service,
- An ABEND in an exit routine,
- The operator responding with S(kip) to the IEHINITT mount message,
- An exit routine indicated that the volume is not to be labeled.
- Invalid characters are specified for the original or modified volume serial number, owner ID, and/or access code.
- A conflict in information returned by an exit routine

Please see “Conflict Processing” on page 241 for details.

Each pre-label exit routine sees the cumulative result of all previous exit routine processing. By cumulative we mean that all results of previous exit routine processing will be indicated in these flags. So, for example, if a conflict is detected after calling the third exit routine, all subsequent exit routines will see the conflict flag, IXWONTL, set. Another example would be that once a routine indicates that the volume is not to be labeled, all subsequent routines will see the IXCANTL flag set.

All post-label exit routines will see the final cumulative result of all pre-label exit routine processing in these flags.

- Other informational data that is provided includes the:
 - VOL1 and HDR1 labels if available,
 - Labels that were read where VOL1 or HDR1 labels were expected but the format was not as expected,
 - Volume serial returned from a LACS VERIFY call if different from the read volume serial,
 - SAF and RACROUTE AUTH return and reason codes

When the volume label is not read for whatever reason, the requested volume serial number is used as the internal volume serial in all authorization checking.

A call to SAF/RACROUTE AUTH is made before the pre-label exits are invoked. The results of this call are passed, uninspected, to the exit routines. If an exit routine returns an RC=0, indicating the volume is to be labelled, it is assumed that the exit reviewed the SAF/RACROUTE return and reason codes and that it is allowing labelling regardless of those values.

If there are no exit routines associated with this exit, or if all routines return an RC=4, then the results of the SAF/RACROUTE call will be inspected and labelling will be performed only if SAF/RACROUTE authorization is indicated.

- A pointer to the UCB
- Sense data that was generated as a result of any non-recoverable I/O error produced while trying to read the VOL1 or HDR1 labels
- Fields INXRQVOL (volume serial), INXRQOWN (owner ID), and INXRQACC (access code) are provided as input, but can be modified by the exit routines under the following conditions:
 - A return code 0 is returned, in which case the currently mounted volume will be labeled with the value in these fields. This applies to all three fields.
 - A return code 8, reason code 4 is returned, in which case the value in INXRQVOL must be changed or a conflict condition will be indicated and the volume will not be labelled. The owner ID and access code fields may also be changed.

Caution in using this facility should be exercised when more than one exit routine is active. A conflict condition can result if one exit routine specifies a changed field that does not agree with the value returned by another exit routine, or if one exit indicates to label the tape and another indicates to label the volume with a new value.

- INXRQVOL

A 6 character field containing the volume serial with which the volume is to be labeled. If more than 1 routine returns a modified volume serial, the values must be the same or a conflict is indicated and the volume is not labeled.

This field is also used to indicate the new volume serial that is to be mounted when a remount request is returned, RC=8, RSN=4.

Note: All pre-label exit routines will see the originally specified volume serial, not the modified volume serial.

- INXRQOWN

The owner ID with which the volume is to be labeled. If more than one exit routine modifies this field, the modified value must be the same or a conflict will be indicated and the volume will not be labeled.

Note: All pre-label exit routines will see the originally specified owner ID, not the modified owner ID.

- INXRQACC

The access code value (if the request is for an ANSI label) with which the volume is to be labeled. If more than one exit routine modifies this field, the modified value must be the same or a conflict will be indicated and the volume will not be labeled.

Note: All pre-label exit routines will see the originally specified access code, not the modified access code.

Conflict Processing

In an environment where a single exit routine exists, the result of calling the routine is straight forward. However, the existence of multiple exit routines is permissible. For this case extensive conflict checking is done to ensure that the exits do not return conflicting information. Whenever a conflict is detected the volume will not be labeled.

Typically a single exit routine will take ownership of the volume and indicate what the result of the labelling request is to be. Ownership is implied by returning a return code 0 or 8. Routines that do not take ownership of the volume should return a return code of 4.

Once again, in a multiple exit routine environment, more than one routine can take ownership of a volume and the volume will be labeled as long as there is no conflict in the information returned from any of the routines. A conflict will be indicated when:

- A return code of 0 and a return code of 8 are returned for the same volume or more than one exit returned an RC=8, but the reason codes are not consistent.
- A return code of 0 is returned by more than one exit and one of the exits specifies a new value for a modifiable field while another exit specifies a different value or does not specify a change.
- A remount was requested by an exit routine but no new volume serial was specified.
- A remount was requested by more than one exit routine and the modified volume serial values don't match.

Special Considerations for NUMBTAPE Processing:

When NUMBTAPE is specified on the IEHINITT control statement the current restriction is that the original volume serial must be all numeric. This restriction will continue to apply, however, the modified volume serial need not adhere to this restriction.

Note: Incrementation of the numeric volume serial value is performed based on the value of the originally specified volume serial. For example, if a volume serial of 002000 is specified on the INITT card and exit processing results in the volume serial being modified to 050000, the next volume serial to be processed will be 002001, not 050001.

Labelling Write Protected Volumes

When a write-protected volume is mounted, pre-label exit routines will be passed the label information just read. If exit routines all agree to label that volume, IEHINITT will attempt to label the volume which will fail. post-label exit routines will be called with LBLRFAIL on. Afterwards, message IEC701D will be issued again. Pre-label and post-label exit routines will again be called as before.

READLBL Related Support

IEHINITT supports a keyword in the IEHINITT control statement,

READLDL = YES | NO

- When READLBL=YES (default)
 - The volume label of the mounted volume is read before calling the pre-label exit. The information gathered from the read volume label is subsequently passed to the pre-label and post-label exits.
- When READLBL=NO
 - The volume label of the mounted volume is not read. INXLBNRD (label-not-read) in INXFLAG2 is set.
 - No volume label information related to the mounted volume is passed to the pre or post-label exits.
 - The requested volume serial is used in LACS verify and authorization checking.

- In particular,
 - No flags related to the mounted volume label are set nor should they be interrogated. These flags include: INXVRDOK, INXHRDOK, INXVLSNS, INXNOLBL, INXVRDTM, INXBLANK, INXIOERR, INXSTDAL, INXVH1OK.
 - The values of VOL1, INXRDVOL, and HDR1, are not read from the mounted volume. Therefore, INXVOL1, INXRDVOL, and INXHDR1 are zero.
 - For pre-label exit, INXSNSOK and INXSENSE refer to the result of I/O issued to read the mounted volume label.
 - If READLBL=NO was specified, INXSNSOK and INXSENSE is never set and is not interrogated.
 - If READLBL=YES was specified or is defaulted, INXSNSOK and INXSENSE may contain valid values if an I/O error occurred on the I/O.
 - For the post-label exit, INXSNSOK and INXSENSE refer to the result of I/O issued to write the volume label, hence they are independent of READLBL values and may be non-zero when passed to the post-label exits if an I/O error occurred.

The Post-Label Exit

Overview

The intent of the post-label exit is to inform the installation exit routines of the results of the labelling request and associated pre-label exit processing.

No action is currently taken based on the return code/reason code returned by the routines.

Registers on Entry

Register	Contents
1	address of the parameter list, INXPLIST, which is mapped by the IEHUEXIT macro
13	address of standard 72 byte save area
14	return address of the caller
15	entry point address of exit routine

Note: The 72 byte save area is provided solely in case the exit routine expects to be able to save the registers on entry. Its contents are not used by the Dynamic Exits Service Facility nor by IEHINITT.

Registers on Exit

There is no requirement to return any values in registers from the exit routines, so it is not necessary to restore any registers on exit from the exit routine.

Return and Reason Code Values

The exit routine return code is set to a value 4 each time an exit is called.

There is currently no requirement to return a return and reason code other than the default values of return code 4, reason code 0.

In an effort to enforce coexistence with any future enhancements to post-label processing, the return and reason code will be inspected and if anything other than RC=4, RSN=0 is returned a warning message will be issued.

Return code 4, reason code 0 indicates that the routines takes no vote on the processing to be done for this exit point. As stated before, there is currently no action taken for this exit, but if this changes in the future a return code of 4/reason code of 0 will allow compatible processing.

Summary of Information Passed to the Post-Label Exit Routines

All the pre-label exit processing information as it existed after the last call to the pre-label exit routines will be passed to the post-label exit routines. This allows all post-label routines to inspect the results of the pre-label processing.

One exception to this is the sense information that may have been passed to the pre-label exits. Any sense passed to the post-label exit will be sense generated by the labelling I/O, if any was done.

In addition, post-label specific information passed in will be:

- VOL1 label with which the volume was labeled, if labelling occurred.
if no labelling I/O was issued, this field will be zero and LBLRNATM will be on.
- one byte of flags indicating the results of the labelling I/O.

Output

If the labelling I/O completes successfully, no new messages nor new return codes are returned in the IEHINITT return code.

If the labelling I/O is not attempted because of pre-label exit processing, a return code 20 is returned (24, if the SYSPRINT card is mi/ssing).

If the labelling I/O is not attempted, or the label I/O fails due to errors related to Pre- or Post-label exit processing IEHINITT messages are shown.

The Re-keying Exit

Overview

The re-keying exit is invoked once for each tape volume after the volume has successfully been re-keyed. The intent is to inform the installation exit routines of the new key label information.

Registers on Entry

Register	Contents
1	address of the parameter list, INXPLIST, which is mapped by the IEHUEXIT macro
13	address of standard 72 byte save area
14	return address of the caller
15	entry point address of exit routine

Note: The 72 byte save area is provided solely in case the exit routine expects to be able to save the registers on entry. Its contents are not used by the Dynamic Exits Service Facility nor by IEHINITT.

Registers on Exit

There is no requirement to return any values in registers from the exit routines, so it is not necessary to restore any registers on exit from the exit routine.

Return and Reason Code Values

The exit routine return code is set to a value 4 each time an exit is called.

There is currently no requirement to return a return and reason code other than the default values of return code 4, reason code 0.

Summary of Information Passed to the Re-keying Exit Routines

A one byte hex value indicating the function for which the routine is being invoked.

INXFUNC = INXREKEY Exit is called for Re-keying processing.

The volume serial and new key label information are passed to the exit routines.

INXRKVOL Six-byte volume serial number
INXKYL1 64-byte key label 1
INXENC1 One-byte key label 1 encoding mechanism
INXKYL2 64-byte key label 2
INXENC2 One-byte key label 2 encoding mechanism

Output

There is currently no requirement to return any return and reason or any values from the exit routines. All returned values are ignored.

Appendix. Accessibility

Accessible publications for this product are offered through the z/OS Information Center.

If you experience difficulty with the accessibility of any z/OS information, please send a detailed message to mhvrcfs@us.ibm.com or to the following mailing address:

IBM Corporation
Attention: MHVRCFS Reader Comments
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Accessibility features

Accessibility features help a user who has a physical disability, such as restricted mobility or limited vision, to use software products successfully. The major accessibility features in z/OS enable users to:

- Use assistive technologies such as screen readers and screen magnifier software
- Operate specific or equivalent features using only the keyboard
- Customize display attributes such as color, contrast, and font size.

Using assistive technologies

Assistive technology products, such as screen readers, function with the user interfaces found in z/OS. Consult the assistive technology documentation for specific information when using such products to access z/OS interfaces.

Keyboard navigation of the user interface

Users can access z/OS user interfaces using TSO/E or ISPF. Refer to *z/OS TSO/E Primer*, *z/OS TSO/E User's Guide*, and *z/OS ISPF User's Guide Vol I* for information about accessing TSO/E and ISPF interfaces. These guides describe how to use TSO/E and ISPF, including the use of keyboard shortcuts or function keys (PF keys). Each guide includes the default settings for the PF keys and explains how to modify their functions.

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users accessing the z/OS Information Center using a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line, because they can be considered as a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that your screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually

exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, you know that your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.

Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol can be used next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 * FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* * FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol giving information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, this indicates a reference that is defined elsewhere. The string following the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you should refer to separate syntax fragment OP1.

The following words and symbols are used next to the dotted decimal numbers:

- ? means an optional syntax element. A dotted decimal number followed by the ? symbol indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5 ?, 5 NOTIFY, and 5 UPDATE, you know that syntax elements NOTIFY and UPDATE are optional; that is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.
- ! means a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicates that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the same dotted decimal number can specify a ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In this example, if you include the FILE keyword but do not specify an option, default option KEEP will be applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, default FILE(KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1.1!

(KEEP), and 2.1.1 (DELETE), the default option KEEP only applies to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

- * means a syntax element that can be repeated 0 or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3*, 3 HOST, and 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

Note:

1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
 2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you could write HOST STATE, but you could not write HOST HOST.
 3. The * symbol is equivalent to a loop-back line in a railroad syntax diagram.
- + means a syntax element that must be included one or more times. A dotted decimal number followed by the + symbol indicates that this syntax element must be included one or more times; that is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can only repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loop-back line in a railroad syntax diagram.

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- For information about software support lifecycle, see: IBM Lifecycle Support for z/OS (<http://www.ibm.com/software/support/systemsz/lifecycle/>)
- For information about currently-supported IBM hardware, contact your IBM representative.

Programming interface information

This publication documents intended Programming Interfaces that allow the customer to write programs to obtain the services of z/OS DFSMS.

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Glossary

This glossary defines technical terms and abbreviations used in DFSMS documentation. If you do not find the term you are looking for, refer to the index of the appropriate DFSMS manual or view the *Glossary of Computing Terms* located at:

IBM Glossary of Computing Terms
(<http://www.ibm.com/software/globalization/terminology/>).

The following cross-reference is used in this glossary:

See: This refers the reader to (a) a related term, (b) a term that is the expanded form of an abbreviation or acronym, or (c) a synonym or more preferred term.

A

ABE Abnormal-end appendage, an appendage of EXCP.

ACB Access method control block.

access method services

A multifunction service program that manages both VSAM and non-VSAM data sets and integrated catalog facility catalogs. It defines data sets and allocates space for VSAM data sets and ICF catalogs. It converts indexed-sequential data sets to key-sequenced data sets; modifies data set attributes in the catalog; reorganizes data sets; facilitates data portability among operating systems; creates backup copies of data sets; helps make inaccessible data sets accessible; lists the records of data sets and catalogs; defines and builds alternate indexes; and converts CVOLs and to integrated catalog facility catalogs.

ACS See *Automatic class selection (ACS)*.

ACS installation exit

User-written code, run after an ACS routine, that provides capabilities beyond the scope of the ACS routine.

ACS interface routine

This calls an ACS routine from an ACS installation-exit routine.

ADDR

Addressed processing or addressed.

ADR Same as ADDR.

aggregate backup

The process of copying an aggregate group and recovery instructions so that a collection of data sets can be recovered later as a group.

aggregate group

A collection of related data sets and control information that have been pooled to meet a defined backup or recovery strategy.

AIX Alternate index.

APF See *Authorized program facility (APF)*.

ASCB Address space control block

ASCII American National Standard Code for Information Interchange.

ASI Asynchronous interrupt.

authorized program facility (APF)

A facility that permits identification of programs authorized to use restricted functions.

automatic class selection (ACS) routine

A sequence of instructions for having the system assign data class, storage class, management class, and storage group for data sets, and storage class, management class, and storage groups for objects.

automatic backup

(1) In DFSMSHsm, the process of automatically copying data sets from primary storage volumes or migration volumes to backup volumes.

(2) In OAM, the process of automatically copying a primary copy of an object from disk, or an optical or tape volume to a backup volume contained in an object backup storage group.

B

backup

The process of creating a copy of a data set or object to be used in case of accidental loss.

backup control data set (BCDS)

In DFSMSHsm, a VSAM key-sequenced data set that contains information about backup versions of data sets, backup volumes, dump volumes, and volumes under control of the backup and dump functions of DFSMSHsm.

backup-while-open (BWO)

This makes a backup copy of a data set while the data set is open for update. The backup copy can contain partial updates.

basic catalog structure (BCS)

The name of the catalog structure in the catalog environment.

basic format

The format of a data set that has a data set name type (DSNTYPE) of BASIC. A basic format data set is a sequential data set that is specified to be neither large format nor extended format. The size of a basic format data set cannot exceed 65 535 tracks on each volume.

BDW Block descriptor word.

binder

The DFSMS program that processes the output of language translators and compilers into an executable program (load module or program object). It replaces the linkage editor and batch loader in z/OS.

BPI Bytes per inch.

BUFC Buffer control block.

C

CA Control area.

candidate volume

A direct-access storage volume that has been defined in an ICF catalog as a VSAM volume; VSAM can automatically allocate space on this volume, as needed.

CDS See *Control data set (CDS)*.

CI Control interval. Also compatibility interface.

class See *SMS class*.

class transition

An event that brings about change to an object's service-level criteria, causing OAM to invoke ACS routines to assign a new storage class or management class to the object.

compress

(1) To reduce the amount of storage required for a given data set by having the system replace identical words or phrases with a shorter token associated with the word or phrase.

(2) To reclaim the unused and unavailable space in a partitioned data set that results from deleting or modifying members by moving all unused space to the end of the data set.

compressed format

A particular type of extended-format data set specified with the (COMPACTION) parameter of data class. VSAM can compress individual records in a compressed-format data set. SAM can compress individual blocks in a compressed-format data set. See *compress*.

construct

One of the following: data class, storage class, management class, storage group, aggregate group, base configuration.

control data set (CDS)

With respect to SMS, a VSAM linear data set containing configurational, operational, or communication information. SMS introduces three types of control data sets: source control data set, active control data set, and communications data set. With respect to DFSMSrmm, a VSAM key-sequenced data set (KSDS) containing the complete inventory of your removable media library.

convert in place

See in-place conversion.

CVAF Common VTOC access facility.

CVT Communication vector table.

D**DADSM**

Direct access device space management.

DASD calculation services (DCS)

A function of DFSMS.

DASD volume

A DASD space identified by a common label and accessed by a set of related addresses. See also *volume, primary storage, migration level 1, migration level 2*.

data class

A collection of allocation and space attributes, defined by the storage administrator, that are used to create a data set.

data set

In DFSMS, the major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access. In z/OS non-UNIX environments, the terms *data set* and *file* are generally equivalent and sometimes are used interchangeably. See also *file*. In z/OS UNIX environments, the terms *data set* and *file* have quite distinct meanings.

DCB Data control block.

DCBE Data control block extension.

DCS DASD calculation services.

DECB Data event control block.

default management class

Part of the SMS base configuration, it identifies the management class that should be used for system-managed data sets that do not have a management class assigned.

device category

A storage device classification used by SMS. The device categories are as follows SMS-managed DASD, SMS-managed tape, non-SMS-managed DASD non-SMS-managed tape.

DFSMSdfp

A DFSMS functional component or base element of z/OS, that provides functions for storage management, data management, program management, device management, and distributed data access.

DFSMSdss

A DFSMS functional component or base element of z/OS, used to copy, move, dump, and restore data sets and volumes.

DFSMShsm

A DFSMS functional component or base element of z/OS, used for backing up and recovering data, and managing space on volumes in the storage hierarchy.

DFSMShsm-managed volume

(1) A primary storage volume, which is defined to DFSMShsm but which does not belong to a storage group.

(2) A volume in a storage group, which is using DFSMShsm automatic dump, migration, or backup services. Contrast with *system-managed volume*, *DFSMSrmm-managed volume*.

DFSMS

See *Data Facility Storage Management Subsystem*.

DFSMSrmm

A DFSMS functional component or base element of z/OS, that manages removable media.

DFSMSrmm-managed volume

A tape volume that is defined to DFSMSrmm. Contrast with *system-managed volume*, *DFSMShsm-managed volume*.

DFSORT

Data Facility Sort.

DSAB Data set association block.

DSCB Data set control block.

dummy storage group

A type of storage group that contains the serial numbers of volumes no longer connected to a system. Dummy storage groups allow existing JCL to function without having to be changed. See also *storage group*.

E**EBCDIC**

Extended binary-coded decimal interchange code.

ENQ An assembler language macro instruction that requests the control program to assign control of one or more serially reusable resources to the active task. It is also used to determine the status of a resource; that is, whether it is immediately available or in use, and whether control has been previously requested for the active task in another ENQ macro instruction.

entry

A collection of information about a cataloged object in a master or user catalog. Each entry resides in one or more 512-byte records.

EOM End-of-module.

EP Entry point.

EXCD Exceptional conditions.

expiration

(1) The process by which data sets or objects are identified for deletion because their expiration date or retention period has passed. On DASD, data sets and objects are deleted. On tape, when all data sets have reached their expiration date, the tape volume is available for reuse.

(2) In DFSMSrmm, all volumes have an expiration date or retention period set for them either by vital record specification policy, by user-specified JCL when writing a data set to the volume, or by an installation default. When a volume reaches its expiration date or retention period, it becomes eligible for release.

extended format

The format of a data set that has a data set name type (DSNTYPE) of EXTENDED. The data set is structured logically the same as a data set that is not in extended format but the physical format is different. Data sets in extended format can be striped or compressed. Data in an extended format VSAM KSDS can be compressed. See also *striped data set*, *compressed format*.

F

file A collection of information treated as a unit. In non-z/OS UNIX environments, the terms *data set* and *file* are generally equivalent and are sometimes used interchangeably. See also *data set*.

filtering

The process of selecting data sets based on specified criteria. These criteria consist of fully or partially-qualified data set names or of certain data set characteristics.

FREEMAIN

An assembler language macro instruction that releases one area of virtual storage that had previously been allocated as a result of a GETMAIN macro instruction.

G

GEN Generic key search.

generation

One member of a generation data group.

GETMAIN

An assembler language macro instruction that is used to allocate an area of virtual storage.

group (1) With respect to partitioned data sets, a member and the member's aliases that exist in a PDS or PDSE, or in an unloaded PDSE.

(2) A collection of users who can share access authorities for protected resources.

H

HA Home address.

I

improved data recording capability (IDRC)

A recording mode that can increase the effective cartridge data capacity and the effective data rate when enabled and used. IDRC is always enabled on the 3490E Magnetic Tape Subsystem.

in-place conversion

The process of bringing a volume and the data sets it contains under the control of SMS without data movement, using DFSMSdss.

installation exit

The means specifically described in an IBM software product's documentation by which an IBM software product may be modified by a customer's system programmers to change or extend the functions of the IBM software product. Such modifications consist of exit routines written to replace an existing module of an IBM software product, or to add one or more modules or subroutines to an IBM software product for the purpose of modifying (including extending) the functions of the IBM software product. Contrast with *user exit routine*.

installation exit routine

A routine written by a system programmer to take control at an installation exit of an IBM software product.

Interactive Storage Management Facility (ISMF)

The interactive interface of DFSMS that

allows users and storage administrators access to the storage management functions.

Interactive System Productivity Facility (ISPF)

An IBM licensed program that serves as a full-screen editor and dialogue manager. Used for writing application programs, it provides a means of generating standard screen panels and interactive dialogues between the application programmer and terminal user.

interval migration

In DFSMSHsm, automatic migration that occurs when a threshold level of occupancy is reached or exceeded on a DFSMSHsm-managed volume, during a specified time interval. Data sets are moved from the volume, largest eligible data set first, until the low threshold of occupancy is reached.

IOB Input/output block.

J

JFCB Job file control block.

JFCBE Job file control block extension for 3800 printer.

JSCB Job step control block.

K

KB Kilobyte (equals two to the tenth power bytes, or 1024).

L

large format

The format of a data set that has a data set name type (DSNTYPE) of LARGE. A large format data set has the same characteristics as a sequential (non-extended format) data set, but its size on each volume can exceed 65 535 tracks. There is no minimum size requirement for a large format data set.

linear data set (LDS)

A VSAM data set that contains data but no control information. A linear data set can be accessed as a byte-addressable string in virtual storage.

LINK An assembler language macro instruction that causes control to be passed to a specified entry point. The linkage relationship established is the same as that created by a BAL instruction.

locate Pertains to functions that do not change the status of a catalog; that is, read-only operations are performed.

LPALIB

Link pack area library.

LRI Logical record interface.

M

MACRF

Macro reference.

management class

A collection of management attributes, defined by the storage administrator, used to control the release of allocated but unused space; to control the retention, migration, and backup of data sets; to control the retention and backup of aggregate groups, and to control the retention, backup, and class transition of objects.

MBBCHHR

Absolute disk address. (Module#, bin#, cylinder#, head#, record#).

MCD MCDS data set record. See migration control data set.

memory

As used in this information, a synonym for the private address space in virtual storage.

migration

The process of moving unused data to lower cost storage in order to make space for high-availability data. If you wish to use the data set, it must be recalled. See also *migration level 1*, *migration level 2*.

migration control data set (MCDS)

In DFSMSHsm, a VSAM key-sequenced data set that contains statistics records, control records, user records, records for data sets that have migrated, and records for volumes under migration control of DFSMSHsm.

migration level 1

DFSMSHsm-owned DASD volumes that contain data sets migrated from primary storage volumes. The data can be compressed. See also *storage hierarchy*. Contrast with *primary storage*, *migration level 2*.

migration level 2

DFSMSHsm-owned tape or DASD

volumes that contain data sets migrated from primary storage volumes or from migration level 1 volumes. The data can be compressed. See also *storage hierarchy*. Contrast with *primary storage, migration level 1*.

MVS/DFP

An IBM licensed program which is the base for the Storage Management Subsystem.

MWE Management work element

N

NSI Next sequential instruction.

NUP No update.

O

OAM See *Object access method*.

OAM Storage Management Component (OSMC)

In the Object Access Method, the component that determines where objects should be stored, manages object movement within the object storage hierarchy, and manages expiration attributes based on the installation storage management policy.

object A named byte stream having no specific format or record orientation.

object access method (OAM)

An access method that provides storage, retrieval, and storage hierarchy management for objects and provides storage and retrieval management for tape volumes contained in system-managed libraries.

object backup storage group

A type of storage group that contains optical or tape volumes used for backup copies of objects. See also *storage group*.

object storage group

A type of storage group that contains objects on DASD, tape, or optical volumes. See also *storage group*.

O/C/EOV

Open, close, end-of-volume.

offline control data set (OCDS)

In DFSMSHsm, a VSAM key-sequenced set that contains information about tape backup volumes and tape migration level 2 volumes.

optical volume

Storage space on an optical disk, identified by a volume label. See also *volume*.

optimal block size

For non-VSAM data sets, optimal block size represents the block size that would result in the greatest space utilization on a device, taking into consideration record length and device characteristics.

z/OS

z/OS is a network computing-ready, integrated operating system consisting of more than 50 base elements and integrated optional features delivered as a configured, tested system.

OSMC

OAM storage management component.

OSR

Object storage and retrieval.

P

partitioned data set (PDS)

A data set on direct access storage that is divided into partitions, called members, each of which can contain a program, part of a program, or data.

partitioned data set extended (PDSE)

A data set that contains an indexed directory and members that are similar to the directory and members of partitioned data sets. A PDSE can be used instead of a partitioned data set.

PDAB Parallel data access block.

PDSCB

Partial data set control block.

PDSE Partitioned data set extended.

performance

(1) A measurement of the amount of work a product can produce with a given amount of resources.

(2) In a system-managed storage environment, a measurement of effective data processing speed with respect to objectives set by the storage administrator. Performance is largely determined by throughput, response time, and system availability.

permanent data set

A user-named data set that is normally

- retained for longer than the duration of a job or interactive session. Contrast with *temporary data set*.
- PLH** Placeholder list.
- pool storage group**
A type of storage group that contains system-managed DASD volumes. Pool storage groups allow groups of volumes to be managed as a single entity. See also *storage group*.
- PR** Pseudo register.
- primary storage**
A DASD volume available to users for data allocation. The volumes in primary storage are called primary volumes. See also *storage hierarchy*. Contrast with *migration level 1*, *migration level 2*.
- PSL** Page save list.
- Q**
- QCT** Queue control block
- R**
- R0** Record zero.
- RB** Request block.
- read-only variable**
An ACS language variable that contains data set or system-derived information. It can be referenced but not altered in an ACS routine.
- read-write variable**
An ACS language variable that is assigned a value within an ACS routine. It can be referenced, and each ACS routine assigns a value to its own unique read-write variable.
- RDW** Record descriptor word.
- record zero (R0)**
Track capacity record on a DASD device.
- recovery**
The process of rebuilding data after it has been damaged or destroyed, often by using a backup copy of the data or by reapplying transactions recorded in a log.
- relative track and record address (TTR)**
Relative track and record address on a direct-access device, where TT represents two bytes specifying the track relative to the beginning of the data set, and R is one byte specifying the record on that track.
- RETURN**
An assembler language macro instruction that is used to return control to the calling CSECT, and to signal normal or abnormal termination of the returning CSECT.
- Rn** General purpose register n.
- RPS** Rotational position sensing.
- RTN** Routine.
- S**
- SAVE** An Assembler language macro instruction that causes the contents of the specified registers to be stored in the save area at the address contained in register 13.
- SCRA** Catalog recovery area in system storage.
- SCRATCH**
An assembler language macro instruction that points to the CAMLST macro instruction. SCRATCH, the first operand of CAMLST, specifies that a data set be deleted.
- SDUMP**
System dump.
- search limit**
The track following the last track that should actually be searched in a data set.
- SEQ** Sequential or sequential processing.
- SETL** Set lower limit of sequential retrieval
- simple name**
The rightmost component of a qualified name. For example, "APPLE" is the simple name in "TREE.FRUIT.APPLE." The simple name corresponds to the lowest index level in the CVOL catalog for the data set name.
- SIO** Start I/O.
- small-data-set-packing data set**
In DFSMSHsm, a VSAM key-sequenced data set allocated on a migration level 1 volume and containing small data sets that have been migrated.
- SKP** Skip sequential or skip sequential processing.
- SMS** Storage Management Subsystem or System Managed Storage.

SMS class

A list of attributes that SMS applies to data sets having similar allocation (data class), performance (storage class), or backup and retention (management class) needs.

sphere

The collection of base cluster, alternate indexes, and upgrade alternate indexes opened to process one or more related paths.

SRA Sphere record area.

storage administrator

A person in the data processing center who is responsible for defining, implementing, and maintaining storage management policies.

storage class

A collection of storage attributes that identify performance goals and availability requirements, defined by the storage administrator, used to select a device that can meet those goals and requirements.

storage group

A collection of storage volumes and attributes, defined by the storage administrator. The collections can be a group of DASD volumes or tape volumes, or a group of DASD, optical, or tape volumes treated as a single object storage hierarchy. See also *pool storage group*, *tape storage group*, *object storage group*, *object backup storage group*, and *dummy storage group*.

storage hierarchy

An arrangement of storage devices with different speeds and capacities. The levels of the storage hierarchy include main storage (memory, DASD cache), primary storage (DASD containing uncompressed data), migration level 1 (DASD containing data in a space-saving format), and migration level 2 (tape cartridges containing data in a space-saving format). See also *primary storage*, *migration level 1*, *migration level 2*, *object storage hierarchy*.

Storage Management Subsystem (SMS)

A DFSMS facility used to automate and centralize the management of storage. Using SMS, a storage administrator describes data allocation characteristics,

performance and availability goals, backup and retention requirements, and storage requirements to the system through data class, storage class, management class, storage group, and ACS routine definitions.

string The part of a control block structure built around a placeholder (PLH) that allows VSAM to keep track of one position in the data set that the control block structure describes.

stripe In DFSMS, the portion of a striped data set, such as an extended format data set, that resides on one volume. The records in that portion are not always logically consecutive. The system distributes records among the stripes such that the volumes can be read from or written to simultaneously to gain better performance. Whether it is striped is not apparent to the application program.

striping

A software implementation of a disk array that distributes a data set across multiple volumes to improve performance.

striped data set

In DFSMS, an extended-format data set consisting of two or more stripes. SMS determines the number of stripes to use based on the value of the SUSTAINED DATA RATE in the storage class. Striped data sets can take advantage of the sequential data striping access technique. See *stripe*, *striping*.

SVCLIB

Supervisor call library.

SVRB Supervisor request block.

SVT Supervisor vector table.

SWA Scheduler work area.

system data

The data sets required by z/OS or its subsystems for initialization and control.

system-managed data set

A data set that has been assigned a storage class.

system-managed storage

Storage managed by the Storage Management Subsystem. SMS attempts to deliver required services for availability,

performance, and space to applications.
See also *system-managed storage environment*.

DFSMS environment

An environment that helps automate and centralize the management of storage. This is achieved through a combination of hardware, software, and policies. In the DFSMS environment for z/OS, this function is provided by DFSMS, DFSORT, and RACF. See also *system-managed storage*.

system-managed tape library

A collection of tape volumes and tape devices, defined in the tape configuration database. A system-managed tape library can be automated or manual. See also *tape library*.

system-managed volume

A DASD, optical, or tape volume that belongs to a storage group. Contrast with *DFSMSHsm-managed volume*, *DFSMSRmm-managed volume*.

system programmer

A programmer who plans, generates, maintains, extends, and controls the use of an operating system and applications with the aim of improving overall productivity of an installation.

T

tape library

A set of equipment and facilities that support an installation's tape environment. This can include tape storage racks, a set of tape drives, and a set of related tape volumes mounted on those drives. See also *system-managed tape library*.

Tape Library Dataserver

A hardware device that maintains the tape inventory that is associated with a set of tape drives. An automated tape library dataserver also manages the mounting, removal, and storage of tapes.

tape storage group

A type of storage group that contains system-managed private tape volumes. The tape storage group definition specifies the system-managed tape libraries that can contain tape volumes. See also *storage group*.

tape volume

A tape volume is the recording space on a single tape cartridge or reel. See also *volume*.

TCB Task control block or Trusted computer base (in Trusted Computer Security Criteria).

TIOT Task I/O table.

temporary data set

An uncataloged data set whose name begins with & or &&, that is normally used only for the duration of a job or interactive session. Contrast with *permanent data set*.

track overflow

A user-specified option that allows a record whose space requirements exceed the space remaining on the track to be partially written on that track and completed on the next track. MVS no longer supports this hardware feature.

transfer control (XCTL)

An assembler language macro that causes control to be passed to a specified entry point.

TTR Relative track record address.

U

UCB Unit control block.

uncatalog

To remove the catalog entry of a data set from a catalog.

unit control block (UCB)

A data area used by MVS for device allocation and for controlling input/output, (I/O) operations.

UPD Update mode, or data modify.

user exit

A point in an IBM-supplied program at which a user exit routine may be given control.

user exit routine

A user-written routine that receives control at predefined user exit points. User exit routines can be written in assembler or a high-level language.

USVR User security-verification routine.

V

VIR VTOC index record.

VIXM VTOC index map.

VMDS

VTOC map of DSCBs.

volume

The storage space on DASD, tape, or optical devices, which is identified by a volume label. See also *DASD volume*, *optical volume*, and *tape volume*.

VRP VSAM resource pool.

VSAM volume data set (VVDS)

A data set that describes the characteristics of VSAM and system-managed data sets residing on a given DASD volume; part of a catalog. See also *basic catalog structure*.

VSRT VSAM shared resource table.

VVDS VSAM volume data set.

VVR VSAM volume record.

W

WAIT An assembler language macro instruction that informs the control program that the issuing program cannot continue until a specific event, represented by an event control block, has occurred.

X

XCTL See *XCTL (Transfer control)*.

XCTL (transfer control)

An assembler language macro that causes control to be passed to a specified entry point without return expected.

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Product Number: 5650-ZOS

Printed in USA

SC23-6850-01

