z/OS

DFSMS Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries

SC35-0427-10

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 379.

This edition applies to version 1, release 13, modification 0 of IBM z/OS (product number 5694-A01) and to all subsequent releases and modifications until otherwise indicated in new editions.

This edition replaces SC35-0427-09.

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About This Book

This book introduces OAM and its role in the support of tape libraries and explains how to do the following tasks:
- Plan and install OAM for use with the tape library
- Define your tape configuration
- Operate the OAM address space
- Invoke LCS External Services to perform various tape library functions
- Customize the installation exits

This book is for system programmers, storage administrators, and system operators who perform these tasks.

Required product knowledge

To understand OAM and tape libraries, you should be familiar with:
- DFSMSdfp
- Integrated catalog facility (ICF)
- Interactive Storage Management Facility (ISMF)
- Hardware configuration definition (HCD)

Referenced documents

The following publications are referenced in this book:

Publication Title	Order Number
z/OS DFSMS Access Method Services for Catalogs	SC26-7394
z/OS DFSMSdfp Storage Administration	SC26-7402
z/OS DFSMSdfp Diagnosis	GY27-7618
z/OS DFSMSrmm Diagnosis Guide	GY27-7619
z/OS DFSMSrmm Implementation and Customization Guide	SC26-7405
z/OS DFSMSrmm Managing and Using Removable Media	SC26-7404
z/OS DFSMS Introduction	SC26-7397
z/OS DFSMS Installation Exits	SC26-7396
z/OS DFSMS Managing Catalogs	SC26-7409
z/OS DFSMS Object Access Method Application Programmer's Reference	SC35-0425
z/OS DFSMS Object Access Method Planning, Installation, and Storage Administration Guide for Object Support	SC35-0426
DFSMS Optimizer Version 1 Release 2 Messages and Codes	SC26-7049
z/OS DFSMS Using the Interactive Storage Management Facility	SC26-7411
IBM TotalStorage 3494 Tape Library Introduction and Planning Guide	GA32-0448
IBM TotalStorage 3494 Tape Library Operator Guide	GA32-0449
IBM System Storage TS3500 Tape Library Introduction and Planning Guide IBM 3584 Tape Library	GA32-0559
IBM System Storage TS3500 Tape Library Operator Guide IBM 3584 Tape Library	GA32-0560
Magstar 3495 Tape Library Introduction and Planning Guide	GA32-0234

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Publication Title	Order Number
IBM 3495 Operator's Guide	GA32-0235
IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide	GA32-0329
IBM System Storage 3592 Tape Drives and TS1120 Controller Introduction and Planning Guide	GA32-0555
IBM System Storage 3592 Tape Drives and TS1120 Controller Operator Guide	GA32-0556
IBM 3953 Tape System Introduction and Planning Guide	GA32-0557
IBM 3953 Library Manager Model L05 Operator Guide	GA32-0558
z/OS DFSMS Software Support for IBM System Storage TS1140, TS1130, and TS1120 Tape Drives (3592)	SC26-7514
3480 Models A11/A22 and B11/B22 Introduction	GA32-0041
GDPS/PPRC Installation and Customization Guide	ZG24-6703
z/OS MVS Initialization and Tuning Guide	SA22-7591
z/OS MVS Initialization and Tuning Reference	SA22-7592
z/OS Hardware Configuration Definition Planning	GA22-7525
z/OS DFSMS Implementing System-Managed Storage	SC26-7407
z/OS DFSMS Software Support for IBM TotalStorage Tape System 3590 Models E1x/H1x	SC35-0484
z/OS HCD User's Guide	SC33-7988
z/OS MVS Planning: Global Resource Serialization	SA22-7600
z/OS MVS Planning: Operations	SA22-7601
z/OS Security Server RACF Command Language Reference	SA22-7687
z/OS MVS System Commands	SA22-7627
z/OS Migration	GA22-7499
z/OS MVS System Messages, Vol 4 (CBD-DMO)	SA22-7634
z/VM CP Planning and Administration	SC24-6083
z/VM Running Guest Operating Systems	SC24-6115
IBM Redbooks IBM System Storage Virtualization Engine TS7700: Tape Virtualization for System Z Servers	SG24-7312
IBM Virtualization Engine TS7700 Series Introduction and Planning Guide	GA32-0567

Accessing z/OS DFSMS information on the Internet

In addition to making softcopy information available on CD-ROM, IBM provides access to z/OS softcopy information on the Internet. To view, search, and print z/OS information, go to the z/OS Internet Library:

`http://www.ibm.com/systems/z/os/zos/bkserv/`

The z/OS Basic Skills Information Center

The z/OS Basic Skills Information Center is a Web-based information resource intended to help users learn the basic concepts of z/OS, the operating system that runs most of the IBM mainframe computers in use today. The Information Center is designed to introduce a new generation of Information Technology professionals to basic concepts and help them prepare for a career as a z/OS professional, such as a z/OS system programmer.

Specifically, the z/OS Basic Skills Information Center is intended to achieve the following objectives:

- Provide basic education and information about z/OS without charge
- Shorten the time it takes for people to become productive on the mainframe
- Make it easier for new people to learn z/OS.

To access the z/OS Basic Skills Information Center, open your Web browser to the following Web site, which is available to all users (no login required): http://publib.boulder.ibm.com/infocenter/zos/basics/index.jsp

How to Read Syntax Diagrams

There is one basic rule for reading the syntax diagrams: Follow only one line at a time from the beginning to the end and code everything you encounter on that line.

The following rules apply to the conventions that are used in the syntax diagrams for all the OAM commands:

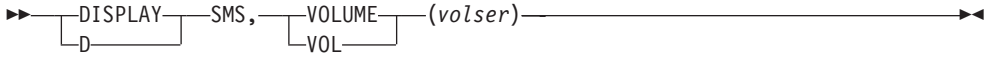
- Read the syntax diagrams from left to right and from top to bottom.
- Each syntax diagram begins with a double arrowhead (►►) and ends with opposing arrows (►◄).
- An arrow (→) at the end of a line indicates that the syntax continues on the next line. A continuation line begins with an arrow (►—).
- Commands and keywords are shown in uppercase letters.
- Some commands and keywords have alternative abbreviations; these appear as part of the stack for that command or keyword. For example, the alternative abbreviation for **DISPLAY** is **D**.

- Where you can choose from two or more keywords, the choices are stacked one above the other. If one choice within the stack lies on the main path, a keyword is required, and you must choose one. In the following example you must choose either **DETAIL** or **STATUS**.

- If a stack is placed below the main path, a keyword is optional, and you can choose one or none. In the following example, **PURGE**, **KEEP**, and **LOCATION** are optional keywords. You can choose any one of the three.

- Where you can choose from two or more keywords and one of the keywords appears above the main path, that keyword is the default. You may choose one or the other of the keywords, but if none is entered, the default keyword is automatically selected. In the following example you may choose either **DETAIL** or **STATUS**. If neither is chosen, **STATUS** is automatically selected.

- Words or names in italicized, lowercase letters represent information that you supply. The values of these variables may change depending on the items to which they refer. For example, *volser* refers to the serial number of a volume, while *storgrp_name* refers to the name of a storage group.
- You must provide all items enclosed in parentheses ( ). You must include the parentheses. In the following example, you must supply the volume serial number (*volser*) and it must be enclosed in parentheses.

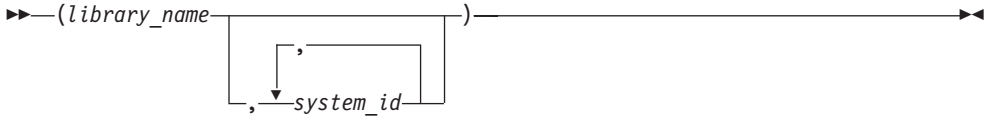


  You would code this as follows:

  D SMS,VOL(*volser***)**

  The variable *volser* is the serial number of the volume you wish to display.
- The repeat symbol shown below indicates that you can specify keywords and variables more than once. The repeat symbol appears above the keywords and variables that can be repeated. For example, when a comma appears in the repeat symbol, you must separate repeated keywords or variables with a comma.

  In the following example, you may specify the *library_name* and one or more system identification numbers (*system_id*) that are separated by commas. You must enclose the name of the library and all of the system IDs in parentheses.



  You would code this as follows:

  (*library_name***,** *system_id***,** *system_id***,** *system_id***)**

  The variable *library_name* is the name of the library you are working with, and *system_id* names three different instances of system identification numbers.

How to send your comments to IBM

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Summary of Changes

Summary of Changes for SC35-0427-10 z/OS Version 1 Release 13

This book contains information previously presented in *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries* (SC35-0427-09).

The following sections summarize the changes to that information.

New Information

This edition includes the following new information:

- "RACF considerations for the VOLCAT" on page 7
- "Scratch allocation assistance" on page 56
- "Selective write protect for disaster recovery (DR) test" on page 101
- "Encryption-Capable 3592 Model E07 Coexistence Considerations" on page 76
- Figure 70 on page 364

Changed Information

- A note been added to "Cartridge Entry Installation Exit (CBRUXENT) Usage Requirements" on page 235.
- Notes have been added to "Changing System Libraries" on page 79.
- "Logical WORM Considerations" on page 26 has been updated.
- "TCDB Volume Error Status Field and Software Error Category in an Automated Tape Library" on page 63 and "Querying the Residence of a Volume" on page 169 have been updated.
- The description of reason code 312 has been updated in Table 5 on page 159, Table 14 on page 179, Table 13 on page 177,Table 15 on page 183, and Table 16 on page 185.
- "Displaying Library Status" on page 124 has been updated.
- "Displaying Library Detail Status" on page 126 has been updated.
- "Displaying tape library attributes" on page 341 has been updated.
- "Hardware" on page 45 has been updated.
- Table 3 on page 46
- "WORM Considerations" on page 50
- "Manual Tape Library Hardware Considerations" on page 51
- "Managing Multiple Media Formats" on page 51
- "Tape Device Selection Information" on page 52
- "Tape Encryption Support" on page 57
- "Performance Scaling Considerations" on page 59
- "Performance Segmentation Considerations" on page 59
- Table 4 on page 60
- "Scratch Threshold Setting and Scratch Allocation Implications" on page 61
- "Entering a Tape Volume into an MTL" on page 111
- "Media Selection in an ATLDS" on page 119

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- "Displaying Tape Drive Status" on page 130
- "Changing the use attribute of a volume" on page 153
- Figure 17 on page 203
- "Change Use Attribute Installation Exit Parameter List (CBRUXCPL)" on page 218
- Figure 39 on page 334
- "Glossary" on page 381

The "Readers' Comments - We'd Like to Hear from You" section at the back of this publication has been replaced with a new section "How to send your comments to IBM" on page xv. The hardcopy mail-in form has been replaced with a page that provides information appropriate for submitting readers comments to IBM.

This document contains terminology, maintenance, and editorial changes, including changes to improve consistency and retrievability.

Summary of Changes for SC35-0427-09 z/OS Version 1 Release 11

This book contains information previously presented in *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries* (SC35-0427-08).

The following sections summarize the changes to that information.

New Information

This edition includes the following new information:

- "Logical WORM Considerations" on page 26 has been added for TS7700 Virtualization Engine Release 1.6 support.
- "TS7680 Tape Virtualization" on page 27 has been added for TS7680 (3958-DE2) support
- "Balanced Mode in the TS7700 Virtualization Engine" on page 56 has been added.

Changed Information

The following topics have been updated for TS7700 Virtualization Engine Release 1.6 support:

- "Larger Logical Volume Sizes" on page 17
- "Improved Cache Management" on page 18
- "TS7700 Virtualization Engine" on page 24
- "Scratch Threshold Setting and Scratch Allocation Implications" on page 61
- "Displaying Library Detail Status" on page 126
- "Displaying Tape Volume Status" on page 138 (new status line)
- "Changing a WORM Tape Volume's Use Attribute" on page 158
- Table 5 on page 159 (new reason codes)
- Table 13 on page 177 (new reason codes)
- Figure 15 on page 189 (new reason codes)
- Figure 17 on page 203
- "Change Use Attribute Installation Exit (CBRUXCUA)" on page 213
- Figure 19 on page 219

- "Glossary" on page 381.

The following topics have been updated for TS7680 (3958-DE2) support:
- "TS7720 Virtualization Engine (3957-VEx)" on page 26
- "Displaying Library Detail Status" on page 126.
- "Glossary" on page 381.

The following topics have been updated with additional information:
- Table 3 on page 46
- "Load Balancing Considerations" on page 54
- "Displaying Library Detail Status" on page 126

This document contains terminology, maintenance, and editorial changes, including changes to improve consistency and retrievability.

Summary of Changes for SC35-0427-08 z/OS Version 1 Release 11

This book contains information previously presented in *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries* (SC35-0427-07).

The following sections summarize the changes to that information.

New Information

This edition includes the following new information:
- Tape library requests can be made to use the UNIT name and allocate to a specific device number or set of devices in an esoteric on the UNIT name, as described in "Demand Allocation with System-Managed Tape" on page 54.
- MVS Device Allocation now supports a "BYDEVICES" load balancing option that will more evenly distribute scratch allocations across all eligible devices, as described in "Load Balancing Considerations" on page 54

This document contains terminology, maintenance, and editorial changes, including changes to improve consistency and retrievability.

Chapter 1. Introduction to Tape Library Management

The Object Access Method (OAM) is a component of DFSMSdfp, the base of the storage management system (SMS) of DFSMS. OAM uses the concepts of system-managed storage, introduced by SMS, to manage, maintain, and verify tape volumes and tape libraries within a tape storage environment.

The management of data on tape volumes is not discussed in this manual. See *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support* for information on OAM's role in the storage of objects on tape volumes. Also, see *z/OS DFSMSrmm Managing and Using Removable Media* for information on of DFSMSrmm's role in the management of data on tape volumes.

In general, a *tape library* is a set of tape volumes and the set of tape drives where those volumes may be mounted. The relationship between tape drives and tape volumes is exclusive; a tape volume residing in a library (*library-resident tape volume*) can only be mounted on a tape drive contained in that library (*library-resident tape drive*), and a library-resident tape drive can only be used to mount a tape volume which resides in the same library. A tape library can consist of one or more tape systems.

When a volume is entered into a tape library, it is assigned to a tape storage group. A tape library can contain volumes from multiple storage groups, and a storage group can reside in up to eight libraries.

As new tape data sets are created, the installation allocates data sets to tape volumes in an SMS-managed tape library by associating one or more tape storage group names (using the SMS storage group ACS routine) with the allocation request. DFSMS ensures that only tape devices within the tape libraries associated with the tape storage groups are allocated to the request. Existing tape data sets on library-resident volumes are allocated to tape drives within the library where the volume resides.

Automated Tape Storage

Tape automation provides satisfactory solutions for many of the problems that occur when tape library storage requires human intervention. Mount times are reduced from minutes to seconds. The number of lost, misfiled, or damaged tapes decreases. Security is enhanced because the tape library hardware and tape cartridges can be kept in a secure area. Customers experience the benefits of a cost-effective, efficient, and automated method for storing their tape media, and they drastically reduce the amount of human intervention required to maintain their tape storage environments.

The IBM Automated Tape Libraries and their supporting software streamline and automate the roles of the storage administrator, tape operator, and the tape librarian. They also use the concepts of SMS to manage the tape volumes within the library.

For a discussion of the IBM TotalStorage Enterprise Automated Tape Library (3495) and the IBM TotalStorage Enterprise Automated Tape Library (3494), see "TotalStorage Automated Tape Library (3495) system attachment" on page 10 and "TotalStorage Automated Tape Library (3494) System Attachment" on page 12. For

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a discussion of the System Storage Tape Library (3584), see “System Storage Automated Tape Library (3584) System Attachment” on page 14.

Automated Tape Library

An automated tape library dataserver (ATLDS) consists of tape drives, tape cartridges, a tape cartridge storage area, input and output stations for inserting and removing cartridges, and a mechanism for moving tape cartridges among these areas. The volumes within an automated tape library are known as library-resident tape volumes. Tape volumes can also be located on shelves outside the automated tape library. These volumes are known as shelf-resident tape volumes. See Figure 1 on page 11 and Figure 2 on page 13 for examples of the IBM TotalStorage Enterprise Automated Tape Library (3495) and the IBM TotalStorage Enterprise Automated Tape Library (3494).

Tape cartridges are stored and retrieved by an automated cartridge accessor. The cartridges are placed in an input station by the tape library operator. The cartridge accessor then scans the external volume label on the cartridge, carries the cartridge to the appropriate storage location, and places it into the library. When a volume mount is requested, the cartridge accessor retrieves the cartridge from the storage location, carries it to the requested drive, and mounts the cartridge in the drive. Upon completion of the tape operation, the tape cartridge is unloaded, the accessor retrieves it from the drive, and returns it to a storage location in the library.

However, the tape library operator can continue library operation during periods when the cartridge accessor is not operational. During this time the operator responds to commands displayed on the manual mode console. This is known as manual mode operation.

In an ATLDS environment, mount and demount messages are only issued to the system log and will not appear on the console.

Manual Tape Storage

Manual tape library management provides the advantages of system-managed tape in a non-automated environment. The tape library operator continues to use the MVS console to receive tape-related instructions. The library volumes can reside on a shelf near the tape library drives to satisfy mount requests. The grouping of volumes and drives provides system-managed support for manual tape libraries in multiple locations.

Manual Tape Library

A manual tape library (MTL) is an installation-defined set of tape drives and a customer-defined set of tape volumes with mount capability on those tape drives. The volumes can be physically stored in shelf storage located near the MTL, but since these volumes are specifically defined as residing in the MTL, they are known as library-resident volumes. When the volumes are logically ejected from the MTL, they become shelf-resident volumes.

In an MTL environment, the operator or tape librarian responds to commands at the MVS console, manually loading and unloading the tape cartridges. Before a tape cartridge can be used, the tape cartridge must first be logically entered into an MTL. Cartridges can be entered into an MTL through invocation of the CBRXLCS manual cartridge entry (MCE), general use programming interface, or through invocation of the LIBRARY ENTER command (see “Entering a Tape Volume into an MTL” on page 111 for more information).

Guidelines:

1. Operation of this support outside of the true stand-alone environment is not intended. To determine feasibility of this support within a non-IBM robotic tape library, contact the manufacturer of the robotic tape library.
2. If a vendor's tape device, emulating a 3490E or IBM TotalStorage Enterprise Tape System 3590 native device, is defined to the library, the manual tape library support will treat this device as a real 3490E or as a real 3590 Model B. When entered into the library, the media must be defined as its emulated media. It is then the user's responsibility to manage media or device incompatibilities. This can be managed by keeping incompatible devices with the same emulated or real device type in separate libraries.

Object Access Method Support for Tape Libraries

OAM uses system-managed storage concepts within the SMS component of DFSMS to provide the management facilities for the physical movement and tracking of the tape volumes used within tape libraries.

There are three components of OAM:
- Object Storage and Retrieval (OSR)
- OAM Storage Management Component (OSMC)
- Library Control System (LCS)

This manual covers the use of the LCS component of OAM in support of tape libraries. For information on the roles of OSR, OSMC, and LCS in support of object data, see *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support*.

OAM provides the following services in support of tape libraries:
- Cartridge entry, eject, audit, mount, and demount processing
- Operator command processing
- Tape configuration database (TCDB) management
- A set of tape library related services which may be used by the installation (see Chapter 6, "Library Control System (LCS) External Services," on page 151)
- Installation exits that influence tape processing at four critical points:
  - Entering a cartridge into a tape library, or importing logical volumes into a virtual tape system (VTS)—CBRUXENT
  - Ejecting a cartridge from a tape library, or exporting logical volumes from a VTS—CBRUXEJC
  - Changing the use attribute of a tape cartridge—CBRUXCUA
  - Allowing the installation to enter a nonlibrary-resident cartridge into a tape library during allocation processing—CBRUXVNL

  See Chapter 7, "Installation Exits," on page 213 for more information on these installation exits.
- Unsolicited attention message processing.

Recommendation: Only a subset of the functions above actually execute within the OAM address space (entry, eject, audit, and unsolicited attention message processing). Cartridge mount and demount activity (job processing) does not require the OAM address space. However, since job processing often results in volumes being entered and error and status messages being displayed, run the installation with the OAM address space active whenever possible.

ISMF Role with Tape Libraries

The storage administrator performs library-related functions through the use of the Interactive Storage Management Facility (ISMF) library management panels.

ISMF serves two roles in tape library management. First, it allows the storage administrator to define tape libraries in the tape configuration database (TCDB). Second, it allows the storage administrator to define tape libraries in specified source control data sets (SCDSs), making them a part of the SMS configuration when that SCDS is activated. Upon activation of an SCDS that has tape libraries defined, an operator on any console within an SMS complex can issue commands targeted for any tape library within the SMS configuration. Each change associated with an SCDS does not take effect until that SCDS is activated. Changes to the TCDB take effect the next time an SCDS that includes that tape library is activated.

Rule: Tape drives associated with either an automated tape library dataserver or a manual tape library must be defined using the hardware configuration definition (HCD). For more information on HCD requirements, see "Creating the Hardware Configuration" on page 84 and to *z/OS HCD User's Guide*.

ISMF allows the storage administrator to define, alter, list, and display:
- Tape library definitions
- Tape storage group definitions
- Data class definitions
- Storage class definitions
- Management class definitions

Managing the tape library's volume inventory is also handled through ISMF. For more detailed information, see Appendix B, "Using ISMF panels to define and monitor your configuration," on page 331 and *z/OS DFSMS Using the Interactive Storage Management Facility*.

Installation Storage Management Policy Overview

Each installation defines a storage management policy that allows effective tape storage management without requiring user intervention. Through ISMF, the storage administrator and system programmer define an installation storage management policy in an SMS configuration.

An SMS configuration for tape libraries consists of the following elements:
- **Base configuration.** The base configuration identifies the systems and system groups in an SMS complex and contains installation defaults.
- **SMS constructs.** Constructs are lists of attributes that are assigned to data sets and storage areas. An SMS configuration can contain five construct types. The following describes all five constructs; however, SMS-managed tape uses only storage group, storage class, and data class. With outboard policy management support in the Virtual Tape Server (VTS), the storage group, storage class, management class, and data class names are sent to the library.
  - **Storage group** allows you to define a storage hierarchy and manage that hierarchy as if it were one large, single storage area.
  - **Storage class** allows you to define different levels of performance objectives and availability requirements for system-managed storage.
  - **Data class** allows you to define specific data attributes.
  - **Management class** allows you to define different backup, retention, and class transition characteristics.

– **Aggregate group** allows you to group a collection of data objects that form a data type. This allows the data to be referred to collectively or individually.

An SMS configuration can contain multiple constructs of each type.

System Groups in an SMS Configuration

The systems that share the SMS configuration may be defined in one of two ways:

- As an individual system (the name of the system is known to SMS)
- As part of a system group (only the name of the group is known to SMS). There can be a maximum of 32 systems, system-group names, or both sharing the SMS configuration.

Recommendation: Although a system group may be defined to SMS, define all systems connected to a tape library as individual systems. If the tape library is connected to a system group, the installation loses the ability to vary the library online or offline to the individual systems that comprise the group. A VARY SMS,LIBRARY command directed to a system group causes the library to be varied online or offline to all the individual systems in the group. There is no way to direct a VARY SMS,LIBRARY command to an individual system that is part of the system group.

Storage Groups and Automated Class Selections Routines

A tape storage group is a collection of tape cartridges that are located within one or more tape libraries. Only a tape storage group may be used in association with tape libraries. As part of the definition of a tape storage group, one to eight library names can be associated with the tape storage group. Tape storage groups can have on each system or system group in the SMS complex any one of the following four attributes:

ENABLED The system can create and access data sets on any tape volume belonging to this storage group. This condition *can* be changed by the VARY SMS,STORGRP operator command.

NOTCON The system cannot create or access data sets on any tape volume belonging to this storage group. This condition *cannot* be changed by the VARY SMS,STORGRP operator command.

DISNEW The system cannot create a new data set that is the first data set on a tape volume. It can read an existing data set, extend an existing data set, and create a new data set that is not the first on a tape volume. This condition *can* be changed by the VARY SMS,STORGRP operator command.

DISALL The system cannot create or access data sets on any tape volume belonging to this storage group. This condition *can* be changed by the VARY SMS,STORGRP operator command.

Tape storage groups can be associated with one or more tape libraries, but all volumes of a multivolume data set *must* be contained within a single library and a single storage group. If one of the volumes required in a multivolume data set request resides outside of the library, the volume not in library installation exit (CBRUXVNL) can be used to direct the volume back into the library.

When a private volume is entered into a tape library and a storage group name is not provided, OAM sets the storage group name to blanks. The blank storage group name becomes the system default. The blank storage group is always enabled on all systems within the Storage Management Subsystem (SMS) complex.

It is a good idea for the storage administrator to assign all volumes in the blank storage group to other named storage groups as soon as possible. This allows an installation to take advantage of the storage group states (ENABLED, NOTCON, DISNEW, and DISALL). Also, the storage group name can be used to direct a volume to a particular library or libraries, rather than to any library within the SMS complex. This ensures that a volume is reentered into the appropriate library following the ejection of that volume, and provides a filter for reducing the length of the volume list displayed through ISMF.

Automated class selection (ACS) routines are storage-administrator-defined routines that automatically identify the storage class, storage group, and data class that are used for allocation of volumes for new tape data sets. The storage group definitions in the active control data set (ACDS) contain the names of the libraries to which these volumes may be assigned. During allocation, these library names are used to find the associated named collection of tape devices or *device pool*. The device pool names are then used during allocation to find the associated device numbers for the tape drives that may be used to satisfy the request.

Notes:

1. For limitations on the number of device pools refer to "Tape Subsystem (Device Pool) Limitation" on page 92.
2. When both DASD and tape storage groups are eligible for a new allocation through the ACS routine, SMS defaults to DASD over the tape storage group, choosing the more efficient device. The user cannot influence this decision after the ACS routine has made the storage group selection.

Understanding the Pre-ACS Routine Exit

The pre-ACS routine exit (IGDACSXT) enables an external source, such as a tape management system, to provide input (through read-only variables) to the ACS routine to influence construct selection and assignment. The tape management system can use these variables to direct new allocations to a particular tape library to coordinate vaulting runs for backups or off-site storage. For more detailed information regarding this pre-ACS routine exit, see *z/OS DFSMS Installation Exits*.

Integrated Catalog Facility and the Tape Configuration Database

The integrated catalog facility (ICF) provides support for the following tape configuration databases:

Volume catalog
: A volume catalog (VOLCAT) is an ICF user catalog marked as a volume catalog. It contains only volume and library entries. There are two types of VOLCAT: general and specific. The TCDB may be shared by all or some of the systems and system groups in one or more SMSplexes that have connection to the tape library dataservers that are defined in the TCDB. The TCDB is the collection of all VOLCATs—the general and all the specifics.

The general VOLCAT
: The default volume catalog contains all the library records as well as any volume records that are not recorded in a specific VOLCAT. Each system

must have access to one and only one general VOLCAT. The general VOLCAT must be defined before defining a tape library. The name of the general volume catalog is hlq.VOLCAT.VGENERAL.

A specific VOLCAT
A volume catalog that contains a specific group of volume records based on the first character of the volume serial number. The name of the specific volume catalog is hlq.VOLCAT.Vx. For examples on defining VOLCATS, see "Creating the Tape Configuration Database" on page 82 or *z/OS DFSMS Access Method Services for Catalogs*.

Note: The "hlq" and the "x" in the name of the volume catalog, **hlq.VOLCAT.Vx**, stand for high-level qualifier and reference to valid character values (A–Z and 0–9) respectively. For information on changing high-level qualifiers on VOLCATs, see *z/OS DFSMS Managing Catalogs*.

The following TCDB records are used in association with tape libraries:

Library record
There is one library record for each tape library. The library record resides within the general VOLCAT. Each record contains information related to the library (for example, library name, library ID, and device type) and is created by the ISMF tape library define option.

Volume record
Each volume record represents a tape volume. It can reside in the general or the specific VOLCAT. It contains information related to a volume (for example, volume serial number, library name, and storage group name) and is created during cartridge entry processing.

Access method services provide users access to catalog entries for tape libraries and tape volumes, allowing them to create, alter, list and delete entries residing in the TCDB. However, access method services is used mainly as a recovery tool to repair damaged catalogs and should be used with caution whenever you create, alter, and delete TCDB entries. Incorrect use of this recovery tool can cause database (host, library manager, and tape management) conflicts. For example, IDCAMS ALTER can be used to change the use attribute of a volume in the TCDB, but it does not change the library manager's inventory record or the tape management system's database. When changing a volume's use attribute, use CBRXLCS FUNC=CUA or ISMF volume ALTER to keep the databases synchronized. For more information concerning recovery of catalog entries, see "Establishing Recovery Procedures" on page 100.

RACF considerations for the VOLCAT

In general, tape users do not require any RACF access authority to the VOLCAT. During job processing, the updates to the VOLCAT are made by authorized system users. However, the VOLCAT still needs a data set profile and should be defined with UACC(NONE). Storage administrators using ISMF should have READ access to STGADMIN.IGG.LIBRARY and IDCAMS users should have an access level to STGADMIN.IGG.LIBRARY appropriate to the function being performed. For the required RACF access level when using IDCAMS, refer to "Required Security Authorization for VOLCAT Operations" in *z/OS DFSMS Access Method Services for Catalogs*.

MVS hardware configuration definition

MVS hardware configuration definition uses the LIBRARY parameter to define drives configured to a tape library. For more information on using HCD to define drives, see "Creating the Hardware Configuration" on page 84 and *z/OS HCD User's Guide*.

Rule: Tape drives associated with an automated tape library dataserver, a manual tape library, or configured as a stand-alone device must be defined using the hardware configuration definition (HCD).

Types of tape volumes

Unlike DASD or optical volumes, which are shared among many users, tapes are assigned to individuals or functions. They are retained for specified periods of time as required by the storage administration plan for your business. Tape cartridges that are assigned to a specific individual or function are considered *private*. Unassigned tapes are known as *scratch* and are used in response to a system scratch request, or assigned as a private tape in response to a nonspecific request from a user. The volume use attribute (whether the cartridge is private or scratch) is initially assigned by the cartridge entry installation exit (CBRUXENT) or set by the ISMF entry default use attribute.

Private tape management

You can use private volumes by explicitly requesting a specific volume serial number.

Scratch tape management

All scratch tapes within a library are contained within common scratch pools—one for each type of media in the library—and cannot be explicitly mounted by specifying a volume serial number. See page 336 for more information on scratch threshold processing. Once a tape is removed from a common scratch pool, it is assigned to a storage group, the volume use attribute is changed to private, and it remains private until it is returned to scratch status.

Private tapes are returned to the common scratch pool through an ISMF ALTER request, through the use of the Library Control System (LCS) external services change use attribute function, or by a tape management system.

Scratch tape management in an MTL

In an MTL environment, because there is no outboard category assignment and outboard selection of a particular scratch volume, the operator, as in the stand-alone environment, is free to mount an appropriate scratch volume. Additionally, in an MTL environment, the scratch volume mounted must be of the appropriate media type for the request, and it must have previously been entered into the library as a scratch volume in the MTL in which the allocated drive resides. The ability of the operator to mount a scratch volume enables volume pooling to work in a fashion similar to that of the stand-alone environment. See your tape management system for specific implementation details about volume pooling and the MTL.

If an MTL resident scratch volume is mounted outside of the MTL environment on a stand-alone device, the volume will remain scratch in the tape configuration database.

Rule: Keep MTL-resident scratch volumes separate from the stand-alone scratch pool.

VTS stacked tape management

OAM does not keep volume records in the tape configuration database (TCDB) for the physical stacked volumes used in the VTS. However, when logical volumes are exported from a VTS, the stacked volumes containing the logical volumes are reported through messages and passed to the cartridge eject installation exit (CBRUXEJC). This is done so that a tape management system can track the physical stacked volume on which an exported logical volume resides.

VTS outboard policy management

Outboard policy management enables you to better manage your VTS stacked and logical volumes. With this support, the SMS construct names that are associated with a volume (storage class, storage group, management class, and data class) are sent to the library. When file sequence 1 is written (DISP = NEW), the 8-character SMS construct names (as assigned through your ACS routines) are passed to the library. At the library, you can define outboard policy actions for each construct name, enabling you and the VTS to better manage your volumes. For example, through the storage group policy and physical volume pooling, you now have the ability to group logical volumes with common characteristics on a set of physical stacked volumes.

Duplicate volume management

Special care must be taken to mount a volume with a duplicate volume serial number outside of an IBM managed tape library. When the duplicate volume serial number is requested, if a volume record exists for that volume in the tape configuration database indicating that the volume is library resident, the allocation for that request will be directed to the library in which the volume resides. To direct the allocation of the duplicate volume to a stand-alone device, a special reserved storage class name, DUPT@SMS, can be specified with the storage class parameter on the JCL with DISP=OLD. This will force allocation of this request to a stand-alone device.

A tape management system such as DFSMSrmm can provide support for managing duplicate volumes while they are both in the library and system-managed. DFSMSrmm duplicate volume support allows you to have different barcoded labels on volumes that have the same VOL1 label volume serial number.

TotalStorage Automated Tape Library (3495) system attachment

The IBM TotalStorage Enterprise Automated Tape Library (3495) is attached to host systems by a communications path to an IBM 3490 or 3490E control unit with the addition of a library attachment facility feature. The feature provides a microprocessor card and attachment cable for connection of each 3490 or 3490E control unit path to the library manager application. The equivalent of the library attachment facility is built into the control unit for an IBM 3590. See “TotalStorage Automated Tape Library (3494) System Attachment” on page 12 for more information concerning these systems.

The ATLDS (see Figure 1 on page 11) is capable of supporting multiple control units and tape drives. The details for each callout in Figure 1 on page 11 are explained in the text that follows. See Table 3 on page 46 for more information concerning configuration capabilities, and “TotalStorage Automated Tape Library (3494) System Attachment” on page 12 for more details concerning the tape systems. For more detailed information regarding the hardware features of the IBM TotalStorage Enterprise Automated Tape Library (3495), see *3495 Tape Library Introduction and Planning Guide*.

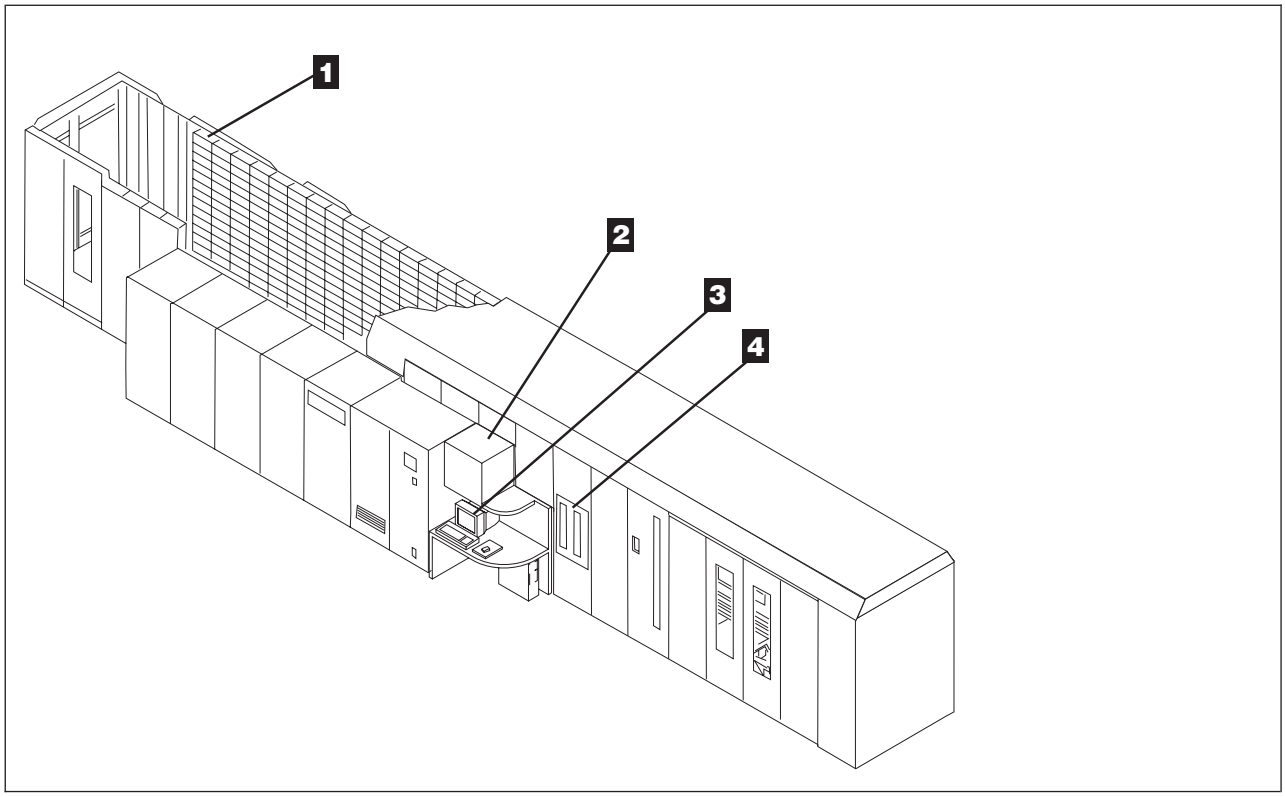

Figure 1. IBM TotalStorage Enterprise Automated Tape Library (3495)

High Capacity Input and Output Facility

All 3495 ATLDS models can have an optional high-capacity input and output facility (Figure 1, item **1**) that reserves a section of the cartridge storage area to be used for input and output of large numbers of cartridges. This optional facility requires that the tape library be placed in *paused mode* (indicating that the cartridge accessor is not active) while the areas are being loaded and unloaded. The software term for the process of ejecting cartridges into the high-capacity output station is known as *bulk eject*, and the software term for the process of entering cartridges into an automated tape library dataserver using the high-capacity input station is known as *bulk entry*.

External High-Capacity Input and Output Facility

The optional external high-capacity input and output station feature (not shown in Figure 1) allows the operator to add or remove up to 240 cartridges from the IBM TotalStorage Enterprise Automated Tape Library (3495) without pausing automated operations or without the operator entering the 3495 enclosure.

Note: If the external high-capacity input and output station feature is installed, the high-capacity input and output facility cannot be enabled.

Manual Mode Terminal

A manual mode terminal (Figure 1, item **2**) is located in the enclosure of the tape library and is used to assist the operator with manual mode operations when the

cartridge accessor is not active. The library manager uses the manual mode terminal to inform the operator which volumes to mount and eject, and where to locate the volumes in the storage cells.

Library Manager Application

The library manager (Figure 1 on page 11, item **3**) is a licensed internal code application installed in the library controller that controls all operations in the tape library. The library manager controls tape library automation, communicates with the host through each control unit, and allows communication paths for operators and service personnel. The library manager is also used for service and test sessions and provides operator status information and control panels for the operator's use. Transaction logs and an error log are also provided as problem determination aids. For more information concerning the library manager for the 3495, see the *3495 Tape Library Introduction and Planning Guide* .

Commands are processed by the library manager and translated into requests for cartridge movement or database processing. The library manager database provides a cross-reference between a volume serial number, a volume's actual storage location, and a volume's category. See "Displaying Tape Volume Status" on page 138 for a list of valid volume categories and their descriptions.

Convenience Input and Output Facility

Each tape library has a convenience input and output station (Figure 1 on page 11, item **4**) for inserting cartridges into and ejecting cartridges from the tape library, without requiring the pausing of automated operations or operator entry into the tape library enclosure area. Each convenience input and output station has a capacity of 20 cartridges.

For more information on these hardware features, see *3495 Tape Library Introduction and Planning Guide*.

TotalStorage Automated Tape Library (3494) System Attachment

The IBM TotalStorage Enterprise Automated Tape Library (3494) (Figure 2 on page 13) can be attached to host systems by two methods. The first method is attachment to host systems through a communications path to the control unit of an IBM 3490E, an IBM 3590, an IBM 3592, or a combination thereof. The second attachment method stems directly from the library manager to open systems hosts through a host attachment feature. This attachment provides direct communication between the open system host and the 3494 library manager.

The details for each callout in Figure 2 on page 13 are explained in the text that follows.

This ATLDS is capable of supporting multiple control units and tape drives. See Table 3 on page 46 for more information concerning configuration capabilities. For more detailed information on the hardware features of the IBM TotalStorage Enterprise Automated Tape Library (3494), see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*, and *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide*.

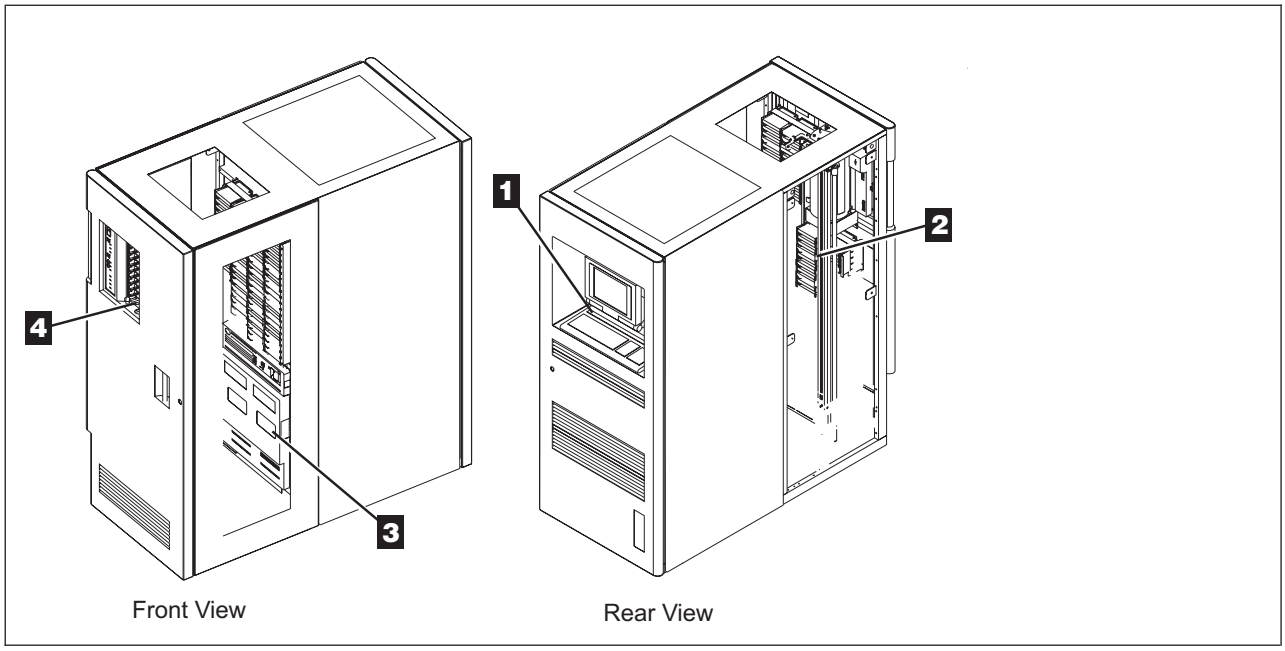

Figure 2. IBM TotalStorage Enterprise Automated Tape Library (3494) L10 Frame

Cartridge Storage Cells

The cartridge storage cells (Figure 2, item **2**) are used to store the tape cartridges associated with this ATLDS. The following tape cartridges are supported:

- IBM Cartridge System Tape (MEDIA1)
- IBM Enhanced Capacity Cartridge System Tape (MEDIA2)
- IBM High Performance Cartridge Tape (MEDIA3)
- IBM Extended High Performance Cartridge Tape (MEDIA4)
- IBM Enterprise Tape Cartridge (MEDIA5)
- IBM Enterprise WORM Tape Cartridge (MEDIA6)
- IBM Enterprise Economy Tape Cartridge (MEDIA7)
- IBM Enterprise Economy WORM Tape Cartridge (MEDIA8)
- IBM Enterprise Extended Tape Cartridge (MEDIA9)
- IBM Enterprise Extended WORM Tape Cartridge (MEDIA10)

Note: Media types beyond MEDIA10 are not supported in the 3494 tape library.

For more information concerning cartridge capacities for the various configurations of the IBM TotalStorage Enterprise Automated Tape Library (3494), see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*.

Tape Systems

The 3494 uses the 3490E Magnetic Tape System, the IBM TotalStorage Enterprise Tape System 3590, and the IBM System Storage Tape System 3592, individually or in combination (Figure 2, item **3**). With z/OS, the tape drives are connected to the host using a tape control unit.

For a discussion of the different tape libraries (automated and manual) and the tape devices and media types supported in each library, refer to "Analyzing Your Hardware Environment" on page 45. Note that later generations of the 3592 (starting with the 3592 Model E07) are not supported in the 3494. The 3592

expands the storage capabilities and performance for these libraries by providing higher performance, a larger capacity cartridge, and increased reliability over previous tape systems. Inside an IBM tape library, the SMS tape software support recognizes the 3590-1 emulated devices by their real device types rather than by the drives they are emulating. This enables tape devices emulating 3590-1 (the 3590 Model B) to coexist in the same library.

Related reading

For additional information on the 3592, see *z/OS DFSMS Software Support for IBM System Storage TS1140, TS1130, and TS1120 Tape Drives (3592)*.

Convenience Input and Output Station

The convenience input/output station (Figure 2 on page 13, item **4**) is an optional feature on the 3494 that is used for inserting cartridges into or ejecting cartridges from the ATLDS, without interrupting normal automated operations. For more detailed information on the convenience input/output features of the IBM TotalStorage Enterprise Automated Tape Library (3494), see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*.

High Capacity Input/Output Facility

The high-capacity input/output facility (not shown) is an option that reserves a section of the cartridge storage area to be used for the input/output of cartridges. Either a high capacity output facility or a high capacity input/output facility can be defined, but not both.

Library Manager Application

The library manager (Figure 2 on page 13, item **1**) is a licensed internal code application installed in the library controller that controls all operations in the tape library. The library manager communicates with the host through each control unit, and allows communication paths for operators and service personnel. The library manager is also used for service and test sessions and provides operator status information and control panels for the operator's use. Transaction logs and an error log are also provided as problem determination aids. For more information concerning the library manager for the 3494 ATLDS, see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*.

System Storage Automated Tape Library (3584) System Attachment

The IBM System Storage® 3584 Tape Library TS3500, with the added 3953 Library Manager, enables the open systems SCSI medium changer library to be connected and used by zSeries® attached hosts. The 3953 Library Manager provides capabilities similar in functionality to the 3494 Library Manager. As with the 3494 automated tape library, the 3584 tape library can be shared by multiple operating system platforms (open systems and System z® attached hosts) and can be partitioned across multiple System z hosts. However, the 3584 tape library supports only the 3592 tape drive technology and the Virtual Tape Server (VTS), unlike the 3494 tape library, which supports (by System z attachment) the 3490E, 3590 and 3592 native tape drive technologies as well as the VTS. For more detailed information regarding the hardware features of the 3584 automated tape library, see *IBM System Storage TS3500 Tape Library Introduction and Planning Guide IBM 3584 Tape Library* and *IBM System Storage TS3500 Tape Library Operator Guide IBM 3584 Tape Library*. For information on the 3953 Library Manager, see *IBM 3953 Library Manager Model L05 Operator Guide and IBM 3953 Tape System Introduction and Planning Guide*.

The 3584 automated tape library supports the IBM System Storage 3592 Model J1A, E05, and E06 tape devices (the same as with the 3494 tape library). In addition, the 3584 automated tape library also supports the 3592 Model E07. As with the 3494 automated tape library, the 3592 tape drives in the 3584 are supported in 3590-1 emulation mode only. Inside an IBM tape library, the SMS tape software support recognizes the 3590-1 emulated devices by their real device types, rather than by the drives they are emulating. This enables different model types to coexist in the same library.

Integrated Library Manager

In the past, attachment of the 3584 tape library to a System z host required installation of the 3953 Library Manager. Starting with the 3592 Model C07 tape control unit, the library management functions that had been provided by the 3953 Library Manager (3953 Model L05) are integrated into the 3592 Model C07. 3592 Model C07 control units in a 3584 logical library partition will operate in a client/server model with the ability for two of the tape control units (for redundancy) to be able to run as servers providing the equivalent 3593 Library Management functionality. The two Library Manager enabled control units form a highly available pair. One tape control unit can fail or be brought down for a code upgrade, and the other control unit will still be able to handle library requests. However, only one of the two Library Manager enabled control units will actively handle library requests at any given time. The other Library Manager enabled control unit will run in standby mode ready to takeover should the primary control unit fail. Also note that the 3592 Model C07 will not be able to coexist in the same 3584 logical library partition with a 3953 Library Manager or with any of the older tape control units (3592 Model C06 or 3592 Model J70). From a host perspective, each 3584 logical library partition in a 3584 tape library appears as a separate library to the host. With the addition of a 3592 Model C07, into an existing 3584 library, an additional 3584 logical library partition will need to be created to segregate any 3592 Model C07 control units from the older tape control units (J70 and C06) and partitions that have a 3953 Library Manager. The 3592 Model C07 control unit will support attachment of the 3592 Model E05, E06 and E07 tape drives. For additional information refer to the IBM System Storage 3592-C07 Controller Customer Information Center at http://publib.boulder.ibm.com/infocenter/etc/cust/index.jsp.

Virtual Tape Server system of the ATLDS

The virtual tape server (VTS) system (not pictured) in an ATLDS combines the random access and high performance characteristics of DASD with outboard hierarchical storage management and virtual tape devices and virtual tape volumes, providing significant reductions in the number of physical cartridges, devices, and automated libraries needed to store customer data.

The key concepts of this system are as follows:

- Emulating 3490-type tape devices (virtual devices)
- Emulating 3490-type tape volumes (virtual volumes)
- Import and export functions
- Tape volume cache
- Storage management of the tape volume cache
- Improved cache management
- Deleting expired virtual tape server logical volume data
- Maintaining data fragments from migrated volumes
- Fast response for nonspecific mount requests
- Use of the IBM Enterprise Tape System 3590 and 3592

- Automatic 3590 and 3592 storage capacity utilization
- Logical library partitioning
- Operator interface with the library manager
- Logical volume inventory
- Physical volume pooling
- Selective dual copy

Emulating 3490-Type Virtual Tape Devices

From a host perspective, the virtual system looks like multiple 3490E control units, each with 16 tape devices. Each emulated device is called a virtual tape device. The virtual system handles all 3490 tape commands. Each virtual device has the following attributes:

- Has a host device address
- Is included in the I/O generation for the system
- Is varied online or offline to a host
- Signals ready when a virtual volume is loaded
- Responds to and processes all 3490E tape commands
- Becomes not ready when a virtual volume is rewound and unloaded
- Indicates that it has a cartridge loader
- Can be associated with a pool of scratch volumes that allow very fast mount access for scratch mounts

  Note: The active status of the cartridge loader depends on the availability of scratch volumes in the assigned pool.

Data is written and read as if it is stored on a real Standard or Enhanced Cartridge System Tape; however, within the system it is really stored on DASD. All tape read and write commands are translated to read and write data records to or from DASD. Volumes residing on the DASD are called virtual volumes. For more information concerning virtual volumes, see "Emulating 3490-Type Virtual Volumes."

All host interactions with data in a VTS are through virtual volumes and associated virtual tape devices; there is no direct access to the data on a physical cartridge or device.

Emulating 3490-Type Virtual Volumes

The virtual tape server (VTS) system in a 3494 or 3584 ATLDS uses virtual volumes for all interactions with host software. When these virtual volumes and the data associated with them are being used by the host system, they are stored in the tape volume cache, not on a physical tape device or volume. For more information on tape volume cache, see "Tape Volume Cache" on page 18 and see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*. These virtual volumes emulate the functional characteristics of a cartridge system tape. Each virtual volume has the following attributes:

- Has a unique volume serial number
- Is loaded and unloaded on a virtual device
- Supports an IBM Standard Label
- Can be appended to after having been initially written from the beginning of the tape
- Has an advantage over a physical volume because the mount response time for a virtual volume request, specific (when in cache) or nonspecific, is faster, since there is no dependency on the physical movement of a cartridge or the loading delays of a physical drive

The tape volume cache of the virtual tape server enables the utilization of the 3590 and 3592 tape technology. When a virtual volume is copied from the tape volume cache to a native cartridge, the volume then becomes a logical volume. A native cartridge that contains logical volumes is referred to as a *stacked volume*. The VTS stacks multiple host-created volumes onto a native cartridge to create a stacked volume. The native library volumes used for stacking are identified through their volume serial numbers.

When a native cartridge identified as a stacked volume is inserted into a library, it becomes part of the volumes managed by the VTS and is not reported to the host as a newly inserted volume. Only the logical volumes specified at the library manager console are reported to the host. By buffering host created volumes, then later stacking them on a native cartridge, the cartridge capacity of the native technology is fully utilized. The cartridges used with this volume stacking technology emulate Cartridge System Tape or Enhanced Capacity Cartridge System Tape to the host system. When a logical volume is moved from a native cartridge to the tape volume cache, the volume becomes a virtual volume again.

Larger Logical Volume Sizes

By default the VTS supports two logical volume sizes 400 MB and 800 MB which correspond to the supported 3490 media types: cartridge system tape (MEDIA1) and enhanced capacity cartridge system tape (MEDIA2). Using outboard policy management support, the default volume size can be overridden at the library through a data class policy specification. If a maximum volume size is specified in the assigned data class, that volume size will override the default volume size for the volume when it is first mounted. A logical volume's maximum volume size can then change when it is mounted as a scratch volume again. However, for TS7700 Virtualization Engine Release 1.6 or later, the logical volume's maximum size can change when the volume is written from load point, for either a scratch or private (specific) request. Prior to Release 1.6, the TS7700 retained the capacity of the logical volume (on reuse), unless the volume was mounted as a scratch volume. For additional information on the supported logical volume sizes, refer to the applicable tape library operator guide. In addition to this, application configuration-related changes may also be needed to fully utilize the larger logical volume sizes (TAPEPERCENTFULL or TAPECAPACITY-type specifications). Starting with Release 1.4 of the TS7700 Virtualization Engine (and only the TS7700 Virtualization Engine), support was put in place for the host (and associated applications) to obtain the logical volume size from the library. Refer to the applicable application-related documentation, for any added support in this area.

VTS System Import and Export Functions

The virtual tape server (VTS) system provides the ability to physically import (enter) and export (remove) logical volumes within the VTS. This support includes managing the physical removal of the native cartridges containing stacked logical volumes from a VTS and the corresponding function for entering these cartridges into a VTS. These functions require interaction with the host and the tape management system software. See “Exporting Logical Volumes from a 3494 VTS System” on page 38 and “Importing Logical Volumes into a 3494 VTS System” on page 30 for more information.

See “Import/Export Considerations for the 3494 VTS” on page 74 for information on coexistence considerations for the VTS import and export functions, particularly for outboard policy management support implications.

Tape Volume Cache

The tape volume cache consists of a high performance array of DASD and storage management software. Virtual volumes are held in the tape volume cache when they are being used by the host system. Outboard storage management software manages which virtual volumes are in the tape volume cache and the movement of data between the tape volume cache and physical devices. The size of the DASD is made large enough so that more virtual volumes can be retained in it than just the ones currently associated with the virtual devices.

After an application modifies and closes a virtual volume, the storage management software in the system makes a copy of it onto a physical tape. The virtual volume remains available on the DASD until the space it occupies reaches a predetermined threshold. Leaving the virtual volume in the DASD allows for fast access to it during subsequent requests. The DASD and the management of the space used to keep closed volumes available is called *tape volume cache*. Performance for mounting a volume that is in tape volume cache is quicker than if a real physical volume is mounted.

Storage Management of the Tape Volume Cache

Storage management software in the system manages the contents of the tape volume cache. Virtual tape volumes are migrated from the tape volume cache to physical tape when they are no longer needed for fast access and recalled from tape to the tape volume cache when they are again requested to be mounted. The storage management software stacks multiple migrated files onto a native tape, thereby utilizing its storage capacity. For more information on this volume stacking concept, see "Emulating 3490-Type Virtual Volumes" on page 16.

Improved Cache Management

Improved cache management enables you, through your installation's ACS routines, to select a cache preference group of 0 or 1. You can use the storage class initial access response time (IART) parameter at the host to select the preference group. If the value specified in this parameter is greater than or equal to 100, the logical volume is associated with cache preference group 0. If the value specified is less than 100, the logical volume is associated with cache preference group 1, which is also the default. When space is needed in the cache, logical volumes associated with preference group 0 will be removed from the cache before logical volumes associated with preference group 1. Volumes are removed from preference group 0 are based on their size, with the largest volumes being removed first. Volumes continue to be removed from preference group 1 based on a least recently used algorithm. Data written to the VTS for backup or long-term archival purposes can assign a storage class that specifies an initial access response time parameter greater than or equal to 100.

With outboard policy management support, you can define the cache preference level at the library through the library manager storage class policy, rather than through the IART parameter. The outboard specification overrides the host IART specification if you have defined a cache preference level setting in the library manager policy construct definition. If the outboard construct was automatically created and was defined with no cache specification, the host IART specification is used. If there is no IART specification, then the default preference level of 1 is used for the volume.

Starting with Release 1.6 of the TS7700 Virtualization Engine, you can use the LIBRARY REQUEST command at the host to temporarily override (while the

volume is in cache) a volume's preference group assignment, causing the volume to remain in cache longer or to be removed from cache sooner. Refer to "Requesting Information from the TS7700 Virtualization Engine" on page 113 for information on the LIBRARY REQUEST command. For additional information on this enhancement and other cache management-related removal options, refer to the TS7700 Customer Information Center.

Deleting Expired Virtual Tape Server Logical Volume Data

Logical volumes in a VTS are stored on physical stacked volumes after the host closes the logical volumes. Without the deletion of expired VTS logical volume data, the data that represents the contents of a logical volume on a physical stacked volume is not expired from the VTS point-of-view until the logical volume is rewritten or otherwise modified. This causes the VTS to continue managing the data as if it were still active, even though the user has actually scratched it. These "user-expired" logical volumes are maintained as active data by the VTS during reclaim processing. These volumes also needlessly consume physical stacked volume resources, thus requiring more physical stacked volumes in a VTS.

The deletion of expired logical volume data eliminates the need for the VTS to manage logical volume data that has already been expired at the host. At the same time, it provides a "grace period" during which the VTS continues to manage the data after the host has expired the data. The deletion times are associated with categories that have the Fast Ready attribute.

Additionally, a "hold" setting can also be associated with categories that have the Fast Ready attribute to restrict the usage of volumes with an unexpired expire time. Restricted volumes cannot be used to satisfy a mount request and cannot be moved to a different category until their expire time duration has elapsed. Since volumes with an unexpired expire time cannot be used to satisfy a mount request, they are also excluded from the scratch volume category count in the DISPLAY SMS,LIBRARY command.

See *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide* for more information on defining the Fast Ready categories.

Secure Data Erase

The secure data erase support guarantees that logical volume data that has expired in the VTS cannot be recovered by any reasonable means once the physical volume where the data resided has been reclaimed. The secure data erasure function is enabled on a physical volume pool basis when a non-zero value is specified for the secure data erase reclaim policy. For additional information on using this support, see *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide*.

Maintaining Data Fragments from Migrated Volumes

When a virtual tape volume is no longer needed in the tape volume cache, the data it represents is not completely removed. A fragment of the data is kept on DASD. The data fragment includes information about the migrated virtual volume so that it can be recalled and it also includes the first several records from the last use of the volume.

Fast Response for Nonspecific Mount Requests

When a nonspecific mount is requested, data is written from the beginning of the tape, overwriting any existing data on the tape. Within a VTS system, a nonspecific mount request is satisfied by accessing the data fragment in the tape volume cache

associated with the virtual volume selected by the library manager to satisfy the request. No recall of the data from the previous usage of the volume is performed because the fragment contains the label information needed by the host tape management software to validate the use of the volume for a nonspecific mount request. The system signals the host that the mount is complete when the fragment is accessed. The result is a very low mount response time because no physical movement or mounting of a cartridge is involved.

Using the 3590 and 3592 Storage Capacity

One of the key features of the VTS is its capability to automatically use the 3590 and 3592 tape technology cartridge storage capacity. With a VTS, volumes being created by the host applications are stored in a tape volume cache built from DASD devices. The size of the tape volume cache is greater than the capacity of a native cartridge. The tape volume cache can potentially contain hundreds of tape volume images called virtual volumes, depending on the size of the volumes and tape volume cache. Through tape volume cache management policies, the VTS moves virtual volumes from the tape volume cache to a native cartridge managed by the VTS system. As virtual volumes are moved from the tape volume cache, they are stacked end to end on the cartridge and take up only the number of bytes written by the host, effectively using all of the storage capacity of the cartridge.

Logical Library Partitioning

To support the requirement that virtual tape server systems coexist with native tape systems in the same library, the library manager partitions the physical library into logical libraries: one library for *each* VTS system (a physical library can contain up to two VTS systems) and another that contains all other systems. This must be done because a virtual tape server system presents the image of 3490-type tape device and yet cannot read or write a real 3490 cartridge. By placing a virtual tape server system in its own logical library, host software will not be able to attempt to allocate a virtual tape server device for a real 3490 mount, and likewise, the other way around.

A logical library can contain:
- A single virtual tape server system
- The native tape systems

Each logical library will have its own unique library sequence number and will look like a separate physical library to the hosts attached to the system in that partition. The physical assets used by the system are managed by the library manager in the library.

Operator Interface

The library manager console is used to perform the setup, management, and status functions needed to support a VTS system.

Logical Volume Inventory

The database in the library manager is expanded to handle the large number of logical volumes that a VTS system uses. There are also operator functions that allow you to add logical volumes by specifying a volume serial number range through the library manager console.

For more information concerning the usage, configuration, and characteristics of the virtual tape server, see *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*.

Physical Volume Pooling

Using outboard policy management support, you can manage logical volumes much more easily and efficiently by grouping volumes that have common characteristics on a set of physical stacked volumes, providing volume affinity. This group of stacked volumes is known as a *physical volume pool*. Common characteristics can include expiration dates, off-site disaster recovery data, backup copies, and so on. Physical volume pooling provides your installation with the following capabilities and benefits:

- It allows you to accurately charge for storage management services that is based on the number of physical stacked volumes that are allocated for a particular enterprise.
- It ensures that you can reserve groups of physical media for specific uses or owners.
- It enhances adherence to security policies by grouping data for different divisions or areas of an enterprise.

Use the library manager storage group policy construct to assign logical volumes to physical stacked volumes and to group sets of stacked volumes into physical volume pools. The VTS system writes the logical volumes that are assigned to this storage group to the set of physical volumes that are assigned to the physical volume pool.

If you do not specify a physical volume pool in the library manager storage group policy construct, the VTS system writes the volumes to the common scratch pool. If you update the library manager storage group policy construct to allow for the assignment of logical volumes to a specific physical volume pool, the VTS does not move the data to the specified pool until the next time you rewind and unload the logical volume from the tape drive.

Selective Dual Copy

Using outboard policy management support, the library can make a second copy of a logical volume and assign it to a secondary physical volume pool. This function is supported in both the stand-alone and in the Peer-to-Peer VTS library. In a Peer-to-Peer VTS, a second copy is made in each distributed library. Because placing a second copy of a logical volume on the same physical media as the primary copy risks the integrity of the data, this support allows you to place the second copy of the logical volume on a physical volume associated with this secondary volume pool. This helps eliminate physical media as a single point of failure.

Use the library manager management class policy construct to make a second copy of a logical volume and assign it to a secondary physical volume pool. The VTS system writes the second copy of the volume to the secondary volume pool that you designate.

If you do not predefine the management class policy construct at the library and the VTS system automatically assigns default actions to the policy, the system does not perform the selective dual copy function. The default action is to make only a primary copy of the logical volume. It is not to create a second copy of the volume in the VTS. If you update the management class policy construct to make a second copy of the volume, the VTS does not make the second copy retroactively. The action of creating the second copy occurs the next time you rewind and unload the logical volume from the tape drive.

Bulk Volume Information Retrieval

The outboard Bulk Volume Information Retrieval (BVIR) facility allows a host job to request and obtain information about all of the logical volumes managed by a virtual tape server (VTS), including a Peer-to-Peer VTS. Within a VTS, a database is maintained that contains information about the state and data validity of each logical volume. This function uses a logical volume to allow a batch job to request information from the VTS. When the logical volume is mounted, the VTS formats the requested information onto the volume as an IBM standard labeled tape volume containing a single file. The file contains multiple records, one for each logical volume in the VTS. Because it is standard volume format, the data is accessible through standard host utilities such as IEBGENER. Physical–to–logical volume mapping is just one example of the information you can obtain with this facility. For additional information on using this facility, refer to the following IBM Whitepapers: *IBM Virtualization Engine TS7700 Series Bulk Volume Information Retrieval User's Guide* and *IBM TotalStorage Virtual Tape Server 3494 Bulk Volume Information Retrieval Function User's Guide*.

Peer-to-Peer Virtual Tape Server

The IBM TotalStorage Enterprise Peer-to-Peer Virtual Tape Server addresses data availability, system availability, remote copy and data vaulting desires for the VTS family. Virtual Tape Controllers exist between MVS hosts and the virtual tape servers to provide replication, transparent tracking, and synchronization of the Logical Tape volumes. The Peer-to-Peer VTS provides multiple copies of all tape data.

The Peer-to-Peer VTS system supports an immediate or deferred copy option. In deferred copy mode, the library schedules creation of the copy upon receiving the rewind/unload command from the host. The copy is then made in the background as VTS activity permits. In immediate copy mode, the copy is started upon receiving the host rewind/unload command and signals completion of the rewind/unload command when the copy operation is complete.

The Peer-to-Peer VTS system appears as one library image to the attached hosts. The single library image is referred to as the composite library. The underlying physical VTS libraries that make up the composite library are referred to as the distributed libraries. All three libraries (the composite library and two distributed libraries) will be defined to the host, whereas the drives and volumes will be defined and associated with the composite library.

The composite library will reflect the overall state of the VTS systems, with individual library status being reflected through the distributed libraries. For example, if one of the distributed libraries is in paused mode and the other is in automated mode, the overall status of the VTS composite library will be automated with messages to the host indicating which of the distributed libraries is paused. If one of the distributed libraries is taken offline at the library, the state of the composite will remain online and operational as long as one of the distributed libraries is operational.

Note: The Import/Export feature is not supported in a Peer-to-Peer VTS system.

Geographically Dispersed Parallel Sysplex Support for Peer-to-Peer VTS

The Geographically Dispersed Parallel Sysplex™ (GDPS®) integrates Parallel Sysplex® technology and remote copy technology to enhance application

availability and improve disaster recovery. GDPS topology is a Parallel Sysplex cluster distributed across two sites, with all critical data mirrored between the sites. GDPS manages the remote copy configuration and storage systems, automates Parallel Sysplex operational tasks, and automates failure recovery from a single point of control, thereby improving application availability. GDPS supports all transaction managers (for example, Customer Information Control System [CICS] and Information Management System [IMS]) and data base managers (for example, DB2®, IMS™, and Virtual Storage Access Method [VSAM]).

The Peer-to-Peer VTS allows GDPS to include tape data in its management of data consistency and integrity across sites. A new I/O VTS selection option is provided for use with GDPS such that all virtual volumes are processed from a primary VTS and a copy is stored on the secondary VTS. GDPS has the control capability to "freeze" copy operations so that tape data consistency can be maintained across GDPS-managed sites. Additionally, GDPS can switch the primary and secondary VTSs, and synchronize system data sets such as catalogs, TCDB, and tape management databases with the Peer-to-Peer VTS after an emergency switchover.

The physical topology of a GDPS consists of a base or Parallel Sysplex cluster spread across two sites, with one or more z/OS systems at each site. GDPS uses the Parallel Sysplex cluster facilities to communicate between the systems. Each GDPS system joins the GDPS Parallel Sysplex cluster group. When a system joins a Parallel Sysplex cluster, GDPS automation will transfer GDPS policy and all GDPS status to the joining system.

If your installation is running Peer-to-Peer VTS under GDPS, take into account the considerations that are shown in Table 1 for your particular environment:

Table 1. Environmental Considerations for a Peer-to-Peer VTS Running Under GDPS

Environment	Results	Notes
Peer-to-Peer VTS runs in immediate copy mode and is fully operational.	The host control data sets for OAM and for your tape management software are consistent with the data on your logical volumes site-to-site as long as the volumes are copied.	The Peer-to-Peer VTS library under GDPS does *not* support logical software partitioning.
A disaster occurs and you are running in immediate copy mode.	• There is no synchronization for open logical volumes. • A rerun of the workload will inform you that you have no valid copy of the data.	The Peer-to-Peer VTS library under GDPS does *not* support logical software partitioning.
A disaster takes place and you are in deferred mode. The distributed library that remains is the input/output (I/O) VTS for that volume.	• There is no synchronization for closed and open logical volumes. • Open logical volumes at the time of the disaster become invalid. • Closed logical volumes at the time of the disaster are valid.	• You are not able to have full control of the selection of the I/O VTS. • The Peer-to-Peer VTS library under GDPS does *not* support logical software partitioning.

Table 1. Environmental Considerations for a Peer-to-Peer VTS Running Under GDPS (continued)

Environment	Results	Notes
A disaster takes place and you are in deferred mode. The distributed library that is damaged is the I/O VTS for that volume. The copy process for a logical volume has not been completed.	• There is no synchronization for closed and open logical volumes. • Open logical volumes at the time of the disaster become invalid. • Closed logical volumes on the damaged VTS at the time of the disaster become invalid.	• You are not able to have full control of the selection of the I/O VTS. • The Peer-to-Peer VTS library under GDPS does *not* support logical software partitioning.

Related reading: For more information on GDPS, see the following documents:

- *GDPS/PPRC Installation and Customization Guide*
- *IBM TotalStorage™ Peer-to-Peer Virtual Tape Server Planning and Implementation Guide*

Selective Peer-to-Peer Copy Mode

Using outboard policy management support, you can specify whether a Peer-to-Peer VTS makes a copy of a logical volume immediately or defers the copy operation to a later time. This is known as *selective peer-to-peer copy mode*. It allows greater flexibility in allocating system resources. This function overrides, on a volume-by-volume basis, the existing copy mode setting.

Use the library manager management class policy to specify whether a volume's copy is made with the immediate or deferred copy mode.

If you do not predefine the management class policy construct at the PtP VTS library and the VTS system automatically assigns default actions to the policy, the selective peer-to-peer copy mode uses the current copy mode setting. If you update the management class policy construct to make an immediate or deferred copy of the volume, that management class policy setting overrides the current setting the next time the volume is written.

Selective Peer-to-Peer Dual Copy

Using outboard policy management support, you can also specify whether a Peer-to-Peer VTS makes a copy of the logical volume in each distributed library. On a volume-by-volume basis, you can indicate which distributed VTS library is to be used as the I/O VTS and whether the data written is to be copied to the other VTS. Use the library manager management class policy to specify which distributed VTS library should be the I/O VTS and to specify the "no copy" option.

TS7700 Virtualization Engine

The IBM System Storage Virtualization Engine TS7700 provides tape virtualization capabilities for the System z environment and is the successor to the IBM Total Storage 3494 Virtual Tape Server (VTS) and the IBM TotalStorage 3494 Peer-to-Peer VTS (PtP VTS). Members of the TS7700 product family include the TS7740 Virtualization Engine (3957-V06 and 3957-V07) and the disk-only TS7720 Virtualization Engine (3957-VEA and 3957-VEB). Unless stated otherwise, references to the TS7700 Virtualization Engine apply to both the TS7740 and the

TS7720 and references to the 3957-V0x apply to both the 3957-V06 and the 3957-V07 and references to the 3957-VEx apply to both the 3957-VEA and the 3957-VEB. In addition to the following sections, for more information on the TS7700 Virtualization Engine, refer to the latest IBM Redbook for the TS7700 as well as the TS7700 Customer Information Center. To view the customer information center for the TS7700 refer to the following Web site: http://publib.boulder.ibm.com/infocenter/ts7700/cust/index.jsp .

Note: In general, references throughout this document to the terms "VTS" and "Peer-to-Peer VTS" also apply to the TS7700 Virtualization Engine. In general, the TS7700 Virtualization Engine uses the existing 3494 VTS and PtP VTS support that is in place at the host. However, with specific releases of the TS7700, explicit host support is added. For TS7700 Release 1.3 refer to APAR OA20065 (z/OS V1R6 and above), for TS7700 Release 1.5 refer to APAR OA24966 (z/OS V1R8 and above), and for TS7700 Release 1.6, refer to APAR OA28632 (z/OS V1R9 and above), and for TS7700 Release 2.0, refer to OA32957 (z/OS V1R10 and above).

TS7740 Virtualization Engine (3957-V0x)

The TS7740 Virtualization Engine, displayed by the host as a 3957-V0x, utilizes virtual and physical tape drives, disk cache, and integrated hierarchical storage management to provide a data storage solution. The TS7740 Virtualization Engine expands upon the capabilities provided by the 3494 VTS and the Peer-to-Peer VTS. The TS7740 Virtualization Engine (each known as a cluster) can be interconnected to form a grid configuration. Using advanced policy management, also referred to as outboard policy management, you can create policies to perform tasks such as creating a secondary copy of data, creating one or more copies across a grid network, and controlling physical volume pooling. This solution provides high availability, disaster recovery, and disaster recovery testing capabilities.

A grid configuration presents itself to the attached hosts as a single library image with 3490-E emulated virtual tape devices. The copying of the volumes in a grid configuration is handled by the clusters and is completely transparent to the host. Each TS7740 Virtualization Engine in a grid manages its own set of physical volumes and maintains the relationship between logical volumes and the physical volumes on which they reside.

The TS7740 Virtualization Engine is supported by the host similarly to the Peer-to-Peer VTS. The TS7740 Virtualization Engine appears as one library image to the attached hosts. The single library image is referred to as the composite library, the logical image of the grid. The underlying clusters of the composite library are referred to as the distributed libraries. As with the Peer-to-Peer VTS, all drives and volumes are associated with the composite library with the distributed libraries being used to report on the state of each library. A stand-alone TS7740 Virtualization Engine (single cluster grid) is a grid consisting of one cluster. Even though the single cluster grid consists of one VTS (distributed library), this is different from the standalone VTS, and requires that a composite library and a distributed library be defined at the host in order to represent the TS7740 Virtualization Engine. Multiple TS7740 Virtualization Engines (multi-cluster grid) form a grid consisting of multiple clusters, and to the host, consists of one composite library and multiple distributed libraries. All the libraries (composite and distributed) must be defined to the host.

TS7720 Virtualization Engine (3957-VEx)

The TS7720 Virtualization Engine, displayed by the host as a 3957 Model VEx, is similar in concept to the TS7740; however, what makes it different is that it provides support for a disk-only solution. The TS7720 is a virtual tape solution that has no back-end physical tape. Because all of the data written to the TS7720 Virtualization Engine resides in cache, the TS7720 supports larger amounts of cache than the TS7740. The TS7720 is also supported in a multi-grid configuration and starting with Release 1.6 of the TS7700, the clusters in a grid can be heterogeneous (TS7720 and TS7740), referred to as a hybrid configuration. Like a TS7740, the TS7720 is also defined to the host using composite and distributed libraries.

When the TS7720 detects that available cache space has fallen below preset thresholds, the TS7720 sends CBR3792E (limited cache free space warning state reached) and CBR3794A (out of cache resource critical state reached) attention messages to the attached hosts. The CBR3792E message can be used to trigger return to scratch processing or the copying of data to another library. If the amount of available cache subsequently reaches the critical state, all fast ready (scratch) mounts are failed and any specific mount operations are allowed; however, any attempt to write to the volume will be failed. Mount operations that have been accepted before entering this state complete and volumes currently mounted can continue to perform host I/O operations. As appropriate, the VARY SMS,STORGRP operator command can also be used to steer scratch allocations to another composite library that is eligible for the scratch request. The DISPLAY SMS,LIBRARY command with DETAIL, can also be used periodically to display the "CACHE PERCENTAGE USED" in a distributed library.

To assist with the cache management in a TS7720, having a TS7740 Virtual Engine in the multi-cluster grid configuration (hybrid configuration) provides an additional back-end tape capability. To manage the migration of data from the TS7720 to the TS7740, with Release 1.6 of the TS7700, there is a 'Volume Removal Policy' at the library. Since the TS7720 has a finite amount of cache, once that cache fills, this policy allows logical volumes to be automatically removed from cache while a copy is retained elsewhere in the grid. This copy could exist on physical tape associated with a TS7740 or in another TS7720 tape volumes cache. When coupled with copy policies, this provides an automatic data migration function between the clusters in the grid.

Logical WORM Considerations

Support for logical WORM is provided with Release 1.6 of the TS7700 Virtualization Engine (for both the TS7740 and the TS7720). Refer to APAR OA28632 (z/OS V1R9 and above) for additional detail. If the TS7700 is a multi-cluster grid, all clusters in the grid must be at a release level that supports logical WORM for the TS7700 to be WORM enabled. To request a logical WORM volume, an outboard data class policy must be defined (at the library) requesting logical WORM. This data class must then be assigned through the ACS routines, for a logical WORM request. A logical volume will become WORM when it is first mounted and written from load point. A volume will not take on the WORM attribute if user data had already been written to the volume. Also, when a dataset written to a WORM volume extends to another volume (EOV processing), the next volume in the chain will also be WORM. This is handled through the existing advanced (outboard) policy management support. As with the 3592 physical WORM tape support, any attempt by the host to modify a previously written user data record of a logical WORM volume will be failed by the TS7700.

With the 3592 WORM tape support, a volume is designated as WORM through usage of special WORM media types (MEDIA6, MEDIA8, MEDIA10, and MEDIA12). A logical volume (MEDIA1 or MEDIA2) will be designated as WORM, not by the usage of a special WORM media type, but when it is first mounted and written from load point (and associated with a data class policy that has WORM functionality enabled at the library). As a result, a common scratch pool is used for both rewritable (R/W) and WORM requests and when a logical volume (R/W or WORM) is returned to scratch it can be reused on a scratch (category) mount as either rewritable (R/W) or as WORM. As with the 3592 WORM tape support, a logical WORM volume is assigned a world-wide unique identifier (WWID) and is associated with a write mount count (WMC). During the mount, the TS7700 assigns a WWID and WMC to the volume.

Once a logical WORM volume has expired, to be consistent with physical WORM and the special release actions that may be in place by the tape management system, for the logical volume's VOLSER to be reused, it must be returned to scratch and the reuse of the volume (as either WORM or rewritable (R/W)) must then occur as a scratch (category) mount. If the volume is subsequently reused as logical WORM, the library will create a new WWID and WMC for this new instance of the volume. If, instead, the expired WORM volume's VOLSER is to be reused (from load point) by specific mount (and not by scratch mount), the volume must first be moved to scratch and ejected "purged" from the library. At that time, the volume can then be entered (as a new logical volume) into the library as private and used as either WORM or rewritable (R/W). Also, once a previously used R/W volume has expired, to be reused as logical WORM, it must also go through the logical WORM steps above if the volume is to be mounted by specific VOLSER (and not by scratch mount). In summary, a logical volume can become WORM when it is mounted as a scratch volume (category mount) or mounted by specific volser and the volser referenced is considered a new logical volume. Refer to your tape management system for its usage of the WWID and the WMC and for its handling of expired logical WORM volumes.

TS7680 Tape Virtualization

The IBM System Storage TS7680 ProtecTIER Deduplication Gateway is designed to deliver a high performance inline data deduplication solution on System z. Like the IBM System Storage TS7720 Virtualization Engine, the TS7680 provides a disk-only virtual tape solution. The TS7680 emulates an IBM tape library and 3592 Model J1A tape drives. The TS7680 appears to the host as an automated tape library (AL) and not as a virtual tape library (VL) and, is displayed as a 3958-DE2 by the DISPLAY SMS,LIBRARY command.

For high availability, the TS7680 supports two nodes, with each node consisting of an enterprise tape control unit and deduplication engine. Each node supports up to 128 virtual tape devices (8 logical control units with 16 devices per logical control unit) and emulates the IBM System Storage 3592 Model J1A tape drive and JA (MEDIA5) media for a maximum configuration supporting up to 256 devices. Even though the library supports up to 256 virtual tape devices, based on the size of the backend disk repository, only a subset of the drives may be supported (refer to the TS7680 product documentation for any configuration-related requirements). Devices in the first (lower) tape control unit are defined using subsystems X'01' through X''08' and devices in the second (upper) tape control unit are defined using subsystems X''11' through X'18'. With the TS7680, one tape controller or deduplication engine can be offline (for code upgrade or repair) and, with a shared disk cache, all logical volumes are accessible through the remaining node's virtual device addresses.

The capacity of a TS7680 logical volume is less than a traditional JA (MEDIA5) physical cartridge (100 GB versus 300 GB). Performance scaling and performance segmentation, which are options with physical JA (MEDIA5) media, are not supported with the TS7680 and will be ignored. The host's compression setting is also ignored by the TS7680. The TS7680 will attempt compression regardless of the setting. Logical volumes defined to the TS7680 (through the IBM ProtecTIER Manager GUI) do not take up any disk space until they are written by the host. The TS7680 will support up to a million logical volumes.

Cache Management

When the TS7680 detects that available cache space has fallen below preset thresholds, the TS7680 sends CBR3792E (limited cache free space warning state reached) and CBR3794A (out of cache resource critical state reached) attention messages to the attached hosts. The CBR3792E message can be used to trigger return to scratch processing or the copying of data to another library. If the amount of available cache subsequently reaches the critical state, all fast ready (scratch) mounts are failed and any specific mount operations are allowed; however, any attempt to write to the volume will be failed. Mount operations that have been accepted before entering this state complete and volumes currently mounted can continue to perform host I/O operations. As appropriate, the VARY SMS,STORGRP operator command can also be used to steer scratch allocations to another library that is eligible for the scratch request. The DISPLAY SMS,LIBRARY command with DETAIL, can also be used periodically to display the “CACHE PERCENTAGE USED”.

When the host returns a volume to scratch, the TS7680 applies (by default) a nine day grace period to the volume. The default grace period can be overridden at install time and set to a value from 0-9 days (0 indicating no grace period). After the grace period elapses, the data associated with the scratch volume will be deleted from the library to free up back-end disk space, rendering the contents of the tape volume unusable. When the TS7680 reaches the critical “Out of Cache Resources” state (CBR3794A), it can also be configured (at install time) to automatically delete data associated with scratch volumes that are in the “grace period”. Volumes with the shortest time remaining in the grace period will be deleted first. The default behavior is to honor the grace period.

Load Balancing

To balance the workload across the two enterprise tape control units, the virtual tape devices should be divided equally across the controllers. For example, if the size of the disk repository supports fewer than 256 devices (for example 128 devices), define 64 devices using subsystems X'01' through X'04' and 64 devices using subsystems X'11' through X'14'. Or, if a given host only needs a subset of the devices, spread the online devices in equal proportions across the two enterprise control units.

If an imbalance across the two enterprise tape controllers is observed with one enterprise tape controller (and its tape subsystems) getting the majority of the mounts, consider using the new MVS Device Allocation TAPELIB_PREF randomization option "BYDEVICES". For a discussion of the load balancing option, refer to “Load Balancing Considerations” on page 54.

For additional information on the IBM System Storage TS7680, refer to the TS7680 Information Center and APAR OA27786 (z/OS V1R9 and above).

Entering a Tape Cartridge into a Tape Library

To enter tape cartridges into an automated tape library dataserver, place the cartridges into an input station of the library. The following actions occur once the cartridges are placed in the input station:

- The library vision system reads the external label of each cartridge to be entered into the library.
- The library manager notifies all connected systems that there are cartridges to be entered into the tape library dataserver.
- The cartridge entry installation exit (CBRUXENT) is invoked to approve or deny the request to enter the cartridges into the library.
- The volume record in the TCDB is created or updated.

Tip: To force cartridge entry processing to occur on a particular system, use the LIBRARY DISABLE command. For more information concerning this command, see "Disabling Installation Exit Processing" on page 115.

Tape cartridges are identified in a VTS at the library manager console through volume serial number ranges. When a native cartridge, identified as a stacked volume, is entered into a library, the volume is recognized as being a VTS managed volume and is not reported to the host as a newly entered volume. Thus, a volume record for the stacked volume is neither created or maintained in the tape configuration database (TCDB). However, the volumes identified at the library manager console as being logical volumes are placed in the insert category and are processed as part of normal cartridge entry. A volume record for the logical volume is created and maintained in the TCDB. If a logical volume fails cartridge entry processing, the logical volume is purged from the library manager database. For information concerning entering logical volumes into a VTS, see "Importing Logical Volumes into a 3494 VTS System" on page 30.

Note: If you have enabled the library for outboard policy management support and if you are defining the logical volumes to the library, the library supports the preassignment of constructs to a volume or a range of volumes. However, this preassignment of constructs is not recommended in the system-managed tape environment. The host, even in coexistence, can reset the preassigned construct names during entry processing. It is recommended that you let the host assign the appropriate constructs during entry and job processing.

Tape cartridges can be entered into a manual tape library through the use of the CBRXLCS manual cartridge entry (MCE) programming interface, or through use of the LIBRARY ENTER command. The following actions occur:

- The cartridge entry installation exit (CBRUXENT) is invoked to approve or deny the entry request.
- The volume record in the TCDB is created or updated.

For more information on manual cartridge entry (MCE), see "Manual Cartridge Entry (MCE)" on page 151. For more information on the LIBRARY ENTER command, see "Entering a Tape Volume into an MTL" on page 111.

Tip: You can also use sample program CBRSPLCS to enter volumes into a manual tape library.

Cartridge Entry Processing Without an Online Device

During cartridge entry processing, even if the library is online and operational to a given host, at least one device needs to be online, or had been online, to that host for the library to be able to send the cartridge entry attention interrupt to that host. If the library is online and operational, yet there are no online devices to a given host, that host will not receive the attention interrupt from the library unless a device had previously been VARYed online. To get around this, ensure that at least one device is online, or had been online, to each host or use the LIBRARY RESET,CBRUXENT command to initiate cartridge entry processing from the host. This is especially important if you only have one host attached to the library that owns the volumes being entered. In general, after you have entered volumes into the library, if you do not see the expected CBR36xxI cartridge entry messages being issues, you can use the LIBRARY RESET,CBRUXENT command from MVS to initiate cartridge entry processing. The LIBRARY RESET,CBRUXENT command causes the host to ask for any volumes in the insert category.

Importing Logical Volumes into a 3494 VTS System

Note: This section discusses the import support that is available in the 3494 VTS. For a discussion of the copy export support that is available in the TS7740 Virtualization Engine (3957-V0x) and what mechanism is used to bring the copy exported volumes back into a TS7740, refer to "Copy Export from the TS7740 Virtualization Engine (3957-V0x)" on page 40.

To introduce logical volumes with data into a VTS library or to reintroduce logical volumes back into a VTS to reuse the volume serial numbers, the volumes must be imported into the library. An import can be performed at the host, with a list of logical volumes to import, or at the library manager, if a single logical volume is to be imported. For more information concerning importing a single logical volume, see "Importing a Single Logical Volume at the Library Manager" on page 33.

An import operation performed at the host begins with you or the tape management system writing the list of volumes to be imported into a library on a logical volume in the library. This logical volume then becomes the import list volume. The input list volume indicates:

Import all logical volumes
The list of volumes written on file sequence 1 is a list of stacked volumes to be imported into the VTS. All logical volumes residing on the stacked volumes specified are imported.

Import specific logical volumes
In this case, the list of volumes is a list of stacked and logical volume pairs; each stacked volume is followed by the logical volume to import.

With IMPORT LIST format 01, import option SCRATCH or INITIALIZE can be specified along with the volume serial numbers of the stacked and logical volume pairs. If this import option is omitted (blank), the data contents of the logical volume are copied into the VTS system and a data fragment file entry and the library manager record are created. If the option specified indicates "SCRATCH", only the data fragment file entry and the library manager record are created (data contents not copied). If the option specified indicates "INITIALIZE", only a library manager record for the volume is created. If a logical volume serial number is not included with the stacked volume serial number, the import option specified applies to all logical volumes on the stacked volume. If you are importing into a library that supports outboard policy management, any constructs that are

associated with the volume at the time of the export are assigned to the volume on the import. IMPORT LIST format 02 can then be used to override these construct names.

With IMPORT LIST format 02, you can also specify additional options to initially set or override the policy management constructs that are associated with a volume. You can set these options on a global or a logical volume basis. Also on a global basis, the import list specification can indicate how the library manages policy names that have not been predefined (FAILIMPORT, CREATENAME, or USEDEFAULT).

File sequence two is written and later updated by the library manager to record the import status of each requested logical volume. All files must be written in the library specified format. see *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide* for details regarding the library specified format. See "SAMPLIB member CBRSPSIM" on page 311, "SAMPLIB member CBRSPPIM" on page 314, and "SAMPLIB member CBRSPPIP" on page 317 for sample JCL that can be used to write the two required files on the import list volume.

The required stacked volumes containing logical volumes to be imported must be entered into the library before initiating the import operation at the library. If the import operation is initiated before the volumes have been entered and placed in the import category, the import operation immediately fails.

Once the import list volume is written and the stacked volumes are entered into the library, the host needs to notify the library of the logical volume being used for the import operation and to initiate the import operation at the library. The CBRXLCS external services programming interface FUNC=IMPORT or the LIBRARY IMPORT command can be used to initiate the import operation and to identify the import list volume. See "Import Logical Volumes (IMPORT)" on page 152 and "Importing Logical Volumes into a VTS" on page 178 for more information. Only one import operation can be queued or in progress at a time in a physical library. This is a different restriction than for export processing which allows one export operation at a time in each VTS system. Also, if an export operation is already queued or in process, an import operation initiated to the same VTS system as the export operation fails. However, an import operation initiated to a different VTS system is allowed.

When all of the requested logical volumes on a stacked volume have been imported, the library manager places the logical volumes in the insert category to be processed as part of normal cartridge entry processing. There are additional flags that are passed to the cartridge entry installation exit (CBRUXENT) to indicate that the volume is a logical volume and that it has been imported. The logical volume flag is also set for non-imported logical volumes entered into a VTS. This provides a mechanism for the tape management system to track logical volumes.

For the import operation to continue with minimal host delays, it is important for a host that owns the TCDB records for the logical volumes being imported to have the OAM address space available to process the volumes in the insert category. This enables the import category to be processed without delays and allows the library to continue with the next stacked volume.

Note: If an import operation is initiated and no host processes the logical volumes added to the insert category within 60 minutes, the VTS terminates the import operation. This termination is equivalent to a cancel initiated by an

operator at the library manager console. See “Canceling an Import Operation” for more information.

All attached hosts are notified once the import operation is complete. This enables the import completion status to be reported independently of the status of the host that initiated the import operation. If the attached host has the import list volume in its TCDB, messages are issued with the completion results of the import operation. See “Import Status Messages” on page 33 for more information.

To release the import stacked volumes from the library, the operator can selectively eject the volume or volumes from the library at the library manager. Another operator option is to alter the volume from the import category to the insert category which would allow the stacked volume to be entered into a VTS or a non-VTS library for reuse as a scratch stacked volume or as a physical scratch volume. Before reusing an import stacked volume, make sure that all the logical volumes on the stacked volume either have been successfully imported, or that the data on the logical volumes is no longer needed.

If using DFSMSrmm as your tape management system, use the SEARCHVOLUME subcommand with CONTAINER(*volser*) to verify that no logical volumes are still associated with the stacked volume. This verification should indicate that all logical volumes have been imported. To reuse the volume as a scratch stacked volume, enter the volume into a VTS library. To reuse the stacked volume as a scratch physical volume, enter the volume into a non-VTS library. The new physical volume will be automatically added to the DFSMSrmm control data set if DFSMSrmm is used. For more information regarding DFSMSrmm commands, see *z/OS DFSMSrmm Managing and Using Removable Media*.

Rule: When a logical volume is successfully imported, the original exported copy of the logical volume is not altered. To avoid losing changes made to the imported copy, do not import this level of data again.

Canceling an Import Operation

If needed, the LIBRARY IMPORT,*volser*,CANCEL command or the CBRXLCS external services programming interface FUNC=IMPORT with the cancel option can be used to cancel an executing import operation to expedite other work or to quiesce library activity in preparation for maintenance. A cancel from the host is normally effective immediately, except for the period of time when host insert processing is occurring for logical volumes that are being imported from a stacked volume. In this case, the host cancel takes effect after host insert processing is completed. The host cancellation method is the preferred method for canceling an import operation. However, in addition to the host cancellation methods, an import operation can also be explicitly canceled at the library manager, if there is no host available to cancel the import operation. Differences in the cancel methods will occur during host insert processing. If the explicit cancel occurs during host insert processing, the import operation terminates and logical volumes that are still assigned to the insert category are left in the insert category to be processed by the host when it is available.

The status of all logical volumes requested for import is found in the status file of the import list volume after the import operation completion. Exported stacked volumes that were provided for import and were completed before the cancel are not affected by the cancel.

Import Status Messages

As the library is processing an import operation, status messages are reported to all attached hosts. This results in OAM issuing message CBR3750I. Status messages are issued at the following key processing points:

- When import processing begins for a stacked volume
- When the library completes importing the requested logical volumes on a stacked volume (that is, the volumes are in the insert category to be processed by the host)
- When the import processing is complete for a stacked volume (that is, all of the requested logical volumes on the stacked volume have been processed by OAM)
- When processing completes for the import operation

The library may also issue message CBR3750I if an error occurs during the import operation that temporarily or permanently stops the operation.

Importing a Single Logical Volume at the Library Manager

There may be instances in which an exported logical volume is needed during job processing and the logical volume has not previously been imported. To expedite this process, the library allows an operator to initiate a single volume import operation at the library manager. The operator enters the stacked volume containing the logical volume to import and indicates which logical volume is being imported. This eliminates the need for the host to write the logical list volume discussed in "Importing Logical Volumes into a 3494 VTS System" on page 30.

To further assist in this process, when a logical volume is exported from the library, the volume record in the TCDB is updated with a shelf location of STACKED=*volser* (if the TCDB record is retained and the shelf location is blank). The volume not in library installation exit sample program, CBRSPUXV, also recognizes a shelf location of STACKED=*volser* and displays the stacked volume. This allows the operator to identify the specific stacked volume on which the requested logical volume resides. If an installation is not using this default support, nor DFSMSrmm, custom modifications to the volume not in library installation exit will need to be made.

The sample volume not in library exit supplied by DFSMSrmm also takes into account whether an exported logical volume is being requested and will display the stacked volume on which the logical volume resides.

As with a host initiated import operation, when the single volume import operation is complete, all hosts attached to the VTS system that performed the operation will be notified of this completion. Only one import operation, host or library initiated, is allowed per physical library.

Checking the Volume Serial Number for Uniqueness

When entering tape cartridges into a tape library, OAM checks each volume serial number in the insert category for uniqueness (see "Volume Serial Number Restrictions" on page 36). If there is already an SMS-managed DASD or optical volume with the same volume serial number as the tape volume being entered, the cartridge entry is rejected. Also, if the media type of the volume being entered does not match the media type of the volume in the TCDB, cartridge entry is rejected. For cartridge entry processing into a manual tape library, only DASD volumes are checked for uniqueness.

If OAM determines that the volume serial number is unique, it obtains the tape volume record from the TCDB. Depending on whether or not a record is found, several different actions can occur:

- Tape volume record is not present (for a newly entered cartridge, normal cartridge entry occurs).
- Tape volume record indicates the volume is in another library (In an automated tape library environment, a check is made to determine if the volume still resides in the other library. If the volume does not reside in that library, entry processing continues. In a manual tape library environment, since a check cannot be made, entry is denied).
- Tape volume record indicates volume is in this library (In an automated tape library environment, entry processing continues. In a manual tape library environment, since the possibility of a duplicate exists, entry is denied.).
- Tape volume record indicates volume shelf-resident (normal cartridge reentry).

Before the volume record is created or updated, the cartridge entry installation exit (CBRUXENT) is called to set or verify values for many of the record fields. See "Cartridge Entry Installation Exit (CBRUXENT)" on page 224 for a list of fields.

Using Global Resource Serialization with Cartridge Entry Processing

Cartridge entry processing is usually serialized; that is, one system performs cartridge entry for the entire SMS complex. This is accomplished by using global resource serialization (GRS) with a SYSTEMS level enqueue.

The resource names are as follows:

```
QNAME-SYSZCBR
RNAME-CARTRIDGE_ENTRY_libname
```

If the library is a PtP VTS, the *libname* represents the composite library.

Note: OAM already performs a SYSTEMS level enqueue for global resource serialization. If you are using IBM global resource serialization ring or star support, you do not need to include the QNAME or RNAME in the SYSTEM inclusion RNL. The QNAME and RNAME are provided for documentation purposes. If a GRS-equivalent product is being used, refer to that product documentation to ensure that the SYSTEMS level enqueue is honored and for any setup that might be needed to propagate the enqueue across your systems.

It is possible to perform cartridge entry processing without global resource serialization. The consequences of unserialized processing are as follows:

1. Cartridge entry occurs concurrently in all processors. Each processor handles a subset of the entered volumes.
2. Some additional processing overhead takes place, due to concurrent processing of the same list of volumes.
3. The cartridge entry installation exit is entered once for each volume on each processor. The installation must account for this possibility when writing the exit.

Recommendation: Use global resource serialization.

Related reading: For more information on using GRS, see *z/OS MVS Planning: Global Resource Serialization*.

Using Global Resource Serialization in a Manual Tape Library

To serialize tape configuration database (TCDB) updates during cartridge entry, eject, and change use attribute processing, a systems level enqueue, at the volume serial number level, is performed using global resource serialization.

The resource names are as follows:

```
QNAME-SYSZCBR
RNAME-MTL_VOLSER_volsername
```

Note: OAM already performs a SYSTEMS level enqueue for global resource serialization. If you are using IBM's global resource serialization ring or star support, you do not need to include the QNAME or RNAME in the SYSTEM inclusion RNL. The QNAME and RNAME are provided for documentation purposes. If a GRS-equivalent product is being used, refer to that product documentation to ensure that the SYSTEMS level enqueue is honored and for any setup that might be needed to propagate the enqueue across your systems.

Recommendation: Use global resource serialization. Without this serialization, simultaneous processing of the same *volser* may result in a double increment or decrement of the appropriate scratch count.

Tape Volume Requirements

The ATLDS and the MTL support a multitude of IBM tape cartridge types, depending on the tape devices and media types supported in the library. Each tape volume is identified by a unique volume serial number with the following requirements being enforced:

- All physical volumes residing in an ATLDS must have a supported external barcode label readable by the automated tape library dataserver vision system unless the unlabeled tape facility at the library manager is being used.
- All volumes residing in a MTL should also have a supported machine readable external label to be compatible with the ATLDS.
- All private volumes must have either an internal IBM standard tape label or an International Organization for Standardization American National Standards Institute (ISO/ANSI) label, unless bypass label processing (BLP) or nonlabeled tape (NL) is specified.
- All private volumes must have identical internal and external volume serial numbers, unless BLP or NL is specified. The internal volume serial number is recorded in the tape volume label (VOL1 label).
- BLP or NL may be requested for input processing on specific volume serial references. It may also be requested for output processing on specific or nonspecific references.
- All volume serial numbers in the same SMS complex must be unique across tape, DASD, and optical environments.
- A scratch volume cannot be requested using a specific volume serial number.
- All volumes of a multivolume data set should reside in the same library, or all should reside outside a library; however, if they do not, the installation will be given the chance to enter the volumes through the volume not in library installation exit (CBRUXVNL).
- All volumes of a multivolume data set must belong to the same tape storage group.
- All volumes of a multivolume data set must be recorded using the same tape recording technology.

- Volumes of a multivolume data set may be an intermix of media types supporting the same recording technology.
- Volumes of a multivolume data set must be recorded either on all rewritable media or on all WORM media and cannot be intermixed.

Accessing the Tape Volumes

Because tape volumes can reside either inside libraries or on shelves outside the library, physical procedures for accessing volumes vary according to their location:

- When a library-resident volume is requested, the system mounts it on a tape drive in the tape library containing the volume.
- When a shelf-resident volume is requested, the installation is given the opportunity to enter the volume into a tape library by using the volume not in library installation exit. If the volume is not entered into the library, the system requests the volume be mounted on a nonlibrary device (stand-alone tape drive).

  Note: Shelf storage may be local to the computer facility and, therefore, accessible to the operator, or it may be located at another location.

Volume Serial Number Restrictions

When a physical tape volume is entered into an ATLDS or MTL, the cartridge must have an external label (readable by machine, human, or both). If the volume is assigned the private use attribute on entry into the tape library, a magnetically recorded volume serial number on the tape volume label must be present and match the volume serial number on the external label. This label is not checked on entry into the tape library, so if there is an error, it is not detected until the volume has been mounted and the label has been read.

If the volume is assigned the scratch use attribute and no volume serial number exists for it, a new volume label with a matching volume serial number is written whenever the data set is opened for output on the tape. For a scratch volume with an existing volume serial number that does not match the volume serial number on the external label, the internal label is rewritten to match the external label.

Recommendation: In the case of an MTL scratch volume, since the label process is not automated, use the IEHINITT utility (or RMM equivalent EDGINERS) to pre-label the scratch cartridge; otherwise, the operator may be prompted for the volume serial number when the volume is first mounted for output.

Ejecting a Tape Cartridge from a Tape Library

Ejecting a cartridge from a tape library breaks the connection between the cartridge and the library in which it resided. Cartridges may need to be moved to a different location and must therefore be ejected from the library in which they currently reside so they may be put into a library at the new location. Once the cartridges are ejected from the library in which they reside, they are no longer associated with that library and are not eligible to be mounted in the library without going through the cartridge entry process.

In the automated tape library environment, there is currently a limit on the number of eject requests that device services can have queued across all libraries from a single system. This queue limit is currently set at 1600. For this limit to be as transparent as possible, OAM will not send more than 100 eject requests to a single library from a single system. If OAM receives more than 100 eject requests for a given library, it will wait until an eject request completes before sending

another request to that library. However, if the OAM address space is stopped or restarted with an SCDS activation, rather than purging the remaining eject requests, OAM will try and send down as many of the remaining eject requests as it can before reaching the device services queue limit of 1600. Additionally, there is a Peer-to-Peer VTS system limitation. This library will only accept up to 1000 eject requests across all connected systems.

Recommendation: Given these limitations (and potential storage constraints when processing thousands of outstanding eject requests), limit the number of outstanding eject requests at any given time to no more than a couple thousand per system. Then, as the outstanding eject requests complete, more can be initiated.

Cartridges can be ejected from a tape library in several ways, as shown in Table 2:

Table 2. Methods for Ejecting Cartridges from a Tape Library

Eject Request Invoked By	Action Taken to Cause Eject	Associated Procedure
OAM	Ejects cartridge automatically following an unsuccessful cartridge entry attempt.	N/A
Operator	Ejects cartridge using the LIBRARY EJECT command.	"Ejecting a Specific Tape Volume" on page 109
Storage administrator	Specifies an EJECT line operator next to a volume serial number on an ISMF Mountable Tape Volume List panel.	"Ejecting a Volume from a Tape Library" on page 374
Application program	Issues the CBRXLCS macro with the EJECT function.	"Ejecting a Tape Cartridge" on page 166

Before a cartridge can be ejected from a tape library, the cartridge eject installation exit (CBRUXEJC) is invoked to approve or deny the eject request. See "Cartridge Eject Installation Exit (CBRUXEJC)" on page 236 for more information.

Rule: OAM does not support the manual removal of volumes from a 3494 tape library for the purpose of ejecting them. The volumes that are manually ejected from a library are still library-resident in the TCDB, causing an out-of-synchronization condition with the library manager database. Volumes must be ejected following the methods outlined in Table 2.

When OAM ejects a tape volume residing in a manual tape library, no automated movement of the cartridge takes place. It is up to the operator to physically remove the tape cartridge from the storage racks associated with the manual tape library.

After the eject request completes, OAM notifies the invoker of the eject request of its success or failure and the volume record in the TCDB is updated or deleted.

For information concerning exporting or removing a logical tape volume from a VTS, see "Exporting Logical Volumes from a 3494 VTS System" on page 38 and "Ejecting a Logical Volume from a VTS" on page 38.

Ejecting a Logical Volume from a VTS

If a logical volume is in a fast ready category at the VTS, it can be ejected (purged) from the library using the methods described in Table 2 on page 37. An export operation for the purpose of deleting a logical scratch volume is not required. If a logical volume is in the insert category, it can also be ejected (purged) using the same methods after a TCDB record is manually created or updated indicating that the volume resides in the library. For information concerning an export operation, see "Exporting Logical Volumes from a 3494 VTS System."

Exporting Logical Volumes from a 3494 VTS System

Note: This section discusses the export support that is available in the 3494 VTS. For a discussion of the copy export support that is available in the TS7740 Virtualization Engine (3957-V0x), refer to "Copy Export from the TS7740 Virtualization Engine (3957-V0x)" on page 40.

To remove a set of logical volumes from a VTS, the operator or the tape management system should first run a vaulting-type operation at the host to determine the list of logical volumes to be exported. This list is then written in volume serial number and destination pairs as the first file on an available logical volume. This volume then becomes the export list volume. This export list volume must reside in the library where the volumes to be exported reside and it must be written in a library specified format. Two more files are also written on this export list volume. File sequence two is a file reserved for future use. File sequence three is written and later updated by the VTS to record the export status of each logical volume listed in the export list. All three files must be written in the library specified format.

See *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide* for details regarding the library specified format. See "SAMPLIB member CBRSPSXP" on page 321 and "SAMPLIB Member CBRSPPXP" on page 324 for sample JCL that can be used to write the three required files on the export list volume. The DFSMSrmm SEARCHVOLUME command with the CLIST option can be used to create this export list. For more information on this command, see *z/OS DFSMSrmm Managing and Using Removable Media*.

Once the export list volume is written, the LIBRARY EXPORT command or the CBRXLCS external programming interface FUNC=EXPORT can be used to identify the export list volume and to initiate the export operation at the library. For more information, see "Export Logical Volumes (EXPORT)" on page 152 and "Exporting Logical Volumes from a VTS" on page 176. Only one export operation can be queued or in progress at a time in each VTS system. Also, if an import is currently queued or in progress, an export operation cannot be initiated to the same VTS system.

The library then mounts the export list volume and determines the list of volumes to export and either the destination or destinations for the logical volumes. Logical volumes with the same destination will be grouped together on the same stacked media. This lets a single export operation cover multiple destination sites. The library then begins writing the export logicals on stacked volumes. If the VTS has outboard policy management support, the volume's policy names are included on the stacked volume. On the third file of the export list volume, the library records the status of each logical volume being exported; this can be referred to as the export status file. If a volume cannot be exported because it is currently in use or does not exist in the library, the export status file indicates the error that occurred,

as well as reflects the successful export of each logical volume. Each exported stacked volume contains a volume map identifying the contents of the stacked volume, logical volume data fragment files for each logical volume successfully copied, and the logical volumes themselves. A single export operation may result in many stacked volumes being exported with multiple volumes per destination.

As the library manager finishes with a stacked volume, the logical volumes are assigned to the exported category. The volumes in this category are then processed by OAM. Volume export processing is similar to eject processing; however, in addition, the cartridge eject installation exit (CBRUXEJC) is passed the container volume serial number of the stacked cartridge on which the logical volume resides. This is information that the tape management system will want to record. The tape management system's acceptance of the eject is implicit (there is no opportunity to fail the eject). However, in an environment where a common TCDB is shared by more than one tape management system and each tape management system has its own database, the tape management system can return UXJIGNOR, Return Code 12, to allow another tape management system who "owns" the exported volume to process. If UXJIGNOR is returned from the CBRUXEJC installation exit, the logical volume remains in the exported category; otherwise, each logical volume is then purged from the library manager inventory and the host TCDB volume record is kept or purged, depending on the disposition specified by the installation exit or defaults set for the library when it was defined using ISMF.

Once all logical volumes residing on a stacked cartridge have been successfully purged from the library manager inventory, the export operation continues at the library, filling another stacked volume for the destination currently being processed. The completed stacked cartridge can then be released by an operator at the library manager either on an individual completion basis, or after a set of volumes has been processed. For the export operation to continue with minimal host delays, it is important for a host that owns the TCDB records for the logical volumes being exported to have the OAM address space available to process the volumes in the exported category. This enables the exported category to be processed without delays and allows the library to continue with the next stacked volume.

Attention: If an export operation is initiated and no host processes the exported category within 60 minutes, the VTS terminates the export operation. This termination is equivalent to a cancel initiated by an operator at the library manager console. See "Canceling an Export Operation" for more information.

Once the export operation is complete, all hosts attached to the VTS system that performed the operation are notified of this completion. This enables export completion status to be reported independently of the status of the host that initiated the export operation. If the attached host has the export list volume in its TCDB, messages are issued with the completion results of the export operation. Status messages are also issued at key processing points throughout the export operation. See "Export Status Messages" on page 40 for more information.

Canceling an Export Operation

Because an extensive list of export volume candidates could take considerable time to complete, it might be necessary to cancel an export operation to expedite other processing or to quiesce the library activity in preparation for maintenance. The LIBRARY EXPORT,*volser*,CANCEL command or the CBRXLCS external services programming interface FUNC=EXPORT with the cancel option can be used for this purpose. A cancel from the host is normally effective immediately, except for the period of time when host purge processing is occurring for logical volumes being

exported to the exported stacked volume. In this case, the host cancel takes effect after host purge processing is completed for the exported stacked volume.

The host cancellation method is the preferred method for canceling an export operation. However, in addition to host cancellation methods, you can also explicitly cancel an export operation at the library manager if there is no host available to cancel the export operation. Differences in the cancel methods will occur during host purge processing. If the explicit cancel occurs during host purge processing, the export operation terminates and logical volumes in the exported category are placed in the insert category (none of these logical volumes will be exported) and the host will perform insert processing on these logical volumes when it is available. The exported stacked volume will go back into the pool of usable scratch stacked volumes.

The status of all logical volumes requested for export is found in the status file of the export list volume after the export operation completes. Exported stacked volumes that were completed and placed in the export hold category before the cancel are not affected by the cancel.

Export Status Messages

As the library is processing an export operation, status messages are reported to all attached hosts. This results in OAM issuing operator message CBR3750I. Status messages are issued at the following key processing points:

- When export processing begins for a particular destination
- When the library completes a stacked volume and the logical volumes are in the exported category and ready for host processing
- When the library completes a stacked volume and it is ready to be released (ejected) by an operator
- When processing completes for a particular destination
- When processing completes for the export operation

The library may also issue message CBR3750I if an error occurs during the export operation that temporarily or permanently stops the export operation.

Copy Export from the TS7740 Virtualization Engine (3957-V0x)

A copy of the data within a TS7740 Virtualization Engine (3957-V0x) can be removed from the library, both in a stand-alone and in a multi-grid configuration. The information below discusses the copy export capability in a stand-alone and in a multi-grid configuration.

Copy export enables a copy of the data to be used for disaster recovery purposes while the original data remains accessible for production use. For the recovery of the copy exported volumes, a modified disaster recovery process is used instead of an import. The copy export support builds on the existing capability (through advanced policy management and management class) to create a secondary copy of a logical volume in a secondary physical pool. During a copy export operation, all of the physical volumes with active data on them, from a specified secondary pool, are removed from the library associated with the TS7740 performing the export operation. Only the logical volumes that are valid on that TS7740 are considered during the execution of the operation (if they are in the cache, but have not yet been copied to the secondary pool, copies are performed as part of the copy export operation). If the TS7740 is in a grid configuration, copies that have not yet been completed to the TS7740 performing the copy export operation are not considered during the execution of the operation. It is expected that the copy

export operation runs on a periodic basis resulting in multiple groups of physical volumes containing the copies of the logical volumes from the TS7740. However, the number of offsite volumes a TS7740 allows is limited to 2000. When a copy export is initiated, the TS7740 determines the total count of physical volumes that are currently offsite, then add to that number the number of physical volumes in the specified pool that have active data on them and would be exported. If that number exceeds 2000, the export fails. During the copy export operation, a copy of the current TS7740's database is written to the exported physical volumes. To restore access to the data on the physical volumes that have been removed, all exported physical volumes for a source TS7740 are placed into a library that is attached to an empty TS7740. A disaster recovery procedure is then performed that restores access using the latest copy of the database.

The physical volumes exported during a copy export operation continue to be managed by the source TS7740 in regards to space management. As logical volumes that are resident on the exported physical volumes are expired, rewritten or otherwise invalidated, the amount of valid data on a physical volume decreases until the physical volume becomes eligible for reclamation based on the criteria provided by the customer. The exported physical volumes to be reclaimed are not brought back to the source TS7740 for processing, instead, a new secondary copy of the remaining valid logical volumes are made using the primary logical volume copy as a source. The next time the copy export operation is performed, the physical volumes with the new copies are also exported. The physical volumes that were reclaimed (that are offsite) are no longer considered to have valid data and can be returned to the source TS7740 to be used as new scratch volumes.

Before initiating a copy export operation using the existing LIBRARY EXPORT command, the export list volume must first be created on the TS7740 that is to perform the export operation (using export list format 03). When creating the export list volume, since a multi-cluster grid configuration can have drives online in more than one TS7740, management class can be used to direct in which TS7740 the export list volume is created. For copy export, the export list volume cannot be valid on more than one TS7740 in a grid configuration, it must only be valid on the TS7740 that is to perform the copy export operation, otherwise the request fails. Then when the LIBRARY EXPORT command is issued, the library directs the export operation to the TS7740 that has a valid copy of the export list volume (again, only one TS7740 can have a valid copy of the export list volume for the export operation to proceed). The export list volume contains instructions regarding the execution of the operation (the number of the secondary pool to export) as well as a reserved file that the TS7740 uses to provide completion status and export operation information. As part of the execution of the copy export operation, the TS7740 creates response records in the reserved file that lists the logical volumes exported and the physical volume that they reside on. This information may be used by the users as a record for what data is offsite. The TS7740 also writes records in the reserved file on the export list volume for any offsite physical volumes that have been reclaimed and no longer contain any active data.

The copy export operation can also be cancelled using the existing LIBRARY EXPORT command with the CANCEL option or it can be cancelled at the library. For a copy export, processing for the current physical volume completes. Status files are written for all logical and physical volumes which completed export processing.

In addition to providing a list of the offsite physical volumes that are empty in the export list volume status file, the Bulk Volume Information Retrieval (BVIR)

function can also be used to obtain a current list of exported physical volumes for a secondary pool. For each exported physical volume, information is provided regarding the amount of active data that each contains.

Because the primary copy of the logical volumes being exported are not removed from the TS7740, no notification of their change in state is performed at the host (the logical volumes are not placed in the exported category, nor is the host notified on which physical volume the exported logical volume resides). Instead, the database entries at the library for the physical volumes are updated to indicate that they have been exported and the hosts are notified that export processing has been completed. In addition to the export completion message which results in the generation of a console message, status messages are also generated during the export operation and displayed at the console using the existing CBR3750I message. When the export operation completes, the user can eject the exported copy physical volumes from the library and move them to an offsite location.

For additional details on the copy export support and the BVIR function, refer to IBM Redbook, *IBM System Storage Virtualization Engine TS7700: Tape Virtualization for System z Servers*, and the following IBM Whitepapers: *IBM Virtualization Engine TS7700 Series Bulk Volume Information Retrieval User's Guide* and *IBM Virtualization Engine TS7700 Series Copy Export User's Guide*.

Host Implications

A copy export operation is initiated using the existing LIBRARY EXPORT command. However, unlike the export support that is available in the 3494 VTS, when the logical volumes are exported from the , a copy of the logical volume remains in the library. So from a host database perspective the logical volumes are still library resident. There is no automatic notification to the host (or to the tape management system) that a copy of the logical volume also exists outside the library. When logical volumes are exported from the 3494 VTS, the volumes are placed in an exported category and the host is notified. As part of this notification, the host processes each volume in the exported category. This results in the host and the tape management system updating their database to indicate that the volume now resides outside the library. The capability also exists for this support to track on which physical volume an exported logical volume now resides. Because there is no host notification with a copy export, it is up to the user to manage and track the exported physical volumes. One mechanism may be to use the existing SHELF LOCATION field in the tape configuration database (TCDB). This is a 32-byte free form field available for the users. As with the 3494 VTS support, you can use the SHELF LOCATION field to track on which physical volume the logical volume resides (using IDCAMS ALTER VOLUMEENTRY). For example, COPY EXPORT STACKED=*xxxxxx* could be placed in this field to differentiate from STACKED=*xxxxxx* which is used with the 3494 VTS support. If you use DFSMSrmm and stacked volume support is enabled, DFSMSrmm automatically handles and tracks the stacked volumes created by copy export. However, there is no way to track which logical volume copies are on the stacked volume. You should retain the updated export list file created by you and updated by the library, so that you have such a record. Refer to *z/OS DFSMSrmm Implementation and Customization Guide* for more information about DFSMSrmm support of copy export.

Using Global Resource Serialization with Export Processing

To prevent multiple hosts from attempting to simultaneously process logical volumes in the export category, a SYSTEMS level enqueue, similar to cartridge entry processing, is used. The resource names are:

```
QNAME–SYSZCBR
RNAME–EXPORTED_CATEGORY_libname
```

It is possible to perform export processing without global resource serialization. The following are the consequences of unserialized processing:

1. Export completion processing occurs simultaneously in all processors. Each processor handles a subset of the exported volumes.
2. Some additional processing overhead takes place, due to concurrent processing of the same list of volumes.
3. The cartridge eject installation exit is entered once for each volume on each processor. The installation must account for this possibility when writing the exit.

Recommendation: Use global resource serialization.

Chapter 2. Planning for the Tape Library Support

In many ways, planning is the most important phase of a product's implementation and administration cycle. Time spent in planning is fully repaid in time, effort, and money saved by a well-implemented installation and a smooth transition to full system integration. This chapter identifies key areas that must be addressed during the planning stage for tape library support, as well as installation procedures to follow when you are ready to install OAM. Rather than repeat large amounts of information available elsewhere, this chapter focuses specifically on issues related to tape library dataservers and provides references to other resources.

Analyzing Your Hardware Environment

Installing a new product is rarely an isolated event. Planners must evaluate how the environment is affected by the new product, as well as how to customize the new product to integrate it with the existing components. This section presents hardware and media requirements and considerations.

Hardware

Drive types supported in a tape library:

3480 Identified in JCL statements as UNIT=3480. Only supported in the MTL.

3490 Sometimes referred to as a base 3490. It is identified on JCL statements as UNIT=3480X. Supported in the 3495 ATLDS and in the MTL.

3490E It is identified on JCL statements as UNIT=3490. Supported in the 3495 and 3494 ATLDS and in the MTL.

3590-1 It is identified on JCL statements as UNIT=3590-1. Supported in the 3495 and 3494 ATLDS and in the MTL as a 3590 Model B Tape Subsystem.

3590-E It is identified on JCL statements as UNIT=3590-1 or UNIT=3490. Supported in the 3494 ATLDS and in the MTL in 3590-1 emulation mode as a 3590 Model E Tape Subsystem.

3590-H It is identified on JCL statements as UNIT=3590-1 or UNIT=3490. Supported in the 3494 ATLDS and in the MTL in 3590-1 emulation mode as a 3590 Model H Tape Subsystem.

3592-J It is identified on JCL statements as UNIT=3590-1 or UNIT=3490. Supported in the 3494 or 3584 ATLDS and in the MTL in 3590-1 emulation mode as a 3592 Model J Tape Subsystem.

3592-2 It is identified on JCL statements as UNIT=3590-1. Supported in the 3494 and 3584 ATLDS and in the MTL in 3590-1 emulation mode as a 3592 Model E05 Tape Subsystem (not encryption capable).

3592-2E It is identified on JCL statements as UNIT=3590-1. Supported in the 3494 and 3584 ATLDS and in the MTL in 3590-1 emulation mode as a 3592 Model E05 Tape Subsystem with encryption

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capability (capable from a host perspective implies that the encryption feature in the drive is enabled).

3592-3E It is identified on JCL statements as UNIT=3590-1. Supported in the 3494 and 3584 ATLDS and in the MTL in 3590-1 emulation mode as a 3592 Model E06 Tape Subsystem with encryption capability (capable from a host perspective implies that the encryption feature in the drive is enabled). Unlike the 3592 Model E05, a non-encryption capable version of the 3592 Model E06 (3592-3) is not supported under System z with control unit attached devices.

3592-4E It is identified on JCL statements as UNIT=3590-1. Supported in the 3584 ATLDS and in the MTL in 3590-1 emulation mode as a 3592 Model E07 Tape Subsystem with encryption capability (capable from a host perspective implies that the encryption feature in the drive is enabled). Unlike the 3592 Model E05, a non-encryption capable version of the 3592 Model E07 (3592-4) is not supported under System z with control unit attached devices.

Notes:

1. The 3495 ATLDS can be configured with 3490, 3490E, and 3590 Model B tape subsystems.
2. The 3494 ATLDS can be configured with 3490E, 3590 Model B, 3590 Model E, 3590 Model H, 3592 Model J, 3592 Model E05, and 3592 Model E06 tape subsystems.
3. The 3584 ATLDS can be configured with 3592 Model J, 3592 Model E05, 3592 Model E06, and 3592 Model E07 tape subsystems.
4. The MTL can be configured with 3480, 3490, 3490E, 3590 Model B, 3590 Model E, 3590 Model H, 3592 Model J, 3592 Model E05, 3592 Model E06, and 3592 Model E07 tape subsystems.

   Note: Due to the compaction incompatibility between the 3480 and the base 3490 (3480X), both of these device types are not allowed in the same manual tape library.
5. Though a mix of tape subsystem is supported within a library (ATLDS or MTL), all drives under the same control unit must have the same capabilities. This ensures that all of the devices under the same control unit are capable of handling the same allocation request.

Table 3 describes hardware configurations that can be used separately or in specific combinations to create or modify your tape storage environment. The notes that correspond to the reference numbers in the table are listed at the end of the table.

Table 3. Tape Storage Configurations

Library Model and Subsystem Device Type	Library Attachment	Media Supported		Recording Technology	Noncompacted Data Capacity
3494 L10 (VTS) Models B10, B16, B18, B20					
3490E	Yes	MEDIA1/2	(R/W)	36	400MB, 800MB
3957 V0x, VEx (VTS)					
3490E	Yes	MEDIA1/2	(R/W)	36	400MB, 800MB
3958 DE2 (VTS)					
3592-J (3590-1 emulation)	Yes	MEDIA5	(R/W)	EFMT1	100GB

Table 3. Tape Storage Configurations (continued)

Library Model and Subsystem Device Type	Library Attachment	Media Supported		Recording Technology	Noncompacted Data Capacity
3495 L20, L30, L40, L50					
3490	Yes	MEDIA1	(R/W)	18	200MB
3490E	Yes	MEDIA1 MEDIA1/2	(R) (R/W)	18 36	200MB 400MB, 800MB
3590-1 **2**	Yes	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3494 L10					
3490E	Yes	MEDIA1 MEDIA1/2	(R) (R/W)	18 36	200MB 400MB, 800MB
3590-1 **2**	Yes	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3590-E **3** (3590-1 emulation)	Yes	MEDIA3/4 MEDIA3/4	(R) (R/W)	128 256	10 GB, 20 GB 20 GB, 40 GB
3590-H **4** (3590-1 emulation)	Yes	MEDIA3/4 MEDIA3/4 MEDIA3/4	(R) (R) (R/W)	128 256 384	10 GB, 20 GB 20 GB, 40 GB 30 GB, 60 GB
3592-J **5** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 **6** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2 EFMT1 EFMT2 EFMT2	300GB 500GB 60GB 100GB 700GB
3592-2E **7** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT1 EFMT2/EEFMT2 EFMT2/EEFMT2	300GB 500GB 60GB 100GB 700GB
3592-3E **8** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10	(R) (R/W) (R/W) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB
3584 L22					
3592-J **5** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 **6** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2 EFMT1 EFMT2 EFMT2	300GB 500GB 60GB 100GB 700GB
3592-2E **7** (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT1 EFMT2/EEFMT2 EFMT2/EEFMT2	300GB 500GB 60GB 100GB 700GB

Table 3. Tape Storage Configurations (continued)

Library Model and Subsystem Device Type	Library Attachment	Media Supported		Recording Technology	Noncompacted Data Capacity
3592-3E 8 (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10	(R) (R/W) (R/W) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB
3592-4E 9 (3590-1 emulation)	Yes	MEDIA9/10 MEDIA9/10 MEDIA9/10 MEDIA11/12 MEDIA13	(R) (R/W) (R/W) (R/W) (R/W)	EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT4/EEFMT4 EFMT4/EEFMT4 EFMT4/EEFMT4	700GB 1000GB 1600GB 4000GB 500GB
Manual Tape Library (MTL)					
3480	N/A	MEDIA1	(R/W)	18	200MB
3490	N/A	MEDIA1	(R/W)	18	200MB
3490E	N/A	MEDIA1 MEDIA1/2	(R) (R/W)	18 36	200MB 400MB, 800MB
3590-1 2	N/A	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3590-E 3 (3590-1 emulation)	N/A	MEDIA3/4 MEDIA3/4	(R) (R/W)	128 256	10 GB, 20 GB 20 GB, 40 GB
3590-H 4 (3590-1 emulation)	N/A	MEDIA3/4 MEDIA3/4 MEDIA3/4	(R) (R) (R/W)	128 256 384	10 GB, 20 GB 20 GB, 40 GB 30 GB, 60 GB
3592-J 5 (3590-1 emulation)	N/A	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 6 (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2 EFMT1 EFMT2 EFMT2	300GB 500GB 60GB 100GB 700GB
3592-2E 7 (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT1 EFMT2/EEFMT2 EFMT2/EEFMT2	300GB 500GB 60GB 100GB 700GB
3592-3E 8 (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10	(R) (R/W) (R/W) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB
3592-4E 9 (3590-1 emulation)	Yes	MEDIA9/10 MEDIA9/10 MEDIA9/10 MEDIA11/12 MEDIA13	(R) (R/W) (R/W) (R/W) (R/W)	EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT4/EEFMT4 EFMT4/EEFMT4 EFMT4/EEFMT4	700GB 1000GB 1600GB 4000GB 500GB
Stand Alone					
3480	N/A	MEDIA1	(R/W)	18	200MB
3490	N/A	MEDIA1	(R/W)	18	200MB
3490E	N/A	MEDIA1 MEDIA1/2	(R) (R/W)	18 36	200MB 400MB, 800MB
3590-1 2	N/A	MEDIA3/4	(R/W)	128	10 GB, 20 GB

Table 3. Tape Storage Configurations (continued)

Library Model and Subsystem Device Type	Library Attachment	Media Supported		Recording Technology	Noncompacted Data Capacity
3590-E **3** (3490E or 3590-1 emulation)	N/A	MEDIA3/4 MEDIA3/4	(R) (R/W)	128 256	10 GB, 20 GB 20 GB, 40 GB
3590-H **4** (3490E or 3590-1 emulation)	N/A	MEDIA3/4 MEDIA3/4 MEDIA3/4	(R) (R) (R/W)	128 256 384	10 GB, 20 GB 20 GB, 30 GB 30 GB, 60 GB
3592-J **5** (3590-1 emulation)	N/A	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-J **5** (3490-E emulation)	N/A	MEDIA5	(R/W)	EFMT1	300 GB
3592-2 **6** (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2 EFMT1 EFMT2 EFMT2	300GB 500GB 60GB 100GB 700GB
3592-2E **7** (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA9/10	(R/W) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT1 EFMT2/EEFMT2 EFMT2/EEFMT2	300GB 500GB 60GB 100GB 700GB
3592-3E **8** (3590-1 emulation)	N/A	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10	(R) (R/W) (R/W) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB
3592-4E **9** (3590-1 emulation)	Yes	MEDIA9/10 MEDIA9/10 MEDIA9/10 MEDIA11/12 MEDIA13	(R) (R/W) (R/W) (R/W) (R/W)	EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT4/EEFMT4 EFMT4/EEFMT4 EFMT4/EEFMT4	700GB 1000GB 1600GB 4000GB 500GB

Table 3. Tape Storage Configurations (continued)

Library Model and Subsystem Device Type	Library Attachment	Media Supported	Recording Technology	Noncompacted Data Capacity

Notes:

1. MB = 1 048 576 bytes
   GB = 1 073 741 824 bytes
   (R) = Read only
   (R/W) = Read and write
   MEDIA1 = IBM Cartridge System Tape
   MEDIA2 = IBM Enhanced Capacity Cartridge System Tape
   MEDIA3 = IBM High Performance Cartridge Tape
   MEDIA4 = IBM Extended High Performance Cartridge Tape
   MEDIA5 = IBM Enterprise Tape Cartridge
   MEDIA6 = IBM Enterprise WORM Tape Cartridge
   MEDIA7 = IBM Enterprise Economy Tape Cartridge
   MEDIA8 = IBM Enterprise Economy WORM Tape Cartridge
   MEDIA9 = IBM Enterprise Extended Tape Cartridge
   MEDIA10 = IBM Enterprise Extended WORM Tape Cartridge
   MEDIA11 = IBM Enterprise Advanced Tape Cartridge
   MEDIA12 = IBM Enterprise Advanced WORM Tape Cartridge
   MEDIA13 = IBM Enterprise Advanced Economy Tape Cartridge
2. 3590-1 represents the 3590 Model B Tape Subsystem and is a system-defined esoteric.
3. 3590-E represents the 3590 Model E Tape Subsystem and is not a system-defined esoteric. It is supported in a library as a 3590 Model E tape subsystem rather than what it is emulating.
4. 3590-H represents the 3590 Model H Tape Subsystem and is not a system-defined esoteric. It is supported in a library as a 3590 Model H tape subsystem rather than what it is emulating.
5. 3592-J represents the 3592 Model J Tape Subsystem and is not a system-defined esoteric. It is supported in a library as a 3592 Model J tape subsystem rather than what it is emulating.
6. 3592-2 represents the 3592 Model E05 Tape Subsystem and is not a system-defined esoteric. It is supported in a library as a 3592 Model E05 tape subsystem rather than what it is emulating.
7. 3592-2E represents the 3592 Model E05 Tape Subsystem with encryption capability and is not a system-defined esoteric. It is supported in a library as a 3592 Model E05 tape subsystem with encryption capability rather than what it is emulating.
8. 3592-3E represents the 3592 Model E06 Tape Subsystem with encryption capability and is not a system-defined esoteric. It is supported in a library as a 3592 Model E06 tape subsystem with encryption capability rather than what it is emulating.
9. 3592-4E represents the 3592 Model E07 Tape Subsystem with encryption capability and is not a system-defined esoteric. It is supported in a library as a 3592 Model E07 tape subsystem with encryption capability rather than what it is emulating.
10. The library models indicated can be configured with any combination of correlating tape subsystem devices. These configurations may vary in the number of drives, slots, and media type supported in the libraries.

WORM Considerations

The write-once, read-many (WORM) function of tape data storage is accomplished on the 3592 models through a combination of microcode controls in the drive and special WORM tape cartridges. The 3592 WORM media types are MEDIA6, MEDIA8, MEDIA10, and MEDIA12.

When the drive senses that a cartridge is a WORM cartridge, the microcode prohibits alteration of user data already written on the tape by means of an overwrite-protection pointer stored in the cartridge memory (CM). Statistical Analysis and Reporting System (SARS) data can be written and updated on WORM tapes because the SARS data is not in the user area of the tape. Each WORM cartridge is identified using a world-wide unique cartridge identifier (WWCID), which is permanent and locked, providing another level of security for data that must be maintained. This permanent locked information is stored in both the cartridge CM and on the tape itself, and can also be associated with the unique barcode VOLSER.

While the overwriting of data is not allowed on a WORM cartridge, appending of data is allowed under certain conditions. For example, an additional file can be appended following the last file on a tape. Records can also be appended to the last file written on the tape.

In the system-managed tape library environment (ATLDS or MTL), WORM media is not mounted by default to satisfy a scratch mount request. WORM scratch volumes must be explicitly requested through data class by the specification of MEDIA6, MEDIA8 MEDIA10, or MEDIA12. In the MTL environment, WORM scratch mounts can be managed through the tape management system pooling support instead of by data class. The DEVSUPxx PARMLIB member keyword, MTL_NO_DC_WORM_OK, allows a WORM scratch volume to be used even if it is not explicitly requested through data class.

Also see "Logical WORM Considerations" on page 26.

Manual Tape Library Hardware Considerations

Operation of this support outside of the true stand-alone environment is not intended. To determine the feasibility of this support within a non-IBM robotic tape library, contact the manufacturer of the robotic tape library. Also, if a vendor's tape device, emulating a 3490E or 3590 native device, is defined to the library, the manual tape library support will treat this device as a real 3490E or as a real 3590 Model B. When entered into the library, the media must be defined as its emulated media. It is then your installation's responsibility to manage media or device incompatibilities. This can be managed by keeping incompatible devices with the same emulated or real device type in separate libraries.

In addition, the manual tape library support can also be used to help manage the IBM System Storage TS3400 Tape Library (3577 Model L5U). Even though the 3592 Model E05 and E06 drives in the TS3400 tape library are in an automated tape library, unlike the 3494 or 3584 tape libraries, the drives in the TS3400 report to the host as if they were stand-alone drives with cartridge loaders. As such, the normal system-managed tape library support that is available with the 3494 or 3584 tape libraries is not applicable to the TS3400. Instead, the drives in the TS3400 must be defined to the host as stand-alone tape drives. For information on the TS3400, refer to *IBM System Storage TS3400 Tape Library Planning and Operator Guide* and the IBM Whitepaper: *Overview of IBM TS1120 Tape Controller Support for TS3400 Tape Library*.

Managing Multiple Media Formats

Your planning strategy must include consideration of multiple media formats and a choice of cartridge system tapes. The TCDB provides the tape device selection information (TDSI) that determines the data class attributes assigned to a volume. Depending on the IBM subsystems, available features, and interchange requirements between stand-alone and library-resident tape drives, you should include the following multimedia considerations:

1. Should data compaction be used?
2. Does the tape subsystem write in 18-track, 36-track, 128-track, 256-track, 384-track, EFMT1, EFMT2, EEFMT2, EFMT3 EEFMT3, EFMT4, or EEFMT4 format?
3. Does the tape subsystem use IBM Cartridge System Tape, IBM Enhanced Capacity Cartridge System Tape, IBM High Performance Cartridge Tape, IBM Extended High Performance Cartridge Tape, IBM Enterprise Tape Cartridge, IBM Enterprise WORM Tape Cartridge, IBM Enterprise Economy Tape Cartridge, IBM Enterprise Economy WORM Tape Cartridge, IBM Enterprise

Extended Tape Cartridge, IBM Enterprise Extended WORM Tape Cartridge, IBM Enterprise Advanced Tape Cartridge, IBM Enterprise Advanced WORM Tape Cartridge, or IBM Enterprise Advanced Economy Tape Cartridge?

Compaction considerations
Compacting data may increase effective storage capacity. The 3490E subsystem uses the improved data recording capability (IDRC) as the default mode. IDRC is a standard feature on the 3490 subsystems. The 3590 and 3592 subsystems use an improved compaction algorithm to increase effective cartridge data capacity.

Recording technology considerations
The 3490 subsystem writes data in the 18-track format. Data written in the 18-track format can be retrieved or read by the 3490E. All 3490E subsystems write data in the 36-track format, which doubles the storage capacity of a tape cartridge.

The 3590 Model B tape drives write data in the 128-track format, the 3590 Model E tape systems write data in the 256-track format, and the 3590 Model H tape systems write data in the 384-track format. Data that is written on a 3590 Model B tape system can also be read on 3590 Model E or Model H tape systems. Data that is written on a 3590 Model E can also be read on a 3590 Model H.

The 3592 Model J tape drives read and write only in EFMT1 format.

The 3592 Model E05 tape drives read and write in EFMT1 and EFMT2 formats.

The encryption-capable 3592 Model E05 tape drives read and write in EFMT1, EFMT2, and EEFMT2 formats.

The 3592 Model E06 tape drives read EFMT1, EFMT2, EEFMT2, EFMT3, and EEFMT3 and write EFMT2, EEFMT2, EFMT3, and EEFMT3 formats.

The 3592 Model E07 tape drives reads EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, and EEFMT4 and writes EFMT3, EEFMT3, EFMT4, and EEFMT4 formats. Read support for EFMT2 and EEFMT2 and write support for EFMT3 and EEFMT3 is provided only with MEDIA9 and MEDIA10. Support for EFMT4 and EEFMT4 is provided with MEDIA9, MEDIA10, MEDIA11, MEDIA12, and MEDIA13.

Tape capacity considerations
It is important to keep in mind the capacities of the tape cartridges you are using within the tape library to allow the most efficient use of the storage space available. Table 3 on page 46 depicts the capacity differences between the tape cartridge types.

Related reading: The management of data on tape volumes is not discussed in this manual. See:

- *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support* for information on OAM's role in the storage of objects on tape volumes.
- *z/OS DFSMSrmm Managing and Using Removable Media* for the role of DFSMSrmm in the management of data on tape volumes.

Tape Device Selection Information

The device selection attributes of a tape volume are recorded in the TDSI fields of the tape volume record. The TDSI fields are set when a tape cartridge is entered

into a library. Your installation should provide a cartridge entry installation exit to assist in the process of setting the TDSI fields. See "Cartridge Entry Installation Exit (CBRUXENT)" on page 224 for more information concerning this cartridge entry installation exit. See "TDSI Coexistence Considerations" on page 74 for more information on TDSI. The following tape device selection information is assigned to the tape volume:

- Recording technique-specified as UNKNOWN, 18TRACK, 36TRACK, 128TRACK, 256TRACK, 384TRACK, EFMT1, EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4.
- Media type-specified as UNKNOWN, MEDIA1, MEDIA2, MEDIA3, MEDIA4, MEDIA5, MEDIA6, MEDIA7, MEDIA8, MEDIA9, MEDIA10, MEDIA11, MEDIA12, or MEDIA13.
- Compaction-specified as UNKNOWN, NONE, or COMPACTED.
- Special attribute-can be set to NONE or READCOMPATIBLE.

3490 read-compatibility processing allows a MEDIA1 cartridge written on a base 3490 device using 18-track recording technique to be mounted and read on a 3490E device. Data originally written to a volume using a base 3490 can be overwritten using a 3490E device as long as the recording starts at the load point of the volume. However, using a 3490E device to write additional data starting in the middle of a volume originally written by a base 3490 is not permitted, since this intermixes the 18-track and 36-track recording techniques on the same volume.

In a nonlibrary environment, the allocation process provides two system-defined esoteric unit names—SYS3480R and SYS348XR—that allow the installation to specify that the volume is used for read-only purposes so that 3490E drives become eligible for allocation.

3590 Model E read-compatibility processing allows a MEDIA3 or MEDIA4 cartridge written on a 3590 Model B using the 128-track recording technique to be mounted and read on a 3590 Model E. Data originally written to a volume using a 3590 Model B can be overwritten using a 3590 Model E as long as the recording starts at the load point of the volume. However, using the 3590 Model E to write additional data starting in the middle of a volume originally written by a 3590 Model B is not permitted, because this intermixes the 128-track and 256-track recording techniques on the same volume.

3590 Model H read-compatibility processing allows a MEDIA3 or MEDIA4 cartridge written on a 3590 Model B tape drive using the 128-track recording technique or a cartridge written on a 3590 Model E tape drive using the 256-track recording technique to be mounted and read on a 3590 Model H tape drive. Data that was originally written to a volume using a 3590 Model B or Model E tape drive can be overwritten using a 3590 Model H tape drive as long as the recording starts at the load point of the volume. However, using the 3590 Model H tape drive to write additional data starting in the middle of a volume originally written by a 3590 Model B or Model E tape drive is not permitted, because this intermixes the recording techniques on the same volume.

3592 read-compatibility processing for the 3592 Model E05, E06, and E07. Because the 3592 Model E05 is downward read and write compatible with the EFMT1 format, explicit specification of the read-compatible special attribute indicator (TDSSPEC) or usage of the LABEL=(,,,IN) on the DD statement of JCL, is not required for an EFMT1 formatted cartridge to be read on a 3592 Model E05. However, since the 3592 Model E06 is only downward read compatible with the EFMT1 format, explicit specification of the read-compatible special attribute

indicator (TDSSPEC) or usage of the LABEL=(,,,IN) on the DD statement of JCL is required for the 3592 Model E06 to be considered eligible for an EFMT1 read request. Furthermore, since the 3592 Model E06 can read and write the EFMT2 and EEFMT2 recording formats, no read-compatible considerations are needed for the EFMT2 or EEFMT2 formats. The 3592 Model E07 is downward read compatible only with the EFMT2 and EEFMT2 formats (and only with MEDIA9 and MEDIA10). Explicit specification of the read-compatible special attribute indicator (TDSSPEC) or usage of the LABEL=(,,,IN) on the DD statement of JCL is required for the 3592 Model E07 to be considered eligible to read a MEDIA9 or MEDIA10 volume recorded in these formats.

In a nonlibrary environment, there are no equivalent 3590 system-defined esoteric unit names.

For a request for an SMS-managed volume, the JCL UNIT specification is ignored, so read-compatibility must be managed in a different manner. There is a read-compatible special attribute indicator in the TDSI that can be set for a read-only request. This enables tape drives that provide read-only support for a particular recording format to be eligible for a read-only request. Your installation is responsible to set the read-compatible special attribute in either of the following manners:

- Using the cartridge entry installation exit (CBRUXENT).
- Using the LCS external services CUA function.
- Using the access method services ALTER VOLUMEENTRY service. (For more information on access method services, see *z/OS DFSMS Access Method Services for Catalogs*.)

Once the attribute is set, it remains set until the volume is returned to scratch. To request read-compatibility for a single usage of the volume, you can specify *LABEL=(,,,IN)* on the DD statement of your JCL.

Demand Allocation with System-Managed Tape

For a system-managed tape request, by default, the JCL UNIT specification is ignored. This enables the automatic class selection (ACS) routines to steer allocation to a set of eligible libraries and devices and enables MVS allocation to randomize across the eligible devices. This is the preferred and recommended way to use the system-managed tape support. There may be times, however, when it is beneficial to direct an allocation request to a specific device or set of devices. You can specify the JCL keyword SMSHONOR on the UNIT parameter or the dynamic allocation text unit DALSMSHR. When this keyword is specified, MVS allocation will use the list of eligible devices returned by SMS and the devices specified on the UNIT parameter and will allocate using the intersection of the two lists. So, if a single device is specified, and that device is one of the eligible devices returned by SMS, MVS allocation will allocate to the device specified. And if an esoteric is specified on the UNIT parameter (one or more devices), MVS allocation will allocate from the intersection of the two lists. Devices that are not in both lists will be ignored. For more information on the SMSHONOR keyword, refer to *z/OS MVS JCL Reference* .

Load Balancing Considerations

This topic discusses load balancing considerations for scratch allocations and specific allocations.

Scratch allocations

For non-specific (scratch) allocations, by default, MVS Device Allocation will first randomize across all eligible libraries and then once a library is selected, will randomize on the eligible devices within that library. In terms of the TS7700 Virtualization Engine, "library" is in reference to a composite library since MVS allocation has no knowledge of the underlying clusters (distributed libraries). z/OS also provides an alternate selection algorithm that will instead randomize scratch allocations across all eligible devices. This alternate algorithm is available at z/OS V1R11 and above, as well as z/OS V1R8 through V1R10 with APAR OA26414 installed.

The default algorithm "EQUAL" works well if the libraries under consideration have an equal number of online devices. For example, if two libraries are eligible for a scratch allocation and each library has 128 devices, over time, each library will receive approximately half of the scratch allocations. Likewise, if one of the libraries has 128 devices and the other library has 256 devices, over time, each of the libraries will still receive approximately half of the scratch allocations regardless of the number of devices in the library.

The alternate algorithm "BYDEVICES" will instead randomize scratch allocations across all devices. For example, if two libraries are eligible for a scratch allocation and each library has 128 devices, over time, each library will receive approximately half of the scratch allocations, similar to the "EQUAL" algorithm. However, if one of the libraries has 128 devices and the other library has 256 devices, over time, the library that has 128 devices will receive approximately 1/3 of the scratch allocations and the library that has 256 devices will receive approximately 2/3 of the scratch allocations.

With the default algorithm "EQUAL", there may also be times when device randomization within the selected library (or composite library) appears unbalanced either across subsystems or across clusters in a TS7700 Virtualization Engine (multi-cluster grid configuration running in balanced mode). As the number of eligible subsystems increases, the likelihood of this imbalance occurring also increases as the number of subsystems increases. If an imbalance is seen that impairs the overall throughput rate of the library, consider enabling the "BYDEVICES" algorithm.

The alternate "BYDEVICES" algorithm can be enabled through the ALLOC*xx* PARMLIB member by using the SYSTEM TAPELIB_PREF(BYDEVICES) parameter or it can be enabled (after an IPL) through the SETALLOC operator command by issuing SETALLOC SYSTEM,TAPELIB_PREF=BYDEVICES. The alternate "BYDEVICES" algorithm can be disabled by specifying the default "EQUAL" algorithm through the SETALLOC command or the ALLOC*xx* PARMLIB member in a similar manner. Before enabling the new load balancing support, care must be taken to ensure that the desired results will be achieved. This is particularly important if the libraries are being shared across multiple systems and the systems may be at different levels of support or if manual actions had already been taken to account for the behavior of algorithms used in previous releases.

Note: The SETALLOC operator command support is available only in z/OS V1R11 or later releases. In earlier z/OS releases, "BYDEVICES" must be enabled through the ALLOC*xx* PARMLIB member.

Specific Allocations

For specific allocations (JES2-only environment), an ordered list of subsystems may be returned to MVS allocation. The environments that support an ordered list

include the 3494 tape library and the TS7700 Virtualization Engine (Release 1.5 and higher). With the TS7700 Virtualization Engine, the list of subsystems returned is in cluster preference order. When an ordered list is returned, MVS allocation attempts to allocate from the first subsystem returned in the list. If an online device is not available within that subsystem, MVS allocation moves to the next subsystem in the list and tries again until a device is chosen. The default algorithm "EQUAL", supports an ordered list for the first seven subsystems returned in the list. After that, if an eligible device is not found, all of the remaining subsystems are considered equal. The alternate algorithm "BYDEVICES" removes the ordered subsystem limitation. With the TS7700 Virtualization Engine (Release 1.5 or higher), additional APAR OA30718 should also be installed prior to enabling the new "BYDEVICES" algorithm. Without this APAR, the ordered subsystem list may not be honored properly, causing specific allocations to appear randomized.

Balanced Mode in the TS7700 Virtualization Engine

A multi-cluster grid can be run in "Preferred" or "Balanced Mode". "Preferred Mode" is where a host has virtual devices online to only *one cluster* in the grid. All allocations are then directed to the devices in that one cluster. "Balanced Mode", on the other hand, is where a host has virtual devices online to *two or more clusters* in the grid. Allocations from the host could then select virtual devices from multiple clusters.

Specific allocation assistance

With Release 1.5 of the TS7700 Virtualization Engine, during device allocation for a specific (private) mount, the host will query the TS7700 to determine which cluster is the “best” cluster to direct the allocation. (This support is also referred to as device allocation assistance (DAA) or affinity list support). With this query, the TS7700 will return an ordered list of clusters with the preferred cluster being listed first. In doing so, the TS7700 looks at whether a valid copy exists in a cluster (in cache or on back-end tape) and other factors to determine the preferred cluster order. Device allocation will then take into account this ordered list of clusters "subsystems" when allocating a device. The allocation assist "affinity" function improves performance by reducing cross cluster mounts. The allocation assist function is supported in a JES2-only environment at z/OS V1R8 and above with APAR OA24966. Refer to information APAR II14516 and “Load Balancing Considerations” on page 54 for additional considerations when running in balanced mode.

Starting with Release 1.7 of the TS7700 Virtualization Engine, this support can be disabled either by a tape hardware specialist dialing into the library or starting with Release 2.0 of the TS7700, through the MVS LIBRARY REQUEST command. Refer to “Requesting Information from the TS7700 Virtualization Engine” on page 113 for information on the LIBRARY REQUEST command. For additional information on device allocation assistance, refer to the TS7700 Information Center.

Scratch allocation assistance

With Release 2.0 of the TS7700 Virtualization Engine, additional support is provided for scratch allocations. If you have a hybrid configuration of interconnected TS7720 and TS7740 clusters, you may want to be able to direct specific workloads to the TS7720 (for fast access) and other (archive-type) workloads to the TS7740. While this can be accomplished without scratch allocation assistance (SAA) through management class (copy) policies at the library, if the allocation request goes to the other cluster, IP (versus FICON) links are used by the library to send the data between the clusters (not as efficient). With scratch allocation assistance, you can establish policies at the library through a management class option that allows you to specify the clusters to which you want

to direct the scratch allocation (candidate clusters) and only those clusters will be considered for the allocation request. If a management class is not specified through the ACS routines, “blanks” will be passed for the management class name indicating that the library’s default management class should be used. If none of the devices in the candidate clusters are currently available (perhaps they are all allocated), the existing MVS allocation options for device allocation recovery (WTOR | WAITHOLD |WAITNOH | CANCEL) are used. This support will also take other things into consideration (clusters being in service prep). If all of the candidate clusters are in service prep or there are no candidate clusters in the assigned management class, the allocation request will be honored as it is without scratch allocation assistance, with an online device being allocated from the available clusters. Copy policies can continue to be used that will direct one or more copies of the data to other clusters.

Scratch allocation assistance can be globally enabled or disabled through the LIBRARY REQUEST command (by default, this function is disabled). The DISPLAY SMS,LIBRARY command output indicates whether the composite library is enabled for scratch allocation assistance. With scratch allocation assistance enabled and requested through management class policies at the library (on an individual management class basis), the TS7700 will then surface a filtered (candidate) list of clusters to the host. Using this filtered list, MVS allocation will then randomly choose a device contained within this filtered list and/or the filtered lists of other eligible grid-configurations (composite libraries). The scratch allocation assist function is supported in a JES2-only environment at z/OS V1R10 and above with APAR OA32957. Refer to ““Requesting Information from the TS7700 Virtualization Engine” on page 113 for information on the LIBRARY REQUEST command. For additional information on scratch allocation assistance, refer to the TS7700 Information Center.

Tape Encryption Support

Data encryption is an important tool for protecting against the possible misuse of confidential information that could occur should tapes be lost or stolen. The 3592 Model E05, Model E06, and Model E07 support tape encryption with the actual encryption and decryption of the data occurring outboard in the tape drive itself. References in this document to "encryption-capable," mean that the encryption feature in the drive has been enabled and the drive is capable of encrypting. In other documents, this may be referred to as "encryption-enabled." For further discussion of encryption-enablement and any MES capabilities, refer to *IBM System Storage TS1120/TS1130 Tape Drive and Controller Introduction and Planning Guide 3592* Models J1A, E05, E06, E07, J70, C06, and C07 and *IBM System Storage TS1120/TS1130 Tape Drive and Controller Operator Guide 3592* Models J1A, E05, E06, E07, J70, C06, and C07

The DFSMS tape subsystem encryption support allows specification by data class that data is to be encrypted when stored on an encryption-capable tape drive. In addition to this, the key label-related information that is used to encrypt the data key (of a tape cartridge) can be specified through the DD statement (JCL, dynamic allocation, and TSO ALLOCATE), data class or Encryption Key Manager (EKM) defaults. When the encryption-capable tape drive needs a key to perform an encrypted write, a data key is generated by the EKM. The data key used to encrypt the data on a tape cartridge is itself encrypted (using the public key of a public/private key pair) with either one or two key encrypting keys (KEKs) stored in the key stores. The KEKs are maintained by the EKM through an existing key store and are pointed to by the appropriate KEK label, also referred to as the key label.

The communication path to the Encryption Key Manager (EKM) is across TCP/IP with the choice to go either in-band or out-of-band for the key management flow. With out-of-band key management, the communication path to the Encryption Key Manager is handled by the control unit going directly to the Encryption Key Manager. Then for in-band key management, the communication path to the Encryption Key Manager is handled across ESCON/FICON with a new IOS proxy interface in z/OS then handling the key exchange (across TCP/IP) with the Encryption Key Manager. The IOS proxy interface supports both a primary and a secondary encryption key manager.

An encryption capable 3592 Model E05 records in the non-encryption enterprise format 1 (EFMT1) and enterprise format 2 (EFMT2) recording formats, and also records in the encryption specific recording format (enterprise encrypted format 2 (EEFMT2)). The EEFMT2 recording format is supported across all of the 3592 media types (MEDIA5, MEDIA6, MEDIA7, MEDIA8, MEDIA9, and MEDIA10). Although the 3592 Model E05 can record in a lower (EFMT1) and a higher (EFMT2) recording format, an encrypted version of the lower recording format (EFMT1) is not supported. Only the higher recording format (EFMT2) is supported with an encrypted version (EEFMT2). You can also use the Performance Scaling and Performance Segmentation data class options, applicable with MEDIA5 and MEDIA9, with EEFMT2. The capacities of EMFT2 and EEFMT2 written tapes are the same.

The 3592 Model E06 records in non-encryption enterprise format 2 (EFMT2) and 3 (EFMT3), as well as encrypted enterprise format 2 (EEFMT2) and 3 (EEFMT3). The encryption formats (EEFMT2 and EEFMT3) are supported across all of the 3592 media types (MEDIA5, MEDIA6, MEDIA7, MEDIA8, MEDIA9, and MEDIA10). You can also use the Performance Scaling and Performance Segmentation data class options, applicable with MEDIA5 and MEDIA9, with EEFMT2 or EEFMT3. The capacities of EMFT3 and EEFMT3 written tapes are the same.

| The 3592 Model E07 records in non-encryption enterprise format 3 (EFMT3) and 4
| (EFMT4), as well as encrypted enterprise format 3 (EEFMT3) and 4 (EEFMT4).
| EFMT3 and EEFMT3 are supported only with media types MEDIA9 and
| MEDIA10. EFMT4 and EEFMT4 are supported with 3592 media types MEDIA9,
| MEDIA10, MEDIA11, MEDIA12, and MEDIA13. You can also use the Performance
| Scaling and Performance Segmentation data class options, applicable with MEDIA9
| and MEDIA11, with the encrypted formats (EEFMT3 or EEFMT4). The capacities of
| EMFT4 and EEFMT4 written tapes are the same.

When writing from the beginning of tape (file sequence 1, DISP=NEW), the encryption capable 3592 Model E05 drive records in the non-encryption recording format (EFMT2) by default; this default is set by z/OS OPEN processing. Lower format EFMT1 and encryption format EEFMT2 must be explicitly requested through data class. The 3592 Model E06 drives records in the non-encryption recording format (EFMT3) by default. Lower formats EFMT2 and EEFMT2, as well as the encryption format EEFMT3, must be explicitly requested through data class.
| The 3592 Model E07 drives records in the non-encryption recording format
| (EFMT4) by default. Lower formats EFMT3 and EEFMT3, as well as the encryption
| formats EEFMT4, must be explicitly requested through data class.

When writing from the beginning of the tape (file sequence 1, DISP=OLD), since this processing does not go through the data class ACS routine, OPEN processing determines if the previous usage of the tape was encrypted and if encrypted, OPEN will explicitly set the EEFMT2 format (3592 Model E05), the EEFMT3 format

(3592 Model E06), or the EEFMT4 format (3592 Model E07) with the volume's existing key management-related information being used by the drive to encrypt the data.

For an encrypted tape cartridge, the cartridge stores not only the encrypted user data but also critical key management-related information which is needed to interact with the key manager when decrypting data on the cartridge. A mix of data written in encrypted and non-encrypted formats is not supported on the same tape cartridge; whether the data on a cartridge is written in encrypted format is determined during OPEN processing, when the first file sequence on the tape is written. If the first file written to a tape is in the encrypted format; all subsequent files written to that tape cartridge are written in the encrypted format. All files written to a cartridge in the encrypted format are encrypted using the same data key. The exception to this is the volume label structure for the first file sequence, which is encrypted using a key known to all encryption capable 3592 drives.

In the 3592 Model E05, Model E06, and Model E07 environment (system-managed or stand-alone), when writing from the beginning of tape (file sequence 1, DISP=NEW), to request the encryption format, EEFMT2 or EEFMT3 or EEFMT4 is specified in data class. OPEN processing passes key management-related information (such as the key labels) to the drive for subsequent communication with the key manager.

For more information regarding the DFSMS encryption support, the encryption key manager (EKM), and the IOS proxy interface to the encryption key manager, refer to *z/OS DFSMS Software Support for IBM System Storage TS1140, TS1130, and TS1120 Tape Drives (3592)*.

Performance Scaling Considerations

Performance scaling, also known as capacity scaling, is an optional data class specification that allows you to contain data in a specified fraction of the tape, yielding faster locate and read times.

The 3592 Model J tape subsystem supports the performance scaling option for the IBM Enterprise Tape Cartridge (MEDIA5). The 3592-2, 3592-2E, and 3592-3E drive models support the performance scaling option on the IBM Enterprise Tape Cartridge (MEDIA5) and on the IBM Enterprise Extended Tape Cartridge (MEDIA9). The 3592-4E drive model supports the performance scaling option on the IBM Enterprise Extended Tape Cartridge (MEDIA9) and on the IBM Enterprise Advanced Tape Cartridge (MEDIA11). Performance scaling, an optional specification, limits the data written to the first 20% of the cartridge (the optimum scaled performance capacity) improving the access time to the data. By default, the MEDIA5, MEDIA9, or MEDIA11 cartridge is used to its full capacity. When written from loadpoint, the scaled tape cartridge is reformatted to its full capacity format or to the performance scaled format, depending on the assigned data class. If performance is of a higher priority than capacity, consider using the performance scaling data class option or the economy length cartridges.

Performance Segmentation Considerations

In addition to performance scaling, performance segmentation is a function that allows you to divide the tape into longitudinal segments. Using this optional data class specification, it is possible to segment the tape into two segments: one as a fast access segment to be filled first, and the other as additional capacity to be filled after the first segment is filled.

The 3592-J model supports the performance segmentation option on the IBM Enterprise Tape Cartridge (MEDIA5). The 3592-2, 3592-2E, and 3592-3E models support the performance segmentation option on the IBM Enterprise Tape Cartridge (MEDIA5) and the IBM Enterprise Extended Tape Cartridge (MEDIA9). The 3592-4E model supports the performance segmentation option on the IBM Enterprise Extended Tape Cartridge (MEDIA9) and on the IBM Enterprise Advanced Tape Cartridge (MEDIA11). Where applicable, both the encryption and the non-encryption formats are supported. When using the performance segmentation option, the overall capacity of the cartridge is limited to 86.6% of the total capacity. The fast access segment occupies the first 20% of the cartridge, followed by the slower access segment. So, for example, using EFMT2 or EEFMT2, a MEDIA5 cartridge written on a 3592 Model E05 has a capacity of 500 GB. If the cartridge is performance segmented, the MEDIA5 cartridge is segmented into a 100 GB fast access segment and a 333 GB slower access segment (for a total capacity of 433 GB). By default, the MEDIA5, MEDIA9, or MEDIA11 cartridge is used to its full capacity. When written from loadpoint, the segmented tape cartridge is reformatted according to the assigned data class.

Because a segmented cartridge only has one physical partition and one EOV indicator, data can only be written to the slower access segment after the fast access segment has been filled. If an application wants to manage what data is placed in which segment, the application needs to manually track and fill the fast access segment before it can place less frequently accessed data in the slower access segment.

Note: A cartridge can be defined for performance scaling or performance segmentation, but not both.

Using the Tape Configuration Database to Manage Tape Volumes

The tape configuration database (TCDB) is an Integrated Catalog Facility user catalog that contains tape volume and tape library records. You can use the TCDB to maintain information about an IBM tape library and the volumes that reside there.

Software Volume Categories

Table 4 identifies the software categories used in support of the ATL. see “TCDB Volume Error Status Field and Software Error Category in an Automated Tape Library” on page 63 for a discussion of the software error category.

Table 4. Software Volume Categories

CATEGORY (in HEX)	NAME	DEFINITION
0001	MEDIA1	Cartridge system tape common scratch pool
0002	MEDIA2	Enhanced capacity cartridge system tape common scratch pool
0003	MEDIA3	High performance cartridge tape common scratch pool
0004	MEDIA4	Extended high performance cartridge tape common scratch pool
0005	MEDIA5	Enterprise Tape Cartridge common scratch pool
0006	MEDIA6	Enterprise WORM Tape Cartridge common scratch pool

Table 4. Software Volume Categories (continued)

CATEGORY (in HEX)	NAME	DEFINITION
0007	MEDIA7	Enterprise Economy Tape Cartridge common scratch pool
0008	MEDIA8	Enterprise Economy WORM Tape Cartridge common scratch pool
0009	MEDIA9	Enterprise Extended Tape Cartridge common scratch pool
000A	MEDIA10	Enterprise Extended WORM Tape Cartridge common scratch pool
000B	MEDIA11	Enterprise Advanced Tape Cartridge common scratch pool
000C	MEDIA12	Enterprise Advanced WORM Tape Cartridge common scratch pool
000D	MEDIA13	Enterprise Advanced Economy Tape Cartridge common scratch pool
000E	ERROR CATEGORY	Scratch volumes for which the software detected an error during processing
000F	PRIVATE CATEGORY	Specific volume category
Note: If the tape library is partitioned, the categories used are derived from the base software categories. See "Partitioning Tape Libraries among Multiple Sysplexes" on page 67 for more information concerning partitioning support.		

Scratch Threshold Setting and Scratch Allocation Implications

If a particular media type is being used in a tape library, IBM suggests setting a scratch threshold value that is greater than zero. This value indicates that the media type is being used in the library. This value also is used for scratch threshold processing, allowing the CBR3660A message to be issued when the number of scratch volumes falls below the scratch threshold setting.

You need to determine whether a library has scratch volumes for the media types requested. A preferred library is one in which each media type requested (or rewritable media inferred from a recording technology specification) for the allocation request has a scratch volume count that is at or above the scratch threshold value. In an ATL, the scratch count is derived from the hardware, so scratch volumes that have been placed in the software error category are not considered usable scratch volumes and are not included in the scratch count. Unless the physical WORM media type is explicitly requested by data class (MEDIA6, MEDIA8, MEDIA10, and MEDIA12), it is excluded from the criteria when determining whether a library is preferred.

The search for a prospective library uses the applicable media type. The applicable media type is based either on the explicit type requested or based on the applicable rewritable media type for the recording technology requested through data class. If the library scratch threshold for the requested (or applicable) media type is zero, the system assumes that the media type is not being used in the library. This library is not considered to be a preferred library. A library with a scratch threshold setting above zero and with the number of scratch volumes at or greater than the threshold value becomes a candidate for the request and is a

preferred library. However, a library with a scratch threshold setting above zero and with a scratch count below the threshold value is not considered to be a preferred library.

If you do not use data class to specify a particular media type or recording technology, all rewritable media types are applicable for the scratch request. All media types with a nonzero scratch threshold value are examined to determine if their scratch count is above or below the threshold. If any of the media types in the library are below the threshold, the library is not preferred. If all the media types with a nonzero scratch threshold setting are at or above threshold, then the library is preferred. If the scratch threshold for all the media types are set to zero, OAM cannot determine which media types exist in the library. By default, the library is considered preferred as it is likely that there are scratch volumes for the media type. However, as the example below explains, this situation can lead to a workload imbalance among multiple libraries depending on whether data class is used for the media interchange.

Recommendation: Set a scratch threshold value for all media types that are being used in a library. In some situations, a workload imbalance could occur if some of the libraries that are eligible for the scratch request set a nonzero scratch threshold value for a particular media type and other libraries leave the scratch threshold value for that media type at zero. *If a media type is to be used in a library, you must set a nonzero scratch threshold value in each of the libraries that are eligible for the scratch allocation.*

The following is an example where the scratch threshold setting would impact workload balancing if some of the eligible libraries had specified a scratch threshold value and other libraries had not. This scenario uses data class to explicitly request MEDIA2. The following three libraries are eligible for the request.

Example:

- Two VTS libraries (ATLVTS1 and ATLVTS2) have zero MEDIA2 threshold settings but have 2000 MEDIA scratch volumes in each library.
- One VTS library (ATLVTS3) has 1000 set for the MEDIA2 scratch threshold and has 2000 MEDIA2 scratch volumes.

When applying scratch threshold factors for the MEDIA2 request, the first two libraries (ATLVTS1 and ATLVTS2) are marked below threshold as OAM assumes that MEDIA2 is not being used in the library because the scratch threshold values are set to zero. The third library (ATLVTS3) is a preferred library because the number of scratch volumes is greater than the scratch threshold setting. Until the third library (ATLVTS3) falls below its scratch threshold for MEDIA2, ATLVTS3 with the specified scratch threshold of 1000 will be preferred and scratch requests probably will be allocated to drives in this library, causing a scratch threshold workload imbalance along the three libraries. In this scenario, providing a reasonable or equivalent scratch threshold setting for the first two VTS libraries creates a better balance for MEDIA2 scratch requests.

However, in the above example, if data class is not being used to request a particular media type, each of the three libraries are considered to be above threshold and are preferred, resulting in a better workload balance across the three

libraries. With the two VTS libraries (ATLVTS1 and ATLVTS2) not having any scratch threshold values set, by default, these libraries would be considered above threshold.

Recommendation: Always set a scratch threshold value that is greater than zero if a particular media type is to be used in a library.

TCDB Volume Error Status Field and Software Error Category in an Automated Tape Library

When a hardware or software error is detected, the volume error status field in the tape configuration database (TCDB) is updated to reflect the error, and the volume may also be placed in the software error category in the library manager database. For a list of the possible error conditions, refer to the description of the *errstat* field in "Displaying Tape Volume Status" on page 138.

More specifically, when a software error is detected for a scratch volume, this results in the volume being placed in the software error category in the library manager database. The setting of an error category prevents the volume from being selected for future nonspecific (scratch) mount requests. In addition, the error status field in the TCDB volume record is updated to reflect the software error condition.

Detecting Software Errors for Private Volumes

A software error detected for a private volume results in an update to the volume record in the TCDB with the appropriate error status; however, since private volumes are requested by volser and not by a category value, there is no need to place private volumes in the software error category.

Detecting Hardware Errors for Volumes

When a hardware error is detected (for either scratch or private volumes), the error is tracked in the library manager database and in the TCDB. Since the library manager tracks hardware-related errors for volumes, there is no need to place the volume in the software error category.

Resetting the Volume Error Status Field

There are several ways to reset the volume error status field in the TCDB and, if applicable, move the volume out of the software error category:

- General use programming interface CBRXLCS FUNC(CUA) can be used to change the volume's use attribute from SCRATCH to PRIVATE, PRIVATE to SCRATCH, PRIVATE to PRIVATE, or SCRATCH to SCRATCH. See "Change Use Attribute (CUA)" on page 151 for more information on how use this interface. If the only purpose of the CBRXLCS invocation is to reset the volume error status field, CBRXLCS FUNC(CUA) from SCRATCH to SCRATCH or PRIVATE to PRIVATE accomplishes this (it is not necessary to actually change the volume's use attribute). Invoking CBRXLCS FUNC(CUA) will also move a volume out of the software error category.
- The ISMF volume ALTER command or line operator can be used to update specific fields in the TCDB volume record, including the volume error status field. If no other changes to the volume are required, invoke ISMF ALTER to change the volume's use attribute from PRIVATE to PRIVATE or SCRATCH to SCRATCH. Changing the volume's use attribute from SCRATCH to PRIVATE or from PRIVATE to SCRATCH using ISMF ALTER also resets the volume's error status field. Invoking ISMF ALTER against a volume record also moves a volume out of the software error category.

- If a volume is ejected from the library where it resides and is reentered into the same library, or a different library, the volume error status field and software error category resets upon entry.
- A successful audit of a volume resets a hardware error in the TCDB (such as misplaced volumes), but it does not clear a software error in the TCDB. Since hardware errors do not result in the volume's category being changed, audit never alters the setting of a volume in the error category. If a scratch volume has a software error associated with it, a successful audit of the volume leaves the volume error condition set in the TCDB and leaves the volume in the error category.

  Note: Also keep in mind that resetting a hardware error condition in the volume's TCDB volume record does not clear the condition in the library manager database.
- When DFSMSrmm is used, EDGUTIL with PARM='MEND(SMSTAPE)' can reset some error status values.

Displaying Scratch Volume Counts

Whenever you use the DISPLAY SMS,LIBRARY command, the scratch volume counts that are displayed reflect the number of scratch volumes in the scratch media categories. If a scratch volume is in the software error category, it is not included in this count because it is not considered a usable scratch cartridge.

Displaying Software Error Category Count

Use the DISPLAY SMS,LIBRARY to display the number of scratch volumes currently in the software error category associated with a particular library. See "Displaying Library Detail Status" on page 126 for more information on this command.

TCDB Volume Error Status Field and the MTL

When a software error is detected, the volume error status field in the tape configuration database (TCDB) is updated to reflect the error, however there is no equivalent software error category. In a manual tape library environment, the setting of this field is for informational use only. An operator can attempt to mount a cartridge with an error condition and if the error condition no longer exists, it will be cleared. Additionally, see"Resetting the Volume Error Status Field" on page 63 for more information.

TCDB Volume Expiration Date

When an expiration date is specified when writing a data set, the volume's expiration date is recorded in the TCDB Volume Expiration Date field. If an expiration date pre-exists for the volume, the later date becomes the new expiration date. If the pre-existing date is later than the new date, the pre-existing date is retained. However, if special "never expire" dates 99365 or 99366 are involved, these special dates take precedence. Special "never expire" dates appear in ISO format as 1999/12/31 for 99365, and 1999/12/32 or 1999/13/01 for 99366.

Console Name Message Routing

Through console name message routing support, an MVS console can be associated with each tape library. Instead of routing library specific messages to all consoles associated with the messages' routing codes, they are routed to a specific library console.

For critical messages that need to be broadcast to a wider audience, the messages will be issued to the library console and to the MVS consoles associated with the routing codes. For example:

```
CBR3758E  Library library-name operation degraded.
```

Associating Console Names with Tape Libraries

When the storage administrator defines a tape library using the ISMF Tape Library Define panel, an MVS console name can be associated with the tape library. The console name is stored in the library record in the TCDB. The console name is also passed to the following installation exits:

- Cartridge Entry Installation Exit (CBRUXENT)
- Cartridge Eject Installation Exit (CBRUXEJC)
- Change Use Attribute Installation Exit (CBRUXCUA)
- Volume Not in Library Installation Exit (CBRUXVNL)

The console name specified on the ISMF Tape Library Define panel must also be defined in the CONSOL*xx* member of PARMLIB for each system connected to the library.

Defining an Alternate z/OS MCS Console

You can define an alternate z/OS MCS console using an active 3270 session on the library manager machine console. You may want to have an active z/OS MCS console on the same machine running the library manager; this allows the person managing the library manager console to perform the following tasks:

- Display and change the status of the tape library and its associated tape drives
- Display the host status of a tape volume within the tape library
- Display or change the status of an SMS TAPE storage group
- Receive library specific MVS messages

Taking Advantage of Console Name Message Routing

To take advantage of console name message routing, the installation must configure each sysplex sharing the library in one of the following ways:

- In a JES3 environment, the console name associated with the library must be attached to the current JES3 global processor, and must be switchable to any local processor capable of becoming the global. The console should be defined in the JES3 initialization deck as an MCS console by specifying TYPE=MCS and using the UNIT keyword on the CONSOLE statement (not the DEVICE statement) to establish the logical association to the actual device number on the individual processors.
- In a cross system communication facility (XCF), define a physical console to receive tape library-specific messages. Make sure each system in the sysplex has that console defined with the same name. A separate console can be used per library.
- In a JES2 environment without XCF, each system must have a separate physical console, and all consoles must have the same name.

If more than one sysplex shares the library, each sysplex must have a separate physical console. If there is a single TCDB, then all consoles must have the same name. If there is a separate TCDB for each sysplex, then each sysplex may have a unique console name.

Sharing a Tape Library Among Multiple Systems

The ATLDS and the MTL may be shared among multiple systems and, in some cases, among multiple SMS complexes. In all cases, it is the responsibility of the installation to ensure that an individual library-resident tape drive not be allocated

by two systems concurrently. This means that the tape drive can be online to only one SMS complex. In addition, if the SMS complex where the tape drive is online does not have JES3 or equivalent support for the sharing of tape drives, the tape drive can be online to only one system. To ensure that volumes intended for VM use are not made available to SMS, the installation should assign a recognizable volume serial number range to VM and a different range to SMS. The cartridge entry installation exit, through use of the *ignore* return code, prevents SMS from using the wrong set of volumes. See Figure 3 for an example of sharing a tape library among systems.

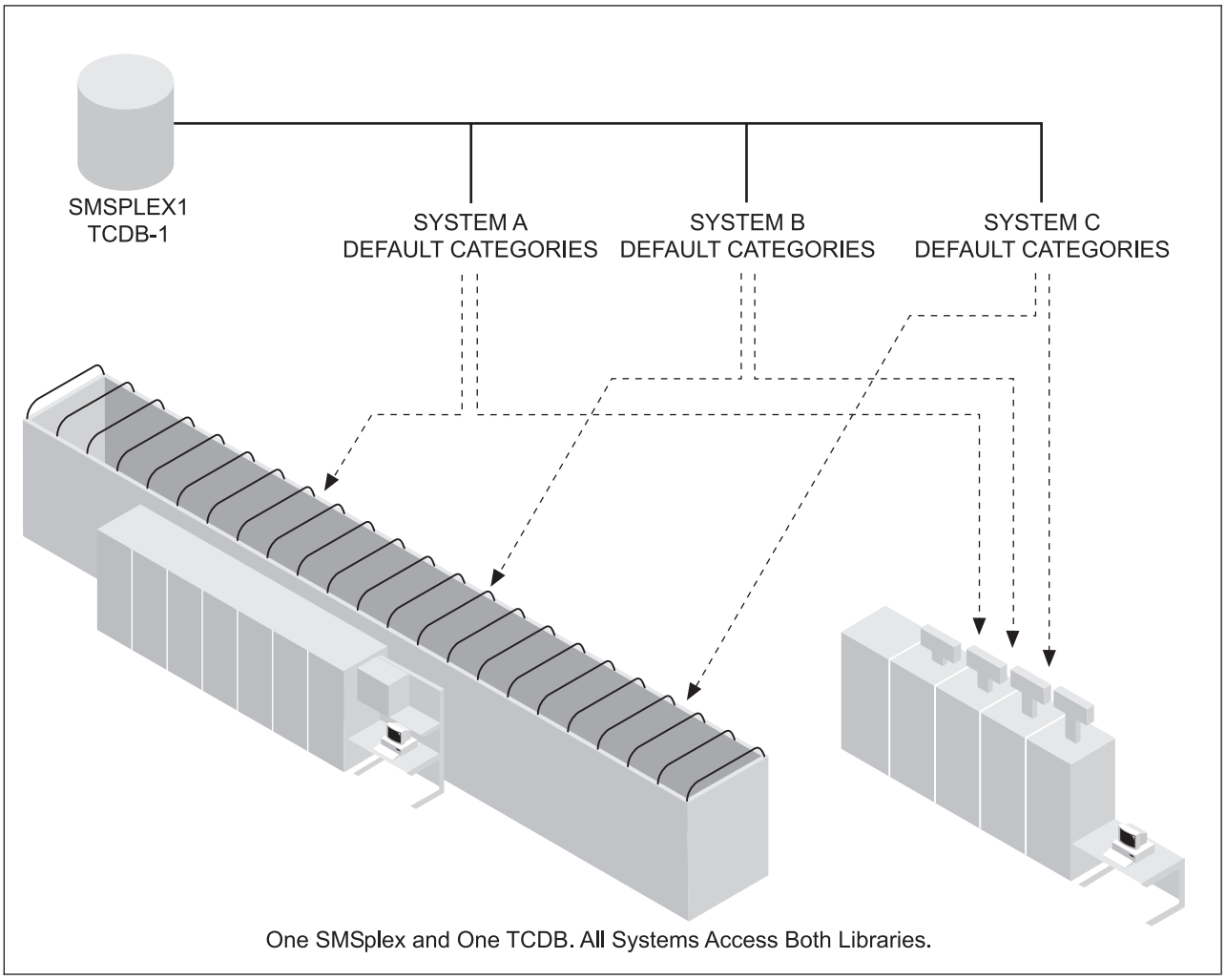

Figure 3. Sharing a Tape Library among Multiple Systems

The ATLDS and the MTL can also be shared among multiple SMS complexes, provided the following restrictions are observed:

- There must be a single shared tape configuration database among all systems in all SMS complexes. This means there is one general volume catalog, and at the most one specific volume catalog for each valid initial volser character.
- The library name associated with the hardware library ID must be the same in each SCDS. The library console name and the scratch volume message thresholds must also be the same. The entry default data class, entry default use attribute, eject default, and system connectivity status can be different in each SCDS.

- There is a single pool of scratch volumes to be shared among all the SMS complexes. This pool consists of separate library manager categories for each of the supported media types.

Managing Private Volumes in a Library Sharing Environment

There are two options for the management of private volumes:

1. The simpler option allows sharing of private volumes among all systems in all SMS complexes. This requires that each SCDS have the same set of tape storage group definitions. All storage groups with the same name must reside in the same set of libraries, though the storage group state on each system in the SMS complex can vary. The cartridge entry installation exit must also be the same on all systems.
2. The other option, which proves more difficult, is to restrict access to private volumes to a single SMS complex. Each SCDS can have its own set of tape storage groups; an attempt to use a private volume in a SMS complex where its assigned storage group does not exist causes the job to fail. When existing private volumes are entered into the library, the cartridge entry installation exit must recognize the volumes which belong to its particular SMS complex. If this is not possible, the volumes may be assigned to the blank storage group at cartridge entry time, then selectively assigned to the proper storage group by the storage administrator at some later time.

No matter which private volume management mechanism is selected, it should be noted that a permanent association between the volume and a particular SMS complex is not possible. When the volume use attribute is changed from private to scratch, the volume becomes eligible for use on any system sharing the ATLDS, or the MTL.

Partitioning Tape Libraries among Multiple Sysplexes

Partitioning a tape library is dividing the resources in the library—tape drives and tape volumes—among multiple systems or sysplexes, or both, for their exclusive use. The set of tape drives and tape volumes which belong to one or more systems or sysplexes, or both may not be used by a nonsharing system or sysplex without manual intervention. Each sharing partition may be either an MVS platform or a non-MVS platform. A single MVS platform may consist of one or more systems or sysplexes, or both, connected to a shared tape configuration database (TCDB); this group of sharing systems or sysplexes, or both, is referred to as a TCDBplex. Multiple TCDBs may each contain configuration information about the library and some subset of the volumes in the library. Partitioning may thus be viewed as dividing a physical library into multiple logical libraries, with each logical library (TCDBplex) represented by one TCDB. Figure 4 on page 68 provides a pictorial description of library partitioning.

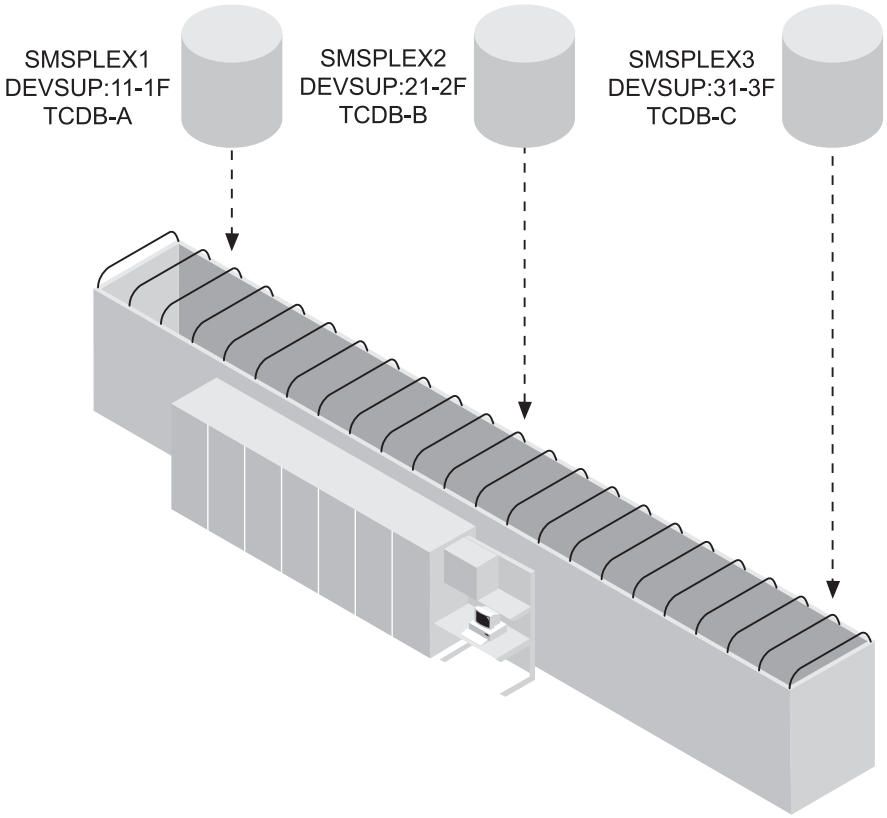

Figure 4. Partitioning a Tape Library

Changing the Library Manager Category Assignments in an ATLDS

To partition a library among multiple TCDBplexes requires separation of the scratch pools; that is, each TCDBplex must have a separate library manager category for each scratch media type. For logical completeness, the error and private volume categories should also be unique to each TCDBplex. The default category assignments are described in Table 4 on page 60.

To change the default category assignments, specify the categories in PARMLIB member DEVSUPxx. The category specification parameters enable the installation to change the default category assignments associated with a system or sysplex, or both. It is the responsibility of the installation to ensure that all systems or sysplexes, or both, associated with the same TCDB (TCDBplex) use the same category assignments. For a discussion of the partitioning-related DEVSUP*xx* parameters, see *z/OS MVS Initialization and Tuning Reference*.

In a partitioned library, it is recommended that the installation use DEVSUP*xx* to change the default categories associated with each TCDBplex. This means that no TCDBplex uses the default categories, so there are no volumes in those categories. If the DEVSUP*xx* parameters are inadvertently removed from one system, scratch mount requests are directed to the empty default categories and the mount requests fail. If there is a TCDBplex that is using the default categories, volumes may be mounted by the system where the DEVSUP*xx* parameters were removed. If

a scratch volume from a default category is mounted on the system where the parameters were removed, it is not used since there is no tape volume record in the TCDB. The volume is assigned to the error category with resultant disruption in library operations in the TCDBplex that owns the default categories.

Processing Default Categories When Using DEVSUP*xx* in an ATLDS

If an installation has been running with its tape libraries in unpartitioned mode for some period of time, the tape volumes will already be assigned to default categories. When the partitioning related DEVSUP*xx* parameters are used, special processing is necessary to move volumes to the new categories established through DEVSUP*xx*:

- Modify the DEVSUP*xx* PARMLIB member associated with each system or sysplex, or both, in each TCDBplex.
- If the library is a Virtual Tape Server (VTS) or a Peer-to-Peer VTS and you wish to take advantage of the library's nonspecific (scratch) mount performance, define the Fast Ready attribute at the library manager for the DEVSUP*xx* scratch categories to be used at the library.
- IPL all systems in the TCDBplex to activate the DEVSUP*xx* changes.
- Ensure that no jobs which require scratch mounts in a library are run. This may be done by varying all library-resident tape drives offline to all systems.
- Start the OAM address space and make sure that all tape libraries are online. The tape drives must remain offline.
- Obtain a list of volumes whose storage group name is '*SCRTCH*' using the ISMF Mountable Tape Volume Application. It is a good idea to do this one library at a time by also specifying the library name.
- Use the ISMF ALTER command (not the line operator) to change the volume use attribute for all volumes in the list from scratch to scratch. This causes the library manager category for each volume to be changed from the default value to the new value established through DEVSUP*xx*. All volumes in the default scratch categories and in the error category are changed to the new DEVSUP*xx* scratch categories.
- It is not necessary to change the category of private volumes. When a private volume is returned to scratch, its category will be changed to one of the new scratch categories.
- Vary the tape drives online as appropriate, and start to run normal tape job streams.

Separating the Volumes for Use in Different TCDBplexes

To ensure that only one TCDBplex has access to any single tape volume, assign a separate range of volume serial numbers to each TCDBplex. Cartridge Entry Installation Exit (CBRUXENT) may be used to accept volume serial numbers in the range assigned to the TCDBplex when they are entered, but to ignore volume serial numbers that are outside the range. Each system in the TCDBplex must have the same installation exit. Each different TCDBplex must have installation exit logic that accepts a different range of volume serial numbers.

DFSMSrmm offers facilities (the PRTITION or the REJECT ANYUSE commands in PARMLIB member EDGRMMxx) that allows an installation to specify partitioning information for this TCDBplex. See "DFSMSrmm Support for Sharing a Tape Library Dataserver" on page 71.

Handling Tape Drives in a Partitioned ATLDS

When a tape library is partitioned, each tape drive may be online in only one sysplex. If the sysplex does not have JES3 or equivalent support for the sharing of tape drives, the tape drive may be online to only one system within the sysplex. A tape drive may be switched from one sysplex to another by varying the drive offline in the old sysplex and then varying it online in the new sysplex.

To provide optimum tape library performance, assign one of the scratch media types to be preloaded into the integrated cartridge loader (ICL) on each 3495 library-resident tape drive. Varying the drive offline in one place and then online in another place does not change which media type has been assigned to the ICL. If the drive is now online in a different sysplex, the category for the preloaded scratch media type is not one that is defined in the new sysplex. A LIBRARY DISPCL or DISPDRV command displays the category as currently assigned. As part of switching the device to the new sysplex, the operator should use LIBRARY SETCL to assign the scratch media type; this causes the assignment of a category that is defined in the new sysplex. In response to the command, the Library Manager unloads the cartridges that are currently in the ICL and replaces them with cartridges from the scratch category in the new sysplex. See “Displaying the Cartridge Loader Scratch Media Type” on page 117, and “Setting the Cartridge Loader Scratch Media Type” on page 117 for more information.

Handling Tape Drives in a Partitioned MTL

When a tape library is partitioned, each tape drive may be online in only one sysplex. If the sysplex does not have JES3 or equivalent support for the sharing of tape drives, the tape drive may be online to only one system within the sysplex. A tape drive may be switched from one sysplex to another by varying the drive offline in the old sysplex and then varying it online in the new sysplex.

To provide optimum tape library performance, first determine which TCDBplex is to own the cartridges in the cartridge loader. For the systems associated with that TCDBplex, use the LIBRARY SETCL command to associate the cartridge loader with a particular media type or ANY (this must be done on each system). To ensure that the other non-owning TCDBplex systems don't attempt to index another system's cartridges, use the LIBRARY SETCL command on those systems to set the cartridge loader to NONE. Also by default, after an IPL the cartridge loader will be set to NONE. See “Displaying the Cartridge Loader Scratch Media Type” on page 117, and “Setting the Cartridge Loader Scratch Media Type” on page 117 for more information.

Ability to use MTL Drives as Stand-Alone

Through use of the MTLSHARE keyword, a manual tape library device on one system can be used on another system as a non-library (stand-alone) device. Specification of the MTLSHARE keyword on the non-MTL (stand-alone) systems also ensures that the cartridge loader can only be indexed on the systems using the device as a manual tape library device. This prevents the stand-alone environment from using scratch cartridges assigned to the manual tape library. For additional information see “Manual Tape Library Considerations” on page 74.

Sharing Tape Volumes between an SMSplex and a Non-MVS Platform

All library-resident tape volumes used by an SMSplex must be defined in the tape configuration database. This means that cartridge entry must occur on an SMS system. Therefore, all volumes to be used exclusively by SMS, and all volumes to be shared by SMS and a non-MVS platform must be entered on an SMS system.

Either the Cartridge Entry Installation Exit or DFSMSrmm may be used to control which cartridges are accepted. Other considerations include:

- If the volumes already contain useful data, they should be assigned the private volume use attribute.
- If the volumes do not contain useful data and they are to be written on the non-MVS platform, they should be assigned the private volume use attribute to prevent their use as scratch volumes by SMS.
- If the volumes do not contain useful data and they are to be written on the SMS system, they may be assigned the scratch volume use attribute.
- All references to the volumes from a non-MVS platform should be specific volume serial number references.
- Private volumes should be returned to scratch only on an SMS system.
- An attempt to mount a volume on one platform will fail if the volume is already in use on another platform.
- Cartridges should be ejected only from an SMS system.

DFSMSrmm Support for Sharing a Tape Library Dataserver

DFSMSrmm provides support for easier installation control over sharing a tape library dataserver. DFSMSrmm provides a cartridge entry installation exit that can be used to help partition volumes in a tape library dataserver across multiple sysplexes. This can include both VM and MVS platforms, as well as multiple SMSplexes. Support for partitioning with VM is provided based on volume naming convention, and at the individual volume level for volumes defined to DFSMSrmm on MVS. With a single tape configuration database (TCDB) across multiple MVS systems and complexes, a single DFSMSrmm control data set is typically used. With a single DFSMSrmm control data set, all volumes can be used on any or all systems with no partitioning possible. Then with carefully selected PRTITION and OPENRULE parameters for DFSMSrmm, you can also partition the tape library dataserver across multiple MVS systems. In doing so, there is typically one-to-one correspondence of tape configuration database TCDB to DFSMSrmm control data sets. You must use the DFSMSrmm facilities to ensure that a single volume is defined in only a single tape configuration database and a single DFSMSrmm control data set. See *z/OS DFSMSrmm Implementation and Customization Guide* for implementation details for these and any additional scenarios. Also refer to the IBM Redbook *Guide to Sharing and Partitioning IBM Tape Library Dataservers*.

Chapter 3. Installing Your Tape Library Support

This chapter explains how to install and customize your tape library environment.

To simplify the installation process, a library of sample jobs and other useful data sets (SAMPLIB) is shipped with the product. This chapter includes instructions for using SAMPLIB (Appendix A, "SAMPLIB Members," on page 259 contains listings of the SAMPLIB members), and an installation checklist to assist you with the software installation of your tape library. Before running any SAMPLIB member, remember to change the JCL to reflect your installation's requirements (for example, accounting information and data set names).

Verifying Prerequisites

Before proceeding with the installation checklist, verify that the hardware and media requirements "Analyzing Your Hardware Environment" on page 45 have been met. Ensure that all the prerequisites have been installed and thoroughly tested to verify that they operate correctly in your processing environment before proceeding with any other installation steps. For more information on prerequisites for DFSMS and z/OS, see *z/OS Migration*.

Outboard Policy Management Coexistence Considerations

Outboard policy management is supported at OS/390® V2R10 and above. There is no separate coexistence support at the full-support release level. Once the full-support PTFs have been installed, for a library with outboard policy management support enabled, the ACS-routine-assigned Storage Management Subsystem (SMS) constructs are passed to the library during mount processing for file sequence 1 (DISP=NEW). However, for specific policy actions to be taken at the library, policies must have been established at the library with defined actions for these SMS construct names. Otherwise, the policies are created by the library by using default actions.

The following results occur when the coexistence support is installed on systems that share an outboard policy management-enabled library:

- Volumes that are returned to scratch from the coexistence and full-support level systems are assigned default policy names of "blanks" at the library.
- A volume's existing policies and actions remain in effect for mount requests on the systems that have the coexistence support installed. This includes a private volume that is mounted and rewritten from the load point.

  Likewise, when a scratch volume is mounted on a system that has the coexistence support installed, the volume when it is returned to scratch has default policy names of "blanks" and actions that are assigned at the library. These default policy names and actions remain set for the volume.
- Also at the coexistence level, multivolume data sets that are extended to another volume are processed the same way as at the full-support level. The policies that are assigned to the previous volser are assigned to the subsequent volume so that the volumes that are associated with the multivolume data set have the same policies in effect.
- To prevent volumes with policy names from being left in the insert category, cartridge entry processing at the coexistence and full-support level are the same.

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Any existing policy names for the volume at the time of entry or import are passed to the cartridge entry installation exit.

Recommendation: Install the appropriate coexistence or full-function outboard policy management support on all systems that share an outboard policy management-enabled library to reduce confusion and maintain policy consistency.

Import/Export Considerations for the 3494 VTS

Logical volumes exported from a 3494 VTS library with no outboard policy management support do not have policy construct data included on the export stacked volume. When these volumes are imported into a library with outboard policy management support, default policy names (blanks) are assigned to the volumes unless explicitly specified through the Import List file.

Logical volumes exported from a library with outboard policy management support have policy construct data included on the export stacked volume. Libraries with no outboard policy management support are capable of importing logical volumes from a library with outboard policy management support by ignoring the policy construct data.

Import List 01 and Import List 02 are supported by libraries with outboard policy management support; however, only Import List 01 is supported by libraries with no outboard policy management support. For more information regarding Import List 02, see "SAMPLIB member CBRSPPIP" on page 317.

Manual Tape Library Considerations

The system keyword MTLSHARE enables MTL-defined devices to be treated as stand-alone devices. This keyword can be specified to either override the IODF MTL definition or without a shared IODF, to indicate that stand-alone devices are being used elsewhere as manual tape library devices. Usage of this keyword tells the system that the cartridge loaders are to be owned by the systems that recognize and treat the devices as MTL resident library devices. This prevents MTL resident scratch volumes from being indexed and incorrectly used by the stand-alone systems. The MTLSHARE keyword (if used) must be specified in the LOAD*xx* member of SYS1.IPLPARM or SYS1.PARMLIB. With a shared SCDS, the manual tape library should only be enabled on those systems that are using the devices in the context of a manual tape library.

TDSI Coexistence Considerations

Built into the base support are coexistence considerations for up-level media types and recording technologies. This support recognizes when it is dealing with up-level tape device selection information (TDSI) information and acts accordingly. For example, during cartridge entry processing, a volume whose media type and/or recording technology is not supported at this system level will be left in the insert category to be processed by a system that understands the up-level TDSI values. Also, if the TCDB is being shared across multiple system levels, volume records containing up-level TDSI information will not be displayed through ISMF. This support also prevents operator commands, job requests, and CBRXLCS requests for up-level volumes from being honored. This prevents the system from processing up-level media that it does not fully understand.

3590 Model H Coexistence Considerations

The 3590 Model H is supported in the base release at z/OS V1R5 with full support PTFs available at earlier release levels. However, device services coexistence support is needed to prevent the 3590 Model H from coming online on a system that does not have the full support installed. This coexistence support is built into their full support PTF. Without the coexistence support installed, the 3590 Model H appears to lower-level systems as a 3590 Model B, which results in an incorrect recording technology being recorded in the tape configuration database (TDSI) and in potential job failures.

Related reading:

1. For more information on existing tape library support, see "TDSI Coexistence Considerations" on page 74.
2. For additional coexistence considerations for the 3590 Model H, see *z/OS DFSMS Software Support for IBM TotalStorage Enterprise Tape System 3590 Models E1x/H1x*.

3592 Model J Coexistence Considerations

Coexistence support for the base 3592 support and MEDIA5 is provided in OS/390 V2R10 and above by installing the needed full-support PTFs without the Device Services enabling PTF. Device services coexistence support prevents the 3592 Model J devices from coming online on a system that does not have all of the full-support PTFs installed. Installation of the base support enabling PTF brings in all of the needed full-support PTFs and enables the base 3592 support on that system.

In support of the additional 3592 media types, MEDIA6, MEDIA7, and MEDIA8, coexistence support is also provided at OS/390 V2R10 and above. However, since full support for these media types is only available at z/OS V1R3 and above, coexistence support is provided at OS/390 V2R10 through the installation of separate coexistence specific PTFs. At the full support release levels, coexistence support is provided by installing the needed full-support PTFs without the Device Services enabling PTF. As with the base 3592 support, installation of this support's enabling PTF will bring in all of the needed support PTFs for MEDIA6, MEDIA7, and MEDIA8. If the system is enabled for the base 3592 support and is not enabled for the additional media support, only MEDIA5 volumes are supported on 3592 drives. Before using the additional 3592 media types, ensure that all of the support code is installed as appropriate (full or coexistence).

Before using MEDIA6, MEDIA7, or MEDIA8 in the tape library environment (ATLDS or MTL), ensure that all 3592 drives in the library are at a microcode level that supports the additional 3592 media types. Otherwise, a drive without the proper microcode support might be allocated for a mount request resulting in potential job failures.

3592 Model E05 Coexistence Considerations

Coexistence support for the 3592 Model E05 is provided at z/OS V1R4 and above by installing the needed full-support PTFs without the Device Services enabling PTF. In addition to this, existing device services support (with APAR OA02207) prevents the 3592 Model E05 devices from coming online on a system that does not have all of the full-support PTFs installed. Installation of the Devices Services enabling PTF brings in all of the needed full-support PTFs. You must install the needed coexistence support on systems that will not have all of the 3592 Model

E05 support installed. Even with full support enabled, the z/OS V1R4 system does not support the MEDIA9 and MEDIA10 media types; these two media types are supported beginning with the z/OS V1R5 release. For more information on existing tape library coexistence support, see "TDSI Coexistence Considerations" on page 74.

Encryption-Capable 3592 Model E05 Coexistence Considerations

Coexistence support for the encryption-capable 3592 Model E05 is provided at z/OS V1R4 and above by installing the needed full-support PTFs without the Device Services enabling PTF. Installation of the Devices Services enabling PTF brings in all of the needed full-support PTFs. Device Services provides coexistence support which allows the encryption-capable 3592 Model E05 devices to come online as 3592-2 drives (not encryption capable) if the system does not have all of the full-support PTFs installed. You must install the needed coexistence support on systems that do not have all of the 3592-2E encryption support installed. Even with full support enabled, the z/OS V1R4 system does not support the MEDIA9 and MEDIA10 media types; these two media types are supported beginning with the z/OS V1R5 release. For more information on existing tape library coexistence support, see "TDSI Coexistence Considerations" on page 74.

Encryption-Capable 3592 Model E06 Coexistence Considerations

Coexistence support for the 3592 Model E06 is provided at z/OS V1R7 and above by installing the needed full-support PTFs without the Device Services enabling PTF. In addition to this, existing device services support prevents the 3592 Model E06 devices from coming online on a system that does not have all of the full-support PTFs installed. Installation of the Devices Services enabling PTF brings in all of the needed full-support PTFs. You must install the needed coexistence support on systems that will not have all of the 3592 Model E06 support installed. For more information on existing tape library coexistence support, see "TDSI Coexistence Considerations" on page 74.

Encryption-Capable 3592 Model E07 Coexistence Considerations

Coexistence support for the 3592 Model E07 is provided at z/OS V1R11 and above by installing the needed full-support PTFs without the Device Services enabling PTF. In addition to this, existing device services support prevents the 3592 Model E07 devices from coming online on a system that does not have all of the full-support PTFs installed. Installation of the Devices Services enabling PTF brings in all of the needed full-support PTFs. You must install the needed coexistence support on systems that will not have all of the 3592 Model E07 support installed. For more information on existing tape library coexistence support, see "TDSI Coexistence Considerations" on page 74.

Considerations When Running z/OS as a Guest under z/VM

If z/OS is run as a guest under the z/VM operating system, STDEVOPT LIBRARY CTL must be specified in the VM directory entry for the VM user ID under which the z/OS guest operating system is IPLed. The STDEVOPT statement specifies the optional storage device management functions available to a virtual machine. The LIBRARY operand with CTL tells the control program that the virtual machine is authorized to issue tape library commands to an IBM® Automated Tape Library Dataserver. If the CTL parameter is not explicitly coded, the default of NOCTL is used. NOCTL specifies that the virtual machine is not authorized to issue commands to a tape library, and this results in an I/O error when z/OS tries to

issue a command to the library. For further information on the STDEVOPT statement, see *z/VM CP Planning and Administration* and *z/VM Running Guest Operating Systems.*

Tape Library Installation Checklist

This section provides a checklist to assist in your installation of the tape library dataserver support. See "Installation Procedures" on page 78 for more detailed information regarding each of these checklist items. Check off each item as it is completed within your installation.

__ 1.

"Building the Library Inventory" on page 78
Build the library inventory.

"Changing System Libraries" on page 79

__ 2. Update PARMLIB.
- __ a. Update IGDSMS*xx* PARMLIB member.
- __ b. Update IEFSSN*xx* PARMLIB member.
- __ c. Update CONSOL*xx* PARMLIB member.
- __ d. Update DEVSUP*xx* PARMLIB member.
- __ e. Update COMMND*xx* PARMLIB member.

__ 3. Update PROCLIB by running CBRAPROC SAMPLIB member.

"Creating the Global Resource Serialization Environment" on page 81

__ 4. Create the global resource serialization environment. (Optional, depending upon your installation.)

"Creating the Tape Configuration Database" on page 82

__ 5. Define the volume catalogs.
- __ a. Define general volume catalog.
- __ b. Define specific volume catalogs (optional, depending upon your installation).
- __ c. Connect the volume catalogs to the SMS complex.
- __ d. Define the RACF® facility class profile. RACF is a component of the Security Server for z/OS.
- __ e. Authorize the storage administrator to the RACF facility class.

"Creating the Hardware Configuration" on page 84

__ 6. Define tape drives using HCD.

"IPLing the System" on page 85

__ 7. IPL the system.

"Creating the SMS Definitions" on page 85

__ 8. Define the base SCDS.

__ 9. Define tape libraries.

__ 10. Define tape storage groups.

__ 11. Define storage classes.

__ 12. Define data classes.

__ 13. Define and test ACS routines.

"Creating the Installation Exit Routines" on page 87

__ 14. Create a cartridge entry installation exit routine (optional, depending upon your installation).

__ 15. Create a change use attribute installation exit routine (optional, depending upon your installation).

__ 16. Create a cartridge eject installation exit routine (optional, depending upon your installation).

__ 17. Create a volume not in library installation exit routine (optional, depending upon your installation).

"Validating the Configuration" on page 87

__ 18. Validate the configuration.

"Activating the SMS Configuration" on page 88

__ 19. Activate the SMS configuration.

"Starting the OAM Address Space" on page 88

__ 20. Start the OAM address space.

"Varying the Library Online" on page 88

__ 21. Vary the library online.

"Displaying and Setting the Cartridge Loader Media Type" on page 88

__ 22. Display and set the cartridge loader media type.

- __ a. Display the cartridge loader media type.
- __ b. Set the cartridge loader media type.

"Running the Job Stream" on page 89

__ 23. Run the job stream.

Installation Procedures

This section provides details to assist in the installation of tape library support in your storage environment.

Building the Library Inventory

1 ***Build the library inventory.***

To initially load the library manager inventory in an ATLDS, insert tape cartridges into the library storage slots and start the teach operation at the library manager console. In a virtual tape server (VTS) library, the logical volumes are identified at the library manager console through volume serial number ranges. All cartridges are placed in the insert category by the library manager for later cartridge entry processing by the host. It is later during OAM address space initialization and the host going through vary online processing that the cartridges in the insert category are processed and the records in the TCDB are created. As the host processes each cartridge in the insert category, the cartridge entry installation exit (CBRUXENT) is invoked to approve or deny the entry of the cartridge.

If the volumes in the library are shared between an MVS and a non-MVS platform, see “Sharing Tape Volumes between an SMSplex and a Non-MVS Platform” on page 70. If the volumes are already owned by a non-MVS platform and are no longer in the insert category, the TCDB volume records must be manually created in order for MVS to have use of the volumes. Because this bypasses the Cartridge Entry Installation Exit, the volumes may also need to be added to your tape management system.

To initially load the MTL inventory, the general use programming interface, CBRXLCS FUNC=MCE, or the LIBRARY ENTER command may be used. Also check with your tape management system to determine what support they may provide for building the MTL inventory.

Changing System Libraries

After using SMP/E to install z/OS, change the system libraries using the following procedures.

2 ***Update PARMLIB.***

2a ***Update IGDSMSxx PARMLIB member.***

Update the IGDSMS*xx* PARMLIB member to include the following OAM-related keywords:

OAMPROC(procname)
: Optional parameter that specifies the procedure name to be used to start the OAM address space. Specify this keyword to start the OAM address space automatically during IPL. The procedure name can be from 1 to 8 characters, and there is no default.

OAMTASK(taskid)
: Optional parameter that specifies the identifier to be used to start the OAM address space. If you specify this keyword without the **OAMPROC** keyword, it is ignored. This identifier can be from 1 to 8 characters, and there is no default. Code the **OAMTASK** keyword if you prefer to use an identifier other than the *procname* when starting the OAM address space. *taskid* is the identifier that is used on the START command. *taskid* corresponds to the ‘identifier’ parameter of the MVS START command documented in *z/OS MVS System Commands*.

These optional parameters are used when you want the OAM address space to start automatically as part of SMS initialization. “OAM” can be used as the procedure name, the task identifier, or both.

Note: For examples of the OAM START command and more information concerning the identifier parameter, see “Starting OAM” on page 106. For more information on the START command, see *z/OS MVS System Commands*. Also, for more details concerning these optional parameters and other keywords associated with the IGDSMS*xx* PARMLIB member, see *z/OS DFSMSdfp Storage Administration*.

2b ***Update IEFSSNxx PARMLIB member.***

Add or update the OAM1 entry in the IEFSSN*xx* PARMLIB member.

```
SUBSYS SUBNAME(OAM1) INITRTN(CBRINIT) INITPARM('[TIME=GMT][,MSG=xx]')
```

where:

TIME=GMT
: Specifies that OAM uses Greenwich Mean Time. If this option is omitted, or if any value other than GMT is specified, local time is used. For tape library volumes, this time specification affects the date set in the tape configuration data base (TCDB) volume record when a volume is entered/imported into or ejected/exported from a tape library.

MSG=*xx*
: Specifies the format of OAM message text:

- MSG=EM specifies message text is in mixed-case English.
- MSG=EU specifies message text is in uppercase English.

If the MSG parameter is omitted, the default is mixed-case English.

OAM1 is the name of the subsystem, and CBRINIT is the name of the initialization module executed at IPL time.

Rule: The SMS subsystem must be started before the OAM1 subsystem is started, therefore ensure that the SMS entry precedes the BEGINPARALLEL keyword in the IEFSSN*xx* parmlib member. The OAM1 subsystem entry in IEFSSN*xx* can then follow the BEGINPARALLEL keyword. If the BEGINPARALLEL keyword is not being used, you must still ensure that the SMS subsystem entry precedes the OAM1 subsystem entry. The OAM1 entry defines the OAM1 subsystem. To prevent a possible system abend, ensure that the subsystem name in the IEFSSN*xx* member is different from the name of the PROCLIB member used to start OAM.

Note: You can add the OAM subsystem without re-IPLing the system by using the SETSSI ADD,S=OAM1,I=CBRINIT command. After the OAM subsystem is started, OAM will ignore any further updates made by subsequent SETSSI commands. See *z/OS MVS System Commands* for information on using the SETSSI command.

2c ***Update CONSOLxx PARMLIB member.***

To define a library console to MVS that allows console name message routing, perform the following steps:

- Update PARMLIB member PARMLIB(CONSOL*xx*).
  - Add console definitions for each library in your SCDS; an example follows:

```
CONSOLE DEVNUM(device number)
        NAME(library console name)
        UNIT(terminal type)
        AUTH(SYS,IO)
        (...)
```

  - The library console name matches the console name defined in your SCDS using the ISMF library definition panel.

    The authorities (SYS and IO) are suggested in order to perform the modify commands for OAM and the VARY commands for MVS.

See *z/OS MVS System Commands* and *z/OS MVS Planning: Operations* for further information regarding multiple console support (MCS) definitions.

2d ***Update DEVSUPxx PARMLIB member.***

Normally, when a scratch volume recorded in higher-level recording format is mounted on a drive that that supports the media type but not the higher-level

recording format, the operating system rejects the mounted volume and asks for another volume to be mounted. This is because the data set labels on the volume cannot be read and validated. If you want the volume to be used, create a DEVSUP*xx* member of PARMLIB and specify VOLNSNS=YES.

If you are partitioning an ATLDS, use the DEVSUP*xx* library partitioning-related parameters to change the system default category assignments. See *z/OS MVS Initialization and Tuning Reference* for more information regarding DEVSUP*xx*.

To take advantage of nonspecific (scratch) mount performance in a Virtual Tape Server (VTS) or a Peer-to-Peer VTS, remember to set the Fast Ready attribute at the library manager for the scratch categories to be used. This includes the system default scratch categories and any user-defined scratch categories to be used for partitioning the library.

For the capability to share MTL devices as stand-alone, see "Manual Tape Library Considerations" on page 74 for potential usage of the MTLSHARE keyword.

3 ***Update PROCLIB, by running CBRAPROC SAMPLIB member.***

Sample jobs are provided in SAMPLIB to assist you in making the needed additions to PROCLIB. Before running each SAMPLIB member:
- Update the JOB statement.
- Ensure that the high-level qualifier on the `//OUT DD JCL` statement matches the naming standard at your installation.

Run SAMPLIB member CBRAPROC (see "SAMPLIB member CBRAPROC" on page 310) to create member OAM in PROCLIB. The following member is created as the default:

```
//OAM PROC OSMC=YES,MAXS=2,UNLOAD=9999,EJECT=LRW,RESTART=YES
//IEFPROC EXEC PGM=CBROAM,REGION=0M,
//  PARM=('OSMC=&OSMC,APLAN=CBROAM,MAXS=&MAXS,',
//        'UNLOAD=&UNLOAD,EJECT=&EJECT,RESTART=&RESTART')
//SYSABEND DD SYSOUT=A
```

Note: The default can be used because most of the parameters are only applicable if OAM is used to store objects. For more information concerning the RESTART parameter, see "Restarting OAM" on page 108. For information concerning the other parameters associated with this procedure statement, refer to *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support*.

Creating the Global Resource Serialization Environment

4 ***Create the global resource serialization environment.***

If you are going to share a tape library among two or more systems in an SMS complex, the global resource serialization environment may be created to include all sharing systems. This allows OAM to serialize the cartridge entry process for more efficient operation. For general information about global resource serialization, see *z/OS MVS Planning: Global Resource Serialization*.

The global resource serialization configuration is defined in member GRSCNF*xx* of PARMLIB, which is described in the *z/OS MVS Initialization and Tuning Guide*. The following resource names are obtained:

```
QNAME-SYSZCBR
RNAME-CARTRIDGE_ENTRY_libname
```

For export processing, the following resource names are used:

```
QNAME-SYSZCBR
RNAME-EXPORTED_CATEGORY_libname
```

For manual tape library processing, the following resource names are used:

```
QNAME-SYSZCBR
RNAME-MTL_VOLSER_volsername
```

For a further discussion of the resource names used by OAM during cartridge entry processing, see "Using Global Resource Serialization with Cartridge Entry Processing" on page 34. For further information regarding resource names used by OAM during VTS export processing, see "Using Global Resource Serialization with Export Processing" on page 42. For further information regarding resource names used with manual tape library processing, see "Using Global Resource Serialization in a Manual Tape Library" on page 35.

Note: OAM already performs a SYSTEMS level enqueue for global resource serialization; therefore, there is no need to include the QNAME or RNAME in the system inclusion RNL. The QNAME and RNAME are provided for documentation purposes.

Creating the Tape Configuration Database

5 ***Define the volume catalogs.***

Use the AMS DEFINE command to define the general volume catalog hlq.VOLCAT.VGENERAL. The general VOLCAT is the default volume catalog and contains all of the library records as well as any volume records that do not reside in a specific volume catalog. This volume catalog must exist before any tape library can be defined.

If a large number of tape volumes have the same first character in the volume serial number, it may be advisable to define specific volume catalogs (hlq.VOLCAT.V*x*), where *x* is the first character of the volume serial number.

Note: The letter **V** is reserved exclusively as the first character in a VOLCAT volume serial number. It readily identifies the volume serial number as belonging to a VOLCAT. To avoid confusion with the VOLCAT naming conventions, the letter **V** is restricted from being used as the first character of a tape library name. Any other character is valid.

See *z/OS DFSMS Access Method Services for Catalogs* manual for more information on the DEFINE command and the *z/OS DFSMS Managing Catalogs* for more information on estimating the size of the catalogs. Keep in mind that each virtual tape server can contain thousands of volumes.

5a ***Define general volume catalog.***

The following example shows how to define the general volume catalog, hlq.VOLCAT.VGENERAL.

```
//DEFVCAT  JOB   ...
//STEP1    EXEC  PGM=IDCAMS
//SYSPRINT DD    SYSOUT=A
//SYSIN    DD    *
     DEFINE USERCATALOG -
            (NAME(hlq.VOLCAT.VGENERAL) -
```

```
            VOLCATALOG -
            VOLUME(338001) -
            CYLINDERS(1 1))
/*
```

The catalog parameters are:

NAME	Specifies the volume catalog, hlq.VOLCAT.VGENERAL.
VOLCATALOG	Specifies that the user catalog is a volume catalog.
VOLUME	Specifies that the user catalog is to reside on volume 338001.
CYLINDERS	Specifies that one cylinder is allocated to the catalog and that when the catalog is extended, it extends in increments of one cylinder.

All other parameters are allowed to default.

Note: The system uses "SYS1" as the default high-level qualifier (*hlq*). You may choose any other high-level qualifier in its place. For more information on changing the high-level qualifiers for VOLCATs, see *z/OS DFSMS Managing Catalogs*.

5b ***Define specific volume catalogs.***

The following example shows how to define a specific volume catalog, hlq.VOLCAT.VT. The catalog contains all the volume entries for tape volumes with the first character of "T" in the volume serial number.

```
//DEFVCAT  JOB   ...
//STEP1    EXEC  PGM=IDCAMS
//SYSPRINT DD    SYSOUT=A
//SYSIN    DD    *
     DEFINE USERCATALOG -
            (NAME(hlq.VOLCAT.VT) -
            VOLCATALOG -
            VOLUME(338001) -
            CYLINDERS(1 1))
/*
```

The catalog parameters are:

NAME	Specifies the volume catalog, hlq.VOLCAT.VT.
VOLCATALOG	Specifies that the user catalog is a volume catalog.
VOLUME	Specifies that the user catalog resides on volume 338001.
CYLINDERS	Specifies that one cylinder is allocated to the catalog and that when the catalog is extended, it extends in increments of one cylinder.

All other parameters are allowed to default.

Note: The system uses "SYS1" as the default high-level qualifier (*hlq*). You may choose any other high-level qualifier in its place. For more information on changing the high-level qualifiers for VOLCATs, see *z/OS DFSMS Managing Catalogs*.

5c ***Connect the volume catalogs to the SMS complex.***

Connect the volume catalogs to all other systems in the SMS complex that use the tape library.

Use the AMS IMPORT command to connect the general volume catalog, *hlq.VOLCAT.VGENERAL* and any specific volume catalog, *hlq.VOLCAT.Vx.*

The following function must be performed on each system in the SMS complex except the one where the catalogs have been defined.

```
IMPORT CONNECT VOLCATALOG OBJECTS((hlq.VOLCAT.VGENERAL) operands)
IMPORT CONNECT VOLCATALOG OBJECTS((hlq.VOLCAT.Vx) operands)
```

5d ***Define the RACF facility class profile.***

Define the RACF facility class profile for access to the tape configuration database.

If you use RACF to protect your system resources, enter the following command from an authorized TSO session:

```
RDEFINE FACILITY STGADMIN.IGG.LIBRARY options
```

5e ***Authorize the storage administrator to the RACF facility class***

The storage administrator TSO logon ID must be authorized for READ-level access to the facility class. Enter the following command to authorize the storage administrator for READ-level access.

```
PERMIT  STGADMIN.IGG.LIBRARY CLASS(FACILITY) ACCESS(READ) ID(logonID)
```

See *z/OS Security Server RACF Command Language Reference* for more information.

Creating the Hardware Configuration

6 ***Define tape drives using HCD.***

Use the MVS hardware configuration definition (HCD) to define the tape drives that belong to the tape library. For an automated tape library device, specify the LIBRARY parameter as YES. For a manual tape library device, specify the MTL parameter as YES. The LIBRARY and MTL parameters are mutually exclusive.

Note: When defining the drives using HCD, device number 0000 is not supported in an automated (which includes virtual) or manual tape library environment.

The devices in an ATLDS are recognized as tape library devices as they are initialized during IPL and during IODF activation. The devices in an MTL are recognized as MTL devices only through the IODF definition.

When you define the tape drives in an ATLDS, you can optionally specify the LIBRARY-ID and LIBPORT-ID parameters. If a tape drive is then busy or unavailable at system IPL, the drive is configured based on the information provided in the optional parameters and a subsequent IODF activate should not be required. Without specification of the optional parameters, tape drives that are busy or unavailable at system IPL are not included in the library control blocks built by the system and are not eligible for allocation until the tape drives become available and an IODF ACTIVATE is issued. When you define the tape drives in an MTL, since the devices are not self-defining during IPL or IODF activation, the

LIBRARY-ID and LIBPORT-ID parameters must be specified. As with an ATLDS, the LIBRARY-ID specified must match the LIBRARY-ID specified on the ISMF define panel and can be any unique five-digit hexadecimal number. The LIBPORT-ID identifies all devices attached to a specified control unit and should start with subsystem "01". Also, note that in the MTL environment, the maximum number of subsystems supported is 32. For further information, see "IPLing the System." See *z/OS HCD User's Guide* for additional information about using the HCD.

Note: For a Peer-to-Peer VTS Subsystem, the LIBRARY-ID specified should be the composite library ID.

Because a library may contain emulated devices, successful communication to at least one device in a subsystem must be made to determine if the devices defined through HCD are real or emulated. If the communication cannot be made during system IPL, the devices in the subsystem will not be considered eligible for allocation until successful communication has been established with the MVS VARY, ONLINE command. This will prevent the wrong device from being considered in allocation recovery.

IPLing the System

7 ***IPL the system.***

Use the new I/O configuration definition that contains the library tape drive definitions to IPL the system. This also activates the OAM1 subsystem. The system issues the following messages and you can use them to verify a successful IPL of the system.

```
CBR8001I OAM1 subsystem initialization starting.
```

Note: If your installation is not using OAM to store objects, and is strictly using OAM for tape library management, ignore the following messages when they are displayed during IPL:

```
CBR8007I No DB2 SSID or the DB2 SSID value of "NONE" has been specified.
OTIS subsystem cannot successfully initialize.

CBR8002I OAM1 subsystem initialization completed.
```

Devices Unavailable at IPL: If message IEA438I is issued during system IPL indicating that devices were not available during the IPL process (perhaps they were in use on another system), perform the following steps:

1. Issue the MVS VARY command to vary the devices online.
2. Issue the ACTIVATE command to activate the IODF containing the devices that were unavailable.

If your installation is using OAM for object support (DASD, optical, or tape), See *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support* for more information.

Creating the SMS Definitions

Creating Definitions with ISMF: ISMF provides a series of panels through which SMS constructs can be defined. See *z/OS DFSMS Using the Interactive Storage Management Facility* for detailed information about using ISMF. Use ISMF to:

- Define the base SCDS
- Define the libraries in the tape configuration database
- Define storage groups
- Define storage classes
- Define data classes
- Write and test ACS routines
- Validate the SCDS

Before proceeding with the following topics, study the relevant information concerning creating the SMS definitions in Appendix B, "Using ISMF panels to define and monitor your configuration," on page 331, and the *z/OS DFSMSdfp Storage Administration*. This book, along with the online ISMF functional and help panels, explains the items you specify using ISMF.

8 ***Define the base SCDS.***

The procedure for defining a source control data set is provided in *z/OS DFSMSdfp Storage Administration*. It is possible to define several source control data sets describing different configurations; however, only one SCDS can be activated at any time.

9 ***Define the tape libraries.***

You need to define your tape library to add the library record to the TCDB and the library definition to the specified SCDS. Choose option 3, DEFINE, on the ISMF Tape Library Application Selection panel (Figure 37 on page 333) to display the ISMF Tape Library Define panel shown in Figure 38 on page 334 and in Figure 40 on page 337. When defining the Peer-to-Peer VTS Subsystem, remember to define not only the composite library but also the underlying distributed libraries.

10 ***Define tape storage groups.***

Use ISMF to define your tape storage groups and the library names associated with the storage groups. For more information on how to define tape storage groups, see *z/OS DFSMSdfp Storage Administration* and *z/OS DFSMS Implementing System-Managed Storage*. To direct allocation to a Peer-to-Peer VTS Subsystem, the composite library should be used and not the associated distributed libraries.

11 ***Define storage classes.***

Use ISMF to define storage classes that cause the installation storage group filter routine to select tape storage groups. The storage class determines whether or not a request is SMS-managed. If a storage class is not assigned, the request is not SMS-managed.

12 ***Define data classes.***

Define data classes to direct your nonspecific requests to a specific media type and recording technology, and to specify whether compaction is required. You may also specify performance scaling, performance segmentation and encryption key label information in your data class definitions. Choose option 4 on the ISMF Primary Option Menu panel to display the ISMF Data Class Define panel to define your data classes.

13 ***Write and test ACS routines.***

Create or modify the installation's storage class, data class, and storage group ACS routines to select tape constructs for certain types of new data requests. There can be only one set of ACS routines in an active configuration. See *z/OS DFSMSdfp Storage Administration* for information on using ISMF to define ACS routines.

Creating the Installation Exit Routines

14 ***Create a cartridge entry installation exit routine—CBRUXENT.***

If all cartridges entered into the library have the same use attribute and the same tape device selection information (TDSI), these values can be assigned using the entry default use attribute and the entry default data class on the library definition.

If cartridges are to have different use attributes, TDSI, or both, you need to write a cartridge entry installation exit routine. You may use SYS1.SAMPLIB member CBRSPUXE as a model. Otherwise, the system uses the installation exit provided with DFSMSrmm. For detailed information on the installation exit, see "Cartridge Entry Installation Exit (CBRUXENT)" on page 224.

15 ***Create a change use attribute installation exit routine—CBRUXCUA.***

If you need to influence the process of changing a volume's use attribute (for example, by preventing the return of a private volume to scratch), you need to create an installation exit routine of your own. You may use SYS1.SAMPLIB member CBRSPLCS as a model. Otherwise, the system uses the installation exit provided with DFSMSrmm. For detailed information on the installation exit, see "Change Use Attribute Installation Exit (CBRUXCUA)" on page 213.

16 ***Create a cartridge eject installation exit routine—CBRUXEJC.***

If you want to be able to prevent the ejection of a cartridge from the library or to change the tape volume record for an ejected cartridge, you need to create an installation exit of your own. You may use SYS1.SAMPLIB member CBRSPUXJ as a model. Otherwise, the system uses the installation exit provided with DFSMSrmm. For detailed information on the installation exit, see "Cartridge Eject Installation Exit (CBRUXEJC)" on page 236.

17 ***Create a volume not in library installation exit routine—CBRUXVNL.***

If you want to be able to insert a volume into a tape library during job set up, device allocation, or library mount processing to prevent job failures, you need to create an installation exit routine of your own. You may use SYS1.SAMPLIB member CBRSPUXV as a working model. Otherwise, the system uses the installation exit provided with DFSMSrmm. For detailed information on the installation exit, see "Volume not in library installation exit (CBRUXVNL)" on page 244.

Note: Customer written installation exits are optional.

Validating the Configuration

18 ***Validate the configuration.***

You cannot use tape libraries until a configuration containing all the elements described in this chapter are defined and validated. See *z/OS DFSMSdfp Storage Administration* for information about validating the configuration that you have just defined.

Activating the SMS Configuration

19 ***Activate the SMS configuration.***

Activate the SMS configuration that contains the library definitions. Only one SCDS can be activated at any time. Activating another SCDS or reactivating the current SCDS while OAM is running causes OAM to restart by default, unless RESTART=NO is specified on the OAM PROCLIB member. During this reinitialization, all libraries are set either online or offline according to the attributes defined in the activated SCDS.

Note: How soon OAM is notified of the SCDS activation depends on the time interval specified with the INTERVAL keyword in the IGDSMS*xx* PARMLIB member.

Starting the OAM Address Space

20 ***Start the OAM address space.***

Start the OAM address space using the MVS START command. See "Starting OAM" on page 106 for the syntax of the START command. Or the system programmer can update the IGDSMS*xx* member of PARMLIB to start OAM automatically during MVS IPL. "Changing System Libraries" on page 79 includes information concerning updating the IGDSMS*xx* member of PARMLIB.

Note: The OAM address space must have been started on at least one of the systems connected to each library to complete the definition of the library or libraries in the TCDB. This completed information in the TCDB is needed to properly run subsequent job streams.

Varying the Library Online

21 ***Vary the library online.***

Vary the library online using the SMS VARY command. See "Varying a Tape Library Online or Offline" on page 107 for the syntax of the VARY command.

If the library was defined as online to the system, it is brought online as part of OAM address space initialization.

Displaying and Setting the Cartridge Loader Media Type

22 ***Display and set the cartridge loader media type.***

22a ***Display the cartridge loader media type.***

Use the MVS LIBRARY DISPCL or the LIBRARY DISPDRV command to display the scratch volume media type assigned to the cartridge loader of each library-resident tape drive. See "Displaying the Cartridge Loader Scratch Media Type" on page 117 and "Displaying Tape Drive Status" on page 130 for the command syntax.

22b *Set the cartridge loader media type.*

Use the MVS LIBRARY SETCL command to set the media type of scratch volumes to be loaded into the cartridge loader of each library-resident tape drive. See "Setting the Cartridge Loader Scratch Media Type" on page 117 for the command syntax.

Running the Job Stream

23 *Run the job stream.*

You can now run a job stream that uses library-resident volumes.

Outboard Policy Management Installation Recommendations

Before installing the outboard policy management support at the library, use the following recommended steps to introduce this support. If a library with outboard policy management support is shared by multiple systems, special consideration should be taken as indicated in the steps below.

1 Define the SMS constructs to be used for outboard policy management and their associated ACS routines. Activate the SCDS that contains the appropriate changes. For example, to take advantage of physical volume pooling, you can define additional storage groups to group logical volumes with common characteristics on the same set of physical stacked volumes.

2 Install the full support PTFs (see OW54054) and coexistence support (see OW54056), as appropriate, across all systems that will be sharing an outboard policy management-enabled library.

Note: If all the systems have not installed the appropriate outboard policy management support yet share both a common TCDB and an outboard policy management-enabled library, the systems with full outboard policy management support begin assigning the construct names as policy names to the volumes in the outboard policy management-enabled libraries. This assignment of construct names is normally a result of mount processing (or another method such as entry processing or manual assignment).

However, when a system with no outboard policy management support or with coexistence support mounts the volume (perhaps to write from load point), the constructs that are assigned by the outboard policy management supported system remain in effect. Also, a system with no outboard policy management support does not clear the policy construct names when it changes the use attribute to scratch. Therefore, previously assigned policies and their associated actions are still in effect if the volume is subsequently used from that system.

The following examples illustrate the assignment of a storage group policy based on three separate scenarios:

Scenario 1: System with Full Outboard Policy Management Support

System A with full outboard policy management support assigns, through the ACS routine, storage group SGBACKUP to volume VOL123 during mount processing for file sequence 1. At the tape library, SGBACKUP is defined and associated with physical stacked volumes belonging to POOL03. Logical volumes belonging to SGBACKUP can then be segregated from logical volumes belonging to other storage groups.

If System A changes the use attribute of VOL123 to scratch, the storage group policy assignment at the library is changed to blanks, which is the default policy. The next time VOL123 is used, a new storage group might be assigned through the storage group ACS routine, and the actions that are defined to the new storage group policy are performed. Also, if System A extends the data set on VOL123 to another volume, the subsequent volume inherits the policies of VOL123.

Scenario 2: System with Coexistence Support

If System B with coexistence support uses VOL123 as a private volume to write from load point immediately after System A's use, the volume is still assigned to storage group SGBACKUP and the data is stored on physical stacked volumes that belong to POOL03. If System B changes the use attribute of VOL123 to scratch, the storage group policy assignment at the library changes to blanks, which is the default policy. Subsequent use of VOL123 by System B, assuming that there is no involvement of System A, continues to use default policy actions. No new policy assignment occurs.

Also, if System B extends the data set on VOL123 to another volume, the subsequent volume inherits the policies of VOL123.

Scenario 3: System with No Support Installed (Full or Coexistence)

If System C with no outboard policy management support uses VOL123 as a private volume to write from load point immediately after System A's use, the volume is still assigned SGBACKUP and the data is stored on physical stacked volumes belonging to POOL03. If System C changes the use attribute of VOL123 to scratch, the SGBACKUP policy attribute remains assigned to VOL123. Subsequent use of VOL123 by System C, with no System A or System B involvement, continues to use SGBACKUP storage group policy actions at the library, which is no longer appropriate for the data that is written on the volume. If System C extends the data set on VOL123 to another volume, the subsequent volume does *not* inherit the policies of VOL123, which results in policy inconsistencies at the library for the volumes of the multivolume data set.

To prevent the systems from improperly using the policies, install the software across all sharing systems before installing the outboard policy management support in the library. Coexistence support is available for DFSMS/MVS V1R5 systems.

If policy name corrections are needed due to a mix of support on the systems, you can change a volume's policy names by using the LCS External Services general programming interface FUNC=CUA or by using the LIBRARY LMPOLICY operator command. However, policy actions based on the policy name changes might not take effect until after the volume is subsequently mounted. Manually changing the policy names does not mean that the actions of the policy are acted upon immediately.

3 As appropriate for your tape management system, update the change use attribute installation exit (CBRUXCUA) and the cartridge entry installation exit (CBRUXENT) with the outboard policy management support capabilities. Link-edit the new version of these exits on the applicable outboard policy management coexistence or full support systems.

4 Install the outboard policy management microcode enhancement and then define policy actions at the library:

- Vary the VTS library offline at the host before installing the outboard policy management support. Otherwise, job processing or entry processing might start

to assign policies before implementation setup is complete. A stand-alone VTS must be varied offline to install the new level of microcode. However, a PtP VTS can remain online to the host with the microcode installed while the libraries are in service preparation mode.

- After the outboard policy management support has been installed at the library, define the SMS constructs "policy names" that will be assigned through the ACS routines and their associated actions. If a policy name is not created at the library, the policy names are automatically created, but given default actions at the library.

  Note: If outboard policy management support is installed before installing the software PTFs, define default policy actions for all new policies so that the library performs as if no outboard policy management support has been installed or continue to use the default policy names (blanks) and actions that are automatically set up by the library. Once all of the appropriate software has been installed, nondefault policy names and actions can be defined at the library.
- Vary the library online at the host.

5 Allow normal job processing to assign policies to volumes, gradually implementing the outboard policy management functions. All existing volumes are initially assigned default policy names (blanks) when the outboard policy management is first installed. Default policies have actions that are equivalent to a library without outboard policy management support. Therefore, a library with all default policies functions like a library with no outboard policy management support installed.

Outboard Policy Management Test Environments

The ideal test environment is for the outboard policy management-enabled library to be attached exclusively to the test system, which allows the test environment to use the same construct names as the production systems.

Recommendation: If the production and test systems share an outboard policy management-enabled library, each test system can have a separate TCDB and a separate SCDS with construct names different from those that are used by the production system. This setup allows the system to experiment with the outboard policy management function without effecting the production system's volumes.

Outboard Policy Management Migration and Expected Actions

When policy names and their associated actions are not predefined at the library, the first time that they are assigned to a volume, the library creates the policy name and assigns default actions.

Storage Group Policy: If the storage group construct is not predefined at the library and the policy is automatically created with default actions, the logical volume that is written is stored on a physical stacked volume from the common scratch pool. If the construct definition is altered to specify a physical pool, the data is not moved to the pool that is specified until after the volume is next mounted.

Storage Class Policy: If you are currently using the storage class Initial Access Response Time (IART) to set cache residency in the VTS, the volume's assigned

storage class construct action overrides the value set by the storage class IART. However, if the storage class construct has not been predefined to the library but was created automatically when the host sent the construct to the library, the policy's cache residency action by default allows the IART value to take precedence. You can explicitly define the storage class policy at the library to allow the host's IART specification to take precedence or to allow the outboard policy action to take precedence. If there is no IART value being passed to the library and the policy construct does not have a cache preference set, the default preference level of 1 is used.

Management Class Policy: If the management class construct is not predefined at the library and the policy is automatically created with default actions, the selective dual copy function is not performed for a volume because the default action does not create a second copy in the VTS for the volume. If the policy definition is updated to make a second copy of the volume, the second copy is not created retroactively. The action of creating the second copy occurs after the volume is subsequently mounted.

If the management class policy name is not predefined at the PtP VTS library and the policy is automatically created with default actions, the Selective PtP Copy Mode action uses the current library mode control settings as a default. If the management class policy PtP Copy Mode is updated, the management class policy copy setting overrides the current library mode control setting when the volume is next written.

In addition to the outboard policy management actions identified above, additional policy actions may be implemented at the library. For a complete discussion of the outboard policy actions see *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator's Guide*.

Tape Subsystem (Device Pool) Limitation

With the system-managed tape library support, each scratch allocation (through the ACS routines) will assign one or more tape storage groups and each tape storage group can be associated with 1-8 tape libraries. As a result of this there can be many tape subsystems (and devices) that are considered eligible for each scratch request. A limitation exists today on the number of tape subsystems (device pools) that SMS and MVS allocation can support with a scratch allocation. Today this limit is 253 tape subsystems or 4048 devices (253 x 16 devices). With APAR OA21462, SMS will detect and limit the number of eligible tape subsystems (device pools) to the first 253 subsystems and will ignore the tape subsystems beyond 253.

For example, if an installation is using the TS7700 Virtualization Engine and assigns SGTAPE and SGTAPE associated with 4 two-cluster grids, the maximum number of tape subsystems that could be returned to SMS would be 4 X (32 subsystems each) = 128 which is well within the existing 253 subsystem limit. However, if an installation, for example were using 6 three-cluster grids, and SGTAPE was associated with all 6 three-cluster grids, the maximum number of tape subsystems that could be returned to SMS would be 6 X (48 subsystems each) = 288 which would go over the existing subsystem limit of 253. If there are more than 253 tape subsystems considered eligible for the scratch request, SMS will only return the first 253 tape subsystems to MVS allocation. As you start using libraries with more and more tape subsystems (for example, the TS7700 Virtualization Engine), review your ACS routines and the number of tape libraries, and subsystems, being used for your scratch allocations.

Library Subsystem Modifications

This section discusses the steps that are necessary when tape subsystems are added, moved or deleted. A cable change within a library that switches ports so that existing subsystems are now associated with different subsystem IDs should be treated as if the subsystems had been physically moved.

For an existing library, before modifying the subsystem configuration, use the VARY SMS command to VARY the library offline to each attached host. After the necessary IODF ACTIVATEs or optional IPL, use the LIBRARY DISPDRV command to verify that the correct number of devices appear in the library configuration and that no device appears multiple times in the display for that library.

Adding Subsystems to a Library

The simplest way to add new subsystems to a new or existing library is to add previously undefined library devices to the physical end of the library. This keeps the existing subsystems associated with the same subsystem IDs and the new subsystems associated with the next sequential subsystem IDs. To add subsystems to a new or existing library, perform the following steps:

1. Use the MVS hardware configuration definition (HCD) to add the new tape devices to the existing or a new IODF.
2. Activate the IODF containing the new tape devices by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
3. Vary the devices online to MVS using the MVS VARY command.
4. Once again, activate the IODF containing the new tape devices to complete the configuration activity by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console..

   Note: Steps 1–4 can be replaced with a system IPL using the IODF that was created in step 1.

If one or more of the subsystems being added to the physical end of the library (library A) had previously existed in another library (library B), perform the following steps:

1. Use the MVS hardware configuration definition (HCD) to delete all devices from library B.
2. Activate the IODF that has the devices from library B removed by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
3. Use HCD to add all of the devices that are now in library A and in library B.
4. Activate the IODF that has all the devices defined by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
5. Vary the devices online to MVS using the MVS VARY command.
6. Once again, activate the IODF containing all of the tape devices to complete the configuration activity by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.

   Note: Steps 1–6 can be replaced with a system IPL using an IODF containing all of the moved or new devices, or both.

If the subsystems being added are not added to the physical end of the library, see "Moving Subsystems within a Library."

Moving Subsystems within a Library

If existing subsystems are physically moved within a library so that the subsystems are now associated with different subsystem numbers (for example, if the new subsystems are not added to the physical end of the library), perform the following steps to properly rebuild the new configuration:

1. Use HCD to delete all devices form the library or libraries involved (multiple libraries might be involved if the devices came from another library).
2. Activate the IODF that has all the devices from the libraries removed by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
3. Use HCD to add all of the devices that are now in each affected library.
4. Activate the IODF that has all the devices defined by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
5. Vary the devices online to MVS using the MVS VARY command.
6. Once again, activate the IODF containing all the tape devices to complete the configuration activity by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console..

   Note: Steps 1–6 can be replaced with a system IPL using the IODF containing all of the library devices.

Deleting Subsystems from a Library

If existing subsystems are physically removed from a library, then perform the following steps to accurately reflect the new configuration:

1. Use HCD to delete all devices from the library.
2. Activate the IODF that has the devices from the library removed by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
3. Use HCD to add all of the devices that are now in the library.
4. Activate the IODF that has all the devices defined by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.
5. Vary the devices online to MVS using the MVS VARY command.
6. Once again, activate the IODF containing all of the tape devices to complete the configuration activity by activating from the ISPF HCD panels, or by entering the MVS ACTIVATE command on the z/OS console.

   Note: Steps 1–6 can be replaced with a system IPL using an IODF that has the deleted devices removed.

   If the deleted subsystems are then added to another library, follow the steps documented in "Adding Subsystems to a Library" on page 93.

The sections above assume that as subsystems are added, moved, or deleted, previously existing subsystems may now be associated with different subsystem IDs. The sections above also document the steps necessary regardless of whether the subsystem IDs at the library manager have changed.

If the steps documented in the sections above are not followed, you may have the same device being configured in multiple device pools or the appearance of more drives then are actually in the library, or both, resulting in subsequent failures during library processing.

Chapter 4. Defining and Monitoring Your Configuration

This topic discusses typical administration tasks for defining and monitoring the SMS configuration associated with your tape library:

- Monitoring and maintaining the tape configuration
- Monitoring and maintaining SMS constructs and definitions
- Establishing recovery procedures
- Retrieving data from a disabled IBM automated tape library

Monitoring and Maintaining the Tape Configuration

ISMF makes it possible to monitor and maintain information associated with the tape configuration database, the source control data set, and the tape volumes that reside in automated and manual tape libraries.

Typical Library Management Functions

The ISMF Library Management option allows you to generate lists of tape libraries and volumes, display the attributes of a tape library, alter definitions that were originally defined, add new definitions, audit tape libraries and tape volumes, and eject tape volumes from the tape library.

This section discusses the effects of some typical configuration maintenance tasks. See Appendix B, "Using ISMF panels to define and monitor your configuration," on page 331 for information concerning the use of ISMF with tape libraries, and see *z/OS DFSMS Using the Interactive Storage Management Facility* for detailed information about using ISMF.

Defining Tape Libraries

The first time a tape library is defined, the storage administrator enters all the appropriate attribute definitions associated with the tape library being defined on the ISMF define panels. Once all the information is entered, an entry containing that information is added to the tape configuration database (TCDB). Also, a tape library definition is added to the specified source control data set (SCDS). For more detail concerning defining tape libraries using ISMF, see "Defining a tape library" on page 331.

When you attempt changes to the attribute definitions of an existing tape library, the information residing in the TCDB associated with the tape library is displayed through a Redefine panel. Changing any of the attributes previously defined results in an update to the TCDB and to the specified SCDS. For more information on redefining tape libraries, see "Redefining a Tape Library" on page 346.

Note: Only one SCDS can be activated at any time. Activating another SCDS or reactivating the current SCDS while OAM is running causes OAM to restart by default, unless RESTART=NO is specified in the OAM PROCLIB member. During this restart, all libraries are set to either online or offline according to the attributes defined in the SCDS. After the restart completes, display all libraries to verify that they are set to the desired operational state.

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Altering the Tape Library Definition

Altering a tape library definition results in an update to the corresponding library record in the TCDB and the SCDS. For more information on altering a tape library, see "Altering a Tape Library" on page 348.

Note: The altered library definition takes effect when the SCDS is activated and OAM is restarted.

Managing the Tape Volume

The ISMF Library Management function also assists in the maintenance and verification of the tape volumes within the tape library dataservers through the use of the Mountable Tape Volume Application available from the Tape Library Application Selection panel (option 1—LIST).

Note: If the TCDB is being shared across multiple system levels, volume records containing TDSI information that are not understood by the level of software on the system are not displayed when a volume list is requested from ISMF. This prevents the system from processing volume records containing TDSI information that is not understood by the system.

Using the Mountable Tape Volume Application, storage administrators can use line operators or ISMF commands to perform inventory tasks against tape libraries and tape volumes. The following functions can be performed using the Mountable Tape Volume Application:

- **AUDIT** a volume, a list of volumes, or a tape library

  Note: The audit functions are not supported in an MTL.
- **ALTER** the use attribute, storage group, shelf location, or owner information of a volume or list of volumes
- **EJECT** a single tape volume

For more detail on the use of the Mountable Tape Volume Application, see "ISMF mountable tape volume application" on page 354.

Auditing the Tape Library Volume in an ATLDS

The AUDIT function in an ATLDS helps you verify the physical location of tape volumes within the library. It verifies whether or not a library volume resides in the location listed for that volume in the library manager inventory. The volume records in the TCDB identify the libraries where the volumes reside. If the TCDB records do not match the library manager inventory when an audit is performed, the TCDB records, the inventory, or both, must be corrected. The AUDIT function does not perform any corrective actions; messages are issued and the volume error status field in each tape volume record is updated, but the purpose of the audit is verification only. For more information concerning auditing tape volumes with ISMF, see "Auditing volumes in an automated tape library" on page 366.

Note: In an environment with multiple systems at different software levels but sharing a common TCDB, library audits should be performed on the system with the highest software level. A library audit on a lower software level does not include higher release level volumes if there are media types unknown to the lower level software.

Altering the Tape Volume Record

ISMF allows you to alter the use attribute, storage group, shelf location, and owner information of a single tape volume or a list of tape volumes through the use of

the ALTER line operator or the ISMF ALTER command. These commands are used from the Mountable Tape Volume List panel (see Figure 60 on page 357). For more detail regarding the ISMF alter commands, see "Altering the volume record" on page 369.

Ejecting the Tape Volume With the EJECT Line Operator

The EJECT line operator is used to eject a single library-resident volume from a tape library with the option of keeping or purging the associated tape volume record within the TCDB. The EJECT line operator command is used from the Mountable Tape Volume List application of ISMF. For more information concerning this line operator and the Mountable Tape Volume List, see "Ejecting a Volume from a Tape Library" on page 374 and Figure 60 on page 357.

Monitoring and Maintaining SMS Library Definitions

ISMF library management makes it possible to monitor and make changes to the SMS library definitions. See *z/OS DFSMS Using the Interactive Storage Management Facility* for detailed information about using ISMF.

Changing z/OS Construct Definitions

As installation requirements change, it may be necessary to update data class, storage group, management class, and storage class definitions in your ACS routines. Definitions for these constructs can be modified using the ISMF ALTER panels.

These updates must be done with caution because volumes that do not require processing after the definitions are changed are not affected by the change, even though they are assigned to the group to which the new definition applies. The updated definitions are used *only* for volumes entering the system or processed by the system after the change.

Outboard Policy Management Definitions

If the library is also enabled for outboard policy management, the construct's policy also needs to be defined outboard at the library with appropriate policy actions, unless default actions are to be used at the library. If the construct's policy does not exist, the library creates the policy name and uses default actions.

Maintaining Tape Storage Group Definitions

New storage groups may be needed for separation of new types of volumes. In addition to defining the new tape storage groups, it is necessary to modify the ACS routines to use the new tape storage groups.

It is important to consider when you are designing these changes that existing volumes do not change their storage group assignments until they are changed to scratch and then back to private, or until they are manually changed either through ISMF volume ALTER, the CBRXLCS FUNC=CUA interface, or the LIBRARY LMPOLICY command. If a private volume is assigned to a new storage group through the storage group ACS routine, the storage group remains as it was set in the tape configuration database.

Changing ACS Routines

As mentioned above, ACS routines may need to be changed to support changes in storage group, data class, management class, or storage class definitions. Defining

new storage groups, data classes, management classes, or storage classes has no affect unless the ACS routines are changed to select those new constructs.

ACS routines can be changed to provide initial class defaults for new volumes. Defining new classes does not always mean new values for parameters; a new class can have the same parameters as an existing class. A new class may be created to make the relationship between a class and an application more understandable. This action makes it possible to modify parameters later to fit the needs of one application without affecting other applications.

A Final Note of Caution about Changing SMS Library Definitions: Changing existing library definitions may not affect all volumes associated with those definitions. Only those being stored after the library definitions have been changed are affected.

Establishing Recovery Procedures

As part of your disaster recovery plan, you should establish and test procedures for recovering the following entities:

- Tape configuration database
- Library entries in the volume catalog
- Volume entries in the volume catalog

Recovering Volume Catalogs

OAM attempts to keep volume catalog entries current. This cannot be accomplished if the catalog entry does not exist or if the catalog is unusable (for example, because of I/O errors). Recovery of the catalog may be required. Standard catalog recovery procedures apply to recovering volume catalogs. Those procedures usually involve making an image copy (for example, IDCAMS EXPORT) at certain intervals and restoring that copy (for example, IDCAMS IMPORT) to recover an unusable catalog, then applying changes to individual records based on some ICF transaction log (for example, SMF records).

Note: For further information on the use of IDCAMS with catalog entries, see *z/OS DFSMS Access Method Services for Catalogs*.

Recreating Library Entries

If library entries are added or deleted after the image copy is made, restoring an image copy does not complete the recovery; you must also recreate those added or deleted entries. Use IDCAMS CREATE or IDCAMS DELETE to create or to delete the library entries.

If library entries are modified after the image copy is made, use IDCAMS ALTER to update the library entry to its current state.

Note: Attempt this level of recovery only if the transaction log recovery cannot be used. For further information on the use of IDCAMS with library entries, see *z/OS DFSMS Access Method Services for Catalogs*.

Recreating Volume Entries

If volume entries are added or deleted after the image copy is made, restoring an image copy does not complete the recovery; you must also recreate those added or deleted entries. Use IDCAMS CREATE or IDCAMS DELETE to create or to delete the volume entries.

If volume entries are modified after the image copy is made, use IDCAMS ALTER to update the volume entry to its current state.

Note: Attempt this level of recovery only if the transaction log recovery cannot be used. For further information on the use of IDCAMS with volume entries, see *z/OS DFSMS Access Method Services for Catalogs*.

Disaster Recovery Site Considerations

If you plan to run your disaster recovery test on a system where there is no tape library, then you must EXPORT DISCONNECT the TCDB from that remote system so that normal stand-alone drive allocation paths are used by SMS and MVS allocation. Your ACS routines should also be reviewed and changed, if necessary, to ensure that they are not assigning a tape storage group that forces the allocation to a tape library.

Typically this processing does not require the OAM address space to be started; however, if you are also using OAM object support and need to start the OAM address space, considerations must be given to any tape library definitions that are in the SCDS. Before starting the OAM address space, any tape library definitions associated with the remote system that have an "Initial Online Status" of "YES" or "NO", need to have the initial online status set to blank to indicate that the library is not connected to that system. This enables the OAM address space to bypass those tape library definitions during OAM initialization. However, for that update to be successful, the TCDB needs to be connected. Once the updates have been made, the TCDB can be disconnected and the updated SCDS can be activated.

Note: For further information on the use of IDCAMS EXPORT of VOLCAT, see *z/OS DFSMS Access Method Services for Catalogs*.

Selective write protect for disaster recovery (DR) test

To better enable disaster recovery (DR) testing, starting with Release 1.7 of the TS7700 Virtualization Engine, the “Selective Write Protect” function allows the library to exclude up to 16 categories from a cluster’s write protect enablement. With this function enabled, only volumes in the specified DR host categories can be modified by the DR host. In addition, the DR host can also mount (for read-only purposes) production scratch volumes (by specific volser) to account for any return to scratch processing that may have occurred on the production systems (the DR host must also have those volumes in private status in the TCDB). The categories excluded from write protect enablement must match those specified in the DEVSUP*xx* PARMLIB member on the DR host. In addition, the DEVSUP*xx* categories used by the DR host must be different from those specified on the production hosts. With Selective Write Protect enabled, any volume assigned to one of the specified categories will be excluded from the cluster’s write protect state. The volumes assigned to the excluded categories can be written to or have their attributes modified. Tape management system considerations include setting up the DR host to allow for a new range of logical volumes to be entered and used at the DR host. To assist with this, DFSMSrmm provides volume management capabilities through their PRTITION and OPENRULE commands. For additional information refer to the TS7700 Information Center.

TCDB Procedure for Retrieving Data from a Disabled IBM Automated Tape Library

There may be a time when you might experience a problem that could disable your IBM automated tape library. The following procedure provides instructions for retrieving data from an IBM automated tape library after a serious library manager failure occurs with the PC controller. By following this procedure, you can allocate your library volumes to stand-alone devices to retrieve your data after a few modifications to the TCDB and possibly the job stream. This procedure is only a short-term solution and should only be used if there is an immediate need for the data in the disabled IBM automated tape library.

Altering Private Tape Configuration Database Records

Alter the TCDB for each private volume serial number from the disabled library that you plan to use. Use IDCAMS or a utility from your tape management system that invokes the IDCAMS facility. The LOCATION field in the TCDB must be altered from LIBRARY to SHELF. When altering the LOCATION field, IDCAMS also modifies the LIBRARYNAME field to SHELF. This field value change allows the private volume serial numbers to be used outside the library for non-SMS-managed requests. After the library manager is back online, and the volumes are returned to their home cells, the LOCATION and LIBRARYNAME fields in the TCDB must be altered. The LOCATION field must be altered back to LIBRARY and the LIBRARYNAME field must be altered to reflect the library name where the volumes reside.

The following are examples for the JCL for IDCAMS:

```
//ALTERVOL JOB 'NAME',MSGCLASS=H,MSGLEVEL=(1,1),CLASS=A
//*********************************
//*ALTER THE LOCATION FIELD TO SHELF FOR OAM100
//*********************************
//ALTER  EXEC PGM=IDCAMS
//SYSPRINT DD  SYSOUT=*
//SYSIN DD *
  ALTER VOAM100-
  VOLUMEENTRY-
  LOCATION(SHELF)
/*
//
```

```
//ALTERVOL JOB 'NAME',MSGCLASS=H,MSGLEVEL=(1,1),CLASS=A
//*********************************
//*ALTER THE LOCATION FIELD TO LIBRARY AND THE
//*LIBRARYNAME FIELD TO ATLF4007 FOR OAM100
//*********************************
//ALTER EXEC PGM=IDCAMS
//SYSPRINT DD SYSOUT=*
//SYSIN DD *
  ALTER VOAM100-
     VOLUMEENTRY-
     LOCATION(LIBRARY)-
     LIBRARYNAME(ATLF4007)
/*
//
```

Changing from SMS-Managed to Non-SMS-Managed Requests

JCL jobs and applications that refer to scratch requests or to altered shelf-resident private volumes using DISP=NEW can be changed from SMS-managed to non-SMS-managed requests in one of two ways:

1. Modify the JCL or application associated PARMLIB member so that the requests are treated as non-SMS-managed requests.
2. Activate a new SCDS that treats the existing JCL and applications with no modifications as non-SMS-managed requests.

By changing to a non-SMS-managed request in the ACS routine, MVS allocation selects a non-SMS-managed device during the allocation process. Examine the constructs and the criteria used in the ACS routines to determine what requests need to be changed to non-SMS-managed.

Note: If storage groups selected from the ACS routine span multiple libraries, scratch allocations are automatically directed to the other libraries.

Changing the Use Attribute of Scratch Volumes

If you are using scratch volumes from the disabled library, then after the disabled library is back online either:

1. Use ISMF to alter the use attribute and the storage group, or
2. Code a CBRXLCS CUA invocation to change the use attribute from S to P and the appropriate storage group from *SCRTCH*

Either of these procedures must be done before any scratch requests are submitted. If one of them is not performed, then previously written data may be overwritten on the next scratch request to that library since the scratch volumes used still exist in a scratch category in the library manager inventory.

If you are using scratch volumes outside the disabled library, then after the disabled library is back online, enter those newly written volumes into the library and assign a use attribute of P and a storage group to preserve the data written on the volumes.

JCL jobs and applications that are referencing existing data on the altered private volumes with DISP=OLD or DISP=MOD may not require any changes. In this case, the ACS routines are not invoked and a device gets allocated based solely on the specified UNIT parameter indicated in the JCL or associated with the application program.

Note: If you have OAM Object Tape support and have altered the SETOAM parameters in the CBROAM*xx* PARMLIB member, you must restart the OAM address space in order for these changes to take effect.

Using the Sample Exit for Volume Not In Library (CBRUXVNL)

After submitting the jobs and applications for the altered private volume serial numbers, the operator replies to a message from the CBRUXVNL exit. The operator either replies CONT to continue the request to a stand-alone device, or DISABLE to deactivate the volume not in library exit for future replies. By disabling the CBRUXVNL exit, the requests for the altered volume serial numbers are allocated to stand-alone devices, but for SMS-managed requests for volumes that reside on the shelf, the jobs fail. The CBRUXVNL exit can be re-enabled by using the OAM LIBRARY RESET,CBRUXVNL command.

Library Manager Database Volume List

It is important to maintain a volume list that has the current home cell locations for your ATLDS library volumes. This volume list can be obtained from the library manager console by selecting DATABASE from the main menu pull-down window

and then selecting a function called LIST DATABASE VOLUMES. This function generates a volume list that has the current home cell locations. This list can be saved on a diskette and referenced or printed with any remote PC ASCII editor. If you configured your Home Cell Mode to FLOAT, this operation will have to be run more often than if this mode was configured to FIXED. Floating home cells can change after volumes are demounted from the library devices. Maintaining these cell locations prevents the operator from manually searching for volumes in the disabled library.

Returning the Library Manager to an Operational Status

After the tape library is returned to an operational state, restore your modified JCL, PARMLIB members, and the TCDB records to their original values. Use the SMS library VARY command to vary the tape library online and then reactivate the original SCDS. After OAM has restarted, run an OAM library audit command to ensure that the volumes are returned to their correct home cell locations before allocating to that library.

Chapter 5. Operating the OAM Address Space

This topic helps you become familiar with operator commands and describes the common tasks needed to operate the OAM address space.

Overview of Operator Tasks

You can perform the following operator tasks:

- Start OAM
- Restart OAM
- Vary:
  - Tape library online and offline
  - Tape drive online and offline
- Eject a specific tape volume
- Audit a tape volume
- Enter a volume into a manual tape library
- Import volumes into a virtual tape server library
- Export volumes from a virtual tape server library
- Request Information from the TS7700 Virtualization Engine
- Disable Cartridge Entry Installation Exit processing
- Disable Volume Not in Library Installation Exit processing
- Re-enable installation exit processing
- Display the cartridge loader scratch media type for a tape drive
- Set the cartridge loader scratch media type for a tape drive or a range of tape drives
- Assign library manager policy names outboard (for libraries that support outboard policy management)
- Display the status of:
  - OAM
  - Tape library
  - Tape drive
  - Tape storage group
  - Tape volume
  - Outstanding OAM messages
- Stop OAM
- Capture Data for Diagnostic Purposes (OAM DUMP)
- Query OAM active and pending tape library requests (OAM QUERY)
- Query device services library information (DEVSERV QLIB)

Note: You may have an environment with multiple systems at different levels sharing a common TCDB. In this event, if a system attempts to perform an operator command against a volume that has a media type or recording technology that is not recognized, the request fails.

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Message Format Conventions

The following conventions are used to show message format:

CBR*nnnn***X Message_text**

where:

CBR Standard OAM message prefix

nnnn Four-digit message number

X Type code:
- **A** Action required
- **D** Decision needed
- **E** Eventual operator action required
- **I** Information only

Message_text
Text of the message.

see *z/OS MVS System Messages, Vol 4 (CBD-DMO)* for explanations and appropriate actions for CBR*xxxxx* messages.

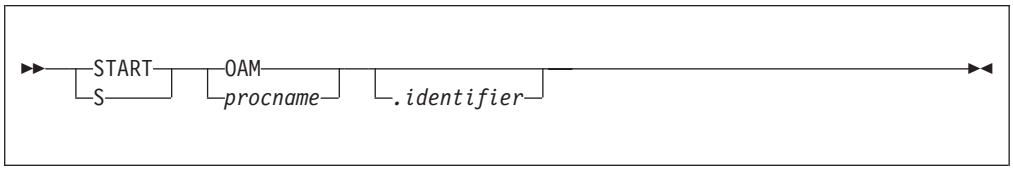
The following is a sample of an OAM message:

```
CBR2601A  Specify shelf location for volume volser.
```

Note: In message text, italicized words indicate a value supplied by the system.

Starting OAM

Use the MVS START command to start the OAM address space manually or to restart the OAM address space after it has terminated. The syntax of the MVS START command that is used to start OAM follows:



OAM Name of the IBM-supplied cataloged procedure that invokes OAM.

procname Name of the user-written cataloged procedure that invokes OAM.

.identifier User-determined name that identifies the OAM address space. If you do not specify an identifier, the system automatically uses the *procname* as the identifier.

Related reading: For further information on the MVS START command and additional parameters that can be specified, see *z/OS MVS System Commands*.

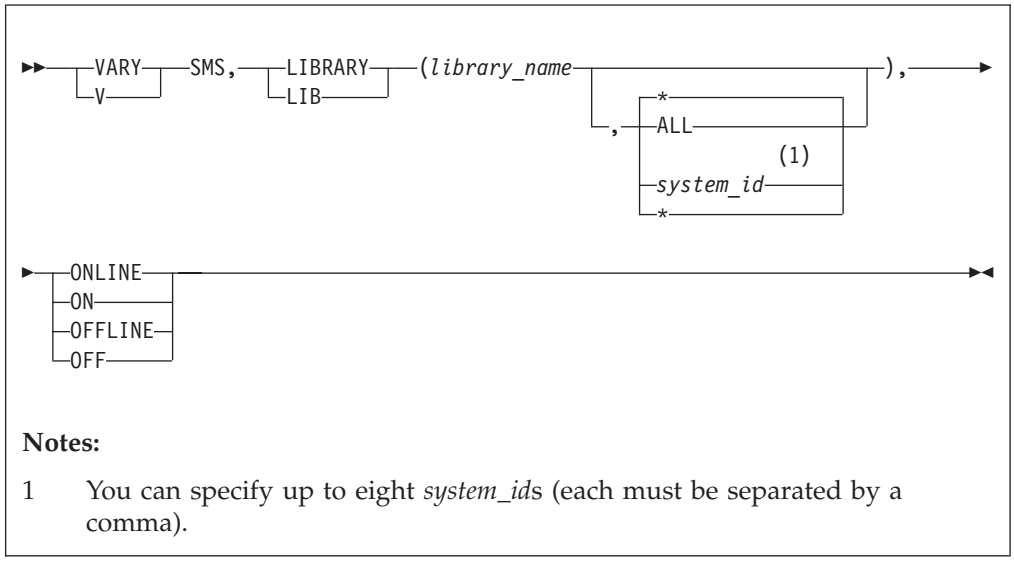
When OAM is initialized, the system issues the following messages:

```
CBR0001I  OAM initialization starting.

CBR0002I  OAM initialization completed.
```

If other CBR*xxxxx* messages are issued, see *z/OS MVS System Messages, Vol 4 (CBD-DMO)* for the appropriate action to take.

Varying a Tape Library Online or Offline

Use the VARY SMS command to vary libraries online or vary them offline. The syntax of the command to vary the libraries follows:



Notes:

1 You can specify up to eight *system_id*s (each must be separated by a comma).

OAM does not set the library offline until all the tape drives in the library are set offline. Such drives are considered offline for library reasons. When an individual drive is marked offline as a result of the **VARY ddd,OFFLINE** command, it is considered offline for operator reasons. Each offline state must be separately reset before the drive is again online. A **VARY SMS,LIB** command does not bring a drive online if the drive is currently offline for operator reasons. A **VARY ddd,ONLINE** command does not bring a drive online if the drive is currently offline for library reasons.

Note: A composite and distributed VTS library can be varied online and offline like any VTS library, though varying a distributed library offline from the host really has no meaning (does not prevent outboard usage of the library). Message CBR3016I warns the user when a distributed library is initialized or varied offline.

LIBRARY | LIB(*library_name***)**
Specifies the name of the library to be varied online or offline. If the name is not specified or the specified library is not defined in the SMS configuration, an error message is displayed.

ALL Varies the state of the tape library on all systems in the SMS complex to which the library is connected.

***** Varies the state of the tape library only on the system or system group from which the VARY command is issued. If the system or system group on which the VARY command is issued is not connected to the named library, an error message is displayed. This is the default.

system_id Varies the state of the tape library only on the systems or system

groups that are specified. If a specified system is not connected to the named tape library, an error message is displayed.

Note: To specify a system or system group that is named ALL, surround it with parentheses; for example, **VARY SMS,LIBRARY(***library_name***,(ALL)),ONLINE**.

ONLINE | ON Specifies that the library be varied online.

OFFLINE | OFF
Specifies that the library be varied offline.

An example of the command to vary a tape library online:

```
VARY SMS,LIBRARY(ATL01),ONLINE
```

An example of the command to vary a tape library offline:

```
VARY SMS,LIBRARY(ATL01),OFFLINE
```

Restarting OAM

OAM provides the ability for you to specify a RESTART option on the OAM started procedure statement (see the example in 81 under *Run SAMPLIB member CBRAPROC*). This option indicates that OAM should or should not be restarted upon notification that a new SCDS has been activated. A new or changed SCDS does not always affect the configuration information that OAM uses; therefore, a restart of the OAM address space may not always be necessary each time a new or changed SCDS is activated. This option provides a choice to the customer to decide on the most efficient use of their OAM resources.

If you specify RESTART=YES (the default), OAM restarts automatically once it is notified that an SCDS activation has occurred. OAM completes work that is currently on its execution queues, requeues any work from outside the OAM address space to the input work queue, and terminates any work from within the OAM address space not currently executing. OAM rebuilds its internal control blocks to match the SMS definitions in the recently activated SCDS. When OAM is back to full capacity (restart complete), the work requeued to the input work queue begins processing.

Note: How soon OAM is notified of the SCDS activation depends on the time interval that you specify with the INTERVAL keyword in the IGDSMS*xx* PARMLIB member.

If you specify RESTART=NO, OAM continues processing without rebuilding its internal control blocks when it is notified that an SCDS activation has occurred.

Message CBR0092I acknowledges that a *new* SCDS has been activated.

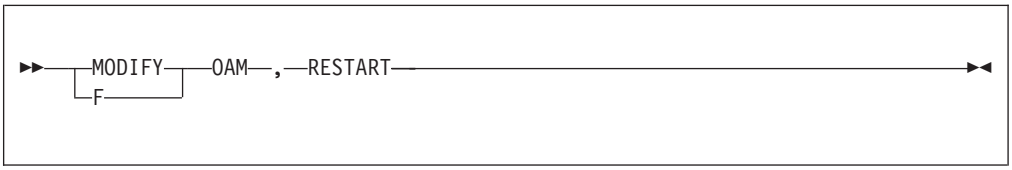
```
CBR0092I  New SMS Source Control Data Set activated.  OAM address space
          restart may be required.
```

It is the responsibility of the installation to ensure that the OAM RESTART command is issued if an OAM address space restart is necessary.

The OAM RESTART command causes OAM to restart the OAM address space. During restart processing, OAM matches the constructs and definitions to those that are found in the active SMS configuration.

By using this command, you can avoid having to perform STOP and START commands of the OAM address space. This command allows the OAM address space to retain its current ASID.

To restart the OAM address space without first stopping OAM, enter the following RESTART command:



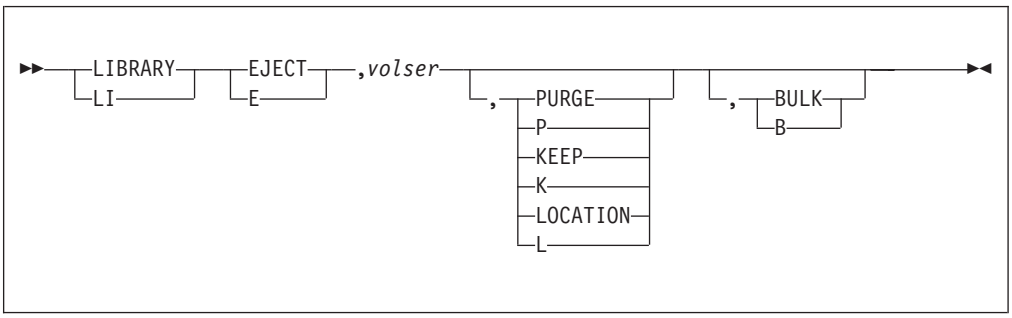
Varying Tape Drives Online or Offline

Use the MVS VARY command to vary tape drives online or offline. See *z/OS MVS System Commands* for additional information on the MVS VARY command.

Ejecting a Specific Tape Volume

Use the MVS LIBRARY EJECT command to eject a specific tape volume from a tape library. When this command is issued for an ATLDS, the tape volume is placed into an output station of the tape library. For an MTL, no physical movement takes place as a result of this command.

The syntax of the command to eject a specific tape volume is:



EJECT | E Specifies a request to eject a specific tape volume from a tape library.

volser Specifies the volume serial number of the tape volume that is ejected from the tape library.

{PURGE | P | KEEP | K | LOCATION | L}
Specifies the disposition of the volume record in the TCDB when a tape cartridge is ejected from the library. If neither PURGE nor KEEP is specified, then the disposition of the volume record in the TCDB is determined by the eject default that is entered on the ISMF Tape Library Define panel.

PURGE | P Specifies that the volume record in the TCDB be deleted upon completion of the EJECT operation.

KEEP | K Specifies that the volume record in the TCDB be retained upon completion of the EJECT operation.

LOCATION | L Specifies that you want to update the shelf location associated with the tape volume. When LOCATION is specified, a write-to-operator-with-replay (WTOR) message is issued to the MVS operator prompting for 32 characters of shelf location information. The entered information is recorded in the shelf location field in the volume record in the TCDB. Specifying the LOCATION keyword implies that the volume record be retained upon completion of the EJECT operation.

{BULK | B} Specifies that the tape volume be placed in the high-capacity or "bulk" output station of the tape library. If neither BULK nor B is specified, the tape volume is placed in the convenience output station. If the high-capacity output station is not configured, the cartridge is ejected to the convenience station. If a convenience station is not installed in a 3494, the cartridge is placed in the single cell output area. (This parameter is ignored for volumes ejected from a MTL.)

To eject a tape cartridge from a tape library, enter the following command:

```
LIBRARY EJECT,TAP003
```

Specifying the Shelf Location

If you specify the LOCATION operand on the LIBRARY EJECT command, the system issues the following message and waits for a reply:

```
CBR2601A  Specify shelf location for volume volser.
```

Provide 1 to 32 characters of shelf location information.

The following message displays when OAM accepts the EJECT command:

```
CBR1000I  OAM EJECT command execution scheduled.
```

One of the following messages displays upon successful completion of the eject request:

```
CBR3010I  Volume volser ejected from library library-name.  Place in shelf
          location shelfloc.

                              or

CBR3011I  Secure checkpoint volume volser ejected from library library-name.
          Place in shelf location shelfloc.
```

If the ejected volume is reentered into a library before the eject completion message is processed, the following message is issued in place of CBR3010I or CBR3011I:

```
CBR3014I Eject processing completed for volume volser.  Reentry into library
          library-name detected.
```

You can provide the shelf location by any of the following means:

- LIBRARY EJECT command
- Cartridge Entry Installation Exit (CBRUXENT)
- Cartridge Eject Installation Exit (CBRUXEJC)
- ISMF volume ALTER function

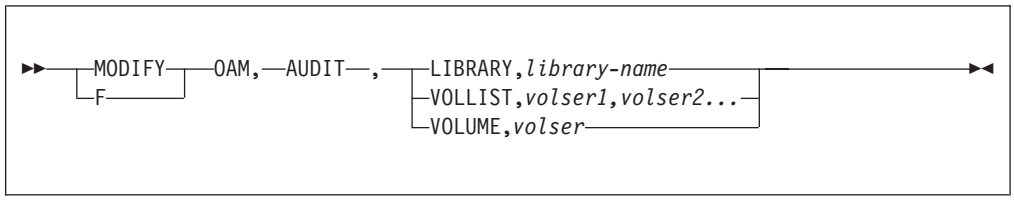
Note: *??????* is displayed in the eject completion messages if you have not provided a shelf location.

Auditing a Volume

OAM provides an AUDIT command that enables you to audit an automated tape library-resident tape volume.

Note: The audit function is not supported for volumes that reside in a manual tape library.

The syntax of the command for the AUDIT function follows:



AUDIT Specifies a request to audit a single volume, list of volumes, or an entire tape library.

VOLUME | VOLLIST | LIBRARY
Specifies the scope of the audit.

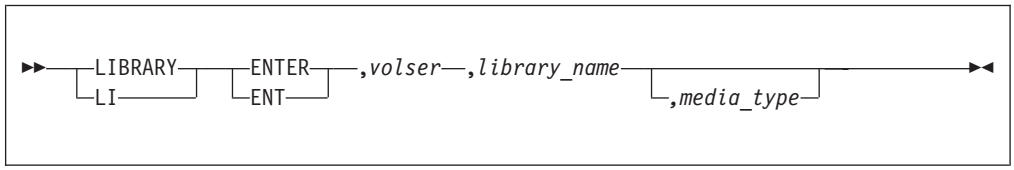
volser Specifies the volume serial number of the tape volume to be audited. If VOLLIST is specified, up to 15 tape volumes can be audited.

library-name Specifies the name of the tape library to be audited.

Entering a Tape Volume into an MTL

Use the LIBRARY ENTER command to enter a tape volume into a manual tape library.

The syntax of the command to enter a tape volume into an MTL follows:



ENTER | ENT Specifies a request to enter a volume into an MTL.

volser Specifies the volume serial number of the volume to be entered into the MTL.

library_name Specifies the name of the library in which the volume is to be entered.

media_type Specifies the media type for the enter request:

MEDIA1 Specifies IBM Cartridge System Tape.

MEDIA2 Specifies IBM Enhanced Capacity Cartridge System Tape.

MEDIA3 Specifies IBM High Performance Cartridge Tape.

MEDIA4 Specifies IBM Expanded High Performance Cartridge Tape.

MEDIA5 Specifies IBM Enterprise Tape Cartridge.

MEDIA6 Specifies IBM Enterprise WORM Tape Cartridge.

MEDIA7 Specifies IBM Enterprise Economy Tape Cartridge.

MEDIA8 Specifies IBM Enterprise Economy WORM Tape Cartridge.

MEDIA9 Specifies IBM Enterprise Extended Tape Cartridge

MEDIA10 Specifies IBM Enterprise Extended WORM Tape Cartridge

MEDIA11 Specifies IBM Enterprise Advanced Tape Cartridge

MEDIA12 Specifies IBM Enterprise Advanced WORM Tape Cartridge

MEDIA13 Specifies IBM Enterprise Advanced Economy Tape Cartridge

You do not have to specify a media type; it is optional. If the media type is not specified and a volume record does not already exist, the media type can be derived from the entry default data class or the cartridge entry installation exit (CBRUXENT), or both.

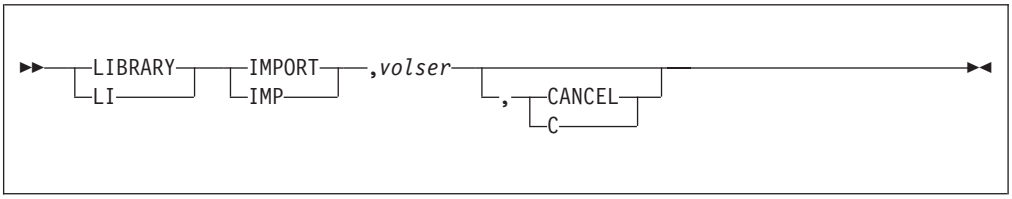
If no media type is determined by any of the above options, the entry will fail.

The LIBRARY ENTER command uses the LCS external services FUNC=MCE programming interface to enter the volume into the MTL.

Importing Tape Volumes into a VTS

Use the LIBRARY IMPORT command to initiate or cancel an import operation at the library. Before you can initiate an import operation, the import list volume must be written to identify which volumes are to be imported. For information on the 3494 VTS, refer to “Importing Logical Volumes into a 3494 VTS System” on page 30. For information on the copy export support in the TS7740 Virtualization Engine (3956-V0x) and what mechanism is used to bring the copy exported volumes back into a TS7740, refer to “Copy Export from the TS7740 Virtualization Engine (3957-V0x)” on page 40.

The syntax of the command to import volumes into a VTS follows:



IMPORT | IMP Specifies a request to initiate (or cancel) the import of logical volumes into a VTS.

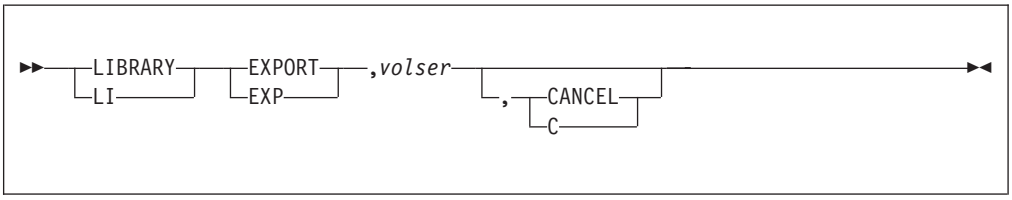
volser Specifies the volume serial number of the import list volume to be used for this import operation.

CANCEL | C Requests that the currently executing import operation for the specified volume serial number be canceled. This is an optional parameter.

Exporting Tape Volumes from a VTS

Use the LIBRARY EXPORT command to initiate or cancel an export operation at the library. Before you can initiate an export operation, the export list volume must be written to identify which volumes are to be exported. For information on the 3494 VTS, refer to "Exporting Logical Volumes from a 3494 VTS System" on page 38, and for information on the copy export support in the TS7740 Virtualization Engine (3956-V0x), refer to "Copy Export from the TS7740 Virtualization Engine (3957-V0x)" on page 40.

The syntax of the command to export volumes from a VTS follows:



EXPORT | EXP Specifies a request to initiate (or cancel) the export of logical volumes from a VTS.

volser Specifies the volume serial number of the export list volume to be used for this export operation.

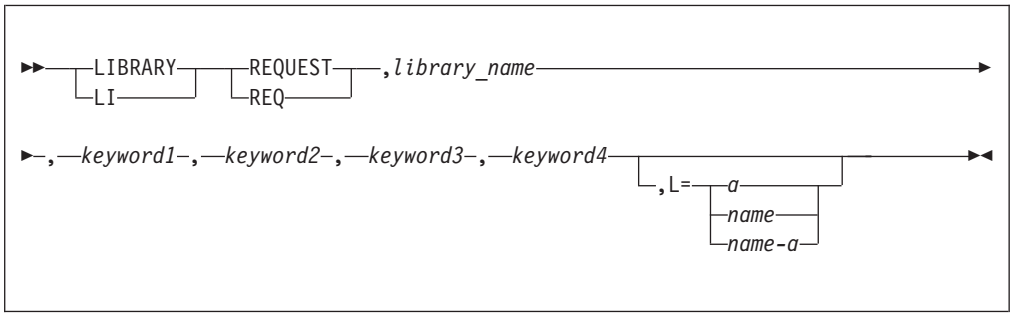
CANCEL | C Requests that the currently executing export operation for the specified volume serial number be canceled. This is an optional parameter.

Requesting Information from the TS7700 Virtualization Engine

Use the MVS LIBRARY,REQUEST command to request information pertaining to the current operational state of the TS7700 Virtualization Engine, its logical and physical volumes, and its physical resources. This command can also be used to perform outboard operations at the library. Based on the operation requested, the library then returns information to the host that is displayed in a multi-line WTO (CBR1280I). The data displayed in the multi-line WTO reflects the data exactly as it is returned to the host by the library. For a detailed discussion of the operations

that are supported and the keywords that can be specified, refer to *IBM Redbooks, IBM System Storage Virtualization Engine TS7700: Tape Virtualization for System z Servers*, and *IBM Whitepaper, IBM Virtualization Engine TS7700 Series z/OS Host Command Line Request User's Guide*.

The syntax of the command for the REQUEST function:



Required Parameters

REQUEST | REQ
Specifies a request to obtain information from the library or to perform an outboard operation at the library. This command is supported only by the TS7700 Virtualization Engine (3957-V0x or 3957-VEx).

library_name
Specifies the library in which the request should be directed. The library specified may be a composite or a distributed library and which library is applicable depends on the keywords specified.

keyword1
Specifies which operation is to be performed at the library.

Optional Parameters

The optional parameters are dependent on the first keyword specified. Based on the first keyword specified, zero or more of the additional keywords may be appropriate.

keyword2
Specifies additional information in support of the operation specified with the first keyword.

keyword3
Specifies additional information in support of the operation specified with the first keyword.

keyword4
Specifies additional information in support of the operation specified with the first keyword.

,*L={a | name | name-a}*
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=name), or both the console name and the display area (L=name-a). The name parameter can be an alphanumeric character string.

Rules: The keywords specified must be from one to eight characters in length and can consist of alphanumeric (A-Z and 0-9), the national character set ($@#), and mask and wildcard-type characters (*%). The only checking done by the host is to verify that the specified keywords conform to the supported

character set. The validity of the keywords themselves and the keywords in combination with each other is verified when the command is received at the library. Any errors that the library encounters are reported back to the host and displayed as part of the command output for CBR1280I.

The following information is displayed:

```
CBR1280I Library library-name request.
Keywords: keyword1[,keyword2,keyword3,keyword4]
------------------------------------------------------------------------
data from the library (1 to 50 lines; up to 70 characters per line)
```

The following are examples of the LIRBARY,REQUEST command output:

If you issue the following command:

```
LIBRARY REQUEST,ATLDIST1,POOLCNT
```

The following information is displayed:

```
CBR1280I Library ATLDISP1 request.
Keywords: POOLCNT
------------------------------------------------------------------------
PHYSICAL MEDIA COUNTS V1
 POOL MEDIA  EMPTY  FILLING   FULL  ERASE    ROR  UNAVAIL
    0     J    340
    0     K    523
    0    JA     83
    0    JB     28
    0    JJ      2
    1    JA    134        3    609      0      0        0
    2    JJ     23        2    325      0      0        0
```

If you issue the following command (for a volume that does not reside in the library):

```
LIBRARY REQUEST,ATLCOMP1,LVOL,Y03469
```

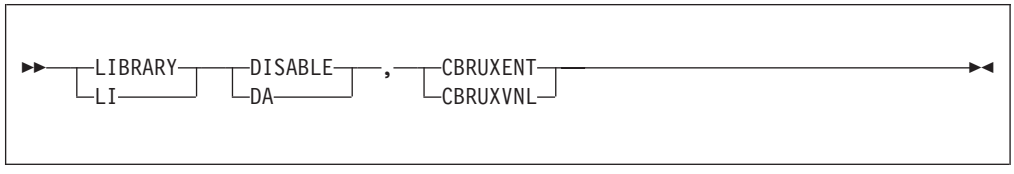
The following information is displayed:

```
CBR1280I Library ATLCOMP1 request.
Keywords: LVOL,Y03469
------------------------------------------------------------------------
LOGICAL VOLUME INFORMATION V1
 LOGICAL VOLUME:               Y03469
 VOLUME NOT IN LIBRARY SPECIFIED
```

Disabling Installation Exit Processing

Use the LIBRARY DISABLE command to disable installation exit processing for a particular system.

The following syntax is of the command to disable the installation exit processing:



DISABLE | DA Specifies a request to disable the installation exit.

CBRUXENT Specifies a request to disable cartridge entry installation exit processing. Cartridge entry processing does not occur on this system while the exit is disabled.

Note: Disabling the cartridge entry installation exit on a system allows cartridge entry to be processed by another system, which is connected to the library and has the cartridge entry exit enabled. In effect, this directs cartridge entry processing to a particular system.

With APAR OA24966 (z/OS V1R8 and above), the cartridge entry installation exit can be disabled prior to the start of the OAM address space to ensure that when the OAM address space is started, entry processing is not attempted on the disabled system.

CBRUXVNL Specifies a request to disable volume not in library installation exit processing.

Note: This does not disable job processing but does result in the volume not in library installation exit being bypassed or not called. In the absence of the CBRUXVNL installation exit's intervention, Job Step Setup processing attempts to allocate an applicable stand-alone tape drive for a volume that has been inadvertently ejected from a tape library. If there is no stand-alone drive capable of handling the tape volume request, the job or dynamic allocation fails. During Device Allocation or during Library Mount Processing, normal job processing for a volume not in the library with no CBRUXVNL installation exit intervention causes the failure of the job step or dynamic allocation.

The following message displays upon successful completion of the disable request:

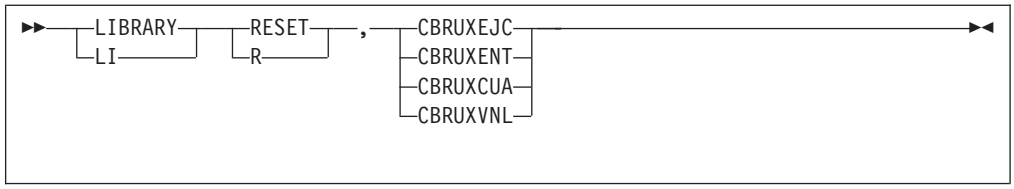
```
CBR1951I  Installation exit installation-exit-name has been disabled by operator command.
```

The installation exit processing on this system is disabled until a LIBRARY RESET command is issued or the system is IPLed. Restarting the OAM address space does not re-enable installation exit processing if it has been disabled by an operator command. You can use the DISPLAY SMS,OAM command to display the current status of the installation exits.

Reenabling Installation Exit Processing

When OAM detects an error during installation exit processing, the function that is being performed when the exit is invoked is disabled. For example, cartridge entry, cartridge eject, private-to-scratch change use attribute, or volume-not-in-library processing is not performed. An installation exit might also request, by way of a return code, that the exit not be invoked again, and function processing continues without the exit. Also an operator, through the use of the MVS LIBRARY DISABLE command, might request that cartridge entry processing on a particular system be disabled, or request that the volume not in library exit be disabled. Use the MVS LIBRARY RESET command to reenable installation exit processing.

The syntax of the command to reestablish installation exit processing follows:



RESET | R Specifies a request to reactivate an installation exit.

CBRUXEJC | CBRUXENT | CBRUXCUA | CBRUXVNL
Specifies which exit to reactivate.

CBRUXEJC Specifies that the cartridge eject installation exit (CBRUXEJC) be reactivated.

CBRUXENT Specifies that the cartridge entry installation exit (CBRUXENT) be reactivated.

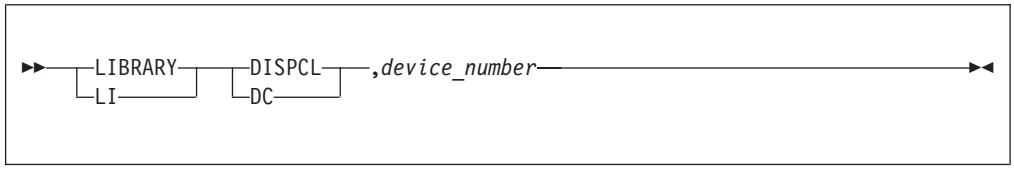
CBRUXCUA Specifies that the change use attribute installation exit (CBRUXCUA) be reactivated.

CBRUXVNL Specifies that the volume not in library installation exit (CBRUXVNL) be reactivated.

Note: Resetting the CBRUXENT installation exit invokes cartridge entry processing for volumes in the insert category.

Displaying the Cartridge Loader Scratch Media Type

Use the MVS LIBRARY DISPCL command to display the media type of scratch volumes that you want loaded into the cartridge loader of a library-resident tape drive. The syntax of the LIBRARY DISPCL command follows:



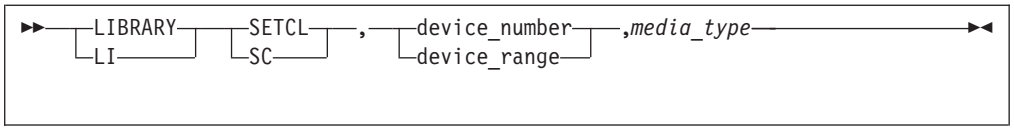
DISPCL | DC Specifies a request to display the media type of scratch volumes you want loaded into the cartridge loader for a library-resident tape drive.

device_number
Specifies the MVS device number of a library-resident tape drive.

Note: The display output for the DISPCL command is the same as the output for the DISPDRV command for a single drive. See "Displaying Tape Drive Status" on page 130 for an example.

Setting the Cartridge Loader Scratch Media Type

Use the MVS LIBRARY SETCL command to set the media type of scratch volumes to be loaded into the cartridge loaders of library-resident tape drives. The syntax of the LIBRARY SETCL command follows:



SETCL | SC Specifies a request to set the media type of scratch volumes to be loaded into the cartridge loader of library-resident tape drives.

device_number
Specifies the MVS device number (*xxxx*).

device_range Specifies the MVS device range (*xxxx–yyyy*). The device number (*xxxx*) must be less than the device number (*yyyy*).

media_type Specifies the media type to be loaded:

MEDIA1 Specifies IBM Cartridge System Tape.

MEDIA2 Specifies IBM Enhanced Capacity Cartridge System Tape.

MEDIA3 Specifies IBM High Performance Cartridge Tape.

MEDIA4 Specifies IBM Expanded High Performance Cartridge Tape.

MEDIA5 Specifies IBM Enterprise Tape Cartridge.

MEDIA6 Specifies IBM Enterprise WORM Tape Cartridge.

MEDIA7 Specifies IBM Enterprise Economy Tape Cartridge.

MEDIA8 Specifies IBM Enterprise Economy WORM Tape Cartridge.

MEDIA9 Specifies IBM Enterprise Extended Tape Cartridge

MEDIA10 Specifies IBM Enterprise Extended WORM Tape Cartridge

MEDIA11 Specifies IBM Enterprise Advanced Tape Cartridge

MEDIA12 Specifies IBM Enterprise Advanced WORM Tape Cartridge

MEDIA13 Specifies IBM Enterprise Advanced Economy Tape Cartridge

NONE In an ATLDS, the cartridge loader is emptied. In an MTL, indexing is not occurring on this system; however, indexing could be occurring on another system.

ANY Valid for MTL only. Media type preferencing through data class is not being used; therefore, index with media appropriate for the drive.

Note: Use this command only for devices in a tape library that have installed cartridge loaders.

Assigning Categories to ATLDS Cartridge Loaders

At the first IPL after the library is configured, media type defaults are no longer set for the cartridge loaders by the system so they remain set to NONE.

Use the LIBRARY SETCL command to assign a media type to the tape library data server cartridge loaders. Once the LIBRARY SETCL command is used, the media type that is assigned to the cartridge loader is preserved. Subsequent IPLs will not modify the assignment. Use the LIBRARY DISPCL command to display the media type.

Assigning Media Types to MTL Cartridge Loaders

For devices in an MTL, the media type setting is not maintained across an IPL and defaults to NONE. You can use the LIBRARY SETCL command to set the media type. However, in an MTL environment, you must issue this command to each sharing system.

Media Selection in an ATLDS

For nonspecific volume requests, the media type assigned to the cartridge loader is preferred if data class is not specified through the data class JCL parameter or through the ACS filter routines. If that scratch category is empty, an appropriate alternate media type is selected. However, if the category assigned to the cartridge loader is NONE, then MEDIA2 is preferred for a 3490E, and MEDIA4 is preferred for a 3590. MEDIA5 is preferred for a 3592 Model J, with MEDIA7 as the alternate media type. MEDIA5 is preferred, with MEDIA7 as the alternate media type when EFMT1 recording format is requested on a 3592 Model J or 3592 Model E05 drive. MEDIA9 is preferred, with MEDIA5 and MEDIA7 as the alternate media types, using the EEFMT2, EFMT3, or EEFMT3 format, or when no recording technology has been specified and a 3592 Model E05 or 3592 Model E06 is allocated. MEDIA11 is preferred, with MEDIA9 and MEDIA13 as the alternate media types using the EFMT4 or EEFMT4 format, or when no recording format has been specified and a 3592 Model E07 is allocated. MEDIA9 is the only applicable media type when using the EFMT3 or EEFMT3 format and a 3592 Model E07 is allocated. 3592 WORM media (MEDIA6, MEDIA8, MEDIA10, and MEDIA12) can be used for a nonspecific volume request only when explicitly requested through data class. If a specific media type is selected using data class, only that media type is used.

If a data set spans multiple volumes, the subsequent volumes are written using the media type of the last volume written. If the scratch category for the media type is empty, rather than fail the job, an appropriate alternate media type is selected.

Media selection in an MTL

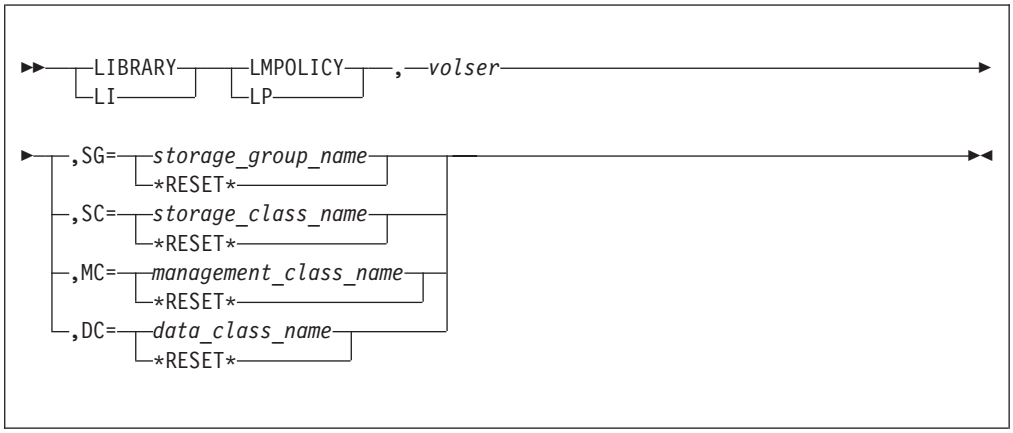
For nonspecific volume requests, the cartridge loader media type assignment through the LIBRARY SETCL command plays an important role. It lets the system know the intended use of the cartridge loader and whether indexing is to occur on this system. If indexing is to occur, it indicates what media type should be loaded in the cartridge loader. If a media type is then preferenced through DATACLASS, an attempt to index the cartridge loader is made only if the media type that is assigned to the device matches the DATACLASS specification. If DATACLASS does not specify a media type, indexing occurs on those systems where the cartridge loader is not set to NONE. If there is no intention to preference a specific media type, all of the cartridge loaders could be set to ANY. This then enables you to load any appropriate media type for the device. After an IPL, the cartridge loaders, by default, are set to NONE.

Assigning Policy Names Outboard

Use the LIBRARY LMPOLICY command to assign or change a volume's policy names outboard at the library. You can use this command only for private, library-resident volumes that reside in a library that supports outboard policy management.

The processing for the LIBRARY LMPOLICY command invokes the LCS external services FUNC=CUA interface. Any errors that the CUA interface returns can also be returned for the LIBRARY LMPOLICY command. See "Return and Reason Codes for CBRXLCS Change Use Attribute" on page 159 for more information on these return codes. If the change use attribute installation exit (CBRUXCUA) is enabled, the CUA function calls the installation exit. This can override the policy names that you set using the LIBRARY LMPOLICY command. The results of this command are specified in the text section of message CBR1086I. To verify the policy name settings and to see whether the CBRUXCUA installation exit changed the policy names you set, display the status of the volume. See "Displaying Tape Volume Status" on page 138.

The syntax of the LIBRARY LMPOLICY command to assign or change volume policy names is as follows:



Required Parameters

The following parameters are required:

LMPOLICY | LP
Specifies a request to set one or more of a private volume's policy names outboard in the library in which the volume resides. The library must support outboard policy management.

volser
Specifies the volume serial number of a private volume which resides in a library with outboard policy management support.

You must specify *at least one* of the following optional parameters. These parameters can be specified in *any order*:

Optional Parameters

SG={*storage_group_name* **| *RESET*}**
Specifies a construct name for the SG parameter. If the request is

successful, the construct name becomes the storage group for the volume in the TCDB and the storage group policy name in the library. If you specify the ***RESET*** keyword, you are requesting that OAM set the volume's storage group name to blanks in the TCDB, and to the default storage group policy in the library, which is also blanks.

SC={*storage_class_name* **| *RESET*}**
Specifies a construct name for the SC parameter. If the request is successful, the construct name becomes the storage class policy name for the volume in the library. If you specify the ***RESET*** keyword, you are requesting that OAM set the volume's storage class name to the default storage class policy in the library, which is blanks.

MC={*management_class_name* **| *RESET*}**
Specifies a construct name for the MC parameter. If the request is successful, the construct name becomes the management class policy name for the volume in the library. If you specify the ***RESET*** keyword, you are requesting that OAM set the volume's management class name to the default management class policy in the library, which is blanks.

DC={*data_class_name* **| *RESET*}**
Specifies a construct name for the DC parameter. If the request is successful, the construct name becomes the data class policy name for the volume in the library. If you specify the ***RESET*** keyword, you are requesting that OAM set the volume's data class name to the default data class policy in the library, which is blanks.

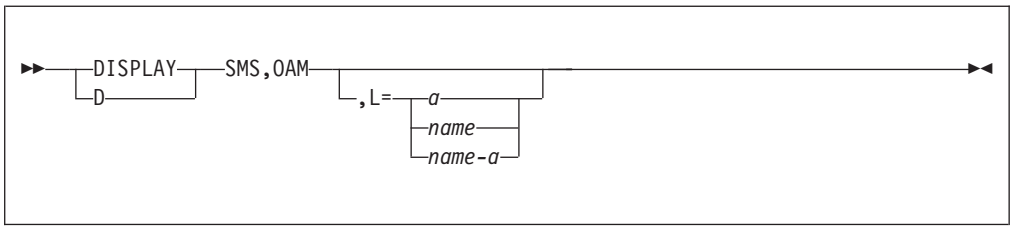
Rule: The values you specify for the SG, SC, MC, and DC policy names must meet the Storage Management Subsystem (SMS) naming convention standards:
- Alphanumeric and national characters only
- Name must begin with an alphabetic or national character ($*@#%)
- No leading or embedded blanks
- Eight characters or less

Construct Validity Checking

The SG specification must be a tape storage group that is defined in the active SMS configuration. The library in which the volume resides must be defined to that storage group. The SC, MC, and DC specification is only checked to ensure that it conforms to SMS naming convention standards. It is not checked against the current active SMS configuration. Use the D SMS, VOLUME command to ensure that correct names are assigned at the library. See “Displaying Tape Volume Status” on page 138.

Displaying OAM Status

Use the DISPLAY SMS,OAM command to display OAM address space status. The syntax of the DISPLAY SMS,OAM command follows:



OAM Displays OAM status.

,L={*a* | *name* | *name-a***}**
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=*name*), or both the console name and the display area (L=*name*-a). The *name* parameter can be an alphanumeric character string.

To display OAM status, enter the following command:

```
DISPLAY SMS,OAM
```

The following information is displayed:

```
CBR1100I OAM status:
TAPE  TOT  ONL  TOT  TOT  TOT  TOT  TOT   ONL    AVL   TOTAL
      LIB  LIB  AL   VL   VCL  ML   DRV   DRV    DRV   SCRATCH
      nnn  ooo  ppp  qqq  rrr  sss  ttttt uuuuu  vvvvv wwwwwwww

exit-name PROCESSING (ENABLED | DISABLED | BYPASSED | OPERATOR DISABLED).
```

A display of the OAM address space status is generated. If you have defined both optical and tape libraries in the SMS configuration, both optical and tape information are generated in this display. For a sample of the CBR1100I message that includes optical information, see *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support*.

The fields in the data line specify the number of each tape library resource as follows:

nnn Total number of tape libraries defined in the active SMS configuration (excluding the Peer-to-Peer Virtual Tape Server distributed libraries) that are connected to the current system (referred to in the following explanations as a connected tape library). The current system is the system on which the DISPLAY SMS,OAM command is entered. For the number of distributed libraries that are defined to the system, refer to the status line towards the bottom of the display.

ooo Number of connected tape libraries that are online (excluding the Peer-to-Peer Virtual Tape Server distributed libraries).

ppp Total number of connected automated tape library dataservers.

qqq Number of connected Virtual Tape Servers (excluding the Peer-to-Peer VTSs).

rrr Number of connected Peer-to-Peer Virtual Tape Server composite libraries.

sss Number of connected manual tape libraries.

ttttt Total number of tape drives, known to the current system, residing in the connected tape libraries. Includes tape drives in both automated tape library dataservers, Virtual Tape Servers and manual tape libraries.

uuuuu Total number of tape drives, known to the current system and residing in the connected tape libraries, that are online.

vvvvv Total number of tape drives, known to the current system and residing in the connected tape libraries, that are online and not allocated.

wwwwwwww Total number of scratch volumes of all media types in the connected tape libraries. This includes scratch volumes in the automated, manual, and virtual tape libraries.

If there are Peer-to-Peer VTS subsystems defined to the system, the following status line is displayed reflecting the number of distributed libraries that are associated with the composite libraries above:

There are also *numvdl-lib* **VTS distributed libraries defined.**

For OAM tape library installation exits, the following fields are displayed in the status messages:

exit-name The name of the exit for which status is being displayed. This can be CBRUXENT, CBRUXEJC, CBRUXCUA, or CBRUXVNL. This line is repeated for each installation exit.

ENABLED The exit is enabled and executes when the requested function is required.

DISABLED The exit is disabled due to an error or an abend in the installation exit. For CBRUXCUA, the exit is disabled for CUA PRIVATE to SCRATCH requests only.

BYPASSED The exit returned a return code 16 indicating that the request function is to continue without calling the exit for all other exits. For CBRUXVNL, either the exit returned a return code 16 indicating that it was not to be called again, or an error (or abend) occurred in the exit and the exit will not invoke.

OPERATOR DISABLED
For CBRUXENT, you have requested to disable the cartridge entry processing by issuing the LIBRARY DISABLE,CBRUXENT command.

For CBRUXVNL, you have requested to disable the volume not in library installation exit by issuing the LIBRARY DISABLE, CBRUXVNL command. The CBRUXVNL installation exit is not invoked during job processing.

You can enable an installation exit that has been OPERATOR DISABLED, using the LIBRARY RESET command or a system IPL.

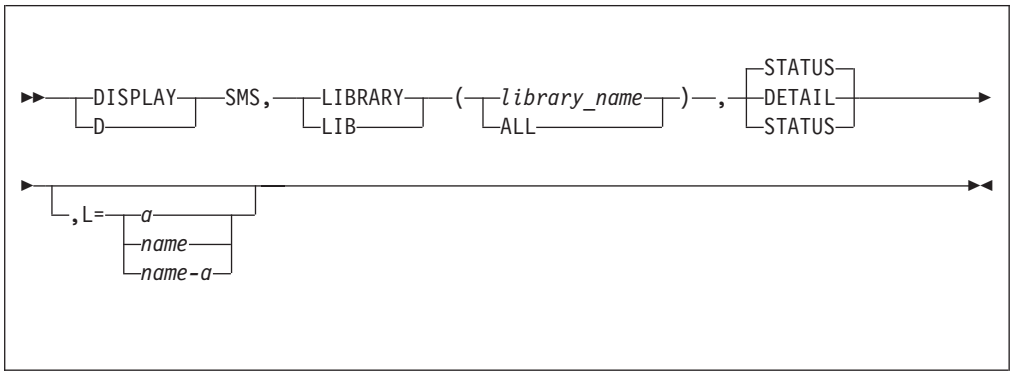
The following is a sample of DISPLAY SMS,OAM status:

```
CBR1100I OAM status:
TAPE  TOT   ONL  TOT  TOT  TOT  TOT  TOT   ONL   AVL   TOTAL
      LIB   LIB   AL   VL  VCL   ML  DRV   DRV   DRV   SCRTCH
        8     7    3    2    3    0  368   355    78     1225
There are also 6 VTS distributed libraries defined.
CBRUXCUA PROCESSING ENABLED.
CBRUXEJC PROCESSING ENABLED.
CBRUXENT PROCESSING ENABLED.
CBRUXVNL PROCESSING ENABLED.
```

Note: If both optical libraries and tape libraries are defined in the SMS configuration, the optical library information is displayed first, followed by the tape library information.

Displaying Library Status

Use the DISPLAY SMS command to display the status of the library. The syntax of the DISPLAY SMS command for library status follows:



LIBRARY | LIB(*library_name* **| ALL)**
Identifies the library to be displayed. If a library name is specified, there is one data line describing the specified library. If ALL is specified, there is one data line for each library in the configuration. To specify a library named ALL, surround it with a double set of parentheses; for example: DISPLAY SMS,LIBRARY((ALL)).

STATUS | DETAIL
The **STATUS** keyword displays the online or offline state of each tape library in the SMS configuration with respect to each system in the SMS complex. **STATUS** is the default. The **DETAIL** keyword displays specific information about the library, such as total number of slots, empty slots, number of drives, scratch volumes, and so on.

Note: A status of ONLINE does not necessarily mean that the library is operational. To determine whether a library is operational, specify the **DETAIL** keyword. See "Displaying Library Detail Status" on page 126 for information on how to obtain detailed library status.

,L={*a* **|** *name* **|** *name-a***}**
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=*name*), or both the console name and the display area (L=*name*-a). The *name* parameter can be an alphanumeric character string.

Displaying Library Connectivity

To display library connectivity for an individual library, enter the following command:

```
DISPLAY SMS,LIBRARY(library_name),STATUS
```

The following information is displayed:

```
 IGD002I 11.19.56 DISPLAY SMS
                                                 1 1 1 1 1 1 1
LIBRARY   CLASS     SYSTEM =  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
name      type                s s s s s s s s s s s s s s s s

                              1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3
LIBRARY   CLASS     SYSTEM =  7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
name      type                s s s s s s s s s s s s s s s s
```

The fields displayed in each data line are as follows:

name Name of the library for which system connectivity and online or offline status is displayed on this line

type Library type (tape or optical)

1–32 Numbers that appear after SYSTEM= indicate system IDs

s Indicates the status of the library:

- **.** Not defined
- **+** Online
- **–** Offline
- **P** Pending offline

Note: A status of ONLINE does not necessarily mean that the library is operational. To determine whether a library is operational, specify the **DETAIL** keyword. See "Displaying Library Detail Status" on page 126 for information on how to obtain detailed library status.

If you specify ALL and STATUS with the LIBRARY keyword and and you define both optical libraries and tape libraries in the SMS configuration, the status is combined in one display similar to the following.

The following is a sample of DISPLAY SMS,LIBRARY(ALL),STATUS:

```
D SMS,LIBRARY(ALL),STATUS
IGD002I 15:09:21 DISPLAY SMS 409
                                               1 1 1 1 1 1 1
LIBRARY   CLASS    SYSTEM=  1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
OPTLIB1   OPTICAL          + . . . . . .
OPTLIB2   OPTICAL          + . . . . . .
OPTLIB3   OPTICAL          + . . . . . .
ATLLIB1   TAPE             + + + . . . . . .
MTLA0001  TAPE             + - P . . . . . .
MTLA0002  TAPE             + - P . . . . . .
PCTREUSE  OPTICAL                    LIBRARY IS NOT A REAL LIBRARY
STDALONE  OPTICAL                    LIBRARY IS NOT A REAL LIBRARY

                           1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3
LIBRARY   CLASS    SYSTEM=  7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
OPTLIB1   OPTICAL          . . . . . .
OPTLIB2   OPTICAL          . . . . . .
OPTLIB3   OPTICAL          . . . . . .
ATLLIB1   TAPE             . + + . . . . . .
MTLA0001  TAPE             + - P . . . . . .
```

```
MTLA0002  TAPE             + - P . . . . . .
PCTREUSE  OPTICAL                    LIBRARY IS NOT A REAL LIBRARY
STDALONE  OPTICAL                    LIBRARY IS NOT A REAL LIBRARY
************************LEGEND*********************************
.  THE LIBRARY IS NOT DEFINED TO THE SYSTEM
+  THE LIBRARY IS ONLINE
-  THE LIBRARY IS OFFLINE
P  THE LIBRARY IS PENDING OFFLINE
P  THE LIBRARY IS PENDING OFFLINE
SYSTEM 1  = SYSTEM1    SYSTEM 2  = SYSTEM2    SYSTEM 3  = SYSTEM3
SYSTEM 4  = SYSTEM4    SYSTEM 5  = SYSTEM5    SYSTEM 6  = SYSTEM6
SYSTEM 7  = SYSTEM7    SYSTEM 8  = SYSTEM8    SYSTEM 9  = SYSTEM9
SYSTEM 10 = SYSTEM10   SYSTEM 11 = SYSTEM11   SYSTEM 12 = SYSTEM12
SYSTEM 13 = SYSTEM13   SYSTEM 14 = SYSTEM14   SYSTEM 15 = SYSTEM15
SYSTEM 16 = SYSTEM16   SYSTEM 17 = SYSTEM17   SYSTEM 18 = SYSTEM18
SYSTEM 19 = SYSTEM19   SYSTEM 20 = SYSTEM20   SYSTEM 21 = SYSTEM21
SYSTEM 22 = SYSTEM22   SYSTEM 23 = SYSTEM23   SYSTEM 24 = SYSTEM24
SYSTEM 25 = SYSTEM25   SYSTEM 26 = SYSTEM26   SYSTEM 27 = SYSTEM27
SYSTEM 28 = SYSTEM28   SYSTEM 29 = SYSTEM29   SYSTEM 30 = SYSTEM30
SYSTEM 31 = SYSTEM31   SYSTEM 32 = SYSTEM32
```

Displaying Library Detail Status

To display detailed status for all libraries, enter the following command:

```
DISPLAY SMS,LIBRARY(ALL),DETAIL
```

The following information is displayed:

```
CBR1110I OAM library status:
TAPE     LIB   DEVICE   TOT    ONL     AVL   TOTAL   EMPTY   SCRTCH   ON OP
LIBRARY  TYP   TYPE     DRV    DRV     DRV   SLOTS   SLOTS   VOLS
tlibname typ   tdevtype llll   mmmm    nnnn  oooooo  pppppp  qqqqqqq  r  s
```

The fields in the data line are defined as follows:

tlibname The name of the tape library.

typ The tape library type, as follows:

- **AL** Automated tape library
- **ML** Manual tape library
- **VL** Virtual Tape Server
- **VCL** Peer-to-Peer VTS or Virtualization Engine Composite Library
- **VDL** Peer-to-Peer VTS or Virtualization Engine Distributed Library
- **UNK** Software was unable to communicate with the tape library to obtain the tape library type.

tdevtyp For an automated tape library (including a virtual tape library), the tape library device type is displayed as DDDD-MMM, where DDDD is the device type of the library, and MMM is the model. For a composite library that is part of a multi-cluster grid, the distributed libraries should be displayed for the underlying machine and model types. “GRID” may be displayed for the composite library’s device type. For a manual tape library, “MANUAL” is displayed.

llll Total number of tape drives, known to the current system, residing in the tape library.

mmmm Total number of tape drives, known to the current system and residing in the tape library, that are online.

nnnn Total number of tape drives, known to the current system and residing in the tape library, that are online and not allocated.

oooooo Total number of storage slots in the tape library dataserver. For a library that resides in a 3584 tape library, the storage slot count is associated with a particular logical library. For other tape libraries, the storage slot count reflects the number of storage slots in the entire physical library. Also, starting with Release 1.5 of the TS7740 (3957-V0x), when the TS7740 is installed in a 3584 tape library (with ALMS), the distributed library no longer surfaces the physical slot information and instead surfaces virtual slot information.

pppppp Total number of empty slots in the tape library dataserver.

qqqqqqq Total number of scratch volumes of all media types in the tape library.

r The tape library online status, as follows:

Y Online

N Offline

P Pending offline

s The tape library operational status, as follows:

Y Operational

N Not operational

If ALL and DETAIL are specified with the LIBRARY keyword and both optical libraries and tape libraries are defined in the SMS configuration, two messages are displayed. The first display contains optical library information. The second display contains the tape library information similar to that shown below.

The following is a sample of DISPLAY SMS,LIBRARY(ALL),DETAIL command where only tape libraries are defined:

```
CBR1110I OAM library status:
TAPE       LIB  DEVICE   TOT  ONL   AVL  TOTAL  EMPTY   SCRTCH  ON  OP
LIBRARY    TYP  TYPE     DRV  DRV   DRV  SLOTS  SLOTS     VOLS
ATL1000L   AL   3494-L10   6    6     6    621     12      234   Y   Y
ATL1001L   AL   3495-L50  64   52    12  13580   6459     5266   P   Y
MTL1002L   ML   MANUAL    16   10     6      0      0      243   Y   Y
ATL20003  VCL   3494-L10  64   60    48      0      0       19   Y   Y
ATL20004  VDL   3494-L10   0    0     0    416    223        0   Y   Y
ATL20005  VDL   3494-L10   0    0     0    416    253        0   Y   Y
VTSBA008   VL   3494-L10   4    4     4   1443     31      146   Y   Y
```

To display detailed status for a particular tape library, enter the following command:

```
DISPLAY SMS,LIBRARY(library_name),DETAIL
```

The following additional information appears concerning the requested library:

```
------------------------------------------------------------------------
MEDIA       SCRATCH       SCRATCH       SCRATCH
TYPE          COUNT     THRESHOLD      CATEGORY
------------------------------------------------------------------------
DISTRIBUTED LIBRARIES:
```

```
COMPOSITE LIBRARY:
------------------------------------------------------------------------
LIBRARY ID:
CACHE PERCENTAGE USED:
OPERATIONAL STATE:  {AUTOMATED | PAUSED | MANUAL MODE}
ERROR CATEGORY SCRATCH COUNT:
SCRATCH STACKED VOLUME COUNT:
PRIVATE STACKED VOLUME COUNT:
CORRUPTED TOKEN VOLUME COUNT:
HIGH CAPACITY INPUT STATION CAPACITY:
HIGH CAPACITY OUTPUT STATION CAPACITY:
------------------------------------------------------------------
[statuslines]
```

The media type, scratch count, scratch threshold, and scratch category lines are displayed only for media that have a threshold value or a scratch count greater than zero. The scratch category counts displayed are returned from the library and reflect the number of usable scratch volumes. The counts displayed do not include volumes assigned to the software error category or volumes in the VTS that are in a delete-expire-hold state. Therefore, the scratch category counts displayed may be less than the scratch counts that appear elsewhere (for example, through ISMF).

In an MTL, the scratch counts that are displayed reflect the current counts that are maintained in the TCDB library record. This is meant to be an approximation. Without having an external source to derive the count, the scratch count from that point forward may be inaccurate if an update of this count in the catalog fails. Periodically check the scratch counts against your tape management system or the TCDB volume records. Also, for an MTL, the scratch category is not applicable and is displayed as zeros for all media types.

For a VTS composite or distributed library, the appropriate composite or distributed line will be displayed, mapping the association of the VTS to the appropriate library.

The library ID line displays the five-character ID assigned to the library.

The cache percentage used will only be displayed for a TS7720 (3957-VEx) distributed library or for a TS7680 (3958-DE2); it indicates what percentage of cache the library has utilized.

For an ATLDS, the error category displays the total number of scratch volumes that have a software error associated with them. Scratch volumes in this category will still have a use attribute of scratch; however, they are not eligible to be mounted.

The scratch stacked volume count is only displayed for a virtual tape server (VTS) library and indicates the number of available physical scratch volumes. For a Peer-to-Peer VTS subsystem, this information can be obtained by displaying the distributed libraries associated with the composite library. This count is suppressed when the library being displayed is a TS7720 (3957-VEx).

The private stacked volume count will only be displayed for a VTS library. This count indicates the number of physical stacked private volumes. For a Peer-to-Peer VTS subsystem, this information can be obtained by displaying the distributed libraries associated with the composite library. This count is suppressed when the library being displayed is a TS7720 (3957-VEx).

For a VTS library with outboard policy management support, the scratch stacked volume count and the private stacked volume count will reflect the cumulative count from all physical volume storage pools. See “Physical Volume Pooling” on page 21 for more information on physical volume pooling.

The corrupted token volume count will only be displayed for a Peer-to-Peer VTS library and indicates the number of volumes in the corrupted token category. For a Peer-to-Peer VTS subsystem, this information can be obtained by displaying the composite library. For corrective action, contact your hardware service representative.

For a VTS composite library, the operational state that is returned to the host is determined by examining the states of the underlying distributed libraries with much of the other status (for instance, I/O station-related status), being provided from the designated user interface (U/I) library. Also, since all of the drives and volumes are defined to and associated with the composite library, the display of a distributed library will show that, from a host perspective, there are no volumes and drives associated with that library. The distributed libraries should be displayed for an accurate picture of the total and empty slot counts (the slot counts associated with the composite library are zero).

The high capacity input and output station lines are only displayed for an ATLDS and only if the station has been configured.

In an ATLDS, the following status lines may appear:
- Operation degraded due to unavailable hardware resource
- Safety enclosure interlock open
- Vision system not operational
- Library manager offline
- Operator intervention required
- Library manager check 1 condition
- All storage slots full
- Out of cleaner volumes
- Dual write disabled
- Environmental alert
- Library manager switchover in progress
- Copy operations disabled
- VTS operations degraded
- Immediate Mode Copy operations deferred
- Service preparation occurring in distributed library *library_name*
- All convenience input stations empty
- All convenience output stations empty
- All convenience output stations full
- Bulk output configured
- Bulk output not configured
- Bulk input/output configured
- Bulk input/output not configured
- High capacity output station full
- Input door open
- Output door open
- Convenience I/O station installed
- Convenience I/O station Input | Output | Import mode
- Convenience I/O station empty
- Convenience I/O station full
- Single cell output facility in use for eject
- Host initiated import in process

- Host initiated export in process
- Library initiated single volume import in process
- Library is out of empty stacked volumes
- Library has insufficient resources to continue mount processing
- Library supports import/export
- Library supports outboard policy management
- Forced Pause Occurred
- Grid Links Degraded
- Limited Cache Free Space - Warning State
- Out of Cache Resources - Critical State
- Library supports logical WORM
- Copy operations disabled by operator command
- Library enabled for scratch allocation assistance

Note: The" Library supports outboard policy management" and "Library enabled for scratch allocation assistance" status lines are displayed only if both the library and the host are enabled for that function.

The following is sample output of the DISPLAY SMS,LIBRARY(LIBVTS1),DETAIL command:

```
CBR1110I OAM library status:
TAPE      LIB  DEVICE     TOT   ONL   AVL   TOTAL   EMPTY   SCRTCH   ON  OP
LIBRARY   TYP  TYPE       DRV   DRV   DRV   SLOTS   SLOTS     VOLS
LIBVTS1   VL   3494-L10   128    100   50    1443     800      146   Y   Y
------------------------------------------------------------------------------
MEDIA       SCRATCH          SCRATCH         SCRATCH
TYPE          COUNT        THRESHOLD        CATEGORY
MEDIA1           16               25            0011
MEDIA2          130               25            0012
------------------------------------------------------------------------------
LIBRARY ID:  22222
OPERATIONAL STATE: AUTOMATED
ERROR CATEGORY SCRATCH COUNT:                 12
SCRATCH STACKED VOLUME COUNT:                243
PRIVATE STACKED VOLUME COUNT:                400
------------------------------------------------------------------------
Library supports import/export.
Library supports outboard policy management.
```

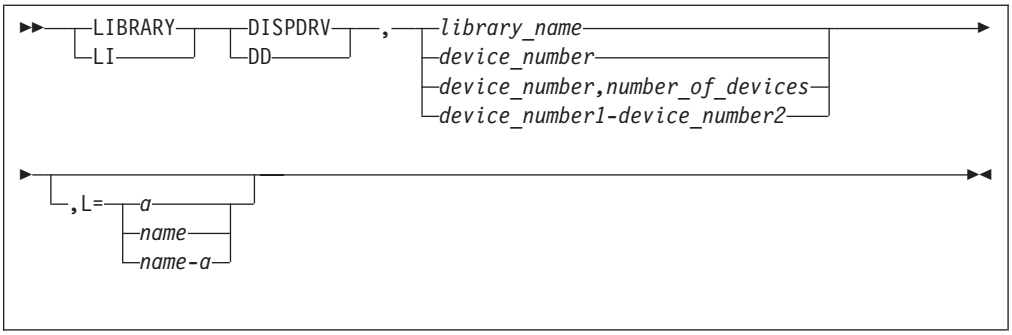
Displaying Tape Drive Status

Use the MVS LIBRARY DISPDRV command to display the status of any of the following combination of drives:

- All tape drives in a tape library
- A single tape drive
- A number of tape drives
- A range of tape drives

You can also use the MVS DISPLAY UNIT command, the MVS DEVSERV command or the JES3 *I,D command to display the status of tape drives within a tape library. See *z/OS MVS System Commands* for additional information on the specific MVS command.

The syntax of the LIBRARY DISPDRV command to display tape drive status is as follows:



DISPDRV | DD
Specifies a request to display tape drive status.

library_name
Specifies the name of the tape library whose tape drives are to be displayed. However, the maximum number of tape drives that is displayed does not exceed 2048.

device_number
Specifies the MVS tape device number to be displayed.

number_of_devices
Specifies the number of devices to be displayed. However, the maximum number of tape drives that is displayed does not exceed 2048.

device_number1
Specifies the first MVS tape device number to be displayed.

device_number2
Specifies the last MVS tape device number to be displayed. However, the maximum number of tape drives that is displayed does not exceed 2048.

,L={*a* **|** *name* **|** *name-a***}**
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=*name*), or both the console name and the display area (L=*name*-a). The *name* parameter can be an alphanumeric character string.

To display tape drive status, enter the following command:

```
LIBRARY DISPDRV,(library_name)
```

The following information is displayed:

```
CBR1220I Tape drive status:
DRIVE     DEVICE  LIBRARY  ON   OFFREASN     LM   ICL      ICL   MOUNT
NUM       TYPE    NAME          LI  OP  PT   AV   CATEGRY  LOAD  VOLUME
devnum   devtyp  libname    b    c   d   e    f   ggggggg     h  mntvol
```

The fields in the data line are defined as follows:

devnum The tape device number.

devtyp Name of the tape device type as follows:

3480 Reads and writes using 18-track recording technique on MEDIA1 cartridges. Not capable of compaction.

3480x Reads and writes using 18-track recording technique on MEDIA1 cartridges. Capable of compaction.

3490 Reads 18-track and 36-track recording technique on MEDIA1 and MEDIA2 cartridges. Writes using 36-track recording technique on either MEDIA1 or MEDIA2 cartridges. Capable of compaction.

3590-1 Reads and writes using 128-track recording technique on MEDIA3 or MEDIA4 cartridges. Capable of compaction.

3590-E Reads 128-track and 256-track recording technique on MEDIA3 and MEDIA4 cartridges. Writes using 256-track recording technique on either MEDIA3 or MEDIA4 cartridges. Capable of compaction. 3590-E is used in this display to represent the 3590-E1*x* family of 3590 tape devices and is not a system defined esoteric.

3590-H Reads 128-track, 256-track, and 384-track recording technique on MEDIA3 and MEDIA4 cartridges. Writes using 384-track recording technique on either MEDIA3 or MEDIA4 cartridges. Capable of compaction. 3590-H is used in this display to represent the 3590-H1*x* family of 3590 tape devices and is not a system defined esoteric.

3592-J Reads and writes using the enterprise format 1 (EFMT1) recording technology on MEDIA5, MEDIA6, MEDIA7, and MEDIA8 cartridges. Capable of compaction. 3592-J is used in the display to represent the 3592 Model J1A tape device and is not a system defined esoteric.

3592-2 Reads and writes Enterprise Format 1 (EFMT1) and Enterprise Format 2 (EFMT2) recording techniques on MEDIA5, MEDIA6, MEDIA7, and MEDIA8 cartridges. Reads and writes Enterprise Format 2 (EFMT2) recording technique on MEDIA9 and MEDIA10 cartridges. Capable of compaction. 3592-2 is used in this display to represent the 3592 Model E05 devices and is not a system defined esoteric.

3592-2E Reads and writes Enterprise Format 1 (EFMT1), Enterprise Format 2 (EFMT2), and Enterprise Encrypted Format 2 (EEFMT2) recording techniques on MEDIA5, MEDIA6, MEDIA7, and MEDIA8 cartridges. Reads and writes Enterprise Format 2 (EFMT2) and Enterprise Encrypted Format 2 (EEFMT2) recording techniques on MEDIA9 and MEDIA10 cartridges. Capable of compaction. 3592-2E is used in this display to represent the encryption-capable 3592 Model E05 devices and is not a system defined esoteric.

3592-3E Reads and writes Enterprise Format 2 (EFMT2), Enterprise Encrypted Format 2 (EEFMT2), Enterprise Format 3 (EFMT3), and Enterprise Encrypted Format 3 (EEFMT3) recording techniques on MEDIA5, MEDIA6, MEDIA7,

MEDIA8, MEDIA9, and MEDIA10 cartridges. Also reads Enterprise Format 1 (EFMT1) formatted cartridges on MEDIA5, MEDIA6, MEDIA7, and MEDIA8 cartridges. Capable of compaction. 3592-3E is used in this display to represent the 3592 Model E06 devices and is not a system-defined esoteric.

3592-4E Reads and writes Enterprise Format 3 (EFMT3) and Enterprise Encrypted Format 3 (EEFMT3) formatted cartridges on MEDIA9 and MEDIA10 cartridges and Enterprise Format 4 (EFMT4) and Enterprise Encrypted Format 4 (EEFMT4) formatted cartridges on MEDIA9, MEDIA10, MEDIA11, MEDIA12, and MEDIA13 cartridges. Also, capable of reading Enterprise Format 2 (EFMT2) and Enterprise Encrypted Format 2 (EEFMT2) formatted cartridges MEDIA9 and MEDIA10 cartridges. Capable of compaction. 3592-4E is used in this display to represent the 3592 Model E07 devices and is not a system-defined esoteric.

3400 This is a 3400 magnetic tape drive.

UNKNOWN Tape device is not recognized.

Whether a device defined through HCD is real or emulated is not determined until successful communication to the device has been made. Until successful communication has been made, the device type displayed will reflect the device type defined through HCD. Thus for emulated devices, beginning with the 3590 Model E, the device type displayed reflects the emulated device type defined through HCD rather than the real underlying device type (3590-E, 3590-H, 3592-J, 3592-2, 3592-2E 3592-3E, and 3592-4E). Once successful communication to the device has been established, the device type displayed will reflect the real underlying device type.

Also, on system levels that support the emulated device type defined through HCD, but do not support the real underlying device type (such as the 3590 Model E, 3590 Model H, 3592 Model J, 3592 Model E05, 3592 Model E06, or 3592 Model E07), the device type displayed reflects the emulated device type that is defined through HCD.

libname Name or ID of the library in which the tape drive resides. For a stand-alone tape drive (nonlibrary-resident drive), this field contains '--N/A--'.

The library name is stored during OAM initialization (or during library VARY processing) for those devices in the library returned by device services. If, after this process, devices in a subsystem are subsequently varied online, the library name displayed may reflect the LIBRARY-ID. As long as the correct library name or library ID is displayed, having the LIBRARY-ID appear in the display should not pose a problem. See "Creating the Hardware Configuration" on page 84 for more information.

b Tape drive status.

Y Online.

N Offline.

P Pending Offline.

Note: A device can be offline with none of the reason indicators below being set. For example, if a device goes through IOS recovery and the device ends up getting boxed, the reason indicator may not be set.

c Tape drive is offline for library reasons:
Y The library in which the tape drive resides is offline.
N The library in which the tape drive resides is online.
— The tape drive does not reside in a tape library.

d Tape drive is offline for operator reasons:
Y You have varied the tape drive offline, or you have defined the device offline at initialization.
N You have varied the tape drive online.

e Tape drive is offline for path reasons:
Y All channel paths to the tape drive are offline.
N At least one channel path to the drive is online.

f Library Manager device availability status:
A The tape drive is available at the Library Manager.
U The tape drive is unavailable at the Library Manager.
— The tape drive does not reside in an automated tape library, or the library manager drive status is unknown.

gggggggg Cartridge loader scratch media category:

MEDIA1 The cartridge loader of the tape drive is set to load with MEDIA1 scratch tapes if available.

MEDIA2 The cartridge loader of the tape drive is set to load with MEDIA2 scratch tapes if available.

MEDIA3 The cartridge loader of the tape drive is set to load with MEDIA3 scratch tapes if available.

MEDIA4 The cartridge loader of the tape drive is set to load with MEDIA4 scratch tapes if available.

MEDIA5 The cartridge loader of the tape drive is set to load with MEDIA5 scratch tapes if available.

MEDIA6 The cartridge loader of the tape drive is set to load with MEDIA6 scratch tapes if available.

MEDIA7 The cartridge loader of the tape drive is set to load with MEDIA7 scratch tapes if available.

MEDIA8 The cartridge loader of the tape drive is set to load with MEDIA8 scratch tapes if available.

MEDIA9 The cartridge loader of the tape drive is set to load with MEDIA9 scratch tapes if available.

MEDIA10 The cartridge loader of the tape drive is set to load with MEDIA10 scratch tapes if available.

| **MEDIA11** The cartridge loader of the tape drive is set to load with MEDIA11 scratch tapes if available.

MEDIA12 The cartridge loader of the tape drive is set to load with MEDIA12 scratch tapes if available.

MEDIA13 The cartridge loader of the tape drive is set to load with MEDIA13 scratch tapes if available.

X'xxxx' The hexadecimal value of the assigned category is not recognized by this system.

NONE For devices in an ATLDS, no category is assigned to the cartridge loader, and the cartridge loader is emptied. For devices in an MTL, indexing does not occur on this system; however, indexing may occur on other systems that own the volumes in the cartridge loader.

ANY The cartridge loader may be loaded with any valid media type. This is only applicable for devices that reside in an MTL.

--N/A-- The tape drive does not reside in an automated tape library, or the library manager drive status is unknown.

h Volume loaded in the cartridge loader.

Y At least one volume has been loaded in the cartridge loader.

N No volume has been loaded in the cartridge loader.

— The tape drive does not reside in an automated tape library dataserver, or the library manager drive status is unknown.

mntvol If there is no mounted volume, or this is not a library-resident drive, or the library manager drive status is unknown, then this field is left blank.

Additional information may appear containing one or more of the following messages:

- Starting device number is not a tape device.
- Number of tape devices requested exceeds 2048; 2048 displayed.
- Number of tape devices requested exceeds the number available.
- No tape devices within display criteria.

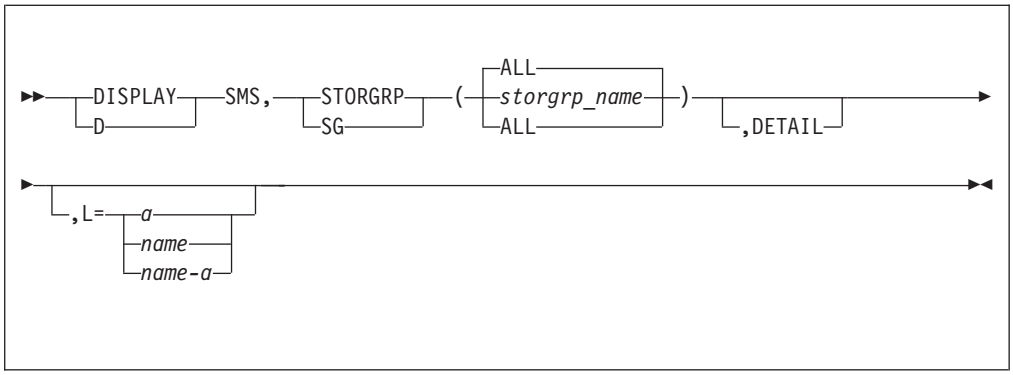
The following is a sample display of the LIBRARY DISPDRV,(ATLF4017) command:

```
CBR1220I Tape drive status:
DRIVE  DEVICE   LIBRARY ON  OFFREASN  LM  ICL      ICL   MOUNT
NUM    TYPE     NAME        LI OP PT  AV  CATEGRY  LOAD  VOLUME
0FC0   3490     ATLF4017 Y  N  N  N   A   NONE     N     TST211
0FC1   3490     ATLF4017 N  N  Y  N   A   NONE     N
0FD0   3590-E   ATLF4017 Y  N  N  N   A   NONE     N     TST256
0FD1   3590-E   ATLF4017 Y  N  N  N   A   NONE     N
0FD2   3590-E   ATLF4017 Y  N  N  N   A   NONE     N
0FD3   3590-E   ATLF4017 Y  N  N  N   A   NONE     N
0FF0   3590-H   ATLF4017 Y  N  N  N   A   NONE     N     TST384
0FF1   3590-H   ATLF4017 Y  N  N  N   A   NONE     N
0FF2   3590-H   ATLF4017 Y  N  N  N   A   NONE     N
0FF3   3590-H   ATLF4017 Y  N  N  N   A   NONE     N
0FE0   3590-1   ATLF4017 Y  N  N  N   A   NONE     N     TST500
```

```
0FE1   3590-1   ATLF4017 Y  N  N  N   A   NONE     N
0FE2   3590-1   ATLF4017 Y  N  N  N   A   NONE     N
0FE3   3590-1   ATLF4017 Y  N  N  N   A   NONE     N
```

Displaying Storage Group Status

Use the DISPLAY command to display storage group status. The syntax of the DISPLAY command follows:



STORGRP | SG(*storgrp_name* **|** *ALL***)**
If *storgrp_name* is specified, the status of the requested tape storage group is displayed. If *storgrp_name* is omitted, then *ALL* is the default and the status of all storage groups within the active configuration is displayed.

,DETAIL Displays the tape libraries associated with the tape storage groups.

,L={*a* **|** *name* **|** *name-a***}**
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=*name*), or both the console name and the display area (L=*name*-a). The *name* parameter can be an alphanumeric character string.

To display status for an individual storage group, enter the following command:

```
DISPLAY SMS,STORGRP(storgrp_name),DETAIL
```

The following information is displayed:

```
CBR1130I OAM storage group status:
TAPE     LIBRARY
STORGRP  NAMES
sgname   libname1 libname2 libname3 libname4
         libname5 libname6 libname7 libname8
```

The fields displayed in each data line are as follows:

sgname Name of the tape storage group

libname1 Names of the one to eight tape libraries associated with the storage group

The following is sample output of the DISPLAY SMS,STORGRP(ALL),DETAIL command:

```
 CBR1130I OAM storage group status:
TAPE     LIBRARY
STORGRP  NAMES
TAPESG1  TAPELIB1
TAPESG2  TAPELIB1  TAPELIB2
TAPESG3  TAPELIB1  TAPELIB2  TAPELIB3
```

If ALL and DETAIL are specified with the STORGRP keyword and both object storage groups and tape storage groups are defined in the SMS configuration, object storage group information is displayed first followed by the tape storage group information similar to that shown in the sample above.

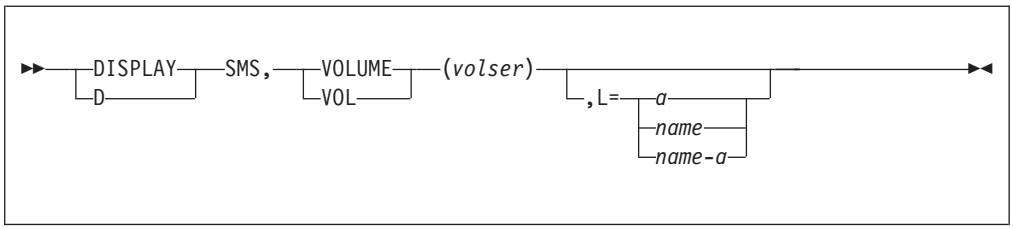
If ALL is specified but DETAIL is *not* specified with the STORGRP keyword and both object storage groups and tape storage groups are defined in the SMS configuration, then the status is combined in one display similar to that shown below.

The following is sample output from the DISPLAY SMS,STORGRP(ALL) command:

```
IGD002I   11.19.56    DISPLAY SMS
                                          1 1 1 1 1 1 1
STORGRP    TYPE       SYSTEM= 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6
BACKUP01   OBJECTB            + . . . . . . . . . . . . . . .
OBJSG01    OBJECT             + . . . . . . . . . . . . . . .
OBJSG02    OBJECT             + . . . . . . . . . . . . . . .
OBJSG03    OBJECT             + . . . . . . . . . . . . . . .
TAPESG1    TAPE               + + + . . . . . . . . . . . . .
TAPESG2    TAPE               . + + . . . . . . . . . . . . .
TAPESG3    TAPE               . - D . . . . . . . . . . . . .
TSODASD    POOL               + + + + + - - + . . . . . . . .

                              1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3
STORGRP    TYPE       SYSTEM= 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
BACKUP01   OBJECTB            . . . . . . . . . . . . . . . .
OBJSG01    OBJECT             . . . . . . . . . . . . . . . .
OBJSG02    OBJECT             . . . . . . . . . . . . . . . .
OBJSG03    OBJECT             . . . . . . . . . . . . . . . .
TAPESG1    TAPE               + + + . . . . . . . . . . . . .
TAPESG2    TAPE               . + + . . . . . . . . . . . . .
TAPESG3    TAPE               . - D . . . . . . . . . . . . .
TSODASD    POOL               + + + + + - - + . . . . . . . .
*****************************LEGEND*********************************
.  THE STORAGE GROUP OR VOLUME IS NOT DEFINED TO THE SYSTEM
+  THE STORAGE GROUP OR VOLUME IS ENABLED
-  THE STORAGE GROUP OR VOLUME IS DISABLED
*  THE STORAGE GROUP OR VOLUME IS QUIESCED
D  THE STORAGE GROUP OR VOLUME IS DISABLED FOR NEW ALLOCATIONS ONLY
Q  THE STORAGE GROUP OR VOLUME IS QUIESCED FOR NEW ALLOCATIONS ONLY
SYSTEM 1  = SYSTEM1    SYSTEM 2  = SYSTEM2    SYSTEM 3  = SYSTEM3
SYSTEM 4  = SYSTEM4    SYSTEM 5  = SYSTEM5    SYSTEM 6  = SYSTEM6
SYSTEM 7  = SYSTEM7    SYSTEM 8  = SYSTEM8    SYSTEM 9  = SYSTEM9
SYSTEM 10 = SYSTEM10   SYSTEM 11 = SYSTEM11   SYSTEM 12 = SYSTEM12
SYSTEM 13 = SYSTEM13   SYSTEM 14 = SYSTEM14   SYSTEM 15 = SYSTEM15
SYSTEM 16 = SYSTEM16   SYSTEM 17 = SYSTEM17   SYSTEM 18 = SYSTEM18
SYSTEM 19 = SYSTEM19   SYSTEM 20 = SYSTEM20   SYSTEM 21 = SYSTEM21
SYSTEM 22 = SYSTEM22   SYSTEM 23 = SYSTEM23   SYSTEM 24 = SYSTEM24
SYSTEM 25 = SYSTEM25   SYSTEM 26 = SYSTEM26   SYSTEM 27 = SYSTEM27
SYSTEM 28 = SYSTEM28   SYSTEM 29 = SYSTEM29   SYSTEM 30 = SYSTEM30
SYSTEM 31 = SYSTEM31   SYSTEM 32 = SYSTEM32
```

Displaying Tape Volume Status

Use the DISPLAY command to display tape volume status. The syntax of the DISPLAY command follows:



VOLUME | VOL(*volser*)
Displays the status of the requested tape volume. There is no option to display all tape volumes known to the system; however, you may use ISMF panels to display a list of tape volumes.

Specifying *volser* displays the status of the requested tape volume.

,L={*a* | *name* | *name-a*}
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=*name*), or both the console name and the display area (L=*name*-a). The *name* parameter can be an alphanumeric character string.

To display tape volume status, enter the following command:

```
DISPLAY SMS,VOLUME(volser)
```

The following information is displayed:

```
CBR1180I OAM tape volume status:
VOLUME    MEDIA     STORAGE   LIBRARY   USE  W   C   SOFTWARE  LIBRARY
          TYPE      GROUP     NAME      ATR  P   P   ERR STAT  CATEGORY
volser    medtype   sgname    libname   u    x   y   errstat   category
-------------------------------------------------------------------------
RECORDING TECH:     aaaaaaaaaa         COMPACTION:         bbbbbbbbbb
SPECIAL ATTRIBUTE:  cccccccccc         ENTER/EJECT DATE:   hhhhhhhhhh
CREATION DATE:      ddddddddddd        EXPIRATION DATE:    eeeeeeeeee
LAST MOUNTED DATE:  fffffffffff        LAST WRITTEN DATE:  gggggggggg
SHELF LOCATION:     shelfloc
OWNER:  owner information
LM SG:  iiiiiiii  LM SC:  jjjjjjjj  LM MC:  kkkkkkkk  LM DC:  llllllll
-------------------------------------------------------------------------
[statuslines]
```

The fields displayed in each data line are as follows:

volser Volume serial number of the requested tape volume.

medtype Media type of the tape volume, as follows:

MEDIA1	IBM Cartridge System Tape
MEDIA2	IBM Enhanced Capacity Cartridge System Tape
MEDIA3	IBM High Performance Cartridge Tape
MEDIA4	IBM Extended High Performance Cartridge Tape
MEDIA5	IBM Enterprise Tape Cartridge
MEDIA6	IBM Enterprise WORM Tape Cartridge
MEDIA7	IBM Enterprise Economy Tape Cartridge

MEDIA8 IBM Enterprise Economy WORM Tape Cartridge

MEDIA9 IBM Enterprise Extended Tape Cartridge

MEDIA10 IBM Enterprise Extended WORM Tape Cartridge

MEDIA11 IBM Enterprise Advanced Tape Cartridge

MEDIA12 IBM Enterprise Advanced WORM Tape Cartridge

MEDIA13 IBM Enterprise Advanced Economy Tape Cartridge

UNKNOWN No media type specified

INVALID Media type specified is not valid

sgname Name of the storage group to which the tape volume belongs.

libname Name of the library in which the tape volume resides. If the volume resides outside a library, this field contains SHELF.

u Tape volume use attribute, as follows:

P Private use attribute

S Scratch use attribute

x Tape volume write protection status, as follows:

Y Write protected

N Not write protected

blank Write protection status unknown

y Tape volume checkpoint status, as follows:

Y Secure checkpoint volume

N Not a secure checkpoint volume

blank Checkpoint status unknown

errstat The software recorded volume error status, as follows:

ANSILAB ANSI label not supported.

CHECKPT Attempt to access secure checkpoint volume.

DAMAGED Cartridge is physically damaged and leader block may be missing.

DUPMOUNT Volume with same *volser* already mounted.

EXTLABEL External label missing or unreadable.

INACCESS Volume inaccessible in library.

INTLABEL Volume label cannot be read.

LABTYPE Invalid volume label type, neither standard nor ANSI.

LNGTHERR Cartridge length exceeds IBM supported maximum.

MEDIAMNT Mounted media does not match the type specified for a scratch volume mount request.

MED2MNT MEDIA2 cartridge mounted on a nonMEDIA2 capable device.

MISSING Volume not in assigned location in library.

NOERROR No errors detected.

NOMATCH Internal and external labels do not match.

NOTINLIB Volume not in library manager inventory.

PASSPROT Attempt to access password-protected volume.

RACFPROT Attempt to access SAF/RACF-protected volume.

REJTMS Volume rejected by the tape management system.

REJUSER Volume rejected by the user's DCB exit or label editing routine.

TRKCMPAT Media was mounted whose recording technology is incompatible with the device.

UNEXPIR Attempt to write over unexpired data.

UNFORMAT Volume has not been formatted with servo tracks and should be returned to the media manufacturer.

UNKNOWN Volume error status unknown.

WRITPROT Attempt to write on write-protected volume.

WRONGVOL Library mounted different volume when this volume was requested.

category Library category to which the volume is assigned, as follows:

BADTOKEN The library has determined that the tokens associated with this volume have been corrupted.

BLKEJECT Volume is to be ejected to the bulk output station.

CONVEJCT Volume is to be ejected to a convenience output station.

ERROR An error has been detected by software during an attempt to mount this scratch volume.

EXPORTED The logical volume has been exported onto a stacked volume, but export completion processing has not occurred at the host.

EXPPEND The export of the logical volume is pending in the library.

INSERT Volume has been put into the library, but has not yet been processed by software cartridge entry.

MANEJECT Volume has been manually removed from the library. Volumes in this category are not processed by the host and remain in this category.

NONE The volume does not reside in an automated tape library.

NOTAVAIL OAM display processor was unable to obtain the volume data record from the tape library.

PRIVATE Volume contains useful data and may be requested only by specific *volser* reference.

SCRMED1 Volume contains no useful data and may be

requested only by nonspecific *volser* reference. The volume resides in the library category for scratch volumes of media type MEDIA1.

SCRMED2 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library category for scratch volumes of media type MEDIA2.

SCRMED3 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA3.

SCRMED4 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA4.

SCRMED5 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA5.

SCRMED6 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA6.

SCRMED7 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA7.

SCRMED8 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA8.

SCRMED9 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA9.

SCRMED10 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA10.

SCRMED11 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA11.

SCRMED12 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The volume resides in the library manager category for scratch volumes of media type MEDIA12.

SCRMED13 Volume contains no useful data and may be requested only by nonspecific *volser* reference. The

| | | volume resides in the library manager category for scratch volumes of media type MEDIA13.

| | **UNKNOWN** | Hardware category is not recognized by software.

aaaaaaaaaa Recording technology used to record the tape:

| | **18 TRACK** | 18-track recording mode

| | **36 TRACK** | 36-track recording mode

| | **128 TRACK** | 128-track recording mode

| | **256 TRACK** | 256-track recording mode

| | **384 TRACK** | 384-track recording mode

| | **EFMT1** | Enterprise Format 1 recording mode

| | **EFMT2** | Enterprise Format 2 recording mode

| | **EEFMT2** | Enterprise Encrypted Format 2 recording mode

| | **EFMT3** | Enterprise Format 3 recording mode

| | **EEFMT3** | Enterprise Encrypted Format 3 recording mode

| | **EFMT4** | Enterprise Format 4 recording mode

| | **EEFMT4** | Enterprise Encrypted Format 4 recording mode

| | **UNKNOWN** | Recording mode not specified

| | **INVALID** | Recording technology specified is invalid

bbbbbbbbbb Compaction mode set during recording:

| | **YES** | Compaction

| | **NO** | No compaction

| | **UNKNOWN** | Compaction not specified

| | **INVALID** | Compaction specified is invalid

ccccccccc Volume special attribute:

| | **RDCOMPAT** | Volume used for read-only. All read-compatible devices are eligible.

| | **NONE** | Volume has no special attribute.

| | **INVALID** | Special attribute specified is invalid.

ddddddddd Date the volume record in the TCDB catalog was initially created, in ISO date format YYYY-MM-DD.

eeeeeeeee Expiration date of the tape volume, in ISO date format YYYY-MM-DD.

fffffffff Date the volume was last mounted, in ISO date format YYYY-MM-DD.

ggggggggg Date a data set was last opened for output on the volume, in ISO date format YYYY-MM-DD.

hhhhhhhhh Date the volume was last entered into or ejected from a tape library, in ISO date format YYYY-MM-DD.

shelfloc Shelf location where the tape volume is stored if the volume

resides outside a library; otherwise, this is the shelf location where the volume is stored when it is ejected from the library.

owner information
Owner information associated with the tape volume.

OAM displays the following four fields only if the library supports outboard policy management. These fields display the library manager policy names. If any of the storage group, storage class, management class, or data class constructs are set to the default policy names, then blanks appear for the policy names. If an error occurs and the library manager policy names cannot be obtained for the volume, **NOTAVAIL** shows in the library manager policy name fields.

iiiiiii Library manager storage group name.

jjjjjjj Library manager storage class name.

kkkkkkkk Library manager management class name.

lllllll Library manager data class name.

status lines Additional tape volume status messages, as follows:
- Audit operation queued in host
- Audit operation queued in library
- Audit operation in progress in library
- Eject operation queued in host
- Eject/Export operation queued in library
- Eject/Export operation in progress in library
- Mount operation queued in library
- Mount operation in progress in library
- Volume mounted on library-resident drive
- Demount operation queued in library
- Demount operation in progress in library
- Volume inaccessible in library
- Volume misplaced in library
- External label missing or unreadable
- Volume used during manual mode
- Logical volume
- Volume is cache resident
- Valid copy in each distributed library
- Dual copy exists in the library
- Volume is WORM tape
- Volume is logical WORM

Notes:

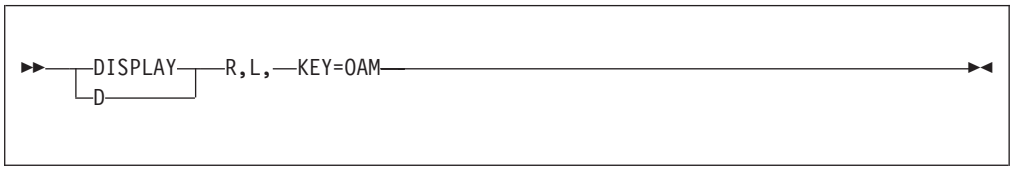
1. The “Dual copy exists in the library” status line is only displayed for the stand-alone VTS. Although a dual copy might exist in each PtP VTS distributed library, this status line will not be displayed.
2. To differentiate between logical and physical WORM, "Volume is WORM tape" will be displayed for a physical WORM volume and "Volume is logical WORM" will be displayed for a logical WORM volume. In addition to this, since a logical volume will retain its WORM state (at the library) until the volume is reused and written from load point; this status line can also be displayed for a scratch volume, reflecting the past usage of the volume.

The following is sample output of the DISPLAY SMS,VOLUME(LOG001) command:

```
CBR1180I OAM tape volume status:
VOLUME   MEDIA   STORAGE   LIBRARY   USE   W   C   SOFTWARE    LIBRARY
         TYPE    GROUP     NAME      ATR   P   P   ERR  STAT   CATEGORY
LOG001   MEDIA2  TAPESG2   LIBVTS1   P     N   N   NOERROR     PRIVATE
-------------------------------------------------------------------------
RECORDING TECH:     36 TRACK         COMPACTION:         NO
SPECIAL ATTRIBUTE:  NONE             ENTER/EJECT  DATE:  2008-05-08
CREATION DATE:      2008-05-08       EXPIRATION DATE:    2009-12-31
LAST MOUNTED DATE:  2011-05-08       LAST WRITTEN DATE:  2011-05-08
SHELF LOCATION:
OWNER:  JEAN SCHILTZ, 9032/2648, IBM CORPORATION, TUCSON, AZ
LM SG:  TAPESG2   LM SC:  TAPESC2   LM MC:  TAPEMC2   LM DC:  MEDIA2DC
-------------------------------------------------------------------------
```

Displaying outstanding OAM messages

Use the DISPLAY command to display the message identification numbers and texts of all immediate action messages, eventual action messages, and messages waiting for replies that OAM has issued. The syntax of the DISPLAY command follows:

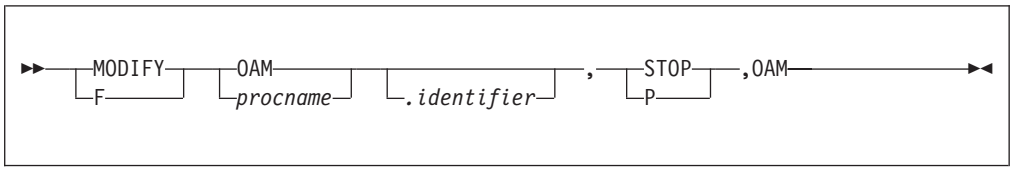


To display outstanding OAM messages, enter the following command:

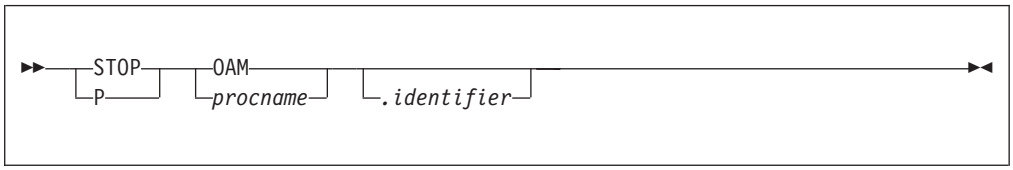
```
DISPLAY R,L,KEY=OAM
```

Stopping OAM

Use the F OAM,STOP command to stop OAM processing. The syntax of the F OAM,STOP command follows:



The syntax of the STOP OAM command to stop OAM is:



To stop OAM, enter the following command:

```
F OAM,STOP,OAM
```

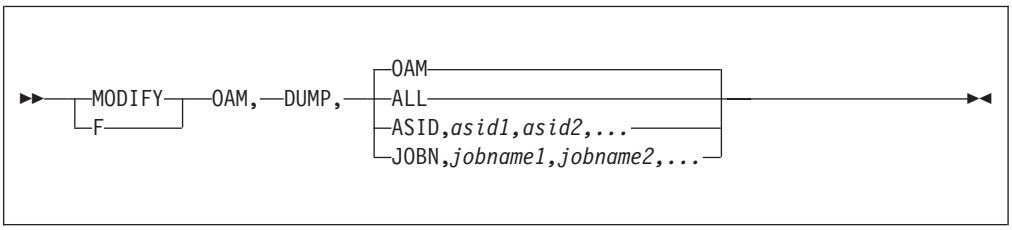
The system displays the following messages indicating OAM termination status.

```
CBR0098I  OAM termination starting.

CBR1000I  OAM STOP command execution scheduled.

CBR0099I  OAM termination completed.
```

Capturing OAM Diagnostic Data

OAM uses SVC dumps as a diagnostic tool for system hangs or performance problems. To capture this data, issue the DUMP command after the problem has been recreated or at the time of failure. OAM provides a streamlined version of the previous DUMP command. The F OAM,DUMP,(*operands*) command automatically collects all the pertinent data needed for diagnostic purposes without you having to key in all the correct parameters.

The syntax of the F OAM,DUMP command follows:



Note: OAM is the default name of the cataloged procedure in your SYS1.PROCLIB. If a name other than OAM is used for the cataloged procedure, use that name in the DUMP statement. For example, MODIFY *procname_name*,DUMP,OAM.

OAM
Specifies a request to schedule an SVC dump for the OAM address space. If the first operand after the **DUMP** verb is either **OAM** or blank, OAM schedules an SVC dump for the OAM address space.

ALL
An SVC dump is scheduled for the OAM address space and any address spaces which currently have work queued to the OAM address space, up to 14 address spaces in addition to OAM.

If the first operand after the DUMP verb is ALL, OAM scans all queues to identify address spaces that are not the OAM address space. OAM scans until all queues are searched or 14 address spaces are found. OAM then schedules an SVC dump for the OAM address space and up to 14 other address spaces that currently have work queued in the OAM address space.

ASID (address space identifier),*asid1,asid2,asid3...*
An SVC dump is scheduled for the OAM address space and any address spaces specified after the ASID operand separated by commas. A valid ASID is a 1 to 4 hexadecimal (0–9, A–F) value. From one to 14 ASIDs can be specified with the ASID operand. If more than 14 ASIDs are specified, the first 14 will be used.

If the first operand after the DUMP verb is ASID, OAM validates that any ASIDs specified following the ASID operand are valid hexadecimal characters (0–9, A–F). If they are valid, OAM, schedules an SVC dump for the OAM address space and any additional address spaces specified (up to 14 address spaces in addition to OAM).

JOBN (job name),*jobname1,jobname2,jobname3...*

An SVC dump is scheduled for the OAM address space and any job spaces specified after the JOBN operand separated by commas. A valid job name is a 1 to 8 character value of the following character set:

- Alphanumeric characters (A–Z, 0–9)
- National characters (&, $, @)
- Wildcard characters (*, ?) where '*' can stand for 0 or more characters, up to the maximum length of the job name string (8) and '?' can stand for one character.

From one to 14 job names can be specified with the JOBN operand. If more than 14 job names are specified, the first 14 will be used.

If the first operand after the **DUMP** verb is **JOBN**, OAM validates that any job names specified following the **JOBN** operand contain the valid character set. If they are valid, OAM schedules an SVC dump for the OAM address space and any job names specified (up to 14 jobs in addition to OAM).

OAM issues messages for any errors found in the DUMP command at SVC scheduling time and at SVC DUMP data capture completion. For more information concerning these messages, see *z/OS MVS System Messages, Vol 4 (CBD-DMO)*.

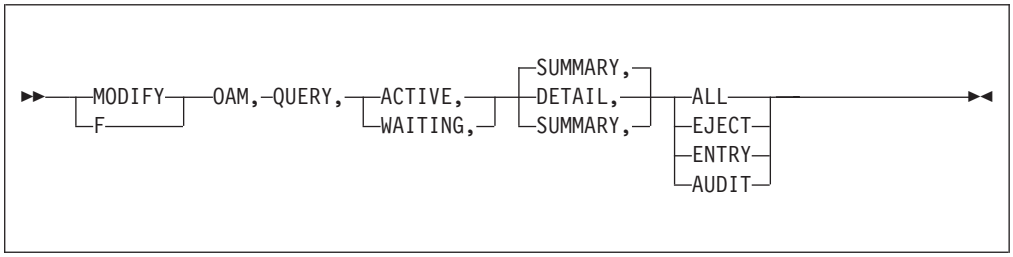
Querying Active and Waiting OAM Tape Library Requests

Use the QUERY command to query the status of active and waiting requests that have been processed in the OAM address space. This query includes only tape library eject, entry, and audit requests. The QUERY command can display the following requests:

- Summary of active tape library requests
- Summary of waiting tape library requests
- Detailed information concerning active tape library requests
- Detailed information concerning waiting tape library requests

Related reading: This publication discusses only information regarding active and waiting tape library requests. For information about using this command with optical and object tape requests, see *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support*.

The syntax of the F OAM,QUERY command follows:



Note: OAM is the default name of the cataloged procedure in your SYS1.PROCLIB. If a name other than OAM is used for the cataloged procedure, use that name in the QUERY statement. For example, MODIFY *procname_name*,QUERY,ACTIVE,SUMMARY.

The following keyword descriptions relate to the QUERY command:

QUERY | Q
Specifies a request to display information about active and waiting tape library requests.

ACTIVE | A | WAITING | W
Specifies whether information about active or waiting requests will be displayed. One of these keywords must be specified on the QUERY command.

ACTIVE | A Specifies that only information about active requests, those currently being processed, will be displayed.

WAITING | W Specifies that only information about requests waiting for processing will be displayed.

SUMMARY | S | DETAIL | D
Specifies whether summary or detailed information should be displayed for the requested category (ACTIVE or WAITING). If neither the SUMMARY nor DETAIL keyword is specified on the QUERY command, then only summary information is displayed for the requested category.

SUMMARY | S
Specifies that only summary information about the requested category should display. This is the default.

DETAIL | D
Indicates that only detailed information about the requested category is to be displayed. When the DETAIL keyword is specified, one of the following keywords is required:

ALL Detail information for all eject, entry, and audit requests (active or waiting) are displayed.

EJECT Detail information for all tape library EJECT requests (active or waiting) are displayed.

ENTRY Detail information for all tape library ENTRY requests (active or waiting) are displayed.

AUDIT Detail information for all tape library AUDIT requests (active or waiting) are displayed.

To display summary information on active tape library requests, enter one of the following commands:

```
F OAM,QUERY,ACTIVE

            or

F OAM,QUERY,ACTIVE,SUMMARY
```

The following information is displayed:

```
CBR1735I TAPE LIBRARY ACTIVE SUM:
    ---- TAPE LIBRARY REQUESTS CURRENTLY BEING PROCESSED ----
    ENTERS   EJECTS   AUDITS
    aaaaaa   bbbbbb   cccccc
```

The fields in the data line are defined as follows:

aaaaaa Total number of tape volume entry requests currently processing. Only one tape volume entry request can be active per library.

bbbbbb Total number of user initiated tape volume eject requests currently processing, queued, or both, at the library manager. Physically

ejected volumes from the library can still appear in this total if OAM has not processed the eject completion message.

cccccc Total number of tape volume audit requests currently processing, queued, or both, at the library manager.

Note: All counts are a snapshot-in-time, so the counts can quickly change.

To display summary information on waiting tape library requests, enter one of the following commands:

```
F OAM,QUERY,WAITING

              or

F OAM,QUERY,WAITING,SUMMARY
```

The following information is displayed:

```
CBR1715I TAPE LIBRARY WAITING SUM:
     ---- TAPE LIBRARY REQUESTS WAITING FOR PROCESSING ----
     ENTERS   EJECTS   AUDITS
     aaaaaa    bbbbbb  cccccc
```

The fields in the data line are defined as follows:

aaaaaa Total number of tape volume entry requests waiting for processing. This is the total number of volumes recognized by OAM as being in the library manager insert category waiting to be processed. If OAM has not received the attention interrupt signalling the addition of cartridges to the insert category, the entered volumes will not be included in the summary count even though they have physically been entered into a library.

bbbbbb Total number of user initiated tape volume eject requests waiting for processing in the OAM address space that have not yet been sent to the library manager.

cccccc Total number of tape volume audit requests waiting for processing in the OAM address space that have not yet been sent to the library manager.

Note: All counts are a snapshot-in-time, so the counts can quickly change.

To display detail information on active tape library requests, enter one of the following commands:

```
F OAM,QUERY,ACTIVE,DETAIL,ALL

               or

F OAM,QUERY,ACTIVE,DETAIL,AUDIT

              or

F OAM,QUERY,ACTIVE,DETAIL,EJECT

              or

F OAM,QUERY,ACTIVE,DETAIL,ENTRY
```

The following message is displayed when either the ALL or AUDIT keyword is used in the command:

```
CBR1773I Auditing tape volume volser, in library lib_name,
         for user userid, request=request.
```

The following message is displayed when either the ALL or EJECT keyword is used in the command:

```
CBR1774I Ejecting tape volume volser, from library lib_name, for user userid.
```

The following message is displayed when either the ALL or ENTRY keyword is used in the command:

```
CBR1775I Tape cartridge entry request in process on library lib_name.
```

To display detail information on waiting tape library requests, enter one of the following commands:

```
F OAM,QUERY,WAITING,DETAIL,ALL

              or

F OAM,QUERY,WAITING,DETAIL,AUDIT

              or

F OAM,QUERY,WAITING,DETAIL,EJECT

              or

F OAM,QUERY,WAITING,DETAIL,ENTRY
```

The following message is displayed when either the ALL or AUDIT keyword is used in the command:

```
CBR1783I Audit request for tape volume volser in library lib_name, for user
         userid, waiting to be processed, request = request.
```

The following message is displayed when either the ALL or EJECT keyword is used in the command:

```
CBR1784I Eject request for tape volume volser in library lib_name, for user
         userid, waiting to be processed.
```

The following message is displayed when either the ALL or ENTRY keyword is used in the command:

```
CBR1785I  number tape cartridge entry requests for library lib_name
           waiting to be processed.
```

Querying Device Services Library Information (DEVSERV QLIB)

The options available with the device services query library (DEVSERV QLIB) command include:

- Requesting a list of tape libraries that are defined in device services active and inactive configuration. The libraries are then listed by their serial number (library-id).
- Requesting a list of devices within a tape library. The devices are listed by device number and displays the library port ID for each device.
- Requesting a list of the outstanding library orders (MOUNT, DEMOUNT, EJECT and AUDIT).

- Validating the connection status of devices in a library.
- Deleting an improperly defined library control block from device services inactive configuration. This can be used in preparation for an IODF activate to remove incorrectly defined library control blocks so they can be rebuilt.

See the DEVSERV QLIB command in *z/OS MVS System Commands* for syntax and additional information.

Chapter 6. Library Control System (LCS) External Services

Library Control System (LCS) External Services provides a programming interface that allows you to access and manipulate information about each tape volume record in the TCDB.

LCS External Services Overview

The executable macro CBRXLCS is used to invoke the LCS External Services to perform the following functions:

- Change the use attribute of a volume
- Enter one or more volumes into a manual tape library
- Eject a tape cartridge from a tape library
- Query the name and type of a tape library where a specified volume resides
- Determine whether a tape volume can be mounted on a specific device
- Export a list of logical volumes from a VTS
- Import a list of logical volumes into a VTS
- Change current operating modes of a Peer-to-Peer VTS library
- Obtain operational mode settings and device-related information from a Peer-to-Peer VTS library
- Obtain library name information

Note: You might have an environment with multiple systems at different levels sharing a common TCDB. In this event, if a system attempts to perform a CBRXLCS function against a volume that has a media type or recording technology that is not recognized, the request fails.

Change Use Attribute (CUA)

The change use attribute (CUA) function changes the status of the specified volume from PRIVATE to SCRATCH, SCRATCH to PRIVATE, PRIVATE to PRIVATE, or SCRATCH to SCRATCH, and updates the tape volume record in the TCDB. It also calls the change use attribute installation exit to allow the installation to approve or disapprove the change in the volume status and to set values for many of the fields in the volume record. See “Change Use Attribute Installation Exit (CBRUXCUA)” on page 213.

Manual Cartridge Entry (MCE)

The manual cartridge entry (MCE) function allows the user to enter a list of one or more tape cartridges into a manual tape library. When the MCE function is invoked, a tape volume record is created or updated in the TCDB. MCE calls the cartridge entry installation exit to allow the installation to approve or disapprove the entry of the cartridge into the manual tape library, and to set values for many of the fields in the volume record. For more information regarding the cartridge entry installation exit, see “Cartridge Entry Installation Exit (CBRUXENT)” on page 224.

Cartridge Eject (EJECT)

The cartridge eject (EJECT) function of the LCS External Services provides two major functions for tape cartridge ejects:

- Can eject a tape volume from a tape library. The tape volume record in the TCDB may be kept or purged. The cartridge eject installation exit is also called

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to allow the installation to approve or disapprove the eject request. If the eject request fails after the installation exit is invoked, the exit can also specify that a second failed eject notification call be made to the exit. See "Cartridge Eject Installation Exit (CBRUXEJC)" on page 236 for more information regarding the cartridge eject installation exit.

- Can determine the eject status of a tape volume. Use the QUERY option of the EJECT function to determine if a volume has an eject request pending on an OAM internal queue. This use of the EJECT function does not invoke the cartridge eject installation exit, as it is only a query. See "Ejecting a Tape Cartridge" on page 166 for more information on this function.

Query Volume Residence (QVR)

The query volume residence (QVR) function allows the installation to query the residency and type of library in which a specified volume resides. It also returns the console name associated with the library, if one has been specified by the installation, and if requested, other available information about the volume from the TCDB and library manager inventory.

Additionally, QVR provides audit capabilities from a tape management system database, since QVR does not require the presence of a TCDB record to perform this audit. A tape management system can use this capability to verify its inventory against the TCDB and the library manager inventory. It can also be used to track and verify the library residency of volumes that are not managed in the TCDB, such as stacked volumes in a VTS. See "Querying the Residence of a Volume" on page 169.

Test Volume Eligibility (TVE)

The test volume eligibility (TVE) function verifies that the specified tape volume serial number can be mounted on the specified tape device. See "Testing the Eligibility of a Volume" on page 174.

Export Logical Volumes (EXPORT)

After the tape management system or customer utility has written the list of logical volumes to export on an export list volume (logical volume residing in the same library as the volumes to be exported), the export function can be used to identify the logical volumes to export and to initiate the export operation at the library. This interface can also be used to cancel an executing export operation. See "Exporting Logical Volumes from a VTS" on page 176.

Import Logical Volumes (IMPORT)

After the tape management system or customer utility has written the list of logical volumes to import on an import list volume (logical volume residing in the same library as the volumes to be imported), the import function can be used to identify the logical volumes to import and to initiate the import operation at the library. This interface can also be used to cancel an existing import operation. See "Importing Logical Volumes into a VTS" on page 178.

Peer-to-Peer Mode Control (PTPMC)

The Peer-to-Peer VTS mode control (PTPMC) function allows an installation or application to change current operating modes of the library. This CBRXLCS function is not supported by the TS7700 Virtualization Engine. If invoked, the

PTPMC function fails with Return Code 12, Reason Code 322, 'Command rejected by the library'. See “Changing Library Operating Modes (Peer-to-Peer VTS Mode Control)” on page 180.

Peer-to-Peer Data (PTPDATA)

The Peer-to-Peer VTS data (PTPDATA) function allows an installation or application to obtain operational mode settings and device-related information from the PTP VTS library. This CBRXLCS function is not supported by the TS7700 Virtualization Engine. If invoked, the PTPDATA function fails with Return Code 12, Reason Code 322, 'Command rejected by the library'. See “Obtaining Operational Mode Settings (Peer-to-Peer VTS Data)” on page 183.

Obtain Library Name Information (OLN)

The obtain library name information (OLN) function of the LCS External Services macro allows you to obtain the library name or library ID, the console name, an indication of whether outboard policy management is supported, and the library type. See “Obtaining Library Name Information (OLN)” on page 185.

LCS External Services Functions

An executable macro called CBRXLCS is used to invoke the functions provided by LCS External Services. The macro expansion sets parameter values in the LCS External Services parameter list (LCSPL), which is mapped by the CBRLCSPL macro, retrieves the entry point for LCS External Services, and branches to perform the requested function. See “CBRXLCS Macro Interface” on page 187 for the CBRXLCS macro usage, return and reason codes, and parameter list.

This section provides the syntax, required and optional parameters, and return and reason codes for each CBRXLCS function.

Changing the use attribute of a volume

Figure 5 provides the CBRXLCS Assembler macro syntax that is used to perform the change use attribute function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=CUA
         ,USE={PRIVATE | SCRATCH}
         ,VOLUME=volume-serial-number
         [,DEVTYPE=tape-device-selection-information-address]
         [,EXPDATE=volume-expiration-date]
         [,GRPNAME=storage-group-name]
         [,WRTDATE=YES]
         [,WRTPROT=write-protection-status]
         [,EXITINFO=installation-exit-information]
         [,GETPOLICY=YES]
         [,SCNAME=storage-class-name]
         [,MCNAME=management-class-name]
         [,DCNAME=data-class-name]
```

Figure 5. CBRXLCS CUA Assembler Macro Syntax

When a value or address is requested, the keyword operand may be one of the following:

- The name of the field that contains the requested value or address
- The number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field

Note: The change use attribute function can also be used to remove a volume from the error category.

Required Parameters

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=CUA
Specifies a request to change the use attribute of a single volume to that of the change use attribute specified in the USE field.

USE=PRIVATE | SCRATCH
USE=PRIVATE specifies that the volume use attribute be set to PRIVATE for the volume. If the library supports outboard policy management, the existing or resulting storage group name in the TCDB is assigned as the private volume's outboard policy name. **USE=SCRATCH** specifies that the volume use attribute be set to SCRATCH for the volume. If the library supports outboard policy management, the default policy names (blanks) are assigned as the scratch volume's outboard policy names.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length), which contains the volume serial number of the volume whose use attribute is to be changed. The volume serial number must be left justified in the field and padded on the right with blanks. If the volume resides in a library, the library must be defined in the active SMS configuration.

Optional Parameters

DEVTYPE=*tape-device-selection-information-address*
Specifies the name of a variable that contains the address of the tape device selection information to be associated with the data sets written on this tape volume. The TDSI is mapped by the structure CBRTDSI (see Figure 18 on page 210), and consists of four 1-byte fields that specify recording technology, media type, compaction indicator, and special attribute to be associated with the volume.

The following fields in the TDSI may be specified on a CUA request:

- Recording technology may be specified as unknown, 18TRACK, 36TRACK, 128TRACK, 256TRACK, 384TRACK, EFMT1, EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4.
- Media type may be specified as unknown, MEDIA1, MEDIA2, MEDIA3, MEDIA4, MEDIA5, MEDIA6, MEDIA7, MEDIA8, MEDIA9, MEDIA10, MEDIA11, MEDIA12, or MEDIA13.
- Compaction may be specified as unknown, none, or compacted.
- Special attribute may be specified as none or read compatible.

Any nonzero TDSI field specified for input is merged with the tape device selection information recorded on the volume record. If incompatible tape device selection attributes, such as 36TRACK recording technology and MEDIA4 media type, result from merging the input, an error is returned and CUA processing is not performed. If CUA processing is successful, the TDSI in the volume record in the TCDB is updated with the new, merged values.

DEVTYPE is used only when USE=PRIVATE is specified, and is otherwise ignored.

EXPDATE=*volume-expiration-date*
Specifies the name of a variable (four-byte length), which contains the

expiration date assigned to the volume. The expiration date should be specified in TIME DEC format; for example, packed decimal digits of the form 0CYYDDDF. This field is only used when USE=PRIVATE is specified, and is otherwise ignored. If the change use attribute installation exit is invoked, the value specified by the exit may override the volume expiration date.

GRPNAME=*storage-group-name*
Specifies the name of a character variable (8-byte length) that contains the name of the storage group to which the volume belongs. The storage group name must be left-justified in the field and padded on the right with blanks, if necessary. This field is only used when USE=PRIVATE is specified, and is otherwise ignored. If a nonblank storage group name is specified on a change to PRIVATE, the storage group must be a tape storage group that is defined in the active configuration. Additionally, if the volume is library-resident, the library must also be defined to the storage group. If a storage group name is specified and there is a change from PRIVATE to PRIVATE, the existing storage group name in the volume record is updated. On a change from PRIVATE to PRIVATE, if no storage group name is specified, the existing storage group name in the TCDB is retained. On a change from SCRATCH to PRIVATE, if no storage group name is specified, the field is set to blanks. If the change use attribute installation exit is invoked, the value specified by the exit may override the storage group name. To be consistent with the existing or resulting storage group name in the TCDB, the storage group name is also assigned as the private volume's outboard storage group policy, if the library supports outboard policy management.

WRTDATE=YES
Specification of this keyword requests the update of the date when a data set was last opened for OUTPUT. The tape volume record is updated with the current date, as returned by the MVS TIME macro, translated into ISO format (YYYY-MM-DD). When this keyword is specified the last mounted date is also set to the current date. This field is only used when USE=PRIVATE is specified, and is otherwise ignored. If the change use attribute installation exit is invoked, it may override the last written date and last mounted date.

WRTPROT=*write-protection-status*
Specifies the name of a character variable (1-byte length) which contains the volume write protection status. If the write-protect tab is set on the tape cartridge, this field should be set to “Y”; if the write-protect tab is not set, this field should be set to “N”; if the tab setting is unknown, it should be set to blank. This field is only used when USE=PRIVATE is specified, and is otherwise ignored. If the change use attribute installation exit is invoked, the value specified by the exit may override the write protection status.

EXITINFO=*installation-exit-information*
Specifies the name of a character variable (16-byte length) that contains a customer specified free-form value to be passed to the change use attribute installation exit (CBRUXCUA).

GETPOLICY=YES
Specifies a request to retrieve the current outboard policy names for a volume from the library. The library policy names are stored in the CBRUXCPL parameter list in the UXCLMSG, UXCLMSC, UXCLMMC, and UXCLMDC fields and passed to the CBRUXCUA installation exit. Blanks in a policy field indicate that the volume has the default policy for that construct assigned to it. If **GETPOLICY=YES** is specified, the CBRUXCUA installation exit can examine the UXCVLOPM indicator to determine if the policy names have been retrieved and stored in the UXCLMOPM fields.

If one or more of the UXCLMSC, UXCLMMC, and UXCLMDC fields is changed by the CBRUXCUA installation exit and the volume use attribute is PRIVATE (PRIVATE to PRIVATE invocation), constructs that are changed are updated in the library. Blanks specified in a policy field indicate that the default policy is requested. The storage group for the TCDB volume record and the outboard storage group policy is specified in UXCGROUP. The UXCLMSG is an input-only variable.

If **GETPOLICY=YES** is not specified, the library manager policy names are not retrieved and passed to the exit. The GETPOLICY option is ignored if outboard policy management is not supported in the library in which the volume resides. It is also ignored on SCRATCH-to-SCRATCH, PRIVATE-to-SCRATCH, and SCRATCH-to-PRIVATE CUA invocations and all CUA invocations for shelf-resident volumes.

GETPOLICY=YES and the **GRPNAME**, **SCNAME**, **MCNAME**, and **DCNAME** parameters are mutually exclusive.

SCNAME=*storage-class-name*
Specifies a request to set a construct name in the library where the specified volume resides as its outboard storage class policy. The *storage-class-name* is an 8-byte character variable, left justified, and padded on the right with blanks, if necessary. If blanks are specified, the request is to set the volume's storage class library policy to the default policy. If a nonblank storage class name is specified, it is only validity checked against Storage Management Subsystem (SMS) naming convention standards and is not checked to see if it is defined in the active configuration.

The **SCNAME** option is ignored if outboard policy management is not supported in the library in which the volume resides, if **USE=SCRATCH**, or if the volume is shelf-resident.

MCNAME=*management-class-name*
Specifies a request to set a construct name in the library where the specified volume resides as its outboard management class policy. The *management-class-name* is an 8-byte character variable, left justified, and padded on the right with blanks, if necessary. If blanks are specified, the request is to set the volume's management class library policy to the default policy. If a nonblank management class name is specified, it is only validity checked against SMS naming convention standards and is not checked to see if it is defined in the active configuration.

The **MCNAME** option is ignored if outboard policy management is not supported in the library in which the volume resides, if **USE=SCRATCH**, or if the volume is shelf-resident.

DCNAME=*data-class-name*
Specifies a request to set a construct name in the library where the specified volume resides as its outboard data class policy. The *data-class-name* is an 8-byte character variable, left justified, and padded on the right with blanks, if necessary. If blanks are specified, the request is to set the volume's data class library policy to the default policy. If a nonblank data class name is specified, it is only validity checked against Storage Management Subsystem (SMS) naming convention standards and is not checked to see if it is defined in the active configuration.

The **DCNAME** option is ignored if outboard policy management is not supported in the library in which the volume resides, if **USE=SCRATCH**, or if the volume is shelf-resident.

Rule: The values that you specify for the GRPNAME, SCNAME, MCNAME, and DCNAME parameters must meet the following SMS naming convention standards:
- Alphanumeric and national characters only
- Name must begin with an alphabetic or national character ($*@#%)
- No leading or embedding blanks
- Eight characters or less

Successful Change Use Attribute Processing

When the change use attribute function is successful, the following processing occurs:

- The use attribute of the volume specified with the VOLUME keyword is changed to the requested value.
- The tape volume record is updated with the values specified on the CBRXLCS macro invocation, by the change use attribute installation exit, or both.
- If the volume resides in an ATLDS, the category of the volume is also changed in the hardware inventory to the requested value.
- If the library supports outboard policy management, the SMS construct names are passed to the library.

Unless the change use attribute installation exit (CBRUXCUA) has been disabled or the installation has indicated that it should not be called, the change use attribute installation exit is invoked for every request to change the use attribute of a volume. See "Change Use Attribute Installation Exit (CBRUXCUA)" on page 213 for further discussion of the exit.

Changing the Use Attribute from SCRATCH to PRIVATE

For a request to change a volume to PRIVATE, the optional parameters that are specified on the CBRXLCS invocation are passed to the installation exit for approval. The exit may override the values supplied on the macro invocation, and the values supplied by the exit are committed to the tape volume record if CUA processing is successful.

Changing the Use Attribute from PRIVATE to SCRATCH

For a request to change a volume to SCRATCH, optional parameters are ignored on the CBRXLCS macro invocation. Upon return from the installation exit, the following default values are set in the tape volume record:

- Volume use attribute = **S**
- Storage group name = ***SCRTCH***
- Write protection status = **N**
- Checkpoint volume indicator = **N**
- Volume expiration date = blank
- Tape device selection values
  - Recording technology is unchanged
  - Media type is unchanged
  - Compaction indicator is unchanged
  - Special attribute is set to none
- If the library supports outboard policy management, default policy names (blanks) are passed to the library.

When the volume whose use attribute is to be changed resides in a tape library, a call is made to the hardware to change the category of the volume. If the hardware change is not successful, the tape volume record is not updated and CUA

processing fails. If the category of the volume is successfully changed, the scratch count for the library is updated with the number of scratch cartridges returned from the hardware.

If changing the use attribute of the volume causes the number of scratch volumes of a particular type in a library to fall below the scratch volume threshold established through the ISMF library management application, operation action message CBR3660A is issued requesting that the operator add the appropriate type of scratch cartridges to the library. If CUA processing causes the scratch count to exceed twice the scratch volume threshold for the scratch type being processed, operation action message CBR3660A is deleted if it is outstanding.

Changing a WORM Tape Volume's Use Attribute

Because OAM has no knowledge of whether a volume contains user data and because volumes may be entered incorrectly as PRIVATE when they are really SCRATCH, OAM does not prevent changing a WORM volume from PRIVATE to SCRATCH (for either physical or logical WORM). Also, when you invoke the CBRUXCUA installation exit, a UXCVWORM indicator in the CBRUXCPL parameter list is set on when the volume is a physical WORM tape to alert the tape management system that the CUA function is being performed for a WORM volume. Because a logical WORM volume is not distinguishable by a unique media type, the UXCVWORM indicator is not turned on for a logical WORM volume. If this information is needed, the CBRUXCUA installation exit can invoke the CBRXLCS FUNC=QVR interface to obtain this information from the library.

Changing to the Same Use Attribute

When the requested use attribute is the same as the existing use attribute (for example, the change from PRIVATE to PRIVATE or from SCRATCH to SCRATCH), the tape volume record is updated with values specified on the CBRXLCS macro invocation, the installation exit, or both; however, a warning return code is returned. In both cases, if the volume resides in a tape library, a call is made to the library to change the category of the volume in the library manager inventory.

Setting Policy Names Outboard Using Keywords

The CUA function allows you to set policy names outboard using keywords. If GRPNAME is specified on the CUA invocation and the volume is a private volume residing in a library with outboard policy management support, the valid storage group name specified in GRPNAME is assigned as the volume's outboard storage group policy. If GRPNAME is not specified, the TCDB storage group name is assigned as the private volume's outboard storage group policy (PRIVATE to PRIVATE CUA).

You can use the SCNAME, MCNAME, and DCNAME keywords to specify values for policy names for the storage class, management class, and data class constructs. One or more of these options can be specified. The fourth policy construct is specified using the existing GRPNAME option. The GETPOLICY keyword cannot be specified at the same time as the GRPNAME, SCNAME, MCNAME, and DCNAME options.

For a scratch volume, the CUA function sets the default policy names outboard; these names consist of blanks. The GRPNAME, SCNAME, MCNAME, and DCNAME options are ignored on SCRATCH-to-SCRATCH and PRIVATE-to-SCRATCH CUA invocations, as scratch volumes are always assigned default policy names.

For information on the CBRUXCUA installation exit, including the CBRUXCPL parameter list, see “Change Use Attribute Installation Exit (CBRUXCUA)” on page 213.

Return and Reason Codes for CBRXLCS Change Use Attribute

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Table 5 provides the reason codes associated with each of the return codes returned by change use attribute processing. See “CBRXLCS Return Codes” on page 188 for more information. Also, for more information concerning other return and reason codes not specific to change use attribute processing, see *z/OS DFSMSdfp Diagnosis*.

Table 5. Change Use Attribute Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful execution.
4	Warning	4	Requested change to SCRATCH but volume was already SCRATCH.
		5	Requested change to PRIVATE but volume was already PRIVATE.
		8	Scratch volume threshold processing did not successfully complete. Check the console log for further diagnostic information.
		131	Scratch volume threshold processing not performed because library was not operational.
		138	Library scratch count not updated in TCDB.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		14	Required use parameter not specified.
		15	Invalid value specified for use.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		25	Invalid expiration date specified.
		26	Library in which volume resides not defined to specified storage group.
		28	Invalid write protect value specified.
		29	Invalid parameter address for LCSPL.
		30	LCSPL not aligned on fullword boundary.
		34	Invalid storage group name specified.
		38	Invalid compaction type specified in TDSI.
		39	Invalid special attribute specified in TDSI.
		40	Invalid combination of TDSI values specified.
		41	Ambiguous TDSI combination specified.
		43	Invalid pointer to TDSI specified.
		54	Storage group not of type tape.
		219	Invalid outboard policy management construct. (SC, MC, and DC)

Table 5. Change Use Attribute Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		220	Mutually exclusive optional keywords specified. This reason code is returned if GETPOLICY is specified with GRPNAME, SCNAME, MCNAME, or DCNAME.
12	Failure	6	Request failed because CUA processing disabled for private to scratch requests.
		7	Installation exit vetoed the requested change.
		53	Library not defined to active configuration.
		58	Failure accessing volume record in TCDB.
		59	Failure accessing library record in TCDB.
		60	Failure accessing SMS storage group constructs.
		61	Device services failure.
		63	Volume record not found in TCDB.
		64	Library record for specified volume not found in TCDB.
		65	No library attached at last IPL.
		70	Volume not found in library manager inventory.
		82	Installation exit abended.
		83	Installation exit returned bad data.
		84	Abend occurred during LCS External Services processing.
		310	Media type or recording technology not supported at this software level.
		312	Function is not compatible with the library (the request cannot be performed by the library due to its current state, its configuration, or set of installed features).
		313	Volume is currently in use.
		322	Command rejected by the library.
		323	Unable to retrieve library policy constructs from a library that supports outboard policy management.
		324	Volume expire time has not elapsed at the library.
		325	I/O terminated due to timeout detection.
		326	Selective device access control group denied request.
		327	Selective device access control group is not valid.
16	Environment	2	OAM control blocks not available.[1]
		80	LCS External Services unable to establish an ESTAE.
		81	LCS External Services unable to obtain storage for installation exit parameter list.

[1]Depending on the CBRXLCS function being performed, one or more OAM initialization-related control blocks might be required. First, verify whether the OAM1 subsystem entry was specified in the IEFSSN*xx* PARMLIB member. Then verify whether the OAM address space has been started.

Entering Cartridges into a Manual Tape Library

Figure 6 on page 161 provides the CBRXLCS Assembler macro syntax that is used to perform the manual cartridge entry function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=MCE
         ,LIBNAME=library-name
         ,VOLLIST=volume-list-pointer
         [,EXITINFO=installation-exit-information]
```

Figure 6. CBRXLCS MCE Assembler Macro Syntax

When a value or address is requested, the keyword operand may be:

- The name of the field that contains the requested value or address
- The number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field

Parameter Descriptions

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=MCE
Specifies a request to enter a list of one or more volumes into a manual tape library.

LIBNAME=*library-name*
Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks.

VOLLIST=*volume-list-pointer*
Specifies a variable that contains the address of the list of volumes to be entered into the manual tape library.

The volume list mapping, LCSV and LCSMLIST, is declared in mapping macro CBRLCSPL. LCSV is the header for the volume list, and LCSMLIST maps the array of volumes and the associated information for each. Volume-list-pointer contains the address of the list header.

Each member of the volume list array contains the volume serial number, left-justified in a six-character field and padded on the right with blanks; a six-byte reserved area; a four-byte field for tape device selection information (TDSI); and two full words into which LCS External Services stores the return code and reason code for this volume.

Processing the Tape Device Selection Information (TDSI)

The tape device selection information for each volume is processed as follows:

- If a volume record exists for the volume to be entered into the manual tape library, all TDSI values are ignored and the values from the existing volume record are passed to the cartridge entry installation exit (CBRUXENT).
- If no volume record exists for the volume to be entered into the manual tape library, TDSI values are processed as follows:
  - Recording technology specified in TDSI is ignored. A volume's recording technology may be determined by using the library's default entry data class, if applicable, by a default recording technology based on the media type, or explicitly set by the CBRUXENT installation exit. If the volume is a SCRATCH volume, UNKNOWN is also a possible recording technology value.
    - If the volume is MEDIA1 and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, 36-track is passed to the exit. UNKNOWN can be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may set an applicable value (18-track, 36-track).

- If the volume is MEDIA2, 36-track is passed to the exit because this is the only applicable recording technology.
- If the volume is MEDIA3 or MEDIA4, and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, 128-track is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (128-track, 256-track, 384-track).
- If the volume is MEDIA5, MEDIA6, MEDIA7, or MEDIA8 and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, EFMT1 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (EFMT1, EFMT2, EEFMT2, EFMT3, or EEFMT3).
- If the volume is MEDIA9 or MEDIA10 and the entry default data class is not defined for the library or not applicable for the volume's media type, by default, EFMT2 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4).
- If the volume is MEDIA11, MEDIA12 or MEDIA13 and the entry default data class is not defined for the library or not applicable for the volume's media type, by default, EFMT4 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (EFMT4 or EEFMT4).
- PRIVATE volumes must have an applicable recording technology set. SCRATCH volumes can be entered with an applicable recording technology or UNKNOWN.

– Media type for the volume must be set before the volume can be entered into the manual tape library. Media type may be specified by any of the following:
  - Input TDSI—specified in field LCSMMED.
  - Default entry data class—this value is used only if no TDSI media type was specified.
  - Cartridge entry installation exit (CBRUXENT)—may provide the media type if it is not specified in TDSI or default entry data class, or may override the value specified. If the installation exit is invoked and returns an invalid media type, cartridge entry processing is discontinued.

    If media type is not available from any of the sources listed above, the volume is not entered into the MTL.
– Compaction type specified in TDSI is ignored, and the UNKNOWN value is passed to the installation exit. The exit may specify a value for compaction type.
– Special attribute specified in TDSI is ignored and a value of NONE is passed to the installation exit. The exit may specify a value for special attribute.

EXITINFO=*installation-exit-information*
Specifies the name of a character variable (16-byte length) that contains a customer-specified free-form value that is passed to the cartridge entry installation exit (CBRUXENT).

The permanent OAM control block structure must be available in order for manual cartridge entry to be performed. This means that the OAM address space must have been started since the last IPL.

When manual cartridge entry is successful, the following processing occurs:
- The tape volume record is either created or updated in the TCDB.
- TDSI for the volume is returned in LCSMTDSI in structure LCSMLIST.
- The scratch volume counts in the library record in the TCDB are updated.
- Message CBR3610I is issued to inform the operator of the volumes which have been entered into the library.

If the cartridge entry installation exit (CBRUXENT) is disabled, cartridge entry processing is not performed. Unless the installation has indicated that the cartridge entry installation exit should not be called, it is invoked for every volume in the list.

Even though the manual tape library supports national characters (@ $ and #) and special characters (, . / ' ( ) * & + – and =), for coexistence, the volume serial number for each of the volumes entered into a manual tape library should meet the same character set defined for an ATLDS: upper case alphabetics or numerics. The volume serial may not contain any imbedded blanks.

The volume serial for each volume entered into a manual tape library may not be a duplicate of a known DASD volume, or a tape volume which resides in another tape library dataserver (according to the tape volume record in the TCDB).

If a volume record exists for a private volume and it contains a nonblank storage group name, the storage group name is validated. If the storage group is not "tape", is not defined to the active SMS configuration, or does not contain the library specified for the MCE request, the request fails and the volume is not entered into the library.

If a volume record exists in the TCDB for an MCE volume and the volume record indicates that the volume already resides in the specified library the entry for this volume fails (duplicate assumed).

If an error is encountered while processing one of the volumes, the return and reason codes for that volume are stored in the fields LCSMRET and LCSMREAS in the volume list array, and processing continues for the rest of the volumes. If an error occurs which causes cartridge entry to be disabled or suspended, no more volumes are processed and error return and reason codes are set for the remaining volumes in the list.

If a volume record exists for the volume entered into the manual tape library, tape device selection information is processed as shown in Table 6.

Table 6. TDSI Processing for MCE—Volume Exists

TDSI Attribute	TDSI Input	Default Entry Data Class	Installation Exit	Volume Record
Recording technology	Ignored	Ignored	May override existing volume record	Updated only if installation exit makes change

Table 6. TDSI Processing for MCE—Volume Exists (continued)

TDSI Attribute	TDSI Input	Default Entry Data Class	Installation Exit	Volume Record
Media type	Ignored	Ignored	Cannot override existing volume record	MCE fails with return code LCSFAIL(12) and reason code LCSFMUMT(321) if media type returned from installation exit does not match the media type defined on the volume record
Compaction	Ignored	Not applicable	May override existing volume record	Updated only if installation exit makes change
Special attribute	Ignored	Not applicable	May override existing volume record	Updated only if installation exit makes change

If no volume record exists for the volume entering the manual tape library, the tape device selection information is processed as shown in Table 7.

Table 7. TDSI Processing for MCE—No Volume Record Exists for Volume

TDSI Attribute	TDSI Input	Default Entry Data Class	Installation Exit	Volume Record
Recording technology	Ignored	Can specify value	Can specify an applicable value, overriding the default value or library default entry data class value passed to the exit.	Created with value passed to installation exit or applicable value specified by installation exit.
Media type	May be specified	Used if no TDSI value specified	Can specify value if not provided in TDSI or default entry data class, or may override value from either source.	Created with value specified in TDSI or default entry data class or installation exit.
Compaction	Ignored	Not applicable	Can specify value.	Created with value specified by installation exit. If no value specified, set to UNKNOWN.
Special attribute	Ignored	Not applicable	Can specify value.	Created with value specified by installation exit. If no value specified, set to NONE.

Return and Reason Codes for CBRXLCS Manual Cartridge Entry: The return code reflecting the most severe error is placed in register 15 and in the LCSPL in field LCSRCODE. The return code for each volume is returned in the field LCSMRET in the volume list array.

The reason code associated with the most severe return code is placed in register 0 and in the LCSPL in field LCSREAS. The reason code for each volume is returned in the field LCSMREAS in the volume list array.

Table 8 on page 165 provides the reason codes associated with each of the return codes returned by manual cartridge entry processing. For more information, see

"CBRXLCS Return Codes" on page 188. Also, for more information concerning other return and reason codes not specific to manual cartridge entry processing, see *z/OS DFSMSdfp Diagnosis*.

Table 8. Manual Cartridge Entry Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful execution.
4	Warning	8	Scratch volume threshold message processing did not successfully complete. Check the console log for further diagnostic information.
		138	The library scratch volume count is not updated in TCDB.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		17	Invalid volume serial number specified.
		20	Required volume list not specified.
		21	Invalid header value specified in volume list.
		23	Required library name parameter not specified.
		26	MCE library is not defined to storage group on tape volume record.
		27	Invalid library name specified.
		29	Invalid parameter address specified for LCSPL or VOLLIST.
		30	LCSPL or VOLLIST not aligned on fullword boundary.
		34	Invalid storage group name.
		35	Required media type not specified from any source.
		53	Library not defined to active configuration.
		54	Storage group specified on volume record is type tape.
		92	Library specified is not an MTL.
		94	Specified volume already resides in another tape library.
		97	Volume of same name is known DASD volume.
		130	Specified volume already resides in this tape library
12	Failure	60	Failure accessing SMS storage group constructs.
		75	UCB scan failure when attempting to determine volume serial uniqueness.
		78	Catalog failure when attempting to retrieve the volume record.
		79	Catalog failure when attempting to update the volume record.
		84	Abend occurred during LCS External Services processing.
		95	Installation exit vetoed the entry of the volume into the library.
		96	Installation exit said to ignore the volume.
		310	Media type or recording technology not supported at this software level.
		321	The media type returned from the Installation Exit does not match the existing media type defined for the volume record in TCDB.
16	Environment	2	OAM control block structure not available.[1]
		80	LCS External Services unable to establish an ESTAE.

Table 8. Manual Cartridge Entry Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		90	Cartridge entry disabled due to an error in the installation exit.
		91	Cartridge entry temporarily suspended.

[1] Depending on the CBRXLCS function being performed, one or more OAM initialization-related control blocks might be required. First, verify whether the OAM1 subsystem entry was specified in the IEFSSN*xx* PARMLIB member. Then verify whether the OAM address space has been started.

Ejecting a Tape Cartridge

Figure 7 provides the CBRXLCS Assembler macro syntax that is used to perform the cartridge eject function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=EJECT
         ,VOLUME=volume-serial-number
         [,EJECTOPT={KEEP | PURGE | QUERY}]
         [,BULKEJCT={YES | NO}]
         [,EXITINFO=installation-exit-information]
         [,USERID=userid]
```

Figure 7. CBRXLCS EJECT Assembler Macro Syntax

When a value is requested, the keyword operand might be either the name of the field that contains the requested value, or the number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field.

Parameter Descriptions

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=EJECT
Specifies a request to eject or query the eject status of a tape volume from a tape library.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length) that contains the volume serial number of the volume to be ejected. The volume serial number must be left justified in the field and padded on the right with blanks.

EJECTOPT=KEEP
Specifies that the TCDB record for the tape volume being ejected should *not* be deleted after the eject completes successfully.

EJECTOPT=PURGE
Specifies that the TCDB record for the tape volume being ejected should be deleted after the eject completes successfully.

If the EJECTOPT parameter is specified on the macro invocation, the cartridge eject installation exit may override it.

If the EJECTOPT parameter value is not specified on the macro invocation, the eject default is used. (This default is established when the library is defined by the storage administrator using the ISMF library define panel.) However, the cartridge eject installation exit (CBRUXEJC) may ultimately override the value.

EJECTOPT=QUERY
Specifies a request to query the OAM internal work queues to determine if an

eject request is pending. CBRXLCS FUNC=QVR should be invoked first to determine if an eject request is pending at the library or if the eject request has completed. If the status of the eject request from the QVR function cannot be determined, you can use this option to determine if the eject request resides on an OAM internal queue but might not have been sent to the library yet.

BULKEJCT=YES
Specifies that the ejected cartridge be placed in the high-capacity output station of an ATLDS. If this parameter is not specified or the high-capacity output station is not configured, the cartridge is placed in the convenience output station. If a convenience station is not installed in a 3494, the cartridge is placed in the single cell output area.

BULKEJCT=NO
Specifies that the cartridge be placed in the convenience output station of an ATLDS. This is the default.

Note: For a manual tape library, BULKEJCT is ignored.

EXITINFO=*installation-exit-information*
Specifies the name of a character variable (16-byte length) that contains a customer specified free-form value that is passed to the cartridge eject installation exit (CBRUXEJC).

USERID=*userid*
Specifies the name of a character variable (8-byte length) that contains a TSO user ID. The field must be left-justified and padded on the right with blanks.

After the eject request is successfully scheduled (a zero return and reason code from the CBRXLCS macro invocation), eject completion or failure messages are sent to this user ID through the system services SEND interface.

Successful EJECT Processing

When the EJECT completes successfully, the following processing occurs:

- The requested volume is ejected from the library.

  For an ATLDS, the volume is placed in an output station of the library. The volume record is deleted from the library manager inventory. For an MTL volume, it is the responsibility of the operator to move the logically ejected volume to an appropriate shelf location. An eject completion message is sent to the optional TSO user ID specified on the macro invocation and to an MVS console.
- The TCDB record for the volume is either kept or purged, as stipulated by one of the following:
  - The installation exit
  - The parameter specified on the macro invocation
  - The default disposition defined for all volumes in the library
- If the TCDB record is kept, it is updated to note that the volume is no longer in the library.
- When the EJECT of a volume is not successfully scheduled through the CBRXLCS macro invocation, the error messages are sent to the system log to provide an audit trail.

To have the cartridge eject installation exit (CBRUXEJC) notified when an eject request fails, see “Failed eject notification processing” on page 238.

Return and Reason Codes for CBRXLCS Eject

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Note: A zero return code and zero reason code from the CBRXLCS EJECT function do not indicate that the cartridge has been ejected; however, they do indicate that the CBRXLCS EJECT function was successful in scheduling the request into the OAM address space for later processing. When the eject request is later processed, the OAM address space relays the success or failure of the eject through the issuance of messages.

Table 9 provides the reason codes associated with each of the return codes returned by cartridge eject processing. For special stipulations concerning the meanings of return and reason codes that are issued for the eject query function, see "Return and Reason Codes for CBRXLCS Eject Query" on page 169. For more comprehensive information on the CBRXLCS return codes, see "CBRXLCS Return Codes" on page 188.

Also, for more information concerning other return and reason codes not specific to cartridge eject processing, see *z/OS DFSMSdfp Diagnosis*.

Table 9. Cartridge Eject Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successfully scheduled.
4	Warning		No warnings are returned by EJECT.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		29	Invalid parameter address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
		201	Volume already ejected (not in library).
		202	Invalid value specified for eject option.
		203	Invalid value specified for bulk eject.
		204	The userid specified contains all binary zeroes or blanks.
12	Failure	45	Library name as defined in volume record is unknown in SMS configuration.
		84	Abend occurred during LCS External Services processing.
		300	OAM abend during eject request processing.
		302	Eject request already pending for volume.
		303	Unable to make user address space nonswappable.
		304	TCDB access error in OAM.
		305	TCDB authorization error in OAM.
		306	OAM internal error.
		307	Volser not in TCDB.

Table 9. Cartridge Eject Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		310	Media type or recording technology not supported at this software level.
16	Environment	2	OAM control block structure not available.[1]
		80	LCS External Services unable to establish an ESTAE.
		400	OAM initialized with null configuration (no libraries).
		401	Library not accessible: offline, pending offline, or not operational.
		402	Vision system inoperative.
		403	Eject processing has been disabled because an error in the eject installation exit has been detected.
		404	OAM address space not available.

[1]Depending on the CBRXLCS function being performed, one or more OAM initialization-related control blocks might be required. First, verify whether the OAM1 subsystem entry was specified in the IEFSSN*xx* PARMLIB member. Then verify whether the OAM address space has been started.

Return and Reason Codes for CBRXLCS Eject Query

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

The conditions shown in Table 10 apply to the return and reasons codes that OAM issues when you specify the **EJECTOPT=QUERY** option on the CBRXLCS EJECT function. Although there are no new return and reason codes for the QUERY option, they have slightly different meanings than those that are given for an eject request.

Table 10. Return and Reason Code Meanings for the EJECTOPT=QUERY Keyword

If the Return Code Is...	And the Reason Code Is...	It Means...
0	0	The volume is library-resident. For the library in which the volume resides, an eject request was not found on the OAM eject queues.
12	302	The eject request is still pending.
8	201	The pending eject has completed.
12	307	The pending eject has completed.

Querying the Residence of a Volume

The Query Volume Residence (QVR) function allows you to determine the tape library in which a specified volume resides. If VOLINFO=YES is specified, the returned information is mapped by the CBRTVI macro. See “Tape Volume Information (CBRTVI Macro)” on page 203 for more information on this macro.

Figure 8 on page 170 provides the CBRXLCS Assembler macro syntax that is used to perform the query volume residence function:

```
CBRXLCS  TYPE=TAPE
         ,FUNC=QVR
         ,VOLUME=volume-serial-number
         [,LIBNAME={library-name}]
         [,TCDBCHK={YES | NO}]
         [,VOLINFO={YES | NO}]
         [,SUBPOOL={spno}]
         [,LOC={ANY | BELOW}]
         [,STORADDR={TVI-storage-address}]
```

Figure 8. CBRXLCS QVR Assembler Macro Syntax

When a value is requested, the keyword operand may be:
- The name of the field that contains the requested value
- The number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field

Parameter Descriptions

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=QVR
Specifies a request to return the name and type of library in which the given volume is resident.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length) that contains the volume serial number of the volume whose residence is to be determined. The volume serial number must be left justified in the field and padded on the right with blanks.

LIBNAME=*library-name*
Specifies the name of a character variable (eight-byte length), that contains the name of the library where the volume is expected to reside. The library name must be left justified in the field and padded on the right with blanks.

If the volume has no volume record in the TCDB, QVR checks for the volume in the specified library. If the volume has a record in the TCDB, QVR validates that the specified library and the library indicated on the volume record match. It also checks to see the whether the volume physically resides in the library specified by this parameter.

Note: A library name of SHELF is considered invalid. The SHELF library name is reserved for shelf-resident volumes.

TCDBCHK=YES | NO
If this optional parameter is omitted or YES is specified, the QVR function attempts to retrieve the specified volume's TCDB record. TCDBCHK=YES is the default.

If this optional parameter is specified and NO is specified, the QVR function does not retrieve the specified volume's TCDB record from the catalog and only makes the call to the library manager of the specified library. With VOLINFO=YES specified, the TVI will contain only information from the library manager inventory of the library specified.

If LIBNAME is not specified, this keyword is ignored.

VOLINFO=YES | NO
Specification of VOLINFO=YES requests that QVR return the information that

is available about the volume from both the volume record in the TCDB and the library manager inventory. The returned information is mapped by the CBRTVI mapping macro.

SUBPOOL=*spno*
Specifies the name of a bit variable (1-byte length) that contains the number of the subpool from which storage for the volume information is obtained. If no subpool is specified, storage is obtained from subpool 0 in the key of the caller. This keyword is only used when VOLINFO=YES is specified, and is otherwise ignored.

LOC=ANY | BELOW
ANY specifies that the storage for the requested information may be obtained above the 16-megabyte line. **BELOW** specifies that the storage for the requested information is to be obtained below the 16-megabyte line. **BELOW** is the default if the **LOC** keyword is omitted. The **LOC** option is ignored if **STORADDR** is specified.

STORADDR=*TVI-storage-address*
Specifies a 4-byte address for LCS External Services to use when returning tape volume information; this information is mapped by the CBRTVI macro. The CBRTVI macro validates TVI header information for the storage specified by **STORADDR**, as follows:

- The value for TVIID must be TVI.
- The value for TVILENG must be at least as large as the TVI mapping macro length currently supported by LCS External Services.

The **STORADDR** keyword is ignored unless you specify **VOLINFO=YES** on the QVR function. Specifying **STORADDR** on subsequent invocations allows you to reuse the TVI storage that was obtained by LCS External Services on the initial QVR invocation. Specifying the LCSTVI@ address as the **STORADDR** value enables the storage to be reused, reducing the number of storage requests that are required for multiple QVR invocations.

Recommendation: On the initial invocation of the QVR function, where **VOLINFO=YES** is specified, allow LCS External Services to obtain the TVI storage. This ensures that the proper CBRTVI mapping macro length is obtained. (This length may change with future enhancements.) On subsequent QVR invocations, you can then specify the TVI address returned on the initial invocation (LCSTVI@) as the **STORADDR** value, thereby reusing the storage. The TVILENG value returned on the initial invocation is the appropriate value for freeing this storage when all QVR invocations are complete.

Successful Query Volume Residence Processing

When the query volume residence function is successful and the volume resides in a library, the following fields in the LCSPL (Figure 15 on page 189) are updated:

- The name of library in which the volume resides is returned in field LCSLIBNM. This may be the library name found in the volume record or the library name specified in the QVR invocation. TVILIBNM contains the library name stored in the TCDB for comparison.
- If the library is an ATLDS, the flag LCSATL is turned on.
- If the library is an MTL, the flag LCSMTL is turned on.
- If a console name has been specified for the library, it is returned in LCSCONSN. Otherwise, LCSCONSN is set to blanks.

- If VOLINFO=YES was specified, LCSTVI@ contains the address of the requested volume information. The information is mapped by macro CBRTVI (see Figure 17 on page 203 for details). Information pertaining to TVIERROR (the constant values) is mapped by macro CBRVERR.

  Note: The caller must free the storage obtained for the tape volume information. To ensure that the correct amount of storage is freed, use the TVILENG field in the TVI header section to free this storage.

Return and Reason Codes for CBRXLCS Query Volume Residence

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Table 11 provides the reason codes associated with each of the return codes returned by query volume residence function. For more information, see "CBRXLCS Return Codes" on page 188. Also, for more information concerning other return and reason codes not specific to the query volume residence function, see *z/OS DFSMSdfp Diagnosis*.

Table 11. Query Volume Residence Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful execution. • If volume resides in an MTL, – if VOLINFO=YES was specified, TVI contains the volume TCDB record information. – if LIBNAME was specified, the library name specified matches the volume record library name. • If the volume resides in an ATL, – if VOLINFO=YES was specified, TVI contains TCDB and library manager information. – if LIBNAME was specified, the specified library name and the volume record library name match, and the library manager information indicates that the volume resides in the specified library. – if LIBNAME,TCDBCHK=NO and VOLINFO=YES was specified, the TVI contains library manager information only. – if neither VOLINFO or LIBNAME was specified, the volume record is found in the TCDB and the TCDB record indicates that the volume is library-resident; no library manager validation is performed.
4	Warning	52	Volume is shelf-resident. If VOLINFO=YES was specified, TVI contains only TCDB information. LIBNAME was not specified.
		61	Unable to access library manager. If VOLINFO=YES, TVI contains only TCDB information. If LIBNAME was specified, the library name specified and the volume record library name matched.
		63	Volume record for specified volume not found in TCDB. If VOLINFO=YES was specified, no volume information is returned. If LIBNAME was specified and the library specified was an MTL, no further validation is performed.

Table 11. Query Volume Residence Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		70	Volume not found in library manager inventory. If VOLINFO=YES was specified, TVI contains only TCDB information. If LIBNAME was specified, the library name specified and the volume record library name matched.
		134	No volume record was found in the TCDB; however, LIBNAME was specified and the volume resides in the specified library. If VOLINFO=YES was specified, TVI contains only library manager information.
		135	Volume record was found in the TCDB. LIBNAME was specified and the volume was found in the library specified. However, the volume record library name and the specified library name did not match. If VOLINFO=YES was specified, TVI contains the volume TCDB information and the library manager information from the library specified for LIBNAME.
		136	Volume record was found in the TCDB. LIBNAME was specified and the volume was not found in the library specified. The volume record library name and the specified library name did not match. If VOLINFO=YES was specified, TVI contains only the volume TCDB information.
		137	Volume record was found in the TCDB. LIBNAME was specified. The volume record library name and the specified library name did not match. Unable to access the library manager of the specified library. If VOLINFO=YES was specified, TVI contains only the volume TCDB information.
		139	Volume record was found in the TCDB. LIBNAME was specified and it did not match the volume record library name. If the library specified was an MTL, no further validation is performed. If VOLINFO=YES was specified, TVI contains the volume record TCDB information.
		323	Unable to retrieve policy names from the library.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		27	Invalid library name specified. SHELF is a reserved name and not allowed for library name specification.
		29	Invalid address specified for LCSPL or mapping macro.
		30	LCSPL or TVI not aligned on fullword boundary.

Table 11. Query Volume Residence Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		216	TCDBCHK=NO and LIBNAME was specified. The library specified is an MTL, no further validation is performed. If VOLINFO=YES was specified, no TVI information is returned.
		221	Invalid storage header or length, or both, specified. If the TVI length specified is incorrect, the correct length is returned in the TVILENG field of the CBRTVI macro.
12	Failure	45	Library name as defined in volume record is unknown in the SMS configuration.
		58	Failure accessing volume record in TCDB.
		59	Failure accessing library record in TCDB. If LIBNAME was specified, there was a failure accessing the library record in TCDB for the specified library name. If LIBNAME was not specified, the failure was in accessing the library record in TCDB for the library name found in the volume record.
		64	Library record not found for specified library.
		65	Library logical type not defined. If LIBNAME is not specified, library logical type is not defined for the library name found in the volume record. If LIBNAME is specified, library logical type is not defined for the library name specified.
		81	GETMAIN failed for TVI storage.
		84	Abend occurred during LCS External Services processing.
		310	Media type or recording technology not supported at this software level.
		319	No volume record found in the TCDB. LIBNAME was specified. The volume was not in the library specified. If VOLINFO=YES was specified, no TVI information is returned.
		320	No volume record found in the TCDB. LIBNAME was specified. Unable to access library manager for the library specified. If VOLINFO=YES was specified, no TVI information is returned.
		322	Command rejected by the library.
16	Environment	80	LCS External Services unable to establish an ESTAE.

Testing the Eligibility of a Volume

Figure 9 provides the CBRXLCS Assembler macro syntax that is used to perform the test volume eligibility function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=TVE
         ,VOLUME=volume-serial-number
         ,UCBPTR=UCB-address
```

Figure 9. CBRXLCS TVE Assembler Macro Syntax

When an address is requested, the keyword operand may be:

- The name of the field that contains the requested address

- The number, in parentheses, of a general register in the range of 2 through 12 that contains the requested address

Parameter Descriptions

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=TVE
Specifies a request to check that a volume can be mounted on a specified device.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length) that contains the volume serial number of the volume to be tested for mount eligibility. The volume serial number must be left justified in the field and padded on the right with blanks.

UCBPTR=*UCB-address*
Specifies the name of a pointer variable that contains the address of the UCB for the device to be checked for mount capability.

Successful Test Volume Eligibility Processing

The caller of the test volume eligibility function must PIN the UCB before passing UCBPTR. For a complete description of UCB pinning, see *z/OS HCD Planning*.

When the TVE function returns return code 0, the volume specified with the VOLUME keyword is eligible to be mounted on the drive associated with the MVS Unit Control Block specified with the UCBPTR keyword for one of the following reasons:
- Both the volume and the device are defined to the same tape library.
- Neither the volume nor the device are defined to a tape library.

When the TVE function returns return code 4, the request has been processed, but the volume is ineligible to be mounted on the specified drive for one of the following reasons:
- The use attribute of the volume is SCRATCH.
- The volume is not library resident but the device is defined to a tape library.
- The volume is library resident but the device is not defined to the same tape library.

Return Codes for CBRXLCS Test Volume Eligibility

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Table 12 represents the reason codes associated with each of the return codes returned by the test volume eligibility function. See “CBRXLCS Return Codes” on page 188 for more information.

Table 12. Test Volume Eligibility Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	The volume is eligible to be mounted on the device.
4		51	Volume is ineligible because its use attribute is SCRATCH; for example, this is a specific request for a scratch volume.

Table 12. Test Volume Eligibility Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		52	Volume is ineligible because it is not library resident but the device is defined to a tape library.
		55	Volume is ineligible because it is library resident but the device is not defined to the same tape library.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		18	Required UCB address not specified.
		19	Invalid address specified for UCB.
		29	Invalid parameter address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
12	Failure	58	Failure accessing the volume record in TCDB.
		59	Failure accessing library record in TCDB.
		64	Unable to determine in which library the volume resides.
		84	Abend occurred during LCS External Services processing.
		310	Media type or recording technology not supported at this software level.
16	Environment	80	LCS External Services unable to establish ESTAE.

Exporting Logical Volumes from a VTS

Figure 10 provides the CBRXLCS Assembler macro syntax that is used to perform the logical volume export function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=EXPORT
         ,VOLUME=volume-serial-number
         [,CANCEL={YES | NO}]
```

Figure 10. CBRXLCS EXPORT Assembler Macro Syntax

Required Parameters

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=EXPORT
Specifies a request to initiate (or cancel) the export of logical volume from a library.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length) that contains the logical volume serial number of the export list volume to be used for this export operation.

Optional Parameters

CANCEL=YES | NO

CANCEL=YES specifies that the export request currently executing in the library where the specified volume resides be canceled.

CANCEL=NO, or no specification for this optional parameter, indicates that the export request of the logical volume from a library be processed.

Export Processing Requirements

The export function requires that OAM is active, that the library for the export operation is online and operational, and that the cartridge eject installation exit (CBRUXEJC) is not disabled. This environment is necessary for the exported logical volumes to go through completion processing and for the stacked volumes containing the logical volumes to be ejected. Also, only one export operation can be active in a library (VTS) at a time, and an export and import operation are not allowed to execute simultaneously in the same library (VTS).

Return Codes for CBRXLCS EXPORT

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Table 13 represents the reason codes associated with each of the return codes returned by the export function. These reason codes reflect the scheduling of the export function to the library, not the actual results of the export function. See "CBRXLCS Return Codes" on page 188 for more information.

Table 13. EXPORT Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successfully scheduled.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		29	Invalid address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
12	Failure	45	Library name as defined in volume record not found in TCDB.
		52	Volume is not library resident.
		58	Failure accessing volume record in TCDB.
		59	Failure accessing library record in TCDB.
		61	Device services failure.
		63	Volume record not found in TCDB.
		70	Volume does not exist in library manager inventory.
		84	Abend occurred during LCS External Services processing.
		310	Media type or recording technology not supported at this software level.
		312	Function is not compatible with the library (the request cannot be performed by the library due to its current state, its configuration, or set of installed features).

Table 13. EXPORT Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		313	Volume is currently in use.
		314	Import/Export already in progress or host processing not complete.
		315	Not enough physical drives available in VTS.
		316	Export operation not in progress.
		317	No scratch stacked volume available.
		322	Command rejected by the library.
		326	Selective device access control group denied request.
		327	Selective device access control group is not valid.
16	Environment	2	OAM control block structure not available.[1]
		80	LCS External Services unable to establish ESTAE.
		93	Library is offline, pending offline, or not operational.
		403	Eject processing has been disabled because an error in the eject installation exit has been detected.
		404	OAM address space not available.

[1]Depending on the CBRXLCS function being performed, one or more OAM initialization-related control blocks might be required. First, verify whether the OAM1 subsystem entry was specified in the IEFSSN*xx* PARMLIB member. Then verify whether the OAM address space has been started.

Importing Logical Volumes into a VTS

Figure 11 provides the CBRXLCS Assembler macro syntax that is used to perform the logical volume import function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=IMPORT
         ,VOLUME=volume-serial-number
         [,CANCEL={YES | NO}]
```

Figure 11. CBRXLCS IMPORT Assembler Macro Syntax

Required Parameters

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=IMPORT
Specifies a request to initiate (or cancel) the import of a logical volume into a VTS.

VOLUME=*volume-serial-number*
Specifies the name of a character variable (six-byte length) that contains the logical volume serial number of the import list volume to be used for this import operation.

Optional Parameters

CANCEL=YES | NO
CANCEL=YES specifies that the import request currently executing in the library where the specified volume resides be canceled.

CANCEL=NO, or no specification for this optional parameter, indicates that the import request of the logical volume into a VTS be processed.

Import Processing Requirements

The import function requires that OAM is active, that the library for the import operation is online and operational, and that the cartridge entry installation exit (CBRUXENT) is not disabled. This environment is necessary for the imported logical volumes to go through entry processing. An import operation is more restrictive than an export operation in that only one import operation is allowed per physical library, while one export operation is allowed per logical library (VTS). Also, import and export operations are not allowed to execute simultaneously in the same library (VTS).

Return Codes for CBRXLCS IMPORT

The return code is placed in register 15 and in the LCSPL in field LCSRCODE. The reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Table 14 represents the reason codes associated with each of the return codes returned by the import function. These reason codes reflect the scheduling (or canceling) of the import function, not the actual results of the import function. See "CBRXLCS Return Codes" on page 188 for more information.

Table 14. IMPORT Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successfully scheduled.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		16	Required volume parameter not specified.
		17	Invalid volume serial specified.
		29	Invalid address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
12	Failure	45	Library name as defined in volume record not found in TCDB.
		52	Volume is not library resident.
		58	Failure accessing volume record in TCDB.
		59	Failure accessing library record in TCDB.
		61	Device services failure.
		63	Volume record not found in TCDB.
		70	Volume does not exist in library manager inventory.
		84	Abend occurred during LCS External Services processing.
		310	Media type or recording technology not supported at this software level.
		312	Function is not compatible with the library (the request cannot be performed by the library due to its current state, its configuration, or set of installed features).
		313	Volume is currently in use.
		314	Import/Export already in progress or host processing not complete.
		315	Not enough physical drives available in VTS.
		316	Import operation not in progress.

Table 14. IMPORT Return and Reason Codes (continued)

Return Code	Error Type	Reason Code	Meaning
		317	No volumes in the import category or no scratch stacked volumes available.
		318	Maximum number of logical volumes defined to library.
		322	Command rejected by the library.
16	Environment	2	OAM control block structure not available.[1]
		80	LCS External Services unable to establish ESTAE.
		93	Library is offline, pending offline or not operational.
		404	OAM address space not available.

[1]Depending on the CBRXLCS function being performed, one or more OAM initialization-related control blocks might be required. First, verify whether the OAM1 subsystem entry was specified in the IEFSSN*xx* PARMLIB member. Then verify whether the OAM address space has been started.

Changing Library Operating Modes (Peer-to-Peer VTS Mode Control)

The Peer-to-Peer VTS mode control (PTPMC) function allows an installation or application, such as Geographically Dispersed Parallel Sysplex (GDPS), to change current operating modes of the library. Upon installation of the library, the customer engineer must determine the default mode settings. (See "Geographically Dispersed Parallel Sysplex Support for Peer-to-Peer VTS" on page 22 for more information on GDPS.)

Attention: In a library with outboard policy management support, the selective peer-to-peer copy mode overrides PTPMC settings. See "Selective Peer-to-Peer Copy Mode" on page 24 for further information on the selective peer-to-peer copy mode.

Figure 12 provides the CBRXLCS Assembler macro syntax that is used to perform the PTPMC function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=PTPMC
         ,LIBNAME=library-name
         [,IOLIB={PRIMARY | PREFERRED | BALANCED | DEFAULT}]
         [,COPYMODE={IMMEDIATE | DEFERRED | DEFAULT}]
         [,DEFVALUE=deferred-priority-threshold]
         [,COPYOPER={ENABLE | DISABLE}]
         [,ACCESS=RWDISCON]
```

Figure 12. Peer-to-Peer VTS Mode Control (PTPMC) Assembler Macro Syntax

When a value is requested, the keyword operand may be one of the following:

- The name of the field that contains the requested value
- The number, in parentheses, of a general register in the range of 2–12 that contains the address of the field

Required Parameters

TYPE=TAPE

Specifies a request related to the TCDB.

FUNC=PTPMC
Specifies a request to change current mode settings of the Peer-to-Peer VTS library.

LIBNAME=*library-name*
Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks. Unless explicitly specified with the parameter, the library name specified can be either a distributed library or a composite library.

Optional Parameters

At least one of the following optional keywords must be specified with the function PTPMC:

- ACCESS
- COPYMODE
- COPYOPER
- IOLIB

If an optional keyword is not specified, the current setting for that option is retained. The operational modes specified are applied to all IBM TotalStorage Virtual Tape Controllers (AX0).

IOLIB=PRIMARY
Specifies a request to set the distributed library that is to be selected for all host I/O operations; this makes the selected library the master library. During mount processing, if the primary VTS is not available, the mount request is failed. If the VTS does not have a valid version of the volume, and a valid version is available on another VTS, a copy operation is performed as part of the mount process. If a valid version cannot be copied, the mount is failed. If the specified VTS does not have the needed volume in cache, and it is in cache in another VTS, a copy operation is also performed. If the needed volume is not in cache in any available VTS, a recall is performed on the specified VTS. The library specified for **LIBNAME** must be a distributed library.

Note: If you are setting **IOLIB=PRIMARY** and the specified distributed library is not currently the master library, the completion of this request can take up to 20 minutes.

IOLIB=PREFERRED
Specifies a request to set the preferred distributed library for host I/O operations. The preferencing is honored as long as the VTS library specified is available and has a valid version of the volume in its cache, and as long as another available VTS does not have the volume in its cache. The library specified for **LIBNAME** must be a distributed library.

IOLIB=BALANCED
Specifies a request to let the library balance the workload across all the VTS libraries in the Peer-to-Peer VTS configuration. The balance of the workload is the primary criterion for selection of the VTS to perform host I/O operations.

IOLIB=DEFAULT
Specifies a request to use the customer engineer's default I/O selection setting on the AX0s for host I/O operations.

COPYMODE=IMMEDIATE
Specifies a request to set the copy mode to **IMMEDIATE**. With this setting, a

copy of the data is made upon receiving the host rewind/unload (RUN) command. The completion of the rewind/unload (RUN) command is held until the copy has been made.

COPYMODE=DEFERRED
Specifies a request to set the copy mode to **DEFERRED**. With this setting, upon receiving the host rewind/unload (RUN) command, the copying of the data is queued.

COPYMODE=DEFAULT
Specifies a request to use the customer engineer's copy mode setting and the customer engineer's deferred mode priority threshold value on the AX0s.

DEFVALUE=*deferred-priority-threshold*
Specifies the name of a bit variable (1-byte length) that contains the number of hours between 0 and 255 for the deferred copy mode priority threshold value. If a copy operation has been queued longer than the number of hours specified by the deferred copy mode priority threshold value, when it is selected for processing, it is given a higher I/O priority than host I/O operations. This specified parameter value affects copy operations that are initiated after the successful completion of this command.

This parameter is only applicable with the **COPYMODE=DEFERRED** specification and is ignored with any other FUNC=PTPMC specification. If **COPYMODE=DEFERRED** is specified without this parameter, the current deferred mode priority threshold value is retained.

COPYOPER=ENABLE
Specifies a request to enable copy operations that have been previously disabled.

COPYOPER=DISABLE
Specifies a request to disable copy operations. Copies currently in progress are completed. Subsequent copies are queued to be performed later when copy operations are enabled again.

ACCESS=RWDISCON
Specifies a request to enable the access mode of Read/Write Disconnected, a special mode that allows controlled access to data when one or more elements of a PTP VTS become unavailable and prevent normal operations. The Read/Write Disconnected mode allows logical volumes to be read, modified, or rewritten, unless the volumes are known to be invalid. This mode forces the available VTS to become the master; it should only be set for one VTS. This mode is no longer in effect when communication with both VTSs has been established and token updates have been completed.

The library specified for **LIBNAME** must be a distributed library. **IOLIB**, **COPYMODE**, and **COPYOPER** specifications are ignored at the library when the **ACCESS** keyword is specified.

Note: Check with your hardware support center for the availability of the Read/Write Disconnected option through this interface. If the installed microcode does not support this option, it will be ignored.

Return Codes for CBRXLCS PTPMC

Table 15 on page 183 represents the reason codes associated with each of the return codes returned by the function PTPMC.

For field LCSRCODE, the return code is placed in register 15 and in the LCSPL. For field LCSREAS, the return code is placed in register 0 and in the LCSPL.

Table 15. PTPMC Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful.
4	Warning		No warnings returned by PTPMC.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		23	Required library name parameter not specified.
		27	Invalid library name.
		29	Invalid parameter address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
		217	At least one optional keyword must be specified with function.
12	Failure	59	Failure accessing library record in TCDB.
		61	Device services failure.
		64	Library record not found in TCDB for requested library.
		84	Abend occurred during LCS External Services processing.
		312	Function is not compatible with the library (the request cannot be performed by the library due to its current state, its configuration, or set of installed features).
		322	Command rejected by the library.
16	Environment	80	LCS External Services unable to establish ESTAE.

For additional information on using the CBRXLCS macro, see "Using the CBRXLCS Macro in an Assembler Environment" on page 187.

Obtaining Operational Mode Settings (Peer-to-Peer VTS Data)

The Peer-to-Peer VTS data (PTPDATA) function allows an installation or application, such as Geographically Dispersed Parallel Sysplex (GDPS), to obtain operational mode settings and device-related information from the PTP VTS library. (See "Geographically Dispersed Parallel Sysplex Support for Peer-to-Peer VTS" on page 22 for more information on GDPS.)

Figure 13 provides the CBRXLCS Assembler macro syntax that is used to perform the PTPDATA function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=PTPDATA
         ,LIBNAME=library-name
         ,DATATYPE={MODE | DEVICE}
         [,SUBPOOL=subpool-number]
         [,LOC={BELOW | ANY}]
```

Figure 13. Peer-to-Peer VTS Data (PTPDATA) Assembler Macro Syntax

When a value is requested, the keyword operand may be one of the following:

- The name of the field that contains the requested value

- The number, in parentheses, of a general register in the range of 2–12 that contains the address of the field

Required Parameters

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=PTPDATA
Specifies a request for Peer-to-Peer VTS library information.

LIBNAME=*library-name*
Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks. The library name specified must be a composite Peer-to-Peer library.

DATATYPE=MODE
Specifies a request for Peer-to-Peer VTS library operating mode information. The information is returned in mapping macro CBRTDI pointed to by LCSTDI@ in the LCSPL output parameter of the CBRLCSPL mapping macro.

DATATYPE=DEVICE
Specifies a request for Peer-to-Peer VTS library device information. The information is returned in mapping macro CBRTDI pointed to by LCSTDI@ in the LCSPL output parameter of the CBRLCSPL mapping macro.

Optional Parameters

SUBPOOL=*subpool-number*
Specifies the name of a bit variable (1-byte length) that contains the number of the subpool from which storage for the requested information is obtained. If no subpool is specified, storage is obtained from subpool 0 in the key of the caller.

LOC=BELOW | ANY
BELOW specifies that the storage for the requested information is to be obtained below the 16-megabyte line. **ANY** specifies that the storage for the requested information may be obtained above the 16-megabyte line. **ANY** is the default value if the **LOC** keyword is omitted.

Notes:

1. The VTS I/O distributed libraries are identified as 1 or 2 in the returned CBRTDI data; however, the TotalStorage Peer-to-Peer VTS Specialist identifies the distributed libraries as 0 and 1. Use the library name or sequence number, or both, that are displayed in the TotalStorage Peer-to-Peer VTS Specialist to ensure that the correct distributed library is being referenced.
2. The caller must free the storage obtained for the returned data information, pointed to by LCSTDI@, for the length specified in the TDILENG field in the CBRTDI mapping macro.

Return and Reason Codes for CBRXLCS PTPMC

Table 16 on page 185 represents the reason codes that are associated with each of the return codes returned by the function PTPDATA.

For field LCSRCODE, the return code is placed in register 15 and in the LCSPL. For field LCSREAS, the return code is placed in register 0 and in the LCSPL.

Table 16. PTPDATA Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful.
4	Warning		No warnings returned by PTPDATA.
8	Invalid request	9	Required type parameter not specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		23	Required library name parameter not specified.
		27	Invalid library name specified.
		29	Invalid parameter address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
		218	Required DATATYPE keyword not specified.
12	Failure	59	Failure accessing library record in TCDB.
		61	Device services failure.
		64	Library record not found in TCDB for requested library.
		81	Unable to obtain storage for TDI information.
		84	Abend occurred during LCS External Services processing.
		312	Function is not compatible with the library (the request cannot be performed by the library due to its current state, its configuration, or set of installed features).
		322	Command rejected by the library.
16	Environment	80	LCS External Services unable to establish ESTAE.

Obtaining Library Name Information (OLN)

The obtain library name information (OLN) function of the LCS External Services macro allows you to obtain the library name or library ID, the console name, an indication of whether outboard policy management is supported, and the library type. The OLN function returns the information in the LCSOPARM fields of the LCS External Services parameter list (CBRLCSPL).

Figure 14 provides the CBRXLCS Assembler macro syntax that is used to perform the OLN function.

```
CBRXLCS  TYPE=TAPE
         ,FUNC=OLN
         ,LIBNAME=library-name |
         ,LIBID=library-ID
```

Figure 14. Obtain Library Name Information (OLN) Assembler Macro Syntax

Required Parameters

TYPE=TAPE
Specifies a request related to the TCDB.

FUNC=OLN
Specifies a request to obtain information for a given library.

LIBNAME=*library-name*
Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks.

LIBID=*library-ID*
Specifies the name of a character variable (five-byte length) that contains the library ID (sequence number) associated with the library on the ISMF library define panel.

Rule: You must specify either LIBNAME or LIBID, but you cannot specify both.

Successful Obtain Library Name Information Processing

Table 17 shows the fields that contain the information returned by the OLN function.

Table 17. OLN Function Fields

Field	Information
LCSLIBNM	Library name
LCSLBID	Library ID
LCSCONSN	Console name
LCSLOPM	Outboard policy management indicator
LCSATL, LCSMTL, LCSVTS, LCSVDL, LCSVCL, LCSVE	Library type indicators
LCSCOMPL	Composite library associated with the specified distributed library

Notes:

1. If you specify the library name when invoking the OLN function, the library ID is returned. If you specify the library ID when invoking the OLN function, the library name is returned.
2. A 3494 VTS tape library has both the LCSATL and the LCSVTS library type indicators set on.
3. A 3494 Peer-to-Peer VTS library has the LCSATL, LCSVTS, and either the LCSVDL or the LCSVCL library type indicators set on.
4. A TS7700 Virtualization Engine (3957-V0x or 3957-VEx) has the LCSATL, LCSVTS, LCSVE and either the LCSVDL or the LCSVCL library type indicators set on.
5. If the specified LIBNAME or LIBID is a distributed library (LCSVDL), LCSCOMPL contains the associated 8-CHAR composite library. If the associated composite library cannot be determined “UNKNOWN” will be returned in LCSCOMPL.

Return and Reason Codes for CBRXLCS OLN

Table 18 on page 187 represents the reason codes that are associated with each of the return codes returned by the function OLN.

For field LCSRCODE, the return code is placed in register 15 and in the LCSPL. For field LCSREAS, the return code is placed in register 0 and in the LCSPL.

Table 18. OLN Return and Reason Codes

Return Code	Error Type	Reason Code	Meaning
0	Successful	0	Successful.
8	Invalid request	9	Required type parameter not specified.
		10	Mutually exclusive required parameters specified.
		11	Invalid value specified for type.
		12	Required function parameter not specified.
		13	Invalid value specified for function.
		27	Invalid library name specified.
		29	Invalid parameter address specified for LCSPL.
		30	LCSPL not aligned on fullword boundary.
		32	Required library ID/library name not specified.
		33	Invalid library ID specified.
12	Failure	59	Failure accessing library record in TCDB.
		60	Failure accessing the SMS storage group constructs.
		61	Device services failure.
		62	Specified library is not defined to active configuration.
		64	Library record not found in TCDB for requested library.
		65	Library logical type not defined.
		84	Abend occurred during LCS External Services processing.
		93	Library is not operational.
16	Environment	80	LCS External Services unable to establish ESTAE.

CBRXLCS Macro Interface

The executable CBRXLCS macro invokes functions that are provided by LCS External Services. This section describes how to use the CBRXLCS macro, the CBRXLCS return and reason codes, and the CBRXLCS parameter list.

Using the CBRXLCS Macro in an Assembler Environment

Perform the following steps to use the CBRXLCS macro in an Assembler language environment:

__ Step 1. Include mapping macro CBRLCSPL to provide a DSECT for the LCS External Services parameter list, as follows:

```
CBRLCSPL
```

__ Step 2. Create copies of the LCSPL in both static and dynamic storage using the LIST form of CBRXLCS, as follows:

```
CBRXLCS  MF=(L,static-list-name)
CBRXLCS  MF=(L,dynamic-list-name)
```

Note: No other keywords can be supplied on the LIST form of CBRXLCS.

__ Step 3. Initialize the LCSPL by copying the static LIST form to the dynamic LIST form.

Rule: Because the length of the LCSPL exceeds 256 bytes, you must use the MVCL instruction for the copy.

__ Step 4. Set parameter values in the LCSPL using the MODIFY form of CBRXLCS, as follows:

```
CBRXLCS  keywords,
     MF =(M,dynamic-list-name)
```

Rule: If you use the MODIFY form of the macro, you must follow it with the EXECUTE form.

__ Step 5. Set the parameter values in the LCSPL using the EXECUTE form of CBRXLCS and invoke LCS External Services to perform the requested function, as follows:

```
CBRXLCS  keywords,
      MF=(E,dynamic-list-name)
```

Note: You can use the EXECUTE form of the macro without having previously used the MODIFY form.

__ Step 6. To check the completeness and compatibility of the set of parameters supplied on a single invocation of CBRXLCS, specify one of the following statements using the MODIFY form of the macro or the EXECUTE form of the macro, as follows:

```
CBRXLCS  keywords,
      MF=(M,dynamic-list-name,COMPLETE)
         or
CBRXLCS  keywords,
      MF=(E,dynamic-list-name,COMPLETE)
```

There is no standard form of the CBRXLCS macro for Assembler language.

CBRXLCS Return Codes

The return code from CBRXLCS is placed in register 15 and in the LCSPL in field LCSRCODE. The corresponding reason code is placed in register 0 and in the LCSPL in field LCSREAS.

Note: See the description of each CBRXLCS function for specific return and reason code pairs.

Code	Meaning
0	Successful execution. The request completed or was scheduled successfully.
4	Request completed with warning condition. The reason code identifies the specific cause of the warning.
8	Invalid request. The reason code identifies the specific cause of the invalid parameter condition.
12	Request failed. The reason code identifies the specific cause of the error.
16	Invalid environment. The reason code identifies the specific cause of the error.

See the "CBRXLCS REASON CODES" area in Figure 15 on page 189 for a specific description of XLCS reason codes. Topic CBRXLCS Return and Reason Codes in *z/OS DFSMSdfp Diagnosis* also contains descriptions of XLCS return and reason codes.

CBRXLCS Execution Environment

The following execution environment is required for use by the CBRXLCS macro:

- Task mode
- Unlocked
- Noncross-memory mode (HASN = PASN = SASN)
- 24-bit or 31-bit addressing mode
- Primary ASC mode (not AR mode)
- You must also have TESTAUTH authorization.

LCS External Services Parameter List (CBRLCSPL Macro)

The LCS External Services Parameter List (LCSPL), mapped by macro CBRLCSPL, is used to pass parameters to the LCS External Services, and to pass return and reason codes and other information back to the caller.

The storage for the LCSPL must be aligned to a fullword boundary. If this is not the case, an error is returned and the requested function is not performed.

Figure 15 provides the format of the LCS External Services parameter list. The **boldfaced** lines of code are new for this release.

Rule: Fields that are identified as RESERVED FOR IBM FUTURE OR INTERNAL USE must not be used by the installation.

```
*------------------------------------------------------------------------*
*                                                                        *
*        LIBRARY CONTROL SYSTEM (LCS) PARAMETER LIST                     *
*                                                                        *
*------------------------------------------------------------------------*
         SPACE 1
LCSPL    DSECT ,                   LCS PARAMETER LIST
         SPACE 1
*------------------------------------------------------------------------*
*                                                                        *
*        CBRXLCS OUTPUT PARAMETERS                                       *
*                                                                        *
*------------------------------------------------------------------------*
LCSOPARM DS    0F                  CBRXLCS OUTPUT PARAMETER SECTION
LCSLIBNM DS    CL8                 LIBRARY NAME
LCSCONSN DS    CL8                 CONSOLE NAME
LCSLBID  DS    CL5                 LIBRARY ID
         DS    CL3                 RESERVED FOR ALIGNMENT
LCSTVI@  DS    A                   ADDRESS OF TAPE VOLUME INFORMATION,
*                                   MAPPED BY CBRTVI
LCSTDI@  DS    A                   ADDRESS OF PTP VTS DATA
*                                   MAPPED BY CBRTDI
         DS    A                   RESERVED FOR IBM FUTURE USE
         DS    A                   RESERVED FOR IBM INTERNAL USE
         DS    A                   RESERVED FOR IBM INTERNAL USE
LCSFLAGS DS    XL1                 OUTPUT FLAGS
LCSATL   EQU   X'80'               ON IF THE LIBRARY IS AUTOMATED
LCSMTL   EQU   X'40'               ON IF THE LIBRARY IS MANUAL
LCSVTS   EQU   X'10'               ON IF THE LIBRARY IS A VTS
LCSVCL   EQU   X'08'               ON IF VTS COMPOSITE LIBRARY
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 1 of 11)

```
LCSVDL   EQU   X'04'               ON IF VTS DISTRIBUTED LIBRARY
LCSVE    EQU   X'02'               ON IF VTS VIRTUALIZATION ENGINE
         DS    XL1                 RESERVED FOR IBM FUTURE USE
LCSMFLGS DS    XL1                 MISCELLANEOUS OUTPUT FLAGS
LCSLOPM  EQU   X'80'               ON IF OUTBOARD POLICY MANAGEMENT
*                                   SUPPORTED IN LIBRARY
         DS    XL1                 RESERVED FOR IBM FUTURE USE
LCSRCODE DS    F                   CBRXLCS RETURN CODE
LCSREAS  DS    F                   CBRXLCS REASON CODE
         DS    XL8                 RESERVED FOR IBM FUTURE USE
LCSPOLEN EQU   *-LCSOPARM          LENGTH EQUATE FOR OUTPUT PARMS
*
*-------------------------------------------------------------------*
*                                                                   *
*        CBRXLCS RETURN CODES                                       *
*   (RETURNED IN REGISTER 15 AND FIELD LCSRCODE UPON                *
*    COMPLETION OF LCS EXTERNAL SERVICES PROCESSING)                *
*                                                                   *
*-------------------------------------------------------------------*
*
LCSSUCC  EQU   0                   SUCCESSFUL EXECUTION
LCSWARN  EQU   4                   REQUEST COMPLETED WITH WARNING
*                                   CONDITION
LCSIREQ  EQU   8                   INVALID REQUEST
LCSFAIL  EQU   12                  REQUEST FAILED
LCSENVIR EQU   16                  INVALID ENVIRONMENT
*
*-------------------------------------------------------------------*
*                                                                   *
*        CBRXLCS INPUT PARAMETERS                                   *
*    (INITIALIZED BY THE CBRXLCS MACRO EXPANSION)                   *
*                                                                   *
*-------------------------------------------------------------------*
LCSIPARM DS    F                   CBRXLCS INPUT PARAMETER SECTION
LCSFLAG  DS    BL4                 FLAG BYTES
LCSFLG1  DS    BL1                 FLAG BYTE 1
*        BITS ASSIGNED TO LCSFLG1
LCS_VOLIST     EQU   B'10000000'   MCE VOLUME LIST PARAMETER SPECIFIED
LCS_VOLUME     EQU   B'00100000'   VOLUME PARAMETER SPECIFIED
LCS_SPNUM      EQU   B'00010000'   SUBPOOL PARAMETER SPECIFIED
LCS_UCBPTR     EQU   B'00001000'   UCBPTR PARAMETER SPECIFIED
LCS_USE        EQU   B'00000100'   USE PARAMETER SPECIFIED
LCS_TYPE       EQU   B'00000010'   TYPE PARAMETER SPECIFIED
LCS_FUNC       EQU   B'00000001'   FUNC PARAMETER SPECIFIED
*
LCSFLG2  DS    BL1                 FLAG BYTE 2
*        BITS ASSIGNED TO LCSFLG2
LCS_DEVTYPE    EQU   B'10000000'   DEVICE TYPE PARAMETER SPECIFIED
LCS_GRPNAME    EQU   B'01000000'   STORAGE GROUP NAME PARAMETER
*                                   SPECIFIED
LCS_EXPDATE    EQU   B'00100000'   EXPIRATION DATE PARAMETER
*                                   SPECIFIED
LCS_WRTDATE    EQU   B'00010000'   LAST DATE WRITTEN PARAMETER
*                                   SPECIFIED
LCS_WRTPROT    EQU   B'00001000'   WRITE PROTECTION STATUS
*                                   PARAMETER SPECIFIED
LCS_LIBID      EQU   B'00000100'   LIBRARY ID PARAMETER SPECIFIED
LCS_LIBNAME    EQU   B'00000001'   LIBRARY NAME PARM SPECIFIED
*
LCSFLG3  DS    BL1                 FLAG BYTE 3
LCS_EXITINFO   EQU   B'10000000'   INSTALLATION EXIT INFORMATION
*                                   SPECIFIED
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 2 of 11)

```
LCS_BULKEJCT   EQU   B'01000000'    BULK EJECT PARAMETER SPECIFIED
LCS_EJECTOPT   EQU   B'00100000'    EJECTOPT PARAMETER SPECIFIED
LCS_VOLINFO    EQU   B'00000100'    VOLINFO=YES SPECIFIED
LCS_USERID     EQU   B'00000010'    USERID SPECIFIED (FUNC EJECT)
LCS_CANCEL     EQU   B'00000001'    CANCEL SPECIFIED
LCSFLG4  DS    BL1                  FLAG BYTE 4 (FUNCTION SPECIFIC)
*  QVR FUNCTION FLAG
LCS_NOTCDBCK   EQU   B'10000000'    NO RECORD RETRIEVAL FOR QVR
LCS_STORADDR   EQU   B'01000000'    STORADDR SPECIFIED
LCS_QVRSPLOC   EQU   B'00100000'    QVR SUBPOOL LOCATION SPECIFIED
*  GDPS PTPMC AND PTPDATA FUNCTION FLAGS
LCS_IOLIB      EQU   B'10000000'    PTPMC IOLIB SPECIFIED
LCS_COPYMODE   EQU   B'01000000'    PTPMC COPYMODE SPECIFIED
LCS_COPYOPER   EQU   B'00100000'    PTPMC COPYOPER SPECIFIED
LCS_ACCESS     EQU   B'00010000'    PTPMC ACCESS SPECIFIED
LCS_DATATYPE   EQU   B'00001000'    PTPDATA DATATYPE SPECIFIED
LCS_SPLOC      EQU   B'00000100'    SUBPOOL LOCATION SPECIFIED
LCS_DEFTHRSH   EQU   B'00000010'    DEFERRED THRESHOLD SPECIFIED
*  CUA OUTBOARD POLICY MANAGEMENT FLAGS
LCS_GETPOLICY  EQU   B'10000000'    GETPOLICY SPECIFIED
LCS_SETLMSC    EQU   B'01000000'    SCNAME POLICY SPECIFIED
LCS_SETLMMC    EQU   B'00100000'    MCNAME POLICY SPECIFIED
LCS_SETLMDC    EQU   B'00010000'    DCNAME POLICY SPECIFIED
*                                   LCS_GRPNAME USED FOR SG
*
*------------------------------------------------------------------------*
*                                                                        *
*        CBRXLCS FUNCTION AND FUNCTION TYPES                             *
*                                                                        *
*------------------------------------------------------------------------*
LCSTYPE  DS    XL1                  FUNCTION TYPE
LCSTAPE  EQU   1                    FUNCTION TYPE = TAPE
*
LCSFUNC  DS    XL1                  REQUEST FUNCTION
*
LCSTVE   EQU   1                    TEST VOLUME ELIGIBILITY
LCSCUA   EQU   3                    CHANGE USE ATTRIBUTE
LCSOLN   EQU   4                    OBTAIN LIBRARY NAME INFORMATION
LCSMCE   EQU   5                    MANUAL CARTRIDGE ENTRY
LCSQVR   EQU   6                    QUERY VOLUME RESIDENCE
LCSEJECT EQU   7                    EJECT VOLUME
LCSIMPRT EQU   8                    IMPORT
LCSEXPRT EQU   9                    EXPORT
LCSPTPMC EQU   10                   PEER-TO-PEER MODE CONTROL
LCSPTPDT EQU   11                   PEER-TO-PEER DATA REQUEST
*
*------------------------------------------------------------------------*
*                                                                        *
*   OTHER INPUT PARAMETERS AND CONSTANTS USED TO INITIALIZE THEM         *
*   (INITIALIZED BY THE CBRXLCS MACRO EXPANSION)                         *
*                                                                        *
*------------------------------------------------------------------------*
LCSUSE   DS    XL1                  USE ATTRIBUTE TYPE
*        VALUES ASSIGNED TO LCSUSE
LCSPRIV  EQU   1                    USE ATTRIBUTE OF PRIVATE
LCSSCR   EQU   2                    USE ATTRIBUTE OF SCRATCH
*
LCSSPNUM DS    XL1                  SUBPOOL NUMBER IN WHICH TO OBTAIN
*                                    STORAGE FOR TVI/TDI
LCSSTOR@ DS     A                   POINTER TO STORADDR STORAGE
LCSEXPDT DS    XL4                  EXPIRATION DATE
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 3 of 11)

```
LCSDVTYP DS    A                   POINTER TO THE TAPE DEVICE
*                                   SELECTION INFORMATION
LCSUCB@  DS    A                   UCB ADDRESS FOR TAPE DRIVE WHOSE
*                                   ELIGIBILITY IS TO BE TESTED
LCSVOL@  DS    A                   POINTER TO A LIST OF VOLUME SERIAL
*                                   NUMBERS
         DS    A                   RESERVED FOR IBM INTERNAL USE
LCSEXITI DS    XL16                INFORMATION TO BE PASSED TO THE
*                                   MCE, CUA, AND EJECT INSTALLATION
*                                   EXITS
LCSUSERID DS   CL8                 USERID (FUNCTION EJECT)
LCSVOLSR DS    CL6                 TAPE VOLUME SERIAL NUMBER
LCSWRTPR DS    CL1                 WRITE PROTECTION STATUS
*        VALUES ASSIGNED TO LCSWRTPR
LCSWPYES EQU   C'Y'                WRITE PROTECT STATUS YES
LCSWPNO  EQU   C'N'                WRITE PROTECT STATUS NO
*
LCSDATAT DS    XL1                 PEER-TO-PEER DATA TYPE
*        VALUES ASSIGNED TO LCSDATAT
LCSMODE  EQU   1                   MODE DATA TYPE REQUEST
LCSDEVIC EQU   2                   DEVICE DATA TYPE REQUEST
*
LCSTRGRP DS    CL8                 STORAGE GROUP NAME
LCSLIBID DS    CL5                 LIBRARY ID
LCSIOLIB DS    XL1                 PEER-TO-PEER IO LIBRARY
*        VALUES ASSIGNED TO LCSIOLIB
LCSPRIM  EQU   1                   PRIMARY IO LIBRARY
LCSPREFD EQU   2                   PREFERRED IO LIBRARY
LCSBALCD EQU   3                   BALANCE IO
LCSIODFT EQU   4                   DEFAULT IO TO CE SETTING
*
LCSCPYMD DS    XL1                 PEER-TO-PEER COPYMODE
*        VALUES ASSIGNED TO LCSCPYMD
LCSIMMED EQU   1                   IMMEDIATE COPY MODE
LCSDFERD EQU   2                   DEFERRED COPY MODE
LCSCPYDF EQU   3                   DEFAULT TO CE SETTING
*
LCSCPYOP DS    XL1                 PEER-TO-PEER COPY OPERATIONS
*        VALUES ASSIGNED TO LCSCPYOP
LCSENABL EQU   1                   ENABLE COPY OPERATIONS
LCSDSABL EQU   2                   DISABLE COPY OPERATIONS
*
LCSLBNM  DS    CL8                 LIBRARY NAME
LCSEJOPT DS    CL1                 EJECT OPTION OF KEEP OR PURGE
*        VALUES ASSIGNED TO LCSEJOPT
LCSKEEP  EQU   C'K'                KEEP TCDB RECORD ON EJECT
LCSPURGE EQU   C'P'                PURGE TCDB RECORD ON EJECT
LCSEJQRY EQU   C'Q'                QUERY OAM EJECT QUEUES
LCSBULK  DS    CL1                 EJECT TO BULK OR CONVENIENCE
*                                   OUTPUT STATION FOR ATL
*        VALUES ASSIGNED TO LCSBULK
LCSBLYES EQU   C'Y'                ATL BULK OUTPUT STATION
LCSBLNO  EQU   C'N'                ATL CONVENIENCE OUTPUT STATION
*
LCSACCES DS    XL1                 PEER-TO-PEER SPECIAL ACCESS
*        VALUES ASSIGNED TO LCSACCES
LCSRWDIS EQU   1                   READ/WRITE DISCONNECTED
*
LCSSPLOC DS    XL1                 SUBPOOL LOCATION SPECIFICATION
*        VALUES ASSIGNED TO LCSSPLOC
LCSANY   EQU   0                   MAY BE ABOVE THE 16 MEG LINE
LCSBELOW EQU   1                   BELOW THE 16 MEGABYTE LINE
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 4 of 11)

```
LCSDPTHV DS    XL1                 DEFERRED PRIORITY THRESHOLD
         DS    CL3                 RESERVED FOR IBM FUTURE USE
LCSPILEN EQU   *-LCSIPARM           LENGTH EQUATE FOR INPUT PARMS
*------------------------------------------------------------------*
*                                                                  *
*        DIAGNOSTIC INFORMATION                                    *
*  (RETURNED FROM LCS EXTERNAL SERVICES)
*                                                                  *
*------------------------------------------------------------------*
LCSDIAG  DS    0F                   DIAGNOSTIC INFORMATION SECTION
LCSSABCD DS    F                   SYSTEM ABEND CODE
LCSSABRC DS    F                   ABEND REASON CODE
LCSLBSRC DS    F                   RETURN CODE FROM DEVICE SVCS
LCSLBSRS DS    F                   REASON CODE FROM DEVICE SVCS
LCSSSIRC DS    F                   RETURN CODE FOR SMS SSI
LCSSMSRC DS    F                   RETURN CODE FROM CONSTRUCT ACCESS
*                                   SERVICES
LCSSMSRS DS    F                   REASON CODE FROM CONSTRUCT ACCESS
*                                   SERVICES
LCSUSRC  DS    F                   RETURN CODE FROM UCBSCAN
LCSUSRS  DS    F                   REASON CODE FROM UCBSCAN
LCSXLIBR DS    F                   RETURN CODE FROM TCDB LIBRARY
*                                   RECORD INQUIRY
LCSXVOLR DS    F                   RETURN CODE FROM TCDB VOLUME
*                                   RECORD INQUIRY
LCSCATRC DS    F                   RETURN CODE FROM CATALOG
LCSCATRS DS    XL2                 REASON CODE FROM CATALOG
         DS    XL2                 RESERVED FOR IBM INTERNAL USE
LCSOAMRC DS    F                   RETURN CODE FROM OAM
LCSOAMRS DS    F                   REASON CODE FROM OAM
LCSCATMI DS    CL2                 CATALOG MODULE ID
LCSLBSNF DS    XL1                 FORMAT OF SENSE RECORD CREATED BY
*                                  3490 CONTROL UNIT AFTER I/O ERROR
*                                  BETWEEN HOST AND CONTROL UNIT
LCSLBERA DS    XL1                 ERROR RECOVERY ACTION (ERA) CODE
*                                  RETURNED AFTER FAILURE TO PERFORM
*                                  REQUESTED LIBRARY FUNCTION
LCSLBERM DS    XL1                 ERROR MODIFIER CODE ASSOCIATED WITH
*                                  THE ERA CODE
LCSFCCW  DS    XL1                 FAILING COMMAND CODE  (CCW)
LCSIOST  DS    XL2                 SUBCHANNEL STATUS INFORMATION,
*                                  INCLUDES DEVICE STATUS FOLLOWED BY
*                                  SUBCHANNEL STATUS
         DS    CL4                 RESERVED FOR IBM FUTURE USE
LCSPDLEN EQU   *-LCSDIAG           LENGTH EQUATE FOR DIAGNOSTIC
*                                  SECTION
*------------------------------------------------------------------*
*                                                                  *
*        LCSPL POLICY INPUT AREA                                   *
*                                                                  *
*------------------------------------------------------------------*
LCSPOLS  DS    0F                  LM POLICY SPECIFICATIONS
*                                  LM STORAGE GROUP IN LCSTRGRP
LCSLMSC  DS    CL8                 LM STORAGE CLASS SPECIFICATION
LCSLMMC  DS    CL8                 LM MANAGEMENT CLASS SPECIFICATION
LCSLMDC  DS    CL8                 LM DATA CLASS SPECIFICATION
*------------------------------------------------------------------*
*                                                                  *
*        LCSPL EXPANSION AREA                                      *
*                                                                  *
*------------------------------------------------------------------*
LCSEXP   DS    0F                  EXPANSION AREA
         DS    CL48                RESERVED FOR IBM FUTURE USE
         DS    CL48                RESERVED FOR IBM FUTURE USE
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 5 of 11)

```
LCSPELEN EQU   *-LCSEXP            LENGTH EQUATE FOR EXPANSION AREA
*
LCSPLENG EQU   *-LCSPL             LENGTH EQUATE
*-------------------------------------------------------------------*
*                                                                   *
*        CBRXLCS VOLUME LIST MAPPING                                *
*  (TO BE INITIALIZED AND PROVIDED AS INPUT FOR A REQUEST           *
*   TO ENTER A LIST OF VOLUMES INTO A MANUAL TAPE LIBRARY (MCE))    *
*                                                                   *
*-------------------------------------------------------------------*
LCSV     DSECT                     (POINTED TO BY LCSVOL@)
LCSVBUF  DS    F                   TOTAL LENGTH OF VOLUME LIST
*                                    (HEADER  + LIST)
LCSVCNT  DS    F                   NUMBER OF VOLUMES IN THE LIST
LCSVLEN  DS    F                   LENGTH OF A VOLUME ENTRY
LCSVADDR DS    A                   POINTER TO FIRST ENTRY
LCSVEND  EQU   *-LCSV              LENGTH OF LCSV
LCSMLIST DSECT                     (POINTED TO BY LCSVADDR FOR AN
*                                    MCE REQUEST)
LCSMVOL  DS    CL6                 LEFT JUSTIFIED, RIGHT PADDED
         DS    CL6                 RESERVED FOR IBM FUTURE USE
LCSMTDSI DS    F                   TAPE DEVICE SELECTION INFORMATION
*                                   (TDSI) FOR THIS VOLUME
LCSMREC  DS    XL1                 TAPE RECORDING TECHNOLOGY
LCSMMED  DS    XL1                 MEDIA TYPE
LCSMCOMP DS    XL1                 COMPACTION
LCSMSPEC DS    XL1                 SPECIAL ATTRIBUTE
LCSMRET  DS    F                   RETURN CODE FOR VOLUME
LCSMREAS DS    F                   REASON CODE FOR VOLUME
LCSMLEND EQU   *-LCSMLIST          LENGTH OF LCSMLIST
*-------------------------------------------------------------------*
*                                                                   *
*        CBRXLCS REASON CODES                                       *
*    (RETURNED IN REGISTER 0 AND FIELD LCSREAS UPON                 *
*     COMPLETION OF LCS EXTERNAL SERVICES PROCESSING,               *
*     AND FIELD LCSMREAS FOR AN MCE REQUEST.)                       *
*                                                                   *
*-------------------------------------------------------------------*
LCSGOOD  EQU   0                   SUCCESSFUL EXECUTION
LCSOAMNA EQU   2                   OAM CONTROL BLOCKS NOT AVAILABLE
LCSWNMNT EQU   3                   DELETED WITH MTL SOFTWARE-ONLY
*                                   SPE
LCSWVAS  EQU   4                   VOLUME ALREADY SCRATCH
LCSWVAP  EQU   5                   VOLUME ALREADY PRIVATE
LCSCUADS EQU   6                   CUA PROCESSING DISABLED
LCSNOCUV EQU   7                   CUA PROCESSING NOT PERFORMED
*                                   FOR THIS VOLUME PER INSTALLATION
*                                   EXIT REQUEST
LCSWSTMP EQU   8                   SCRATCH VOLUME THRESHOLD MESSAGE
*                                   PROCESSING WAS NOT COMPLETED
*                                   SUCCESSFULLY
LCSIRTYP EQU   9                   REQUIRED TYPE PARAMETER NOT
*                                   SPECIFIED
LCSIRMEX EQU   10                  MUTUALLY EXCLUSIVE REQUIRED
*                                   PARAMETERS SPECIFIED
LCSITYPE EQU   11                  INVALID TYPE VALUE SPECIFIED
LCSIRFUN EQU   12                  REQUIRED FUNC PARAMETER NOT
*                                   SPECIFIED
LCSIFUNC EQU   13                  INVALID FUNC VALUE
LCSIRUSE EQU   14                  REQUIRED USE PARAMETER NOT
*                                   SPECIFIED
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 6 of 11)

```
LCSIUSE  EQU   15                INVALID USE VALUE
LCSIRVOL EQU   16                REQUIRED VOLUME PARAMETER NOT
*                                 SPECIFIED
LCSIVOL  EQU   17                INVALID VOLUME VALUE
LCSIRUCB EQU   18                REQUIRED UCBPTR NOT SPECIFIED
LCSIUCB  EQU   19                INVALID UCBPTR VALUE SPECIFIED
LCSIRLST EQU   20                REQUIRED VOLLIST NOT SPECIFIED
LCSIVL   EQU   21                INVALID VOLUME LIST VALUE
LCSISGL  EQU   22                INVALID VALUE IN STORAGE GROUP LIST
*                                  HEADER
LCSIRLBN EQU   23                REQUIRED LIBRARY NAME NOT SPECIFIED
LCSIVLMM EQU   24                INVALID VOLUME LIST, MIXED MEDIA,
*                                  REWRITABLE AND WORM VOLUMES
LCSIEXPD EQU   25                INVALID EXPIRATION DATE VALUE
LCSILBND EQU   26                LIBRARY NOT DEFINED TO STORAGE
*                                 GROUP
LCSILBNM EQU   27                INVALID LIBRARY NAME SPECIFIED
LCSIWPS  EQU   28                INVALID WRITE PROTECT STATUS VALUE
LCSIBADR EQU   29                INVALID ADDRESS SPECIFIED FOR PARAMETER LIST
*                                 OR MAPPING MACRO
LCSIWDBD EQU   30                ADDRESS NOT ON WORD BOUNDARY
*                                 OR LEVEL
LCSIRTDS EQU   31                REQUIRED TAPE DEVICE SELECTION
*                                 INFORMATION (TDSI) NOT SPECIFIED
*
LCSIRLID EQU   32                REQUIRED LIBRARY ID OR LIBRARY
*                                 NAME NOT SPECIFIED
LCSILID  EQU   33                INVALID VALUE SPECIFIED FOR LIBRARY
*                                 ID
LCSISGNM EQU   34                INVALID STORAGE GROUP NAME
LCSIRMED EQU   35                REQUIRED MEDIA TYPE NOT SPECIFIED
*                                 FOR MCE VOLUME
*
LCSICOMP EQU   38                INVALID COMPACTION SPECIFIED
*                                 IN TDSI
LCSISPEC EQU   39                INVALID SPECIAL ATTRIBUTE SPECIFIED
*                                 IN TDSI
LCSIDSC  EQU   40                INVALID COMBINATION OF TAPE DEVICE
*                                 SELECTION VALUES SPECIFIED
LCSIATDC EQU   41                AMBIGUOUS TDSI COMBINATION
*                                 SPECIFIED
LCSITDNA EQU   42                TAPE DEVICE SELECTION VALUE
*                                 SPECIFIED WHERE NOT ALLOWED OR
*                                 NOT APPLICABLE
LCSITDSP EQU   43                INVALID POINTER TO TDSI SPECIFIED
*
LCSIDISP EQU   44                INVALID VALUE SPECIFIED FOR DISP
*                                  KEYWORD
LCSFLUNK EQU   45                LIBRARY NAME AS DEFINED IN VOLUME
*                                 RECORD NOT FOUND IN TCDB
LCSNENAB EQU   46                NO ENABLED STORAGE GROUPS
LCSFSSTG EQU   47                NOT ALL VOLUMES ASSOCIATED WITH THE
*                                 SAME STORAGE GROUP
LCSSGNDS EQU   48                STORAGE GROUP STATE IS NOTCON,
*                                 DISALL, OR DISNEW
LCSFNDP  EQU   49                NO DEVICE POOLS EXIST TO FULFILL
*                                 REQUEST FOR TDSI SPECIFICATION
LCSFVSCR EQU   51                SPECIFIC VOLSER REQUEST FOR SCRATCH
*                                 VOLUME
LCSFNLRS EQU   52                VOLUME(S) RESIDE OUTSIDE LIBRARY
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 7 of 11)

```
LCSFNLCB EQU   53                  LIBRARY FOR SPECIFIED VOLUME NOT
*                                   DEFINED TO SMS CONFIGURATION
LCSFNTSG EQU   54                  SMS STORAGE GROUP WAS
*                                   NOT OF TYPE TAPE
LCSFDNRV EQU   55                  REQUESTED DEVICE DOES NOT RESIDE IN
*                                   SAME LIBRARY AS REQUESTED VOLUME
*
LCSFNLSG EQU   56                  NO LIBRARIES ASSOCIATED WITH LIST
*                                   OF STORAGE GROUPS OR THE LIBRARY IS
*                                   UNKNOWN
LCSFXVOL EQU   58                  FAILURE ACCESSING THE VOLUME RECORD
*                                   IN THE CATALOG
LCSFXLIB EQU   59                  FAILURE ACCESSING THE LIBRARY
*                                   RECORD IN THE CATALOG
LCSFCASV EQU   60                  FAILURE ACCESSING THE SMS STORAGE
*                                   GROUP CONSTRUCTS
LCSFLBSV EQU   61                  FAILURE ACCESSING HARDWARE
*                                   CONFIGURATION INFORMATION
LCSFLIBN EQU   62                  SPECIFIED LIBRARY IS NOT DEFINED
*                                   TO ACTIVE SMS CONFIGURATION
LCSNOVR  EQU   63                  VOLUME RECORD NOT FOUND FOR
*                                   REQUESTED VOLUME
LCSNOLR  EQU   64                  LIBRARY RECORD NOT FOUND IN TCDB
*                                   FOR REQUESTED LIBRARY
LCSFLNDF EQU   65                  LIBRARY LOGICAL TYPE NOT DEFINED
LCSNRECT EQU   66                  NO DEVICE POOLS TO FULFILL REQUEST
*                                   FOR SPECIFIED RECORDING TECHNOLOGY
*
LCSNMEDX EQU   67                  NO DEVICE POOLS TO FULFILL REQUEST
*                                   FOR SPECIFIED MEDIA TYPE
LCSCANCL EQU   69                  REQUEST FAILED BECAUSE VOLUME NOT
*                                   IN LIBRARY INSTALLATION EXIT
*                                   (CBRUXVNL) SAID TO CANCEL JOB
LCSFVNIL EQU   70                  VOLUME NOT FOUND IN LIBRARY MANAGER
*                                   INVENTORY
LCSFFULL EQU   72                  DELETED WITH MTL SOFTWARE-ONLY
*                                   SPE
LCSFDUPV EQU   74                  REQUEST FAILED BECAUSE VOLUME
*                                   SERIAL NUMBER ALREADY EXISTS IN
*                                   LIBRARY MANAGER INVENTORY
LCSFUCBS EQU   75                  UNEXPECTED UCBSCAN ERROR
*                                   ENCOUNTERED DURING PROCESSING
LCSFLBEN EQU   76                  DELETED WITH MTL SOFTWARE-ONLY
*                                   SPE
LCSFLBEJ EQU   77                  DELETED WITH MTL SOFTWARE-ONLY
*                                   SPE
LCSFXVRV EQU   78                  ERROR ATTEMPTING TO RETRIEVE
*                                   VOLUME RECORD
LCSFXVUP EQU   79                  ERROR ATTEMPTING TO WRITE VOLUME
*                                   RECORD
LCSESTAY EQU   80                  ESTAE ROUTINE NOT ESTABLISHED
LCSEGETF EQU   81                  GETMAIN FAILED FOR DEVICE POOL
*                                   NAMES LIST OR LOCAL WORKING
*                                   STORAGE
LCSEXITF EQU   82                  ABNORMAL TERMINATION OCCURRED
*                                   DURING INSTALLATION EXIT
*                                   (CBRUXCUA) EXECUTION
LCSXINVD EQU   83                  INVALID RETURN CODE OR DATA
*                                     RETURNED FROM CHANGE USE
*                                     ATTRIBUTE INSTALLATION EXIT
*                                     (CBRUXCUA)
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 8 of 11)

```
LCSEABND EQU   84                  ABNORMAL TERMINATION OCCURRED
*                                    DURING EXECUTION
*
LCSENDIS EQU   90                  CARTRIDGE ENTRY PROCESSING HAS
*                                    BEEN DISABLED
LCSENSUS EQU   91                  CARTRIDGE ENTRY PROCESSING HAS
*                                    BEEN SUSPENDED FOLLOWING ERROR
*                                    INVOKING INSTALLATION EXIT
LCSNOTMT EQU   92                  LIBRARY FOR MCE NOT MANUAL TAPE
*                                    LIBRARY
LCSLBOFF EQU   93                  LIBRARY OFFLINE, PENDING
*                                    OFFLINE, OR NOT OPERATIONAL
LCSINLIB EQU   94                  SPECIFIED VOLUME ALREADY RESIDES
*                                    IN ANOTHER LIBRARY
LCSXVETO EQU   95                  INSTALLATION EXIT VETOED ENTRY
*                                    OF VOLUME INTO LIBRARY
LCSXIGNR EQU   96                  VOLUME NOT ENTERED INTO MTL BECAUSE
*                                    INSTALLATION EXIT SAID TO IGNORE
*                                    THE VOLUME
LCSDASDV EQU   97                  VOLUME OF SAME VOLSER IS KNOWN DASD
*                                    VOLUME
*
*
*
*    ADDITIONAL REASON CODES ASSOCIATED WITH RETURN CODE
*    LCSWARN(4)
*
LCSNTMNT EQU  120                   VOLUME IS INELIGIBLE BECAUSE
*                                    THE TYPE OF MEDIA DEFINED IN
*                                    THE VOLUME RECORD MAY NOT BE
*                                    MOUNTED ON SPECIFIED DEVICE
LCSMMISM EQU  121                   VOLUME IS INELIGIBLE BECAUSE
*                                    THE TYPE OF MEDIA DEFINED IN
*                                    THE TDSI DOES NOT MATCH MEDIA
*                                    DEFINED ON THE VOLUME RECORD
LCSVERST EQU  122                   VOLUME IS INELIGIBLE BECAUSE
*                                    THE VOLUME RECORD REFLECTS AN
*                                    ERROR STATUS
LCSRTNMT EQU  123                   VOLUME IS INELIGIBLE BECAUSE THE
*                                    SPECIFIED RECORDING TECHNOLOGY
*                                    IS INCOMPATIBLE WITH THE VOLUME
*                                    MEDIA TYPE OR THE SPECIFIED
*                                    DRIVE TYPE
LCSSAMEL EQU  130                   SPECIFIED VOLUME ALREADY
*                                    RESIDES IN THIS TAPE LIBRARY
LCSWLNOP EQU  131                   SCRATCH VOLUME THRESHOLD PROCESS-
*                                    SING NOT PERFORMED BECAUSE
*                                    LIBRARY WAS NOT OPERATIONAL
LCSWNSCT EQU  132                   DELETED WITH 3590 SUPPORT
LCSWNULR EQU  133                   DELETED WITH 3590 SUPPORT
LCSWLMIO EQU  134                   NO TCDB RECORD BUT VOLUME RESIDES
*                                    IN SPECIFIED LIBRARY
LCSWMSLM EQU  135                   LIBRARY MISMATCH, VOLUME RESIDES
*                                    IN SPECIFIED LIBRARY
LCSWMSNF EQU  136                   LIBRARY MISMATCH, VOLUME NOT FOUND
*                                    IN SPECIFIED LIBRARY
LCSWMSLF EQU  137                   LIBRARY MISMATCH, UNABLE TO ACCESS
*                                    SPECIFIED LIBRARY
LCSWSCNU EQU  138                   LIBRARY SCRATCH COUNT NOT
*                                    UPDATED IN TCDB
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 9 of 11)

```
LCSWMSLN EQU  139                   LIBRARY NAME MISMATCH, SPECIFIED
*                                    LIB NAME DID NOT MATCH MTL VOLUME
*                                    RECORD LIB NAME
*    ADDITIONAL REASON CODES ASSOCIATED WITH RETURN CODE
*    LCSIREQ(8)
*
LCSEJCTD EQU  201                  VOLUME ALREADY EJECTED
LCSEJEJO EQU  202                  INVALID VALUE FOR EJECT OPTION
LCSEJBLK EQU  203                  INVALID VALUE FOR BULK EJECT
*
LCSIUSER EQU  204                  INVALID TSO USERID SPECIFIED
LCSBADRT EQU  215                  NOT ALL VOLUMES HAVE THE SAME
*                                   RECORDING TECHNOLOGY
LCSINOLN EQU  216                  INVALID TCDBCHK=NO SPECIFIED
*                                   WITH MTL LIB NAME
LCSIMOPT EQU  217                  AT LEAST ONE OPTIONAL KEYWORD MUST
*                                     BE SPECIFIED WITH FUNCTION
LCSIRDAT EQU  218                  REQUIRED DATATYPE NOT SPECIFIED
LCSIOPMC EQU  219                  INVALID POLICY NAME
LCSIEXCL EQU  220                  MUTUALLY EXCLUSIVE OPTIONAL
*                                   KEYWORDS SPECIFIED
LCSISHLG EQU  221                  INVALID STORAGE HEADER AND/OR
*                                   LENGTH
*
*    ADDITIONAL REASON CODES ASSOCIATED WITH RETURN CODE
*    LCSFAIL(12)
*
LCSEJABD EQU  300                  OAM ABEND DURING EJECT REQUEST
LCSEJPND EQU  302                  EJECT REQUEST ALREADY PENDING
*                                  FOR VOLUME
LCSEJUSE EQU  303                  UNABLE TO MAKE USER ADDRESS
*                                  SPACE NON-SWAPPABLE
LCSEJTCD EQU  304                  TCDB ACCESS ERROR IN OAM
LCSEJTCA EQU  305                  TCDB AUTHORIZATION ERROR IN
*                                  OAM
LCSEJOAM EQU  306                  OAM INTERNAL ERROR
LCSEJVOL EQU  307                  VOLSER NOT IN TCDB
LCSFNSUP EQU  310                  MEDIA TYPE OR RECORDING TECHNOLOGY
*                                  NOT SUPPORTED AT THIS SOFTWARE
*                                  LEVEL
LCSFNSML EQU  311                  DELETED WITH MTL SOFTWARE-ONLY
*                                  SPE
LCSFNCOM EQU  312                  FUNCTION NOT COMPATIBLE WITH
*                                   THE LIBRARY
LCSFVINU EQU  313                  VOLUME IS CURRENTLY IN USE
LCSFSEQK EQU  314                  IMPORT/EXPORT ALREADY IN
*                                   PROGRESS OR HOST PROCESSING
*                                   NOT COMPLETE
LCSFNEDR EQU  315                  NOT ENOUGH PHYSICAL DRIVES
*                                   AVAILABLE IN VTS
LCSFMXNX EQU  316                  IMPORT/EXPORT NOT IN PROGRESS
LCSFMTCT EQU  317                  EMPTY CATEGORY
*                                   IMPORT:  NO IMPORT VOLUMES
*                                   EXPORT/IMPORT:  NO SCRATCH
*                                     VOLUMES
LCSFLFUL EQU  318                  MAXIMUM LOGICALS DEFINED TO
*                                   LIBRARY
LCSFNRNF EQU  319                  NO TCDB RECORD AND VOLUME NOT
*                                   FOUND IN SPECIFIED LIBRARY
LCSFNRLF EQU  320                  NO TCDB RECORD AND UNABLE TO
*                                   ACCESS SPECIFIED LIBRARY
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 10 of 11)

```
LCSFMUMT EQU  321                  MANUAL CARTRIDGE ENTRY FAILED,
*                                   MEDIA TYPE RETURNED FROM THE
*                                   INSTALLATION EXIT DOES NOT
*                                   MATCH THE MEDIA TYPE DEFINED
*                                   IN THE VOLUME RECORD.
LCSFCMRJ EQU  322                  COMMAND REJECTED BY THE LIBRARY
LCSFOPCN EQU  323                  UNABLE TO RETRIEVE POLICY
*                                   NAMES(S)FROM LIBRARY
LCSFNXPD EQU  324                  VOLUME EXPIRE TIME HAS NOT ELAPSED
LCSFIOTO EQU  325                  I/O TERMINATED DUE TO TIMEOUT
*                                  DETECTION
LCSFACDE EQU  326                  SELECTIVE DEVICE ACCESS CONTROL
*                                    GROUP DENIED REQUEST
LCSFACNV EQU  327                  SELECTIVE DEVICE ACCESS CONTROL
*                                   GROUP IS NOT VALID
*    ADDITIONAL REASON CODES ASSOCIATED WITH RETURN CODE
*    LCSENVIR(16)
*
LCSEJNUL EQU  400                  OAM INITIALIZED WITH NULL
*                                  CONFIGURATION
LCSEJLIB EQU  401                  LIBRARY NOT ACCESSIBLE,
*                                  OFFLINE, OR NOT OPERATIONAL
LCSEJVIS EQU  402                  VISION SYSTEM NOT OPERATIONAL
LCSEJXAB EQU  403                  EJECT PROCESSING HAS BEEN
*                                  DISABLED BECAUSE AN ERROR IN
*                                  THE EJECT INSTALLATION EXIT
*                                  (CBRUXEJC) HAS BEEN DETECTED
LCSEJNAV EQU  404                  OAM ADDRESS SPACE NOT
*                                    AVAILABLE
LCSNOOAM EQU  404                  OAM ADDRESS SPACE NOT
*                                    AVAILABLE
.END     MEND                      */
```

Figure 15. The LCS External Services Parameter List—CBRLCSPL Macro (Part 11 of 11)

Tape Data Information (CBRTDI Macro)

Tape data information (TDI), mapped by macro CBRTDI, is used to pass information about the composite Peer-to-Peer VTS library that is specified on the CBRXLCS PTPDATA request. Depending on the PTPDATA request, either the library's operating mode information or the library's device information is returned in TDI. Figure 16 gives the format for the tape device information.

```
************************************************************************
*                                                                      *
*             TAPE DATA INFORMATION MAPPING                            *
*                                                                      *
************************************************************************
         SPACE 1
TDI      DSECT ,
         SPACE 1
************************************************************************
*                                                                      *
*             TDI HEADER                                               *
*                                                                      *
************************************************************************
TDIHDR   DS    0F           TDI HEADER
TDIID    DS    CL4          TDI  IDENTIFIER  EBCDIC  'TDI  '
TDILENG  DS    F            LENGTH OF TDI
*                             TDI HEADER + DATA HEADER + DATA
*                             (LENGTH OF STORAGE TO BE FREED)
TDIVER   DS    XL1          VERSION OF TDI
TDIREV   DS    XL1          REVISION LEVEL OF TDI
TDISPNUM DS    XL1          SUBPOOL IN WHICH TDI WAS OBTAINED
*                             IF NOT SPECIFIED, SUBPOOL ZERO USED
         DS    CL1           RESERVED
TDIDHDR@ DS    A             ADDRESS OF MODE OR DEVICE DATA
TDILNGTH EQU   *-TDIHDR      LENGTH OF TDI MACRO HEADER
         SPACE 1
************************************************************************
*                                                                    *
*                DATA HEADER FOR MODE CONTROL SETTINGS               *
*                                                                    *
************************************************************************
TDIMODE  DSECT               MODE SETTING DATA MAPPING
TDIMSLEN DS    F             DATA MSG LENGTH (LENGTH OF THIS DSECT
*                            PLUS LENGTH OF MODE CONTROL DATA ENTRIES)
TDIMSNUM DS    F             NUMBER OF MODE CONTROL DATA ENTRIES
*                              (IF AN AX0 IS NOT AVAILABLE, AN ENTRY
*                              IS NOT RETURNED.)
TDIMSDLN DS    F             LENGTH OF ONE MODE CONTROL DATA ENTRY
TDIMSADR DS    A             ADDRESS OF 1ST MODE CONTROL DATA ENTRY
TDIMAX0S DS    XL1           NUMBER OF AX0'S CONFIGURED
TDIMAX0P DS    XL1           AX0 ID THAT PROCESSED THIS REQUEST
         DS    XL2           RESERVED
TDIMDHDR EQU   *-TDIMODE     LENGTH OF TDI MODE SETTING DATA HEADER
         SPACE 1
```

Figure 16. The Tape Data Information Assembler Mapping Macro—CBRTDI (Part 1 of 3)

```
*********************************************************************
*                                                                   *
*            MODE CONTROL DATA ENTRY                                *
*                                                                   *
*********************************************************************
TDIMODDT DSECT               MODE CONTROL DATA ENTRY
TDIMAX0I DS    XL1           AX0 IDENTIFIER
TDIIOMOD DS    BL1           I/O SELECTION CRITERIA
TDIOBALN EQU   B'10000000'   BALANCED IO SELECTION CRITERIA
TDIOPREF EQU   B'01000000'   PREFERRED IO SELECTION CRITERIA
TDIOPRIM EQU   B'00100000'   PRIMARY IO SELECTION CRITERIA
TDICPYMD DS    BL1           COPY MODE AND COPY OPERATIONS
TDIIMMED EQU   B'10000000'   COPYMODE ON=IMMEDIATE/OFF=DEFERRED
TDIENABL EQU   B'00001000'   COPYOPER ON=ENABLED/OFF=DISABLED
TDIACCES DS    BL1           SPECIAL ACCESS CONTROL
TDIRDMOD EQU   B'10000000'   READ ONLY ACCESS MODE
TDIRWDIS EQU   B'01000000'   READ/WRITE DISCONNECTED ACCESS MODE
TDIWTPRT EQU   B'00100000'   WRITE PROTECT ACCESS MODE
TDIDMPTV DS    XL1           DEFERRED MODE PRIORITY THRESHOLD
TDIVDLID DS    XL1           PRIMARY/PREFERRED IO DISTRIBUTED LIBRARY
*                              ID
TDICEDTV DS    XL1           CE DEFAULT FOR DEFERRED MODE PRIORITY
*                              THRESHOLD VALUE
         DS    CL3           RESERVED
TDIDEVRG DS    XL1           DEVICE RANGE
*                              X'10' 16 VIRTUAL DEVICES CONFIGURED
*                              X'20' 32 VIRTUAL DEVICES CONFIGURED
TDICESET DS    BL1           CE DEFAULT SETTINGS
TDICEBAL EQU   B'10000000'   BALANCED IO SELECTION CRITERIA
TDICEPRF EQU   B'01000000'   PREFERRED IO SELECTION CRITERIA
TDICECPY EQU   B'00010000'   COPYMODE ON=IMMEDIATE/OFF=DEFERRED
*                            LOWER NIBBLE MAY CONTAIN CE SPECIFIED IO
*                            DISTRIBUTED LIBRARY ID IF CE ESTABLISHED
*                            PREFERRED IO SELECTION CRITERIA
TDICPYCT DS    F             DEFERRED COPY OPERATION COUNT
TDIMELEN EQU   *-TDIMODDT    LENGTH OF ONE TDI MODE ENTRY
         SPACE 1
*********************************************************************
*                                                                   *
*            DATA HEADER FOR DEVICE INFORMATION                     *
*                                                                   *
*********************************************************************
TDIDVICE DSECT               DEVICE DATA MAPPING
TDIMDLEN DS    F             DATA MSG LENGTH (LENGTH OF THIS DSECT
*                              PLUS LENGTH OF DEVICE DATA ENTRIES)
TDINVTD  DS    F             NUMBER OF DEVICE DATA ENTRIES
TDIDDLEN DS    F             LENGTH OF ONE DEVICE DATA ENTRY
TDIDDADR DS    A             ADDRESS OF 1ST DEVICE DATA ENTRY
TDIDVHDR EQU   *-TDIDVICE    LENGTH OF TDI DEVICE HEADER
         SPACE 1
*********************************************************************
*                                                                   *
*            DEVICE DATA ENTRY                                      *
*                                                                   *
*********************************************************************
TDIDEVDT DSECT               DEVICE DATA ENTRY
TDIVDVID DS    XL2           VIRTUAL DEVICE IDENTIFIER
*                              AX0 IDENTIFIER/DEVICE NUMBER COMBINATION
```

Figure 16. The Tape Data Information Assembler Mapping Macro—CBRTDI (Part 2 of 3)

```
TDIIOID  DS    XL1           I/O VTS IDENTIFIER
TDIVOLSR DS    CL6             MOUNTED VOLUME
TDIVFLAG DS    BL1           VOLUME FLAGS
TDIWRITM EQU   B'10000000'   AT LEAST ONE WRITE COMMAND SUCCESSFUL
*                             FOR THE MOUNTED VOLUME
         DS    CL6           RESERVED
TDIDVLEN EQU   *-TDIDEVDT    LENGTH OF ONE TDI DEVICE ENTRY
         SPACE 1
*********************************************************************
*                                                                   *
*             HEADER  CONSTANTS                                     *
*                                                                   *
*********************************************************************
TDIIDC   EQU   C'TDI  '      TDI  IDENTIFIER
TDIVERV  EQU   2             VERSION
TDIREVV  EQU   0             REVISION LEVEL
```

Figure 16. The Tape Data Information Assembler Mapping Macro—CBRTDI (Part 3 of 3)

Tape Volume Information (CBRTVI Macro)

Tape volume information (TVI), mapped by macro CBRTVI, is used to pass information from both the TCDB and the library manager inventory about the volume specified on a CBRXLCS query volume residence request.

Figure 17 gives the format for the tape volume information. The **boldfaced** lines of code are new for this release.

```
*********************************************************************
*                                                                   *
*        TAPE VOLUME INFORMATION MAPPING                            *
*                                                                   *
*********************************************************************
         SPACE 1
TVI      DSECT ,
         SPACE 1
*********************************************************************
*                                                                   *
*          HEADER                                                   *
*                                                                   *
*********************************************************************
TVIHDR   DS    0F          TVI HEADER
TVIID    DS    CL4         TVI IDENTIFIER EBCDIC 'TVI '
TVILENG  DS    F           LENGTH OF TVI
*                           USE THIS VALUE FOR STORAGE LENGTH
*                           WHEN FREEING TVI STORAGE
TVIVER   DS    XL1         VERSION OF TVI
TVIREV   DS    XL1         REVISION LEVEL OF TVI
TVISPNUM DS    XL1         SUBPOOL IN WHICH TVI WAS OBTAINED
         DS    XL1         RESERVED FOR IBM USE
         DS    F           RESERVED FOR IBM USE
*********************************************************************
*                                                                   *
*          VOLUME SERIAL                                            *
*                                                                   *
*********************************************************************
TVIVOLSR DS    CL6          VOLUME SERIAL NUMBER
*********************************************************************
*                                                                   *
*          VOLUME INFORMATION FROM THE TCDB                         *
*                                                                   *
* NOTE:  LIBRARY NAME AND CONSOLE NAME ARE FOUND IN THE LCSPL       *
*            - LIBRARY NAME IS STORED IN FIELD LCSLIBNM             *
*            - CONSOLE NAME IS STORED IN FIELD LCSCONSN             *
*                                                                   *
* IF THE LIBRARY NAME IS SPECIFIED ON THE QVR INVOCATION, LCSLIBNM *
* CONTAINS THE SPECIFIED LIBRARY AND LCSCONSN CONTAINS THE CONSOLE *
* NAME OF THE SPECIFIED LIBRARY.  THE SPECIFIED LIBRARY NAME MAY   *
* OR MAY NOT MATCH THE LIBRARY NAME IN THE VOLUME RECORD, TVILIBNM.*
*                                                                   *
* IF THE LIBRARY NAME IS NOT SPECIFIED ON THE QVR INVOCATION,       *
* AND THE VOLUME RECORD EXISTS IN THE TCDB, BOTH LCSLBNM AND        *
* TVILIBNM FIELDS CONTAIN THE LIBRARY NAME FOUND IN THE VOLUME      *
* RECORD.  LCSCONSN CONTAINS THE CONSOLE NAME OF TVILIBNM.          *
*                                                                   *
*          INCLUDE MAPPING MACRO CBRVERR TO DEFINE CONSTANTS        *
*          FOR THE VALUES ASSIGNED TO TVIERROR.                     *
*                                                                   *
*********************************************************************
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 1 of 6)

```
TVIUSEA  DS    CL1          VOLUME USE ATTRIBUTE AS DEFINED IN
*                           THE TAPE VOLUME RECORD
*                             'P' FOR PRIVATE
*                             'S' FOR SCRATCH
         DS    XL1          RESERVED FOR IBM USE
TVITDSI  DS    0F           TAPE DEVICE SELECTION INFORMATION
TVIREC   DS    XL1             RECORDING TECHNOLOGY
TVIMEDIA DS    XL1             MEDIA TYPE
TVICOMP  DS    XL1             COMPACTION
TVISPEC  DS    XL1             SPECIAL ATTRIBUTE
TVIERROR DS    H            VOLUME ERROR STATUS
         DS    XL2          RESERVED FOR IBM USE
TVISTGRP DS    CL8          STORAGE GROUP NAME
TVIWPROT DS    CL1          WRITE PROTECTION STATUS
*                             'Y' FOR WRITE-PROTECTED
*                             'N' FOR NOT WRITE-PROTECTED
*                             ' ' BLANK FOR STATUS UNKNOWN
TVICHKPT DS    CL1          CHECKPOINT VOLUME INDICATOR
*                             'Y' FOR CHECKPOINT VOLUME
*                             'N' FOR NOT CHECKPOINT VOLUME
*                             ' ' BLANK FOR STATUS UNKNOWN
TVILOC   DS    CL1          VOLUME LOCATION CODE
*                             'L' FOR LIBRARY-RESIDENT
*                             'S' FOR SHELF-RESIDENT
TVIVINFO DS    BL1          ADDITIONAL VOLUME INFORMATION
TVIVWORM DS    B'10000000'  ON IF VOLUME IS WORM TAPE AS DEFINED
*                           IN THE TAPE VOLUME RECORD (SET FOR
*                           PHYSICAL WORM - TVILWORM SET FOR
*                           LOGICAL WORM)
TVISHLOC DS    CL32         SHELF LOCATION
TVIOWNER DS    CL64         VOLUME OWNER INFORMATION
TVICREAT DS    CL10         VOLUME RECORD CREATION DATE
TVIENTEJ DS    CL10         LAST ENTRY OR EJECTION DATE
TVIMOUNT DS    CL10         LAST MOUNTED DATE
TVIWRITE DS    CL10         LAST WRITTEN DATE
TVIEXPIR DS    CL10         VOLUME EXPIRATION DATE
TVILIBNM DS    CL8          LIBRARY NAME FROM VOLUME RECORD
         DS    CL24         RESERVED FOR IBM USE
*********************************************************************
*                                                                   *
*        VOLUME INFORMATION FROM LIBRARY MANAGER                    *
*                                                                   *
*********************************************************************
TVIOPM   DS    0CL32        OUTBOARD POLICY MANAGEMENT
TVILMSG  DS    CL8           LIBRARY MANAGER STORAGE GROUP NAME
TVILMSC  DS    CL8           LIBRARY MANAGER STORAGE CLASS NAME
TVILMMC  DS    CL8           LIBRARY MANAGER MANAGEMENT CLASS
*                             NAME
TVILMDC  DS    CL8           LIBRARY MANAGER DATA CLASS NAME
*
TVIHCAT  DS    XL2          VOLUME CATEGORY IN HEX
TVILCAT  DS    CL2          VOLUME CATEGORY FROM LIBRARY MANAGER
*                            (CONSTANTS FOR CATEGORIES ASSIGNED TO
*                             TVILCAT ARE DECLARED LATER IN MACRO
*                             MACRO)
TVIMEDTY DS    XL1          VOLUME MEDIA TYPE
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 2 of 6)

```
*                          (FOR VALID VALUES, SEE MEDIA TYPE
*                          CONSTANTS UNDER TCDB TAPE DEVICE
*                          SELECTION INFORMATION)
TVIATTR  DS    XL1         VOLUME ATTRIBUTE
*                           0 PHYSICAL NON-VTS VOLUME
*                           1 LOGICAL VTS VOLUME
*                           2 VTS LOGICAL VOLUME BEING
*                              IMPORTED
*                           3 PHYSICAL VTS VOLUME
TVISTAT  DS    0BL2        VOLUME STATUS
TVISTAT1 DS    BL1         VOLUME STATUS - BYTE 1
TVIINACC EQU   B'10000000' VOLUME IS IN LIBRARY BUT INACCESSIBLE
TVIMNT   EQU   B'01000000' VOLUME IS MOUNTED
TVIMNTQ  EQU   B'00100000' VOLUME IS QUEUED FOR MOUNT
TVIMNTIP EQU   B'00010000' VOLUME IN PROCESS OF BEING MOUNTED
TVIDMNTQ EQU   B'00001000' VOLUME QUEUED FOR DEMOUNT
TVIDMNTP EQU   B'00000100' VOLUME IN PROCESS OF BEING DEMOUNTED
TVIEJCQ  EQU   B'00000010' VOLUME IS QUEUED FOR EJECT/EXPORT
TVIEJCIP EQU   B'00000001' VOLUME IN PROCESS OF BEING
*                                      EJECTED/EXPORTED
TVISTAT2 DS    BL1         VOLUME STATUS - BYTE 2
TVIAUDQ  EQU   B'10000000' VOLUME QUEUED FOR AUDIT
TVIAUDIP EQU   B'01000000' VOLUME IN PROCESS OF BEING AUDITED
TVIMISS  EQU   B'00100000' VOLUME IS MISPLACED
TVIBLAB  EQU   B'00010000' VOLUME HAS UNREADABLE OR NO LABEL
TVIUMAN  EQU   B'00001000' VOLUME WAS USED DURING MANUAL MODE
TVIMANEJ EQU   B'00000100' VOLUME WAS MANUALLY EJECTED
TVIFASTR EQU   B'00000010' VOLUME IS ASSIGNED TO A CATEGORY
*                     WITH FAST READY ATTRIBUTE SET
TVISTATA DS    BL1         ADDITIONAL VOLUME STATUS
TVICACHE EQU   B'10000000' VOLUME IS CACHE RESIDENT
TVIVCOPY EQU   B'01000000' VALID COPY IN EACH DISTRIBUTED
*                          LIBRARY
TVIDCOPY EQU   B'00100000' DUPLICATE COPY IN THE STAND ALONE
*                          VTS LIBRARY
TVIVOPM  EQU   B'00010000' NON DEFAULT TVIOPM PROVIDED
TVILOPM  EQU   B'00001000' VOLUME RESIDES IN A LIBRARY WITH
*                          OUTBOARD POLICY MANAGEMENT SUPPORT
TVILWORM EQU   B'00000100' LOGICAL WORM VOLUME[1]
         DS    BL1         RESERVED FOR IBM USE
         DS    CL24        RESERVED FOR IBM USE
         DS    0D          END OF VTI
TVILNGTH EQU   *-TVI
         SPACE 1
*********************************************************************
*                                                                   *
*  TCDB USE ATTRIBUTE CONSTANTS                                     *
*                                                                   *
*********************************************************************
TVIPRIV  EQU   C'P'        PRIVATE USE ATTRIBUTE
TVISCRT  EQU   C'S'        SCRATCH USE ATTRIBUTE
         SPACE 1
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 3 of 6)

1. Because a logical volume will retain its WORM state (at the library) until the volume is reused and written from load point, the TVILWORM indicator can also be returned for a scratch volume, reflecting the past usage of the volume.

```
*********************************************************************
*                                                                   *
*  TCDB TAPE DEVICE SELECTION INFORMATION CONSTANTS                 *
*                                                                   *
*********************************************************************
*        CONSTANTS TO DEFINE RECORDING TECHNOLOGY
TVINOREC  EQU   0            RECORDING TECHNOLOGY UNKNOWN OR
*                            UNSPECIFIED
TVI18TRK  EQU   1           READ/WRITE ON  18 TRACK DEVICE
TVI36TRK  EQU   2           READ/WRITE ON  36 TRACK DEVICE
TVI128TRK EQU   3           READ/WRITE ON 128 TRACK DEVICE
TVI256TRK EQU   4           READ/WRITE ON 256 TRACK DEVICE
TVI384TRK EQU   5           READ/WRITE ON 384 TRACK DEVICE
TVIEFMT1  EQU   6           READ/WRITE ON ENTERPRISE FORMAT 1
*                               (EFMT1) DEVICE
TVIEFMT2  EQU   7           READ/WRITE ON ENTERPRISE FORMAT 2
*                               (EFMT2) DEVICE
TVIEEFMT2 EQU   8           READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*                               (EEFMT2) DEVICE
TVIEFMT3  EQU   9           READ/WRITE ON ENTERPRISE FORMAT 3
*                               (EFMT3) DEVICE
TVIEEFMT3 EQU   10          READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 3
*                               (EEFMT3) DEVICE
TVIEFMT4  EQU   11          READ/WRITE ON ENTERPRISE FORMAT 4
*                               (EFMT4) DEVICE
TVIEEFMT4 EQU   12           READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 4
*                                (EEFMT4) DEVICE
*        CONSTANTS TO DEFINE MEDIA TYPE
TVINOMED EQU   0            MEDIA TYPE UNKNOWN OR UNSPECIFIED
TVIMED1  EQU   1            MEDIA1 - CARTRIDGE SYSTEM TAPE
TVIMED2  EQU   2            MEDIA2 - ENHANCED CAPACITY CARTRIDGE
*                             SYSTEM TAPE
TVIMED3  EQU   3            MEDIA3 - HIGH PERFORMANCE CARTRIDGE
*                             TAPE
TVIMED4  EQU   4            MEDIA4 - EXTENDED HIGH PERFORMANCE
*                             CARTRIDGE TAPE
TVIMED5  EQU   5            MEDIA5 - ENTERPRISE TAPE CARTRIDGE
TVIMED6  EQU   6            MEDIA6 - ENTERPRISE WORM CARTRIDGE
*                             TAPE
TVIMED7  EQU   7            MEDIA7 - ENTERPRISE ECONOMY
*                             CARTRIDGE TAPE
TVIMED8  EQU   8            MEDIA8 - ENTERPRISE ECONOMY WORM
*                             CARTRIDGE TAPE
TVIMED9  EQU   9            MEDIA9 - ENTERPRISE EXTENDED
*                             TAPE CARTRIDGE
TVIMED10  EQU  10           MEDIA10 - ENTERPRISE EXTENDED WORM
*                             TAPE CARTRIDGE
TVIMED11 EQU   11           MEDIA11 - ENTERPRISE ADVANCED
*                             TAPE CARTRIDGE
TVIMED12 EQU   12           MEDIA12 - ENTERPRISE ADVANCED
*                             WORM TAPE CARTRIDGE
TVIMED13 EQU   13           MEDIA13 - ENTERPRISE ADVANCED
*                             ECONOMY TAPE CARTRIDGE
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 4 of 6)

```
*            CONSTANTS TO DEFINE COMPACTION
*        (TVIIDRC AND TVICOMPT CAN BE USED INTERCHANGEABLY)
TVICMPNS EQU   0            COMPACTION UNKNOWN OR NOT SET
TVINOCMP EQU   1            NO COMPACTION
TVIIDRC  EQU   2            COMPACTION
TVICOMPT EQU   2            COMPACTION
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE
TVINOSPC EQU   0            VOLUME HAS NO SPECIAL ATTRIBUTE
TVIRDCOM EQU   1            VOLUME WILL BE MOUNTED FOR READ ONLY -
*                            ALL READ-COMPATIBLE DEVICES MAY BE
*                            SELECTED
*********************************************************************
*                                                                   *
*  VOLUME ATTRIBUTE CONSTANTS                                       *
*                                                                   *
*********************************************************************
TVIPHYCL EQU   0            PHYSICAL NON-VTS VOLUME
TVILOGCL EQU   1            LOGICAL VTS VOLUME
TVIMPORT EQU   2            VTS LOGICAL VOLUME BEING IMPORTED
TVISTKED EQU   3            PHYSICAL VTS VOLUME
*
  ******************************************************************
*                                                                   *
*  MISCELLANEOUS SOFTWARE CONSTANTS                                 *
*                                                                   *
*********************************************************************
TVIYES   EQU   C'Y'         YES
TVINO    EQU   C'N'         NO
TVIBLANK EQU   C' '         BLANK
*
*********************************************************************
*                                                                   *
*  LIBRARY MANAGER CATEGORY CONSTANTS FOR TVILCAT                   *
*                                                                   *
*********************************************************************
TVISCRM1 EQU   C'S1'        VOLUME IS MEDIA1 SCRATCH
TVISCRM2 EQU   C'S2'        VOLUME IS MEDIA2 SCRATCH
TVISCRM3 EQU   C'S3'        VOLUME IS MEDIA3 SCRATCH
TVISCRM4 EQU   C'S4'        VOLUME IS MEDIA4 SCRATCH
TVISCRM5 EQU   C'S5'        VOLUME IS MEDIA5 SCRATCH
TVISCRM6 EQU   C'S6'        VOLUME IS MEDIA6 SCRATCH
TVISCRM7 EQU   C'S7'        VOLUME IS MEDIA7 SCRATCH
TVISCRM8 EQU   C'S8'        VOLUME IS MEDIA8 SCRATCH
TVISCRM9 EQU   C'S9'        VOLUME IS MEDIA9 SCRATCH
TVISCRMA EQU   C'SA'        VOLUME IS MEDIA10 SCRATCH
TVISCRMB EQU   C'SB'        VOLUME IS MEDIA11 SCRATCH
TVISCRMC EQU   C'SC'        VOLUME IS MEDIA12 SCRATCH
TVISCRMD EQU   C'SD'        VOLUME IS MEDIA13 SCRATCH
TVIERRC  EQU   C'ER'        VOLUME IS IN ERROR CATEGORY
TVIPRIVC EQU   C'PR'        VOLUME IS IN PRIVATE CATEGORY
TVIINSRT EQU   C'IN'        VOLUME IS IN INSERT CATEGORY
TVICNVEJ EQU   C'CE'        VOLUME IS IN CONVENIENCE EJECT CATEGORY
TVIBLKEJ EQU   C'BE'        VOLUME IS IN BULK EJECT CATEGORY
TVIPURGE EQU   C'PG'        VOLUME IS IN PURGE CATEGORY
TVIMEJCT EQU   C'ME'        VOLUME IS IN MANUAL EJECT CATEGORY
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 5 of 6)

```
TVIIMPRT EQU   C'IM'        VOLUME IS IN IMPORT CATEGORY
*                          (PHYSICAL VOLUMES CONTAINING LOGICAL
*                           VOLUMES TO IMPORT)
TVIIMPND EQU   C'IP'        VOLUME IS IN IMPORT PENDING CATEGORY
TVIEXPND EQU   C'XP'        VOLUME IS IN EXPORT PENDING CATEGORY
TVIEXPTD EQU   C'XD'        VOLUME IS IN EXPORTED CATEGORY
TVISTAKD EQU   C'ST'        VOLUME IS IN STACKED VOLUME CATEGORY
*                          (PHYSICAL VOLUMES THAT VTS MANAGES)
TVIUNASN EQU   C'UA'        VOLUME IS IN UNASSIGNED CATEGORY
TVIEXPHD EQU   C'EH'        VOLUME IS IN EXPORT HOLD CATEGORY
*                          (PHYSICAL VOLUMES CONTAINING LOGICAL
*                          VOLUMES THAT COMPLETED EXPORT
*                          PROCESSING)
TVICEXP  EQU C'CX'          VOLUME IS IN COPY EXPORT CATEGORY
*                          (PHYSICAL VOLUMES THAT HAVE BEEN OR
*                          ARE IN THE PROCESS OF BEING COPY
*                          EXPORTED)
TVICEXPH EQU C'CH'          VOLUME IS IN COPY EXPORT HOLD CATEGORY
*                          (PHYSICAL VOLUMES THAT HAVE BEEN MOVED
*                          OR ARE BEING MOVED INTO THE COPY
*                          EXPORT HOLD STATE)
TVIBADTK EQU   C'BT'        VOLUME IS IN CORRUPTED TOKEN CATEGORY
TVIBDLBL EQU   C'BL'        VOLUME IS IN UNREADABLE OR INVALID
*                           INTERNAL LABEL CATEGORY
TVIUNK   EQU   C'UN'        VOLUME CATEGORY IS NOT KNOWN
*********************************************************************
*                                                                   *
*        HEADER CONSTANTS                                           *
*                                                                   *
*********************************************************************
TVIIDC   EQU   C'TVI '      TVI IDENTIFIER
TVIVERV  EQU   1            VERSION
TVIREVV  EQU   13           REVISION LEVEL
.END     MEND     */
```

Figure 17. The Tape Volume Information Assembler Mapping Macro—CBRTVI (Part 6 of 6)

Tape Device Selection Information (CBRTDSI macro)

Tape device selection information (TDSI), mapped by macro CBRTDSI, is used to pass device selection information to and among system components providing tape library support. Figure 18 on page 210 gives the format for Tape Device Selection Information.

```
*-------------------------------------------------------------------*
*           TAPE DEVICE SELECTION INFORMATION                       *
*-------------------------------------------------------------------*
TDSI     DSECT ,              TAPE DEVICE SELECTION INFORMATION
*
*-------------------------------------------------------------------
TDSDEVT  DS    0F
TDSREC   DS    XL1            RECORDING TECHNOLOGY
TDSMEDIA DS    XL1            MEDIA TYPE
TDSCOMP  DS    XL1            COMPACTION TYPE
TDSSPEC  DS    XL1            SPECIAL ATTRIBUTES
*-------------------------------------------------------------------*
*               CONSTANT FOR DONTCARE OR ZERO                       *
*        ZERO, OR TDSNOCAR, IS AN ACCEPTABLE VALUE FOR TDSI.        *
*-------------------------------------------------------------------*
TDSNOCAR EQU   0
*-------------------------------------------------------------------*
*        CONSTANTS TO DEFINE RECORDING TECHNOLOGY                   *
*-------------------------------------------------------------------*
TDSNOREC    EQU   0           RECORDING TECHNOLOGY UNKNOWN OR
*                             UNSPECIFIED
TDS18TRK    EQU   1           READ/WRITE ON  18 TRACK DEVICE
TDS36TRK    EQU   2           READ/WRITE ON  36 TRACK DEVICE
TDS128TRK   EQU   3           READ/WRITE ON 128 TRACK DEVICE
TDS256TRK   EQU   4           READ/WRITE ON 256 TRACK DEVICE
TDS384TRK   EQU   5           READ/WRITE ON 384 TRACK DEVICE
TDSEFMT1    EQU   6           READ/WRITE ON ENTERPRISE
*                               FORMAT 1 (EFMT1) DEVICE
TDSEFMT2    EQU   7           READ/WRITE ON ENTERPRISE
*                               FORMAT 2 (EFMT2) DEVICE
TDSEEFMT2   EQU   8           READ/WRITE ON ENTERPRISE ENCRYPTED
*                               FORMAT 2 (EEFMT2) DEVICE
TDSEFMT3    EQU   9           READ/WRITE ON ENTERPRISE
*                               FORMAT 3 (EFMT3) DEVICE
TDSEEFMT3   EQU   10          READ/WRITE ON ENTERPRISE ENCRYPTED
*                               FORMAT 3 (EEFMT3) DEVICE
TDSEFMT4    EQU   11          READ/WRITE ON ENTERPRISE
*                               FORMAT 4 (EFMT4) DEVICE
TDSEEFMT4   EQU   12          READ/WRITE ON ENTERPRISE ENCRYPTED
*                               FORMAT 4 (EEFMT4)DEVICE

*-------------------------------------------------------------------*
*        CONSTANTS TO DEFINE MEDIA TYPE                             *
*-------------------------------------------------------------------*
TDSNOMED EQU   0             MEDIA TYPE UNKNOWN OR UNSPECIFIED
TDSMED1  EQU   1             MEDIA1 - CARTRIDGE SYSTEM TAPE
TDSMED2  EQU   2             MEDIA2 - ENHANCED CAPACITY
*                             CARTRIDGE SYSTEM TAPE
TDSMED3  EQU   3             MEDIA3 - HIGH PERFORMANCE CARTRIDGE
*                               TAPE
TDSMED4  EQU   4             MEDIA4 - EXTENDED HIGH PERFORMANCE
*                               CARTRIDGE TAPE
TDSMED5  EQU   5             MEDIA5 - ENTERPRISE TAPE CARTRIDGE
TDSMED6  EQU   6             MEDIA6 - ENTERPRISE WORM TAPE
*                             CARTRIDGE
TDSMED7  EQU   7             MEDIA7 - ENTERPRISE ECONOMY TAPE
*                             CARTRIDGE
TDSMED8  EQU   8             MEDIA8 - ENTERPRISE ECONOMY WORM
*                             TAPE CARTRIDGE
```

Figure 18. The Tape Device Selection Information Assembler Mapping—CBRTDSI (Part 1 of 2)

```
TDSMED9  EQU   9             MEDIA9 - ENTERPRISE EXTENDED TAPE
*                             CARTRIDGE
TDSMED10 EQU   10            MEDIA10 - ENTERPRISE EXTENDED WORM
*                             TAPE CARTRIDGE
TDSMED11 EQU   11            MEDIA11 - ENTERPRISE ADVANCED
*                             TAPE CARTRIDGE
TDSMED12 EQU   12            MEDIA12 - ENTERPRISE ADVANCED
*                             WORM TAPE CARTRIDGE
TDSMED13 EQU   13            MEDIA13 - ENTERPRISE ADVANCED
 *                           ECONOMY TAPE CARTRIDGE
*-------------------------------------------------------------------*
*                                                                   *
*        CONSTANTS TO DEFINE COMPACTION TYPE                        *
*        (THE MEANING OF THE COMPACTION FIELD HAS CHANGED           *
*         FROM TYPE OF COMPACTION TO COMPACTION YES/NO.             *
*         TDSIDRC AND TDSCOMPT CAN BE USED INTERCHANGEABLY.)        *
*-------------------------------------------------------------------*
TDSCMPNS EQU   0             COMPACTION TYPE UNKNOWN OR NOT SET
TDSNOCMP EQU   1             NO COMPACTION
TDSIDRC  EQU   2             COMPACTION
TDSCOMPT EQU   2             COMPACTION
*-------------------------------------------------------------------*
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE                      *
*-------------------------------------------------------------------*
TDSNOSPC EQU  0                  VOLUME HAS NO SPECIAL ATTRIBUTE
TDSRDCOM EQU  1                  VOLUME WILL BE MOUNTED FOR READ
*                                ONLY - ALL READ-COMPATIBLE
*                                DEVICES MAY BE SELECTED
*-------------------------------------------------------------------*
```

Figure 18. The Tape Device Selection Information Assembler Mapping—CBRTDSI (Part 2 of 2)

Chapter 7. Installation Exits

The following material provides information for creating your own installation exit routines. For examples of SAMPLIB jobs pertaining to these installation exits, see Appendix A, "SAMPLIB Members," on page 259.

Each of the installation exits (CBRUXENT, CBRUXEJC, CBRUXCUA, and CBRUXVNL) are linked to (on each invocation) using the MVS LINK macro and must reside in a library in the LNKLST concatenation. Because the exits are called (on each invocation) using the MVS LINK macro, a new copy of the exit can be LINKEDITED on the system at any point in time and OAM will pick up the new version. However, if the exit had been previously disabled or return code 16 had been used to bypass the exit, to re-enable the exit, you must also restart OAM or issue the LIBRARY RESET command.

Change Use Attribute Installation Exit (CBRUXCUA)

When you issue the CBRXLCS macro FUNC=CUA, the ISMF ALTER line operator from the mountable tape volume list, or the LIBRARY LMPOLICY command, the Change Use Attribute installation exit (CBRUXCUA) is called before the volume record is changed.

This installation exit is designed to allow the installation the opportunity to approve or disapprove the proposed change to the volume's use attribute, and to view, and if necessary, to change many fields in the TCDB volume record as well as outboard policy fields, if applicable. Approval or disapproval is communicated by way of the return code which is passed back in register 15. Volume record fields are updated by changing the appropriate fields in the change use attribute installation exit parameter list (CBRUXCPL).

The change use attribute installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see *z/OS DFSMSrmm Managing and Using Removable Media*, *z/OS DFSMSrmm Implementation and Customization Guide*, and *z/OS DFSMSrmm Diagnosis Guide*.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample change use attribute exit (CBRSPUXC) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system. For more information on this SAMPLIB member, see "SAMPLIB member CBRSPUXC" on page 275.

If the caller of the CBRXLCS macro specified EXITINFO on the macro invocation, the 16 bytes of free-form information provided on the invocation are passed to the exit. If the CBRXLCS invocation is called during job processing for a scratch volume, SMS TVRU S->P is passed to the exit. If EXITINFO is not specified on the CBRXLCS invocation, the field in the exit parameter list contains binary zeros.

The following library-related information is passed to the exit but may not be updated by the installation:

- Library name
- Library device type

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- Library logical type
- Library description
- Library console name (if specified) or blanks
- Library supported function indicator

If the volume is not library-resident, the exit parameter list indicates a library name of SHELF and all the other library fields in the exit parameter list are blank.

Both the current use attribute as it is recorded in the tape volume record and the new use attribute are passed to the exit as input variables.

On a change to SCRATCH, the fields that are passed to the exit represent the values in the tape volume record as it currently exists in the TCDB before any changes are made. If a volume is being changed from PRIVATE to SCRATCH, and if the installation exit supplies new values for any of the following fields, they are ignored. The following default scratch values are set before committing the changes to the TCDB:
- Volume use attribute = **S**
- Storage group name = ***SCRTCH***
- Write protection status = **N**
- Checkpoint volume indicator = **N**
- Volume expiration date = blank
- Tape device selection values:
  - Recording technology is unchanged
  - Media type is unchanged
  - Compaction indicator is unchanged
  - Special attribute is set to none
- If the library supports outboard policy management, default construct names (blanks) are passed to the library.

On a change to PRIVATE, the fields that are passed to the exit represent the values in the volume record as updated with the parameters specified on the CBRXLCS macro invocation. The installation may override some of those parameters as described in the table below. If the installation makes no changes, the values are committed to the TCDB as presented in CBRUXCPL. If the exit changes some fields, they are processed as described below.

If a field is described as 'input only' in the table below, it may not be updated by the installation. If it is described as 'output', it may be updated by the installation. If it is further described as 'verified', the contents or format of the field is validated before updating the TCDB volume record with information from the installation.

For a change to PRIVATE or SCRATCH for a physical WORM tape volume, the UXCVWORM indicator is set on. For a logical WORM tape volume, this indicator is not turned on. Since a logical WORM volume is not distinguishable by a unique media type, the UXCVWORM indicator is not turned on for a logical WORM volume. If this information is needed, the CBRUXCUA installation exit can invoke the CBRXLCS FUNC=QVR interface to obtain this information from the library.

If the installation exit returns with an invalid value in a parameter field, returns with an invalid return code, or abnormally terminates, the current request fails. In addition, change use attribute processing for subsequent PRIVATE to SCRATCH requests is disabled and the change use attribute exit is not called again until either OAM is stopped and started, or the LIBRARY RESET,CBRUXCUA operator command is issued.

Note: When an error occurs in the installation exit, PRIVATE to SCRATCH requests are disabled in order to prevent the inadvertent assignment of a private volume to scratch status. Processing continues for SCRATCH-to-PRIVATE, SCRATCH-to-SCRATCH, and PRIVATE-to-PRIVATE requests without invocation of the change use attribute installation exit.

Table 19 on page 216 lists the parameters that are passed to the exit. The fields may or may not be updated by the installation, depending on the function being performed (for example, changed to SCRATCH or PRIVATE).

Table 19. Parameters Passed To The Installation Exit—CBRUXCUA

Parameter	SCR->PRIV	PRIV->SCR
Volume serial number	Input only	Input only
Current use attribute	Input only	Input only
New use attribute	Input only	Input only
Storage group name	Output/Verified	Output (ignored)
Write protection status	Output/Verified	Output (ignored)
Checkpoint volume indicator	Output/Verified	Output (ignored)
Volume location code	Input only	Input only
Shelf location	Output	Output
Volume owner information	Output	Output
Volume record creation date	Input only	Input only
Last entry or eject date	Input only	Input only
Last mounted date	Output/Verified	Output/Verified
Last written date	Output/Verified	Output/Verified
Volume expiration date	Output/Verified	Output (ignored)
Tape device selection information	Input only	Input only
Installation exit information	Input only	Input only
Storage class name	Output/Verified	Output (ignored)
Data class name	Output/Verified	Output (ignored)
Management class name	Output/Verified	Output (ignored)
Supported functions indicators	Input only	Input only
Volume information indicators	Input only	Input only

If a field is described as *verified*, the following values are checked for validity upon return from the exit:

Storage Group Name
When a volume is changed from *scratch* to *private* or *private* to *private*, the storage group name that is supplied may be blanks. If a nonblank value is supplied, the name must be defined in the active SMS configuration as a tape storage group. In addition, if the volume is library-resident, the library must be defined to that storage group.

Storage Class Name
When a volume is changed from *scratch* to *private* or *private* to *private*, the storage class name that is supplied may be blank. If a nonblank value is supplied, the name must only conform to Storage Management Subsystem (SMS) naming conventions standards. See "Syntax Rules" on page 217 for the syntax checking that is performed.

Data Class Name
When a volume is changed from *scratch* to *private* or *private* to *private*, the data class name that is supplied may be blank. If a nonblank value is supplied, the name must only conform to Storage Management Subsystem (SMS) naming conventions standards. See "Syntax Rules" on page 217 for the syntax checking that is performed.

Management Class Name
When a volume is changed from *scratch* to *private* or *private* to *private*, the management class name that is supplied may be blank. If a nonblank value is supplied, the name must only conform to Storage Management Subsystem (SMS) naming conventions standards. See "Syntax Rules" for the syntax checking that is performed.

Syntax Rules: The values that you specify for the storage group, storage class, data class, and management class construct (policy) names must meet the following SMS naming convention standards:

- Alphanumeric and national characters only
- Name must begin with an alphabetic or national character ($*@#%)
- No leading or embedded blanks
- Eight characters or less

Write protection status
Y, **N**, or blank can be specified.

Checkpoint volume indicator
Y, **N**, or blank can be specified.

Last mounted date
The date specified must be in ISO format (YYYY-MM-DD) or blanks.

Last written date
The date specified must be in ISO format (YYYY-MM-DD) or blanks.

Volume expiration date
The date specified must be in ISO format (YYYY-MM-DD) or blanks.

Outboard Policy Management Considerations

The UXCLOPM indicator in the CBRUXCPL parameter list is set on when the library in which the volume resides supports outboard policy management, notifying the CBRUXCUA installation exit of this capability.

The CUA GETPOLICY option requests that the volume's policy names be retrieved from the library and passed to the CBRUXCUA installation exit in the UXCLMOPM fields of the CBRUXCPL parameter list. The UXCVLOPM indicator indicates that UXCLMOPM fields contain the constructs that are retrieved from the library. The exit can change the UXCLMOPM values for the storage class (UXCLMSC), management class (UXCLMMC), and data class (UXCLMDC) fields. These values then set the volume outboard policy names in the library in which the volume resides. If you set the storage group policy value in the UXCGROUP field, this value is updated in the TCDB and at the library.

If the GETPOLICY option is specified on the CUA invocation for a scratch volume, it is ignored. The GETPOLICY option is only honored for PRIVATE-to-PRIVATE CUA requests for a volume that resides in a library that supports outboard policy management.

If the SCNAME, MCNAME, DCNAME, or GRPNAME option, or all, are specified on the CUA invocation, the UXCVCOPM indicator notifies the exit that one or more of the UXCLMOPM fields has a value that changes the volume's outboard policy names. If the request is to change the storage group name, both the UXCLMSG and the UXCGROUP fields contain the new value. If GRPNAME is not specified, the UXCGROUP field contains the TCDB storage group and the UXCLMSG field contains binary zeros. The installation exit can change the policy field values.

THE CBRUXCUA installation exit can invoke the QVR function to retrieve the existing library policy names for a volume for comparison of existing policy names to the requested policy names. For more information about the QVR function, see "Query Volume Residence (QVR)" on page 152.

If CUA is invoked with a policy change request and the policy field value is all blanks, the request is to set the policy name to the default policy. If a policy is not being changed, the UXCPL policy field is initialized to binary zeros indicating the current policy name, whether the default or a specific policy name is being retained.

If you do not specify a policy keyword, the UXCLMOPM fields contain binary zeros. The CBRUXCUA installation exit can assign construct values in the input/output fields (UXCLMMC, UXCLMSC, and UXCLMDC). The storage group name can only be specified in the UXCGROUP field.

Job Processing Considerations

If the library supports outboard policy management and if the CUA invocation is for job processing of a scratch volume, UXCJOBP is set on and the UXCEXITI field contains SMS TVRU S->P. Changes to UXCGROUP, UXCLMSC, UXCLMMC, and UXCLMDC are ignored. UXCJOBP indicates that the storage group and other policy names are already set at the library and cannot be changed by the exit at this time.

If the volume resides in a library that does not support outboard policy management, the storage group can be changed even if the UXCEXITI field contains SMS TVRU S->P. In this case, the UXCLOPM and UXCJOBP indicators are off.

Change Use Attribute Installation Exit Parameter List (CBRUXCPL)

The change use attribute installation exit (CBRUXCUA) is passed by way of register 1, the pointer to a parameter list mapped by CBRUXCPL. Figure 19 on page 219 provides the format of CBRUXCPL.

```
UXCPL        DSECT ,                CBRUXCUA PARAMETER LIST
             SPACE 1
*********************************************************************
*                                                                   *
*        CHANGE USE ATTRIBUTE INSTALLATION EXIT PARAMETERS          *
*                                                                   *
*********************************************************************
UXCPARM      DS   0D                CBRUXCUA PARAMETER SECTION
UXCLIB       DS   CL8               LIBRARY NAME
*                                    (INPUT VARIABLE)
UXCLDEV      DS   CL8               LIBRARY DEVICE TYPE
*                                    (INPUT VARIABLE)
UXCLCON      DS   CL8               LIBRARY CONSOLE NAME
*                                    (INPUT VARIABLE)
UXCLTYP      DS   CL1               LIBRARY LOGICAL TYPE
*                                    'R' FOR AUTOMATED LIBRARY
*                                    'M' FOR MANUAL LIBRARY
*                                    (INPUT VARIABLE)
UXCSUPPT     DS   XL1               SUPPORTED FUNCTION
UXCLOPM      EQU  X'80'              ON IF OUTBOARD POLICY MANAGEMENT
*                                    SUPPORTED IN LIBRARY
*                                    (INPUT VARIABLE)
UXCJOBP      EQU  X'40'             ON IF CALLING EXIT FOR JOB
*                                    PROCESSING AND POLICY NAME
*                                    CHANGES IGNORED
*                                    (INPUT VARIABLE)
             DS   CL6               RESERVED
UXCLDESC     DS   CL120             LIBRARY DESCRIPTION
*                                    (INPUT VARIABLE)
             DS   CL8               RESERVED
UXCVOLSR     DS   CL6               VOLUME SERIAL NUMBER
*                                    (INPUT VARIABLE)
UXCVINFO     DS   XL1               ADDITIONAL VOLUME INFORMATION

UXCVLOPM     EQU  X'80'              ON IF OUTBOARD POLICY INFORMATION
*                                    RETRIEVED AS REQUESTED WITH
*                                    GETPOLICY
*                                    (INPUT VARIABLE)
UXCVCOPM     EQU  X'40'              ON IF POLICY INFORMATION
*                                     SPECIFIED ON CUA INTERFACE
*                                    (INPUT VARIABLE)
UXCVWORM     EQU  X'20'              ON IF VOLUME IS PHYSICAL WORM
*                                    (INPUT VARIABLE – NOT TURNED ON
*                                    FOR LOGICAL WORM)
UXCCUSEA     DS   CL1               CURRENT USE ATTRIBUTE OF THE VOLUME
*                                    AS RECORDED IN THE TAPE
*                                    VOLUME RECORD IN THE TCDB
*                                    'P' FOR PRIVATE
*                                    'S' FOR SCRATCH
*                                    (INPUT VARIABLE)
UXCUSEA      DS   CL1               REQUESTED VOLUME USE ATTRIBUTE
*                                    SPECIFIED ON THE CBRXLCS MACRO
*                                    'P' FOR PRIVATE
*                                    'S' FOR SCRATCH
*                                    (INPUT VARIABLE)
```

Figure 19. Change Use Attribute Installation Exit Parameter List—CBRUXCPL (Part 1 of 4)

```
UXCWPROT     DS   CL1              WRITE PROTECTION STATUS
*                                  'Y' FOR WRITE-PROTECTED
*                                  'N' FOR NOT WRITE-PROTECTED
*                                  (INPUT FOR CHANGE TO SCRATCH
*                                  OUTPUT FOR CHANGE TO PRIVATE)
UXCCHKPT     DS   CL1              CHECKPOINT VOLUME INDICATOR
*                                  'Y' FOR CHECKPOINT VOLUME
*                                  'N' FOR NOT CHECKPOINT VOLUME
*                                  (INPUT FOR CHANGE TO SCRATCH
*                                  OUTPUT FOR CHANGE TO PRIVATE)
UXCLOC       DS   CL1              VOLUME LOCATION CODE
*                                  'L' FOR LIBRARY-RESIDENT
*                                  'S' FOR SHELF-RESIDENT
*                                  (INPUT/OUTPUT VARIABLE)
UXCTDSI      DS   0F               TAPE DEVICE SELECTION INFORMATION
UXCREC       DS   XL1              RECORDING TECHNOLOGY
*                                  (INPUT VARIABLE)
UXCMEDIA     DS   XL1              MEDIA TYPE
*                                  (INPUT VARIABLE)
UXCCOMP      DS   XL1              COMPACTION
*                                  (INPUT VARIABLE)
UXCSPEC      DS   XL1              SPECIAL ATTRIBUTE
*                                  (INPUT VARIABLE)
UXCGROUP     DS   CL8              STORAGE GROUP NAME
*                                  (INPUT FOR CHANGE TO SCRATCH
*                                  OUTPUT FOR CHANGE TO PRIVATE)
UXCSHLOC     DS   CL32             SHELF LOCATION
*                                  (INPUT/OUTPUT VARIABLE)
UXCOWNER     DS   CL64             VOLUME OWNER INFORMATION
*                                  (INPUT/OUTPUT VARIABLE)
             DS   CL8              RESERVED
UXCCREAT     DS   CL10             VOLUME RECORD CREATION DATE
*                                  (INPUT VARIABLE)
UXCENTEJ     DS   CL10             LAST ENTRY OR EJECTION DATE
*                                  (INPUT VARIABLE)
UXCMOUNT     DS   CL10             LAST MOUNTED DATE
*                                  (INPUT/OUTPUT VARIABLE)
UXCWRITE     DS   CL10             LAST WRITTEN DATE
*                                  (INPUT/OUTPUT VARIABLE)
UXCEXPIR     DS   CL10             VOLUME EXPIRATION DATE
*                                  (INPUT FOR CHANGE TO SCRATCH
*                                 OUTPUT FOR CHANGE TO PRIVATE)
             DS   CL10             RESERVED
             DS   CL4              RESERVED
UXCEXITI     DS   CL16             INFORMATION TO BE PASSED TO THE
*                                  INSTALLATION EXIT
UXCLMOPM     DS   0CL32            OUTBOARD POLICY MANAGEMENT
UXCLMSG      DS   CL8              LIBRARY MANAGER STORAGE GROUP
*                                  TO CHANGE VALUE, USE UXCGROUP
*                                  (INPUT VARIABLE)
UXCLMSC      DS   CL8              LIBRARY MANAGER STORAGE CLASS
*                                  (INPUT/OUTPUT VARIABLE)
UXCLMMC      DS   CL8              LIBRARY MANAGER MANAGEMENT CLASS
*                                  (INPUT/OUTPUT VARIABLE)
UXCLMDC      DS   CL8              LIBRARY MANAGER DATA CLASS
*                                  (INPUT/OUTPUT VARIABLE)
             DS   0D               END OF UXCPL
UXCPLLEN     EQU   *-UXCPL
             SPACE 1
*************************************************************************
*                                                                       *
*        RETURN CODES                                                   *
*                                                                       *
*************************************************************************
```

Figure 19. Change Use Attribute Installation Exit Parameter List—CBRUXCPL (Part 2 of 4)

```
UXCNOCHG     EQU  0                CHANGE THE VOLUME USE ATTRIBUTE AS
*                                  REQUESTED USING PARAMETER VALUES
*                                  PASSED IN ON INPUT
UXCCHG       EQU  4                CHANGE THE USE ATTRIBUTE AS
*                                  REQUESTED BUT NOTE THAT PARAMETER
*                                  VALUES HAVE BEEN RETURNED BY EXIT
UXCFAIL      EQU  8                DO NOT CHANGE THE VOLUME USE
*                                  ATTRIBUTE
*            EQU  12               RESERVED
UXCDONT      EQU  16               DO NOT CALL THE VOLUME USE
*                                  ATTRIBUTE INSTALLATION EXIT
*                                  AGAIN, BUT CHANGE THE USE
*                                  ATTRIBUTE AS REQUESTED USING
*                                  PARAMETER VALUES PASSED IN
*                                  ON INPUT
             SPACE 1
*********************************************************************
*                                                                   *
*        LIBRARY LOGICAL TYPE CONSTANTS                             *
*                                                                   *
*********************************************************************
UXCREAL      EQU  C'R'             AUTOMATED LIBRARY
UXCMAN       EQU  C'M'             MANUAL LIBRARY
             SPACE 1
*********************************************************************
*                                                                   *
*        USE ATTRIBUTE CONSTANTS                                    *
*                                                                   *
*********************************************************************
UXCPRIV      EQU  C'P'             PRIVATE USE ATTRIBUTE
UXCSCRT      EQU  C'S'             SCRATCH USE ATTRIBUTE
             SPACE 1
*********************************************************************
*                                                                   *
*        TAPE DEVICE SELECTION INFORMATION CONSTANTS                *
*                                                                   *
*********************************************************************
UXNOCAR      EQU  0                ZERO IS AN ACCEPTABLE TDSI VALUE
*********************************************************************
*        CONSTANTS TO DEFINE RECORDING TECHNOLOGY                   *
*********************************************************************
UXCNOREC     EQU  0                RECORDING TECHNOLOGY UNKNOWN OR
*                                    UNSPECIFIED
UXC18TRK     EQU  1                READ/WRITE ON 18-TRACK DEVICE
UXC36TRK     EQU  2                READ/WRITE ON 36-TRACK DEVICE
UXC128TRK    EQU  3                READ/WRITE ON 128-TRACK DEVICE
UXC256TRK    EQU  4                READ/WRITE ON 256-TRACK DEVICE
UXC384TRK    EQU  5                READ/WRITE ON 384-TRACK DEVICE
UXCEFMT1     EQU  6                READ/WRITE ON ENTERPRISE FORMAT 1
*                                     (EFMT1) DEVICE
UXCEFMT2     EQU  7                READ/WRITE ON ENTERPRISE FORMAT 2
*                                     (EFMT2) DEVICE
UXCEEFMT2    EQU  8                READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*                                     (EEFMT2) DEVICE
UXCEFMT3     EQU  9                READ/WRITE ON ENTERPRISE
*                                     FORMAT 3 (EFMT3) DEVICE
UXCEEFMT3    EQU  10               READ/WRITE ON ENTERPRISE ENCRYPTED
*                                     FORMAT 3 (EEFMT3) DEVICE
UXCEFMT4     EQU  11               READ/WRITE ON ENTERPRISE
*                                     FORMAT 4 (EFMT4) DEVICE
UXCEEFMT4    EQU  12               READ/WRITE ON ENTERPRISE ENCRYPTED
*                                     FORMAT 4 (EEFMT4) DEVICE
```

Figure 19. Change Use Attribute Installation Exit Parameter List—CBRUXCPL (Part 3 of 4)

```
*********************************************************************
*        CONSTANTS TO DEFINE MEDIA TYPE                             *
*********************************************************************
UXCNOMED     EQU  0                MEDIA TYPE UNKNOWN OR UNSPECIFIED
UXCMED1      EQU  1                MEDIA1 - CARTRIDGE SYSTEM TAPE
UXCMED2      EQU  2                MEDIA2 - ENHANCED CAPACITY CARTRIDGE
*                                    SYSTEM TAPE
UXCMED3      EQU  3                MEDIA3 - HIGH PERFORMANCE CARTRIDGE
*                                    TAPE
UXCMED4      EQU  4                MEDIA4 - EXTENDED HIGH PERFORMANCE
*                                    CARTRIDGE TAPE
UXCMED5      EQU  5                MEDIA5 - ENTERPRISE TAPE
*                                    CARTRIDGE
UXCMED6      EQU  6                MEDIA6 - ENTERPRISE WORM TAPE
*                                    CARTRIDGE
UXCMED7      EQU  7                MEDIA7 - ENTERPRISE ECONOMY
*                                    TAPE CARTRIDGE
UXCMED8      EQU  8                MEDIA8 - ENTERPRISE ECONOMY
*                                    WORM TAPE CARTRIDGE
UXCMED9      EQU  9                MEDIA9 - ENTERPRISE EXTENDED TAPE
*                                    CARTRIDGE
UXCMED10     EQU  10               MEDIA10 - ENTERPRISE EXTENDED WORM TAPE
*                                    CARTRIDGE
UXCMED11     EQU  11               MEDIA11 - ENTERPRISE ADVANCED
*                                    TAPE CARTRIDGE
UXCMED12     EQU  12               MEDIA12 - ENTERPRISE ADVANCED
*                                    WORM TAPE CARTRIDGE
UXCMED13     EQU  13               MEDIA13 - ENTERPRISE ADVANCED
*                                    ECONOMY TAPE CARTRIDGE
*********************************************************************
*        CONSTANTS TO DEFINE COMPACTION (THE MEANING OF THE         *
*        COMPACTION FIELD HAS CHANGED FROM TYPE OF COMPACTION       *
*        TO COMPACTION YES/NO - UXCIDRC AND UXCCOMPT                *
*        CAN BE USED INTERCHANGEABLY)                               *
*********************************************************************
UXCCMPNS     EQU  0                COMPACTION UNKNOWN OR NOT SET
UXCNOCMP     EQU  1                NO COMPACTION
UXCCOMPT     EQU  2                COMPACTION
UXCIDRC      EQU  2                COMPACTION
*********************************************************************
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE                      *
*********************************************************************
UXCNOSPC     EQU  0                VOLUME HAS NO SPECIAL ATTRIBUTE
UXCRDCOM     EQU  1                VOLUME WILL BE MOUNTED FOR READ ONLY -
*                                    ALL READ-COMPATIBLE DEVICES MAY BE
*                                    SELECTED
*********************************************************************
*                                                                   *
*        MISCELLANEOUS CONSTANTS                                    *
*                                                                   *
*********************************************************************
UXCPLSP      EQU  230              UXCPL SUBPOOL NUMBER
UXCYES       EQU  C'Y'             YES
UXCNO        EQU  C'N'             NO
UXCBLANK     EQU  C' '             BLANK
             SPACE 2
             MEND  ,
```

Figure 19. Change Use Attribute Installation Exit Parameter List—CBRUXCPL (Part 4 of 4)

Storage is obtained below the line, from subpool 230, user key, for the installation exit parameter list.

Change Use Attribute Installation Exit (CBRUXCUA) Return Codes

The following are the return codes that can be passed back from the CBRUXCUA exit:

Code	Meaning
0	Change the use attribute of the volume specified as requested. No changes have been made to the parameter list (CBRUXCPL). Use what existed at the time the installation exit was called.
4	Change the use attribute of the volume specified and note that one or more fields in the parameter list (CBRUXCPL) have changed.
8	Do not change the use attribute of the volume specified. **Note:** If the installation does not allow the use attribute of a volume to be changed from SCRATCH to PRIVATE, the job may fail for the volume required.
12	Reserved.
16	Do not call the change use attribute installation exit again. Change the use attribute of the volume as requested using the existing volume record information.

Note: If the installation has returned return code 16 indicating that the exit should not be called again, the exit can be reactivated either by stopping and restarting OAM or issuing the LIBRARY RESET,CBRUXCUA command. If the exit abnormally terminates, passes back an invalid return code, or passes back invalid data, PRIVATE to SCRATCH change use attribute processing is discontinued until one of the above actions has been taken. This is intended to protect user data from being inadvertently scratched.

Change Use Attribute Installation Exit (CBRUXCUA) Usage Requirements

The change use attribute installation exit must reside in load module CBRUXCUA. It is invoked by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-megabyte line. The installation exit must be coded and link-edited on the system as re-entrant.

Under some circumstances, CBRUXCUA may be invoked in a key other than the job key. Therefore, all storage dynamically acquired by CBRUXCUA should be obtained from subpool 227, 228, 229, 230, 231, or 241, in order to ensure that it is accessible in the program status word (PSW) key.

The following characteristics describe the execution environment in which the change use attribute installation exit is invoked:

- Task mode
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The addressing mode specified when the exit was linkage edited
- Primary ASC mode (not AR mode)
- User key, supervisor state

Mapping macro CBRUXCPL must be included by the installation exit.

Cartridge Entry Installation Exit (CBRUXENT)

This installation exit is called to approve or disapprove entry of a cartridge into a library and to determine TCDB volume record contents for each volume that is entered into a library. If the library supports outboard policy management, the installation exit can also obtain and set outboard policy names.

The cartridge entry installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see *z/OS DFSMSrmm Managing and Using Removable Media*, *z/OS DFSMSrmm Implementation and Customization Guide*, and *z/OS DFSMSrmm Diagnosis Guide*.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample cartridge entry installation exit (CBRSPUXE) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system. For more information on this SAMPLIB member, see "SAMPLIB member CBRSPUXE" on page 282.

The following library-related information is passed to the exit. None of the library-related information can be modified by the exit.

- Library name
- Library device type
- Library console name
- Library logical type
- Library description
- Library support indicator

Table 20 lists the volume-related parameters that are passed to the exit.

Table 20. Fields Passed to the Installation Exit—CBRUXENT

Parameter	Parameter Description	Input/Output
UXEVOLSR	Volume serial number	Input only
UXEVATTR	Volume attribute	Input only
UXEVINFO	Additional volume information	Input only
UXEUSEA	Volume use attribute	Output/Verified
UXEWPROT	Write protection status	Output/Verified
UXECHKPT	Checkpoint volume indicator	Output/Verified
UXETDSI	Tape device selection information	Output/Verified
UXELOC	Volume location code	Input only
UXEGROUP	Storage group name	Output/Verified
UXESHLOC	Shelf location	Output
UXEOWNER	Volume owner information	Output
UXECREAT	Volume record creation date	Input only
UXEENTEJ	Last entry or eject date	Input only
UXEMOUNT	Last mounted date	Output/Verified
UXEWRITE	Last written date	Output/Verified
UXEEXPIR	Volume expiration date	Output/Verified
UXEEXITI	Installation exit information	Input only

Table 20. Fields Passed to the Installation Exit—CBRUXENT (continued)

Parameter	Parameter Description	Input/Output
UXELMSG	Library manager storage group	Input only
UXELMSC	Library manager storage class	Output/Verified
UXELMMC	Library manager management class	Output/Verified
UXELMDC	Library manager data class	Output/Verified

The fields that are not marked as input only may be modified by the exit. If it is described as *output*, it may be updated by the installation. If it is further described as *verified*, the contents or format of the field is checked for validity before updating the TCDB volume record with information from the installation and, if applicable, updating the library with the changed outboard policy names. Date fields are in ISO format (YYYY-MM-DD).

For a previously unknown volume (no volume record exists), the volume serial number, the default volume use attribute, and the default tape device selection information are passed to the exit. The default volume use attribute is set by the storage administrator using the ISMF library define panel. The default tape device selection information (TDSI) is derived from the default entry data class, which is also set by the storage administrator using the ISMF library define panel. The default TDSI information is set as follows:

1. The library vision system determines the media type when the cartridge is entered. OAM uses this information to set the TDSI media type.
2. If a default entry data class is supplied in the library definition, the TDSI recording technology is set from the data class.
3. For media type MEDIA1, OAM sets 36-track recording technology if the default volume use attribute is PRIVATE and no recording technology is specified.
4. For media type MEDIA2, OAM always sets 36-track recording technology.
5. For media types MEDIA3 and MEDIA4, OAM sets 128-track recording technology if the default volume use attribute is PRIVATE and no recording technology is specified.
6. For MEDIA5, MEDIA6, MEDIA7, and MEDIA8, OAM sets EFMT1 recording technology if the default volume use attribute is PRIVATE and no recording technology is specified.
7. For MEDIA9 and MEDIA10, OAM always sets EFMT2 recording technology if the default volume use attribute is PRIVATE and no recording technology is specified.
8. For MEDIA11, MEDIA12, and MEDIA13, OAM always sets EFMT4 recording technology if the default volume use attribute is PRIVATE and no recording technology is specified.

The remaining volume-related values are set to blanks. A volume record creation date of blanks indicates that the TCDB volume record does not exist.

For a known volume, whatever information existed in the volume record at the time the cartridge was entered is passed to the exit.

The UXEVATTR field can be used to determine if the volume being entered is a physical (non-VTS) volume, a logical volume, or a logical volume being imported.

If the shelf location field for a logical volume being imported indicates STACKED=*volser* at the beginning of the field, this information is passed to the entry exit and is cleared upon successful entry of the volume. This should be the exported stacked volume that was recorded in the volume record in the TCDB when the logical volume was exported.

If the cartridge entry processing in the manual tape library, was initiated with the manual cartridge entry programming interface, the 16-byte pass through value specified with the EXITINFO keyword on the CBRXLCS FUNC(MCE) macro invocation in passed to the installation exit as an input-only value. Otherwise, UXEEXITI contains binary zeros.

Since cartridge entry processing in a manual tape library can be initiated by the MCE programming interface, or the LIBRARY ENTER command, the tape device selection field UXEMEDIA may be modified by the installation exit. If a media type is not provided before the invocation of the exit, and the exit makes no changes, entry processing for this volume fails, but processing for other volumes continues. However, if the exit explicitly modifies the media type and specifies an invalid value, entry processing is discontinued for this and all subsequent volumes. For entry processing in an automated tape library dataserver, UXEMEDIA is an input only field (the media type returned by the vision system is used).

The following values are validity checked upon return from the exit:

- Volume use attribute

  S(SCRATCH) or **P**(PRIVATE) can be specified.
- Storage group name

  For a volume use attribute of SCRATCH, the storage group name that is supplied by the exit is ignored. OAM sets the storage group name to ***SCRTCH***. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the storage group name may be set to blanks. A nonblank storage group name is always validity checked, even if the installation exit has not changed the value. The storage group name must be defined in the active SMS configuration as a tape storage group, and the library into which the volume is entered must be one of those in which the storage group resides. If the storage group name does not pass validation, and it is not provided by the installation exit, the cartridge is ejected, but cartridge entry processing continues.
- Storage class name

  For a volume use attribute of SCRATCH, the storage class name that is supplied by the exit is ignored. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the storage class name that is supplied may be blank. If a nonblank volume is supplied, the name must only conform to SMS naming convention standards. See “Syntax Rules” on page 227 for the syntax checking that is performed.
- Management class name

  For a volume use attribute of SCRATCH, the management class name that is supplied by the exit is ignored. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the management class name that is supplied may be blank. If a nonblank volume is supplied, the name must only

conform to SMS naming convention standards. See "Syntax Rules" for the syntax checking that is performed.

- Data class name

  For a volume use attribute of SCRATCH, the data class name that is supplied by the exit is ignored. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the data class name that is supplied may be blank. If a nonblank volume is supplied, the name must only conform to SMS naming convention standards. See "Syntax Rules" for the syntax checking that is performed.

- Write protection status

  Y, **N**, or blank can be specified.

- Checkpoint volume indicator

  Y, **N**, or blank can be specified.

- Last mounted date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.

- Last written date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.

- Volume expiration date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.

- Tape device selection information:
  - Tape recording technology may be specified as unknown, 18-track, 36-track, 128-track, 256-track, 384-track, EFMT1, EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4. The recording technology must be applicable for the media type. If it is returned as unknown and there is only one applicable recording technology for the media type, the applicable recording technology is set by default. If the volume is PRIVATE and the media type has more than one applicable recording technology, it is invalid for the installation exit to return unknown for the recording technology. The following are valid recording technology and media type combinations:
    - MEDIA1 and 18-track or 36-track (or unknown if volume is SCRATCH)
    - MEDIA2 and 36-track or unknown
    - MEDIA3, MEDIA4 and 128-track, 256-track, or 384-track (or unknown if volume is SCRATCH)
    - MEDIA5, MEDIA6, MEDIA7, MEDIA8 and EFMT1, EFMT2, EEFMT2, EFMT3, or EEFMT3 (or unknown if volume is SCRATCH)
    - MEDIA9, MEDIA10 and EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4 (or unknown if volume is SCRATCH)
    - MEDIA11, MEDIA12, MEDIA13 and EFMT4 or EEFMT4 (or unknown if volume is SCRATCH).
  - For automated cartridge entry, the media type returned by the hardware is always used.
  - Compaction may be specified as unknown, none, or compacted.
  - Special attribute may be specified as none or read-compatible.

Syntax Rules: The values that you specify for the storage group, storage class, data class, and management class construct (policy) names must meet the following SMS naming convention standards:

- Alphanumeric and national characters only
- Name must begin with an alphabetic or national character ($*@#%)
- No leading or embedded blanks

- Eight characters or less

Shelf location and owner information are not validity checked.

If the installation exit returns with an invalid value in a parameter field, returns with an invalid return code, or abnormally terminates, cartridge entry processing is discontinued until OAM has been stopped and restarted, or the LIBRARY RESET,CBRUXENT command has been issued to reenable the cartridge entry installation exit. This is intended to prevent the inadvertent assignment of a private volume to scratch status. For an automated tape library dataserver, the volume remains in the insert category.

Note: During cartridge entry processing in an ATLDS, it is not possible to determine which system in an SMS complex will perform cartridge entry processing for any particular occurrence unless the LIBRARY DISABLE,CBRUXENT command has been issued to disable cartridge entry installation exit processing on a system. However, to prevent unpredictable results, the installation should provide the same cartridge entry installation exit for each system in the SMS complex. If the library is being partitioned, each system in the TCDBplex must also run with the same cartridge entry installation exit. The LIBRARY DISABLE,CBRUXENT command can be used to test a new version of the exit by forcing cartridge entry processing to occur on a particular system.

Outboard Policy Management Processing When Calling the Entry Exit

If the library has outboard policy management support enabled, the UXELOPM indicator is set on in the CBRUXEPL parameter list to indicate that the library is enabled for outboard policy management support.

If a volume has nondefault policy names assigned to it, as may be the case with an imported logical volume, the library policy names are passed to the entry exit in the UXELMOPM fields. The UXEVOPM indicator is set on to indicate that at least one of these fields has a nondefault policy name. Otherwise, by default, blanks are passed in these fields. See “Cartridge Entry Installation Exit Parameter List (CBRUXEPL)” on page 231 for more information on these new fields in the parameter list.

The following indicators are set if the import list explicitly sets a policy name:

UXEVSGSP The storage group name is explicitly set by the import list.

UXEVMCSP The management class name is explicitly set by the import list.

UXEVSCSP The storage class name is explicitly set by the import list.

UXEVDCSP The data class name is explicitly set by the import list.

If a volume being entered has a TCDB record, the UXEGROUP field will contain the TCDB storage group, unless explicitly specified through the import list (indicated by bit flag UXEVSGSP). If the UXEVSGSP indicator is set, and the use attribute is PRIVATE, the UXEGROUP field contains the value specified in UXELMSG. This ensures that any changes through the import list are reflected in the TCDB record. UXELMSG will contain the storage group policy name that exists in the library if a nondefault policy name exists or blanks, by default. For a private volume, if the TCDB storage storage group is blanks and the library has a nondefault policy name, the UXELMSG value is also assigned to UXEGROUP.

If a volume being entered does not have a TCDB record, and the library has a nondefault policy name, the UXEGROUP field contains the value specified in UXELMSG. This ensures if the entry exit makes no changes, or changes the use attribute to PRIVATE, that the TCDB storage group field and the library manager policy names are the same.

Outboard Policy Management Processing When Returning from the Entry Exit

If the use attribute is SCRATCH when returning from the exit and the library supports outboard policy management, the construct names at the library are set to the default policy names, which contain blanks.

If the use attribute is PRIVATE when returning from the exit and the library does not support outboard policy management, the storage group policy name set by the cartridge entry installation exit (CBRUXENT) is stored in the TCDB, but the policy names for storage class, management class and data class in the new policy fields are ignored.

For a private volume, if the library supports outboard policy management, the cartridge entry installation exit (CBRUXENT) can assign or change policy names in the new fields. To change the storage group, use UXEGROUP, as UXELMSG is an input-only field.

To change the policy names or assign new names for storage class, management class, or data class policies, the exit can update the respective fields: UXELMSC, UXELMMC, UXELMDC. Upon return, these fields are checked for valid syntax (starts with an alphabetic or a national character [$*@#%], contains no embedded blanks, contains alphanumeric and national characters only); otherwise, the fields must contain all blanks in order to set the default policy names. These constructs are not validated to ensure that they are valid SMS constructs in the current SCDS as is done for the storage group. If the construct names are syntactically correct, the library is updated with these policy names. This approach provides greater flexibility, especially on import.

Cartridge Entry Installation Exit Parameter List (CBRUXEPL)

The cartridge entry installation exit (CBRUXENT) is passed by way of register 1, the pointer to a parameter list mapped by CBRUXEPL. Figure 20 provides the format of CBRUXEPL.

```
UXEPL    DSECT ,           CARTRIDGE ENTRY INSTALLATION EXIT
*                            PARAMETER LIST
*********************************************************************
*
*        CARTRIDGE ENTRY INSTALLATION EXIT PARAMETERS
*
*********************************************************************
UXEPARM  DS    0D          CBRUXENT PARAMETER SECTION
UXELIB   DS    CL8         LIBRARY NAME
*                            (INPUT VARIABLE)
UXELDEV  DS    CL8         LIBRARY DEVICE TYPE
*                            (INPUT VARIABLE)
UXELCON  DS    CL8         LIBRARY CONSOLE NAME
*                            (INPUT VARIABLE)
UXELTYP  DS    CL1         LIBRARY LOGICAL TYPE
*                            'R' FOR AUTOMATED LIBRARY
*                            'M' FOR MANUAL LIBRARY
*                            (INPUT VARIABLE)
UXESUPPT DS    XL1         SUPPORTED FUNCTION
UXELOPM  EQU   X'80'         ON IF OUTBOARD POLICY MANAGEMENT
*                              SUPPORTED IN LIBRARY
*                            (INPUT VARIABLE)
         DS    CL6         RESERVED
UXELDESC DS    CL120       LIBRARY DESCRIPTION
*                            (INPUT VARIABLE)
         DS    CL8         RESERVED
UXEVOLSR DS    CL6         VOLUME SERIAL NUMBER
*                            (INPUT VARIABLE)
UXEVATTR DS    XL1         VOLUME ATTRIBUTE
*                            0 PHYSICAL NON-VTS VOLUME
*                            1 LOGICAL VTS VOLUME
*                            2 IMPORTED VTS LOGICAL VOLUME
*                            (INPUT VARIABLE)
UXEVINFO DS    XL1         ADDITIONAL VOLUME INFORMATION
*                            (INPUT VARIABLE)
UXEVOPM  EQU   X'80'         ON IF NON-DEFAULT POLICY NAMES
*                              EXIST AT THE LIBRARY
UXEVSGSP EQU   X'40'         ON IF STORAGE GROUP NAME
*                              SPECIFIED THROUGH IMPORT LIST
UXEVMCSP EQU   X'20'         ON IF MANAGEMENT CLASS NAME
*                              SPECIFIED THROUGH IMPORT LIST
UXEVSCSP EQU   X'10'         ON IF STORAGE CLASS NAME
*                              SPECIFIED THROUGH IMPORT LIST
UXEVDCSP EQU   X'08'         ON IF DATA CLASS NAME
*                              SPECIFIED THROUGH IMPORT LIST
UXEUSEA  DS    CL1         VOLUME USE ATTRIBUTE
*                            'P' FOR PRIVATE
*                            'S' FOR SCRATCH
*                            (INPUT/OUTPUT VARIABLE)

UXEWPROT DS    CL1         WRITE PROTECTION STATUS
*                            'Y' FOR WRITE-PROTECTED
*                            'N' FOR NOT WRITE-PROTECTED
*                            (INPUT/OUTPUT VARIABLE)
```

Figure 20. The Cartridge Entry Installation Exit Parameter List—CBRUXEPL (Part 1 of 4)

```
UXECHKPT DS    CL1          CHECKPOINT VOLUME INDICATOR
*                             'Y' FOR CHECKPOINT VOLUME
*                             'N' FOR NOT CHECKPOINT VOLUME
*                             (INPUT/OUTPUT VARIABLE)
UXELOC   DS    CL1          VOLUME LOCATION CODE
*                             'L' FOR LIBRARY-RESIDENT
*                             'S' FOR SHELF-RESIDENT
*                             (INPUT VARIABLE)
UXETDSI  DS    0F           TAPE DEVICE SELECTION INFORMATION
UXEREC   DS    XL1          TAPE RECORDING TECHNOLOGY
*                             (INPUT/OUTPUT VARIABLE)
UXEMEDIA DS    XL1          MEDIA TYPE
*                             (INPUT/OUTPUT VARIABLE FOR MTL)
*                             (INPUT VARIABLE FOR ATLDS)
UXECOMP  DS    XL1          COMPACTION
*                             (INPUT/OUTPUT VARIABLE)
UXESPEC  DS    XL1          SPECIAL ATTRIBUTE
*                             (INPUT/OUTPUT VARIABLE)
UXEGROUP DS    CL8          STORAGE GROUP NAME
*                             (INPUT/OUTPUT VARIABLE)
UXESHLOC DS    CL32         SHELF LOCATION
*                             (INPUT/OUTPUT VARIABLE)
UXEOWNER DS    CL64         VOLUME OWNER INFORMATION
*                             (INPUT/OUTPUT VARIABLE)
         DS    CL8          RESERVED
UXECREAT DS    CL10         VOLUME RECORD CREATION DATE
*                             (INPUT VARIABLE)
UXEENTEJ DS    CL10         LAST ENTRY OR EJECTION DATE
*                             (INPUT VARIABLE)
UXEMOUNT DS    CL10         LAST MOUNTED DATE
*                             (INPUT/OUTPUT VARIABLE)
UXEWRITE DS    CL10         LAST WRITTEN DATE
*                             (INPUT/OUTPUT VARIABLE)
UXEEXPIR DS    CL10         VOLUME EXPIRATION DATE
*                             (INPUT/OUTPUT VARIABLE)
         DS    CL10         RESERVED
         DS    CL4          RESERVED
UXEEXITI DS    CL16         INSTALLATION EXIT INFORMATION
*                             (INPUT VARIABLE)
UXELMOPM DS    0CL32        OUTBOARD POLICY MANAGEMENT
UXELMSG  DS    CL8          LIBRARY MANAGER STORAGE GROUP
*                             TO CHANGE VALUE, USE UXEGROUP
*                             (INPUT ONLY)
UXELMSC  DS    CL8          LIBRARY MANAGER STORAGE CLASS
*                             (INPUT/OUTPUT VARIABLE)
UXELMMC  DS    CL8          LIBRARY MANAGER MANAGEMENT CLASS
*                             (INPUT/OUTPUT VARIABLE)
UXELMDC  DS    CL8          LIBRARY MANAGER DATA CLASS
*                             (INPUT/OUTPUT VARIABLE)
         DS    0D                 END OF UXEPL
UXEPLLEN EQU   *-UXEPL
         SPACE 1
*********************************************************************
*
*        RETURN CODES
*
*********************************************************************
UXENOCHG EQU   0            PERFORM ENTER AS REQUESTED
*                             USING PARAMETER VALUES PASSED
*                             IN ON INPUT
UXECHG   EQU   4            PERFORM ENTER REQUEST BUT NOTE
*                             THAT PARAMETER VALUES HAVE
*                             CHANGED ON EXIT
```

Figure 20. The Cartridge Entry Installation Exit Parameter List—CBRUXEPL (Part 2 of 4)

```
UXEFAIL  EQU   8           DENY ENTER REQUEST (FOR AN ATLDS, THE
*                            VOLUME IS EJECTED FROM THE LIBRARY)
UXEIGNOR EQU   12          IGNORE ENTER REQUEST (FOR AN ATLDS
*                            THE VOLUME REMAINS IN THE LIBRARY
*                            IN THE INSERT CATEGORY)
UXEDONT  EQU   16          DO NOT CALL THE CARTRIDGE ENTRY
*                            INSTALLATION EXIT AGAIN AND
*                            PERFORM CARTRIDGE ENTRY AS
*                            REQUESTED USING THE PARAMETER
*                            VALUES PASSED IN ON INPUT
         SPACE 1
*********************************************************************
*
*        LIBRARY LOGICAL TYPE CONSTANTS
*
*********************************************************************
UXEAUTO  EQU   C'R'         AUTOMATED/REAL LIBRARY
UXEMAN   EQU   C'M'         MANUAL LIBRARY
         SPACE 1
*********************************************************************
*
*        VOLUME ATTRIBUTE CONSTANTS
*
*********************************************************************
UXEPHYCL EQU   0            PHYSICAL NON-VTS VOLUME
UXELOGCL EQU   1            LOGICAL VTS VOLUME
UXEIMPRT EQU   2            IMPORTED VTS LOGICAL VOLUME
         SPACE 1
*********************************************************************
*
*        USE ATTRIBUTE CONSTANTS
*
*********************************************************************
UXEPRIV  EQU   C'P'         PRIVATE USE ATTRIBUTE
UXESCRT  EQU   C'S'         SCRATCH USE ATTRIBUTE
         SPACE 1
*********************************************************************
*
*        TAPE DEVICE SELECTION INFORMATION (TDSI) CONSTANTS
*
*********************************************************************
UXENOCAR EQU   0            ZERO IS AN ACCEPTABLE VALUE FOR TDSI
*********************************************************************
*        CONSTANTS TO DEFINE TAPE RECORDING TECHNOLOGY
*********************************************************************
UXENOREC  EQU   0           RECORDING TECHNOLOGY UNKNOWN OR
*                            UNSPECIFIED
UXE18TRK  EQU   1           READ/WRITE ON 18 TRACK DEVICE
UXE36TRK  EQU   2           READ/WRITE ON 36 TRACK DEVICE
UXE128TRK EQU   3           READ/WRITE ON 128 TRACK DEVICE
UXE256TRK EQU   4           READ/WRITE ON 256 TRACK DEVICE
UXE384TRK EQU   5           READ/WRITE ON 384 TRACK DEVICE
UXEEFMT1  EQU   6           READ/WRITE ON ENTERPRISE FORMAT 1
*                            (EFMT1) DEVICE
UXEEFMT2  EQU   7           READ/WRITE ON ENTERPRISE FORMAT 2
*                            (EFMT2) DEVICE
UXEEEFMT2 EQU   8           READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*                            (EEFMT2) DEVICE
UXEEFMT3  EQU   9           READ/WRITE ON ENTERPRISE
*                            FORMAT 3 (EFMT3) DEVICE
UXEEEFMT3 EQU   10          READ/WRITE ON ENTERPRISE
*                            ENCRYPTED FORMAT 3 (EEFMT3) DEVICE
```

Figure 20. The Cartridge Entry Installation Exit Parameter List—CBRUXEPL (Part 3 of 4)

```
UXEEFMT4  EQU   11          READ/WRITE ON ENTERPRISE FORMAT 4
*                           (EFMT4) DEVICE
UXEEEFMT4 EQU   12          READ/WRITE ON ENTERPRISE ENCRYPTED
*                            FORMAT 4 (EEFMT4) DEVICE
*********************************************************************
*        CONSTANTS TO DEFINE MEDIA TYPE
*********************************************************************
UXENOMED EQU   0            MEDIA TYPE UNKNOWN OR UNSPECIFIED
UXEMED1  EQU   1            MEDIA1 - CARTRIDGE SYSTEM TAPE
UXEMED2  EQU   2            MEDIA2 - ENHANCED CAPACITY CARTRIDGE
*                           SYSTEM TAPE
UXEMED3  EQU   3            MEDIA3 - HIGH PERFORMANCE CARTRIDGE
*                           TAPE
UXEMED4  EQU   4            MEDIA4 - EXTENDED HIGH PERFORMANCE
*                           CARTRIDGE TAPE
UXEMED5  EQU   5            MEDIA5 - ENTERPRISE TAPE CARTRIDGE
UXEMED6  EQU   6            MEDIA6 - ENTERPRISE WORM TAPE CARTRIDGE
UXEMED7  EQU   7            MEDIA7 - ENTERPRISE ECONOMY TAPE CARTRIDGE
UXEMED8  EQU   8            MEDIA8 - ENTERPRISE ECONOMY WORM TAPE
*                           CARTRIDGE
UXEMED9  EQU   9            MEDIA9 -  ENTERPRISE EXTENDED TAPE
*                                     CARTRIDGE
UXEMED10 EQU   10           MEDIA10 - ENTERPRISE EXTENDED WORM TAPE
*                                     CARTRIDGE
UXEMED11 EQU   11           MEDIA11  ENTERPRISE ADVANCED
*                                     TAPE CARTRIDGE
UXEMED12 EQU   12           MEDIA12  ENTERPRISE ADVANCED
*                                     WORM TAPE CARTRIDGE
UXEMED13 EQU   13           MEDIA13  ENTERPRISE ADVANCED
*                                     ECONOMY TAPE CARTRIDGE
*********************************************************************
*        CONSTANTS TO DEFINE COMPACTION
* (THE MEANING OF THE COMPACTION FIELD HAS CHANGED FROM TYPE OF
*  COMPACTION TO COMPACTION YES/NO - UXEIDRC AND UXECOMPT CAN BE
*  USED INTERCHANGEABLY)
*********************************************************************
UXECMPNS EQU   0            COMPACTION UNKNOWN OR NOT SET
UXENOCMP EQU   1            NO COMPACTION
UXEIDRC  EQU   2            COMPACTION
UXECOMPT EQU   2            COMPACTION
*********************************************************************
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE
*********************************************************************
UXENOSPC EQU   0            VOLUME HAS NO SPECIAL ATTRIBUTE
UXERDCOM EQU   1            VOLUME WILL BE MOUNTED FOR READ ONLY -
*                             ALL READ-COMPATIBLE DEVICES MAY BE
*                             SELECTED
         SPACE 1
*********************************************************************
*
*         MISCELLANEOUS CONSTANTS
*
*********************************************************************
UXEPLSP  EQU   0            UXEPL SUBPOOL NUMBER
UXEYES   EQU   C'Y'         YES
UXENO    EQU   C'N'         NO
UXEBLANK EQU   C' '         BLANK
```

Figure 20. The Cartridge Entry Installation Exit Parameter List—CBRUXEPL (Part 4 of 4)

OAM obtains storage below the line, from subpool 0, key 5, or subpool 0, user key, for the installation exit parameter list.

Cartridge Entry Installation Exit (CBRUXENT) Return Codes

The following are the return codes that can be passed back from the exit:

Code	Meaning
0	Perform cartridge entry as requested. No changes have been made to the parameter list (CBRUXEPL). Use what existed at the time the installation exit was called.
4	Perform cartridge entry and note that one or more fields in the parameter list (CBRUXEPL) have changed.
8	Do not allow this cartridge to be entered. For an automated tape library dataserver, OAM schedules the cartridge to be ejected.
12	Ignore the cartridge entry request. For an automated tape library dataserver, OAM leaves the cartridge in the library (volume left in the insert category).
16	Do not call the cartridge entry installation exit again. Perform cartridge entry as requested using the attributes that existed at the time that the exit was originally called.

If an invalid return code is passed back, OAM discontinues cartridge entry processing.

Note: Once OAM is told not to invoke the installation exit again (return code 16) or cartridge entry processing is discontinued, the only way to reactivate the exit is to stop and restart OAM, or to issue the LIBRARY RESET,CBRUXENT command.

Cartridge Entry Installation Exit (CBRUXENT) Usage Requirements

The cartridge entry installation exit must reside in load module CBRUXENT. It is invoked by OAM by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-MB line. If multiple tape libraries are defined to the system, the installation exit must be coded and link-edited on the system as re-entrant.

Note: CBRUXENT is invoked out of the master address space when it is driven as a result of the LIBRARY ENTER command (for manual cartridge entry processing).

The following characteristics describe the execution environment in which the cartridge entry installation exit is invoked:

- Task mode
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The addressing mode specified when the exit was linkage edited
- Primary ASC mode (not AR mode)
- Key 5, problem state; or a user key, supervisor state

Rule: Mapping macro CBRUXEPL must be included by the installation exit.

Cartridge Eject Installation Exit (CBRUXEJC)

The cartridge eject installation exit (CBRUXEJC) is called to approve or disapprove a request to eject a volume from a tape library, as a notification call when a logical volume has been exported, as a notification call when a volume eject has failed, and to determine the TCDB volume record disposition and contents for each volume.

The cartridge eject installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see *z/OS DFSMSrmm Managing and Using Removable Media*, *z/OS DFSMSrmm Implementation and Customization Guide*, and *z/OS DFSMSrmm Diagnosis Guide*.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample cartridge eject installation exit (CBRSPUXJ) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system. For more information on this SAMPLIB member, see "SAMPLIB member CBRSPUXJ" on page 290.

The following library-related information is passed to the exit. None of the library-related information can be modified by the installation exit.

- Library name
- Library device type
- Library console name, or blanks
- Library logical type
- Library description

The exit is also informed of the disposition of the volume record (KEEP or PURGE), and of the volume eject status.

Table 21 lists the volume-related parameters that are passed to the exit.

Table 21. Fields Passed to the Installation Exit—CBRUXEJC

Parameter	Parameter Description	Input/Output
UXJVDISP	Volume record disposition	Output/Verified
UXJNCALL	Notification call indicator	Input only
UXJSTKVS	Stacked "container" volume	Input only/with export call
UXJVOLSR	Volume serial number	Input only
UXJFLAGS/UXJCBACK	Failed eject notification call indicator	Output
UXJUSEA	Volume use attribute	Output/Verified
UXJWPROT	Write protection status	Output/Verified
UXJCHKPT	Checkpoint volume indicator	Output/Verified
UXJLOC	Volume location code	Input only
UXJTDSI	Tape device selection information	Input only
UXJGROUP	Storage group name	Output/Verified
UXJSHLOC	Shelf location	Output
UXJOWNER	Volume owner information	Output
UXJCREAT	Volume record creation date	Input only

Table 21. Fields Passed to the Installation Exit—CBRUXEJC (continued)

Parameter	Parameter Description	Input/Output
UXJENTEJ	Last entry or eject date	Input only
UXJMOUNT	Last mounted date	Output/Verified
UXJWRITE	Last written date	Output/Verified
UXJEXPIR	Volume expiration date	Output/Verified

The fields that are not marked as input only may be modified by the exit. If it is described as *output*, it may be updated by the installation exit. If it is further described as *verified*, the contents or format of the field is validity checked before updating the TCDB volume record with information from the installation exit. Date fields are in ISO format (YYYY-MM-DD).

The 16-byte pass-through value specified with the EXITINFO keyword on the CBRXLCS FUNC(EJECT) macro invocation is passed to the installation exit as an input-only value. If the eject request has come from any source except CBRXLCS, the field contains binary zeros.

If a volume record disposition of purge (**P**) is returned by the installation exit, the only value retained from the parameter list is the shelf location. This enables the proper shelf location to be displayed upon eject completion.

If a volume record disposition of keep (**K**) is returned by the installation exit, the following values are checked for validity:

- Volume use attribute

  S (SCRATCH) or **P** (PRIVATE) can be specified.
- Storage group name

  For a volume use attribute of SCRATCH, OAM sets the storage group name to *SCRTCH*. Any name supplied by the exit is ignored. For a volume use attribute of PRIVATE, the storage group name may be set to blanks. If a nonblank value is provided, the storage group must be part of the active configuration, and it must be a tape storage group.
- Write protection status

  Y, **N**, or blank can be specified.
- Checkpoint volume indicator

  Y, **N**, or blank can be specified.
- Last mounted date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.
- Last written date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.
- Volume expiration date

  The date specified must be in ISO format (YYYY-MM-DD) or blanks.

Shelf location and owner information are not validity checked.

If the installation exit returns with an invalid value in a volume record field, returns with an invalid return code, or abnormally terminates, cartridge eject processing is discontinued until OAM has been stopped and restarted, or the LIBRARY RESET,CBRUXEJC command has been issued to re-enable the cartridge eject installation exit.

Failed eject notification processing

If an eject request fails after the exit has been invoked, the tape configuration database, your tape management system database, and the library manager database might report the library residency of the volume differently. To help avoid these discrepancies, on the initial call to the exit (UXJNCALL value UXJEJECT), the UXJCBACK indicator can be set by the exit. If this indicator is set and the eject request then fails, a failed eject notification call is made to the exit (UXJNCALL value UXJRFAIL). This call provides an opportunity for the tape management system to update its database information on the residency of the volume.

Note: Failed eject notification support is not performed for manual tape library volumes.

Export completion processing

Unlike a physical volume, a logical volume with data cannot be removed from a VTS by ejecting it from the library.

To remove a logical volume with data from a library, the volume must be physically exported from the library. For more information on the export process, see "Exporting Logical Volumes from a 3494 VTS System" on page 38.

When a logical volume is successfully exported from the library, the cartridge eject installation exit is notified and a notification call indicator (UXJEXPRT) is set in field UXJNCALL. The volume serial number of the stacked container volume on which the logical volume resides can be found in the stacked volume container field, UXJSTKVS. The installation or its tape management system then stores the container information for later use when the logical volume is imported back into a library. If the TCDB is shared across multiple systems but each system has its own tape management system database, the exit can return with RC=12 (IGNORE) if the exported volume is not known to this tape management system. This leaves the volume in the exported category to be processed by a system that "owns" that volume. If appropriate for the installation, the 32-character free form shelf location field in the TCDB volume record (located in the UXJSHLOC field of the cartridge eject installation exit parameter list) can also be used to store the container volume serial number. This would require that the volume record be kept after a logical volume is exported from the library.

If the volume record disposition returned from the exit indicates that the volume record should be kept and the shelf location returned from the exit is blank, LCS automatically stores the container volume serial number in the shelf location field of the volume record as STACKED=*volser*. This information can later be used in the volume-not-in-library installation exit (CBRUXVNL) to assist the installation and operator in importing a logical volume. LCS also stores this information if the exit is not to be invoked, the volume record disposition is KEEP, and the shelf location is blank.

This call to the installation exit is a notification call only because the export operation for the logical volume is near completion. This means that the logical volume has already been written to a stacked volume, which will soon be ready for removal. All cartridge eject parameter list fields that can be updated today when a physical volume is ejected from a library can be updated when a logical volume is exported from a library and are subject to the same validity checks. If the export then fails during completion processing, the library recovers by putting the exported volume back into the insert category. There is no failed eject notification call.

Cartridge eject installation exit parameter list (CBRUXJPL)

The cartridge eject installation exit (CBRUXEJC) is passed by way of register 1, the pointer to a parameter list mapped by CBRUXJPL. Figure 21 provides the format of CBRUXJPL.

```
UXJPL       DSECT ,               CBRUXEJC PARAMETER LIST
            SPACE 1
*************************************************************************
*                                                                       *
*        CARTRIDGE EJECT INSTALLATION EXIT PARAMETERS                   *
*                                                                       *
*************************************************************************
UXJPARM     DS   0D               CBRUXEJC PARAMETER SECTION
UXJLIB      DS   CL8              LIBRARY NAME
*                                   (INPUT VARIABLE)
UXJLDEV     DS   CL8              LIBRARY DEVICE TYPE
*                                   (INPUT VARIABLE)
UXJLCON     DS   CL8              LIBRARY CONSOLE NAME
*                                   (INPUT VARIABLE)
UXJLTYP     DS   CL1              LIBRARY LOGICAL TYPE
*                                   'R' FOR AUTOMATED LIBRARY
*                                   'M' FOR MANUAL LIBRARY
*                                   (INPUT VARIABLE)
            DS   CL7              RESERVED
UXJLDESC    DS   CL120            LIBRARY DESCRIPTION
*                                   (INPUT VARIABLE)
            DS   CL8              RESERVED
UXJVDISP    DS   CL1              VOLUME RECORD DISPOSITION
*                                   'K' KEEP VOLUME RECORD IN
*                                   THE TAPE CONFIGURATION
*                                   DATA BASE
*                                   'P' PURGE VOLUME RECORD FROM
*                                   THE TAPE CONFIGURATION
*                                   DATA BASE
*                                   (INPUT/OUTPUT VARIABLE)
UXJNCALL    DS   XL1              NOTIFICATION CALL INDICATOR
*                                   0 EJECT REQUEST FOR VOLUME
*                                   1 LOGICAL VOLUME
*                                     SUCCESSFULLY EXPORTED
*                                   2 FAILED EJECT NOTIFICATION
*                                   (INPUT VARIABLE)
UXJSTKVS    DS   CL6              STACKED CONTAINER
*                                   VOLUME ON WHICH EXPORTED
*                                   LOGICAL VOLUME RESIDES
*                                   (INPUT VARIABLE W/EXPORT CALL)
UXJVOLSR    DS   CL6              VOLUME SERIAL NUMBER
*                                   (INPUT VARIABLE)
UXJFLAGS    DS   XL1              FLAG BYTE
UXJCBACK    EQU  X'80'              FAILED EJECT NOTIFICATION CALL
*                                   REQUESTED - APPLICABLE TO SET
*                                   IF UXJNCALL HAS 0 VALUE
*                                   (OUTPUT VARIABLE)
            DS   CL1              RESERVED
UXJUSEA     DS   CL1              VOLUME USE ATTRIBUTE
*                                   'P' FOR PRIVATE
*                                   'S' FOR SCRATCH
*                                   (INPUT/OUTPUT VARIABLE)
```

Figure 21. The Cartridge Eject Installation Exit Parameter List—CBRUXJPL (Part 1 of 5)

```
UXJWPROT     DS   CL1              WRITE PROTECTION STATUS
*                                   'Y' FOR WRITE-PROTECTED
*                                   'N' FOR NOT WRITE-PROTECTED
*                                   (INPUT/OUTPUT VARIABLE)
UXJCHKPT     DS   CL1              CHECKPOINT VOLUME INDICATOR
*                                   'Y' FOR CHECKPOINT VOLUME
*                                   'N' FOR NOT CHECKPOINT VOLUME
*                                   (INPUT/OUTPUT VARIABLE)
UXJLOC       DS   CL1              VOLUME LOCATION CODE
*                                   'L' FOR LIBRARY-RESIDENT
*                                   'S' FOR SHELF-RESIDENT
*                                   (INPUT VARIABLE)
UXJTDSI      DS   0F               TAPE DEVICE SELECTION INFO
UXJREC       DS   XL1              TAPE RECORDING TECHNOLOGY
*                                   (INPUT VARIABLE)
UXJMEDIA     DS   XL1              MEDIA TYPE
*                                   (INPUT VARIABLE)
UXJCOMP      DS   XL1              COMPACTION TYPE
*                                   (INPUT VARIABLE)
UXJSPEC      DS   XL1              SPECIAL ATTRIBUTE
*                                   (INPUT VARIABLE)
UXJGROUP     DS   CL8              STORAGE GROUP NAME
*                                   (INPUT/OUTPUT VARIABLE)
UXJSHLOC     DS   CL32             SHELF LOCATION
*                                   (INPUT/OUTPUT VARIABLE)
UXJOWNER     DS   CL64             VOLUME OWNER INFORMATION
*                                   (INPUT/OUTPUT VARIABLE)
             DS   CL8               RESERVED
UXJCREAT     DS   CL10             VOLUME RECORD CREATION DATE
*                                   (INPUT VARIABLE)
UXJENTEJ     DS   CL10             LAST ENTRY OR EJECTION DATE
*                                   (INPUT VARIABLE)
UXJMOUNT     DS   CL10             LAST MOUNTED DATE
*                                   (INPUT/OUTPUT VARIABLE)
UXJWRITE     DS   CL10             LAST WRITTEN DATE
*                                   (INPUT/OUTPUT VARIABLE)
UXJEXPIR     DS   CL10             VOLUME EXPIRATION DATE
*                                   (INPUT/OUTPUT VARIABLE)
             DS   CL10             RESERVED
             DS   CL4              RESERVED
UXJEXITI     DS   CL16             INSTALLATION EXIT INFORMATION
*                                   (INPUT VARIABLE)
             DS   0D               END OF UXJPL
UXJPLLEN     EQU  *-UXJPL
             SPACE 1
*************************************************************************
*                                                                       *
*        RETURN CODES                                                   *
*                                                                       *
*************************************************************************
UXJNOCHG     EQU  0                PERFORM EJECT/EXPORT AS NOTIFIED
*                                    USING PARAMETER VALUES
*                                    PASSED IN ON INPUT
UXJCHG       EQU  4                PERFORM EJECT/EXPORT AS NOTIFIED
*                                    BUT NOTE THAT PARAMETER VALUES
*                                    HAVE CHANGED ON EXIT
```

Figure 21. The Cartridge Eject Installation Exit Parameter List—CBRUXJPL (Part 2 of 5)

```
UXJFAIL      EQU  8                PHYSICAL VOLUME NOT TO BE EJECTED
*
UXJIGNOR     EQU  12               IGNORE EXPORT COMPLETION PROCESSING
*                                  FOR THIS LOGICAL VOLUME (VOLUME
*                                  REMAINS IN EXPORTED CATEGORY)
UXJDONT      EQU  16               DO NOT CALL THE CARTRIDGE
*                                    EJECT INSTALLATION EXIT AGAIN
*                                    AND PERFORM CARTRIDGE
*                                    EJECT/EXPORT AS NOTIFIED
*                                    USING THE PARAMETER VALUES
*                                    PASSED IN ON INPUT
             SPACE 1
*************************************************************************
*                                                                       *
*        LIBRARY LOGICAL TYPE CONSTANTS                                 *
*                                                                       *
*************************************************************************
UXJAUTO      EQU  C'R'             AUTOMATED/REAL LIBRARY
UXJMAN       EQU  C'M'             MANUAL LIBRARY
             SPACE 1
*************************************************************************
*                                                                       *
*        VOLUME RECORD DISPOSITION (EJECT TYPE) CONSTANTS               *
*                                                                       *
*************************************************************************
UXJKEEP      EQU  C'K'             KEEP VOLUME RECORD
UXJPURGE     EQU  C'P'             PURGE VOLUME RECORD
             SPACE 1
*************************************************************************
*                                                                       *
*       NOTIFICATION CALL INDICATOR CONSTANTS                           *
*************************************************************************
UXJEJECT     EQU   0               EJECT REQUEST FOR A VOLUME
UXJEXPRT     EQU   1               LOGICAL VOLUME SUCCESSFULLY
*                                    EXPORTED
UXJRFAIL     EQU   2               FAILED EJECT NOTIFICATION
*************************************************************************
*                                                                       *
*        USE ATTRIBUTE CONSTANTS                                        *
*                                                                       *
*************************************************************************
UXJPRIV      EQU  C'P'             PRIVATE USE ATTRIBUTE
UXJSCRT      EQU  C'S'             SCRATCH USE ATTRIBUTE
             SPACE 1
*************************************************************************
*                                                                       *
*        TAPE DEVICE SELECTION INFORMATION (TDSI) CONSTANTS             *
*                                                                       *
*************************************************************************
UXJNOCAR     EQU  0                ZERO IS AN ACCEPTABLE VALUE
*                                    FOR TDSI
*************************************************************************
*        CONSTANTS TO DEFINE TAPE RECORDING TECHNOLOGY                  *
*************************************************************************
UXJNOREC     EQU  0                RECORDING TECHNOLOGY UNKNOWN
*                                    OR UNSPECIFIED
UXJ18TRK     EQU  1                READ/WRITE ON AN 18 TRACK
*                                    DEVICE
UXJ36TRK     EQU  2                READ/WRITE ON A 36 TRACK
*                                    DEVICE
```

Figure 21. The Cartridge Eject Installation Exit Parameter List—CBRUXJPL (Part 3 of 5)

```
UXJ128TRK    EQU  3                READ/WRITE ON A 128 TRACK
*                                   DEVICE
UXJ256TRK    EQU  4                READ/WRITE ON A 256 TRACK
*                                   DEVICE
UXJ384TRK    EQU  5                READ/WRITE ON A 384 TRACK
*                                   DEVICE
UXJEFMT1     EQU  6                READ/WRITE ON ENTERPRISE FORMAT 1
*                                   (EFMT1) DEVICE
UXJEFMT2     EQU  7                READ/WRITE ON ENTERPRISE FORMAT 2
*                                   (EFMT2) DEVICE
UXJEEFMT2    EQU  8                READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*                                   (EEFMT2) DEVICE
UXJEFMT3     EQU  9                READ/WRITE ON ENTERPRISE
*                                   FORMAT 3 (EFMT3) DEVICE
UXJEEFMT3    EQU  10               READ/WRITE ON ENTERPRISE
*                                   ENCRYPTED FORMAT 3 (EEFMT3) DEVICE
UXJEFMT4     EQU  11               READ/WRITE ON ENTERPRISE FORMAT 4
*                                   (EFMT4) DEVICE
UXJEEFMT4    EQU  12               READ/WRITE ON ENTERPRISE ENCRYPTED
*                                   FORMAT 4 (EEFMT4) DEVICE
*************************************************************************
*        CONSTANTS TO DEFINE MEDIA TYPE                                 *
*************************************************************************
UXJNOMED     EQU  0                MEDIA TYPE UNKNOWN OR
*                                   UNSPECIFIED
UXJMED1      EQU  1                MEDIA1 - CARTRIDGE SYSTEM TAPE
UXJMED2      EQU  2                MEDIA2 - ENHANCED CAPACITY
*                                   CARTRIDGE SYSTEM TAPE
UXJMED3      EQU  3                MEDIA3 - HIGH PERFORMANCE
*                                   CARTRIDGE TAPE
UXJMED4      EQU  4                MEDIA4 - EXTENDED HIGH PERFORMANCE
*                                   CARTRIDGE TAPE
UXJMED5      EQU  5                MEDIA5 - ENTERPRISE TAPE CARTRIDGE
UXJMED6      EQU  6                MEDIA6 - ENTERPRISE WORM TAPE CARTRIDGE
UXJMED7      EQU  7                MEDIA7 - ENTERPRISE ECONOMY TAPE CARTRIDGE
UXJMED8      EQU  8                MEDIA8 - ENTERPRISE ECONOMY WORM TAPE
*                                   CARTRIDGE
UXJMED9      EQU  9                MEDIA9 - ENTERPRISE EXTENDED TAPE
*                                   CARTRIDGE
UXJMED10     EQU  10               MEDIA10 - ENTERPRISE EXTENDED WORM TAPE
*                                   CARTRIDGE
UXJMED11     EQU  11               MEDIA11 - ENTERPRISE ADVANCED
*                                   TAPE CARTRIDGE
UXJMED12     EQU  12               MEDIA12 - ENTERPRISE ADVANCED
*                                   WORM TAPE CARTRIDGE
UXJMED13     EQU  13               MEDIA13 - ENTERPRISE ADVANCED
*                                   ECONOMY TAPE CARTRIDGE
*************************************************************************
*        CONSTANTS TO DEFINE COMPACTION (THE MEANING OF THE             *
*        COMPACTION FIELD HAS CHANGED FROM TYPE OF COMPACTION           *
*        TO COMPACTION YES/NO - UXJIDRC AND UXJCOMPT                    *
*        CAN BE USED INTERCHANGEABLY)                                   *
*************************************************************************
UXJCMPNS     EQU  0                COMPACTION UNKNOWN OR NOT SET
UXJNOCMP     EQU  1                NO COMPACTION
UXJCOMPT     EQU  2                COMPACTION
UXJIDRC      EQU  2                COMPACTION
```

Figure 21. The Cartridge Eject Installation Exit Parameter List—CBRUXJPL (Part 4 of 5)

```
*********************************************************************
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE                      *
*********************************************************************
UXJNOSPC     EQU  0                VOLUME HAS NO SPECIAL
*                                    ATTRIBUTE
UXJRDCOM     EQU  1                VOLUME WILL BE MOUNTED FOR READ
*                                    ONLY - ALL READ-COMPATIBLE
*                                    DEVICES MAY BE SELECTED
             SPACE 1
*********************************************************************
*                                                                   *
*        MISCELLANEOUS CONSTANTS                                    *
*                                                                   *
*********************************************************************
UXJPLSP       EQU   0                UXJPL SUBPOOL NUMBER
UXJYES        EQU   C'Y'             YES
UXJNO         EQU   C'N'             NO
UXJBLANK      EQU   C' '             BLANK
              SPACE 2
              MEND  ,
```

Figure 21. The Cartridge Eject Installation Exit Parameter List—CBRUXJPL (Part 5 of 5)

OAM obtains storage below the line, from subpool 0, key 5, for the installation exit parameter list.

Cartridge eject installation exit (CBRUXEJC) return codes

The following are the return codes that can be passed back to OAM:

Code	Meaning
0	Perform cartridge ejection as requested. No changes have been made to the parameter list (CBRUXJPL). Use the attributes that existed at the time the installation exit was originally called.
4	Perform cartridge ejection and note that one or more fields in the parameter list (CBRUXJPL) have changed.
8	Do not allow this cartridge to be ejected.
12	Ignore export completion processing for this logical volume. OAM leaves the volume in the library in the exported category.
16	Do not call the cartridge eject installation exit again and perform cartridge ejection as requested using the attributes that existed at the time the installation exit was originally called.

Note: If an invalid return code is passed back, OAM discontinues cartridge eject processing.

Cartridge eject Installation exit (CBRUXEJC) usage requirements

The cartridge eject installation exit must reside in load module CBRUXEJC. It is invoked by OAM through the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-megabyte line. If multiple tape libraries are defined to the system, the installation exit must be coded and linkedited on the system as reentrant.

Note: Once OAM is told not to invoke the installation exit again (return code 16) or cartridge ejection processing is discontinued, the only way to reactivate the exit is to stop and restart OAM, or issue the LIBRARY RESET,CBRUXEJC command.

The following characteristics describe the execution environment in which the cartridge eject installation exit is invoked:
- Task mode
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The addressing mode specified when the exit was linkage edited
- Primary ASC mode (not AR mode)
- Key 5, problem state

Mapping macro CBRUXJPL must be included by the installation exit.

Volume not in library installation exit (CBRUXVNL)

The volume not in library installation exit (CBRUXVNL) receives control under a variety of circumstances and error conditions. The primary purpose of the exit is to give the installation the opportunity to enter a volume into a tape library during job step setup, device allocation, and library mount processing.

The volume not in library installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see *z/OS DFSMSrmm Managing and Using Removable Media*, *z/OS DFSMSrmm Implementation and Customization Guide*, and *z/OS DFSMSrmm Diagnosis Guide*.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample volume not in library installation exit (CBRSPUXV) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system. For more information on this SAMPLIB member, see "SAMPLIB member CBRSPUXV" on page 297.

Note: For an MTL, the LIBRARY ENTER command can be used to allow an operator to enter the desired volume into the MTL.

Invoking the Installation Exit

This installation exit can be invoked during the following processing steps:
- Job step setup
- Device allocation
- Library mount

The following conditions can cause invocation of the exit:
- If some of the tape volumes in a multivolume tape data set are not resident in a tape library, the request would fail, because all the tape volumes belonging to the same multivolume data set must reside in the same tape library. The exit can be used to direct the missing tape volumes back into the library.

  Note: In a multivolume data set request, during job step setup and device allocation processing, the exit is only invoked when the first volume of the data set does not reside in a tape library. However, later during library mount processing, the exit is invoked each time a multivolume data set volume is needed but does not reside in the tape library. The exit can wait until library mount processing to get the additional volumes entered on an "as needed" basis, or if it is known that specific applications always use the entire multivolume data set, the exit, during job step setup, can instruct the operator to enter all volumes of the

multivolume data set. The choice is determined by the exit. However, keep in mind that the exit is only passed one volume serial number at a time, and is not passed all the volumes in the multivolume data set, nor is it passed any data set information.

- If none of the tape volumes reside in a tape library, or the tape volumes were previously resident in a tape library but are currently shelf-resident, they are considered non-SMS managed tape volumes and are allocated to a tape drive of the appropriate device type outside a tape library. The exit can be used to enter the tape volumes into a tape library.

  For example, if the only 3490E tape drives that an installation has are inside a tape library, then whenever a shelf-resident enhanced capacity cartridge system tape is requested, it must be entered into a tape library containing a 3490E tape drive. The exit can be used to direct the enhanced capacity cartridge system tape into a library that is capable of handling the request.

  Note: Before invoking the exit during job step setup, OAM does not know if there are any stand-alone drives capable of handling the volume. The exit is invoked to report that the tape volume is not in a tape library, and it allows the exit to decide whether the volume should reside in a tape library, and if so, which tape library should be used.
- If a tape volume is ejected from a tape library between job step setup and library mount processing, the request requiring the tape volume would fail. The exit can reenter the required tape volume into the specified tape library to prevent the job from failing.

  However, if a logical volume is being exported from a tape library dataserver between job setup and library mount processing, the mount request immediately fails, since an export operation is not immediate.

  Note: The input to the exit at device allocation does not identify the library to which the tape volume must return, because the information was erased when the volume was ejected from the library. Therefore, the exit must rely upon other sources to determine which library should receive the missing volume.
- If tape volumes are not library-resident in a tape library and are physically located in a remote area, requests for these volumes are allocated to stand-alone tape drives and are delayed until the volumes are retrieved and mounted on the stand-alone tape drives. While jobs are waiting for these tape volumes to be mounted, the system resources allocated to these tape volumes are unavailable for use by other jobs. CBRUXVNL can identify this condition and interact with the installation's tape management system to determine the best course of action to alleviate this waste of time and resource.
- Since the ATLDS has a *finite* tape cartridge capacity, infrequently used tape volumes may be ejected until their next scheduled use. These tape cartridges should be reentered in advance of reuse to avoid job processing delays, but since this is not always possible, this exit can be used to identify and correct this condition, preventing job failures.

  Note: With JES3, the job step notification occurs before the job being scheduled for execution. Therefore, missing tapes can be located and entered into the tape library well in advance of usage.

Processing Options for the Installation Exit

The following options are available to the exit:

- Continue without entering the cartridge into a library.

- Locate the requested volume and enter it into a tape library.
- Cancel the request immediately.
- Indicate that the exit not be invoked again.

Logical Volume Considerations

If a logical volume is requested to be mounted, it is important that the installation exit also display the exported stacked volume that contains the logical volume. If the OAM supplied default is being used, this information is automatically displayed if the shelf location in the TCDB volume record is STACKED=*volser*.

Entering Tape Volumes in the Library Using the Installation Exit

To enter tape volumes into the library under the direction of the exit, the following conditions must both be met:

- OAM must be up and running on at least one of the systems sharing the tape library dataserver in the SMS complex or TCDBplex.
- OAM must have been started since the most recent IPL on the system running the requested job.

When entering a volume into a tape library under the direction of CBRUXVNL, you must set the volume use attribute to PRIVATE; otherwise, the request fails. This is because only specific volume requests are handled by the exit and a specific volume request for a scratch tape is not permitted. Volume use attributes are set by default from the ISMF Library Definition or by the cartridge entry installation exit.

Perform the following steps when you enter a volume into a tape library:

- Locate the requested volume using the tape management system inventory.
- Enter the volume into a tape library (or if indicated, the specific tape library). For a logical volume, enter the required exported stacked volume and initiate a single volume import at the library manager console.
- Reply to the outstanding WTOR at the MVS console.

Note: If the exit is waiting for an extended period for human intervention to finish processing, this causes delays for other jobs that may be processing at the same time or that may need the same resources as the job for which the exit is active. If the volume is not entered into the library within 15 minutes, CBR3646D is issued indicating that the operator should retry or cancel the job request.

Possible Error Conditions

The installation may introduce a number of error conditions in the process of re-entering a cartridge into a library under the control of the volume not in library installation exit. The following errors may cause immediate or eventual job failures:

- Entering a volume into the wrong library (prompts the issuance of message CBR3646D)
- Setting the wrong storage group name in the cartridge entry installation exit
- Setting incorrect tape device selection information in the cartridge entry installation exit
- Setting the scratch volume use attribute in the cartridge entry installation exit incorrectly
- Inadvertently requesting a volume with a level of TDSI information not recognized by the system

Note: If the operator enters the volume into the wrong library, or OAM is not aware of the entry of the volume within 15 minutes, OAM issues the CBR3646D message. This allows the operator the opportunity to correct the situation and retry or cancel the operation.

The best way to avoid these errors is to not eject the volumes in the first place. If this is not practical, then the tape volume record should be kept by using the KEEP option of the LIBRARY EJECT operator command or through the ISMF Mountable Tape Volume line operator when the volume is ejected. This preserves the information about the tape volume so that the Cartridge Entry Installation Exit does not have to rebuild the tape volume record.

If a job on a lower-level system inadvertently requests a volume whose media type or recording technology is not understood at this software level, the exit can cancel the job, returning a return code 8, or it can proceed with entering the volume. If the exit proceeds and enters the volume, once it is successfully entered on an up-level system and the exit returns with a return code 4 (indicating retry), the job on the down-level system fails during job step setup on subsequent retrieval of the volume record. If the host detects that it is an up-level volume (if the TCDB volume record exists), the call to the exit is bypassed and the job is canceled.

Job Step Setup

CBRUXVNL is invoked during job step setup processing to provide an opportunity to enter the tape volume into any tape library chosen. The call to the exit is made when the first or only volume serial number specified on the DD statement or dynamic allocation request is not an online DASD volume and no record exists in the TCDB for the volume, or a record exists but indicates the volume is shelf-resident. Shelf-resident means the tape volume was ejected from the tape library with the KEEP option, which retained the TCDB record. For new data sets, this occurs just before calling the ACS routines; for old data sets, this occurs when the TCDB search completes before device allocation.

Note: Refer to APAR OA11079, available at z/OS V1R4 and above, for changes to the processing related to offline DASD volumes. With this APAR installed, or starting with z/OS V1R8, during DISP=OLD processing, the CBRUXVNL exit is no longer called for offline DASD volumes.

Table 22 lists the contents of the exit input when a volume record does not exist in the TCDB.

Table 22. CBRUXVNL Input During Job Step Setup—No TCDB Volume Record

Variable	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	1 indicates job step setup processing
UXNERROR	1 indicates no TCDB record

Table 23 lists the contents of the exit input when a shelf-resident tape volume record exists in the TCDB.

Table 23. CBRUXVNL Input During Job Step Setup—Existing TCDB Volume Record

Parameter	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	1 indicates job step setup processing

Table 23. CBRUXVNL Input During Job Step Setup—Existing TCDB Volume Record (continued)

Parameter	Meaning
UXNERROR	2 indicates volume is shelf-resident
UXNGROUP	Storage group name
UXNUSEA	Volume use attribute
UXNWPROT	Write protection status
UXNCHKPT	Checkpoint volume indicator
UXNLOC	Volume location code
UXNSHLOC	Shelf location
UXNOWNER	Volume owner information
UXNCREAT	Volume record creation date
UXNENTEJ	Last entry or ejection date
UXNMOUNT	Last mounted date
UXNWRITE	Last written date
UXNEXPIR	Volume expiration date
UXNTDSI	Tape device selection information

Table 24 lists the job information fields and possible content when invoked for job step setup. Job information is only passed to the exit during the job step setup CBRUXVNL invocation as this is the critical time for the exit to determine if the volume should be entered into a library. At device allocation and library mount processing, it has already been determined that the volume should reside in a tape library; therefore, job information is not passed to the CBRUXVNL installation exit for these invocations.

Table 24. CBRUXVNL Input During Job Step Setup—Job Information Fields

Parameter	Meaning
UXNJINFO	If on, indicates job information is provided on the job step setup invocation. Indicator is off for device allocation and library mount processing. If off, job information fields contain zeros.
UXNJOBNM	Job Name - contains zeros if not available
UXNSTPNM	Step Name - contains zeros if not available
UXNPRGNM	Program Name - contains zeros if not available
UXNDDNM	DD Name - contains zeros if not available. May contain blanks if not the first data set in a concatenated data set DD statement
UXNDSN	Data Set Name - contains zeros if not available
UXNUNIT	Unit Name - contains zeros if not available
UXNDISP	Disposition fields (UXNDISP1, UXNDISP2, UXNDISP3) - contain standard JCL disposition parameters (status, normal, abnormal). May contain zeros if not available or, in some cases, may contain default disposition settings

Table 24. CBRUXVNL Input During Job Step Setup—Job Information Fields (continued)

Parameter	Meaning
UXNCATLG and UXNDEVTP	If the UXNCATLG is on, UXNDEVTP contains the 4-byte device type from the catalog. For old allocations, if a volser was not specified and the dataset is cataloged, then the UXNCATLG indicator is set on and the UXNDEVTP field contains the 4-byte device type from the catalog. Otherwise, the UXNCATLG indicator is off and the UXNDEVTP field contains zeros. When unit information is available (UNIT=), the UXNUNIT field contains the passed value; otherwise, the UXNUNIT field contains zeros.

Device Allocation

If a tape volume is inadvertently ejected from a tape library between job step setup processing and device allocation, the exit is invoked during device allocation to let the installation reenter the volume. This invocation occurs for the first or only volume of the request when there is no TCDB record or the volume is shelf-resident. The requested volume should be entered into the tape library in which it was resident during job step setup.

Note: Although there are circumstances in which the job may run successfully if the volume is entered into any tape library, it is recommended that the volume be entered into the library in which it was resident during job step setup.

Table 25 lists the contents of the exit input when a volume record does not exist in the TCDB.

Table 25. CBRUXVNL Input During Device Allocation—No TCDB Volume Record

Parameter	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	2 indicates device allocation processing
UXNERROR	1 indicates no TCDB record

Table 26 lists the contents of the exit input when a shelf-resident tape volume record exists in the TCDB.

Table 26. CBRUXVNL Input During Device Allocation—Existing TCDB Volume Record

Parameter	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	2 indicates device allocation processing
UXNERROR	2 indicates volume is shelf-resident
UXNGROUP	Storage group name
UXNUSEA	Volume use attribute
UXNWPROT	Write protection status
UXNCHKPT	Checkpoint volume indicator
UXNLOC	Volume location code
UXNSHLOC	Shelf location

Table 26. CBRUXVNL Input During Device Allocation—Existing TCDB Volume Record (continued)

Parameter	Meaning
UXNOWNER	Volume owner information
UXNCREAT	Volume record creation date
UXNENTEJ	Last entry or ejection date
UXNMOUNT	Last mounted date
UXNWRITE	Last written date
UXNEXPIR	Volume expiration date
UXNTDSI	Tape device selection information

Library mount processing

If a tape volume is inadvertently ejected from a tape library between device allocation and library mount processing, the exit is invoked during library mount processing to let the installation reenter the volume. This exit is only invoked when the tape library fails a mount request because the tape volume is being ejected or cannot be found in the tape library. To prevent the CBR3646D message from being issued, the requested volume must be reentered into the tape library in which it was resident when the tape drive was allocated.

Table 27 lists the contents of the exit input when the volume record does not exist in the TCDB.

Table 27. CBRUXVNL Input Library Mount Processing—No TCDB Volume Record

Parameter	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	3 indicates library mount processing
UXNERROR	1 indicates no volume record in the TCDB
UXNLIB	Library name to which the volume must be re-entered (target)
UXNLDEV	Library device type of the target library
UXNLCON	Library console name of the target library
UXNLTYP	Library logical type of the target library
UXNLDESC	Library description of the target library

Table 28 lists the contents of the exit input when the volume record still exists in the TCDB.

Table 28. CBRUXVNL Input Library Mount Processing—Existing TCDB Volume Record

Parameter	Meaning
UXNVOLSR	Volume serial number
UXNWHERE	3 indicates library mount processing
UXNERROR	4 indicates volume is being ejected 3 indicates volume is in a different library 2 indicates volume is shelf-resident
UXNLIB	Library in which the volume must be re-entered (target)
UXNLDEV	Library device type of the target library

Table 28. CBRUXVNL Input Library Mount Processing—Existing TCDB Volume Record (continued)

Parameter	Meaning
UXNLCON	Library console name of the target library
UXNLTYP	Library logical type of the target library
UXNLDESC	Library description of the target library
UXNLIBRS	Library in which the volume currently resides (might not be the same library as the target resident library)
UXNGROUP	Storage group name
UXNUSEA	Volume use attribute
UXNWPROT	Write protection status
UXNCHKPT	Checkpoint volume indicator
UXNLOC	Volume location code
UXNSHLOC	Shelf location
UXNOWNER	Volume owner information
UXNCREAT	Volume record creation date
UXNENTEJ	Last entry or ejection date
UXNMOUNT	Last mounted date
UXNWRITE	Last written date
UXNEXPIR	Volume expiration date
UXNTDSI	Tape device selection information

Volume not in library installation exit parameter list (CBRUXNPL)

The volume not in library installation exit (CBRUXVNL) is passed by way of register 1, the pointer to a parameter list mapped by CBRUXNPL.

The installation exit, CBRUXVNL, cannot update the tape volume record. All fields in the volume not in library installation exit parameter list (CBRUXNPL) are input only. Figure 22 on page 252 provides the format of CBRUXNPL.

```
UXNPL    DSECT ,            VOLUME NOT IN LIBRARY PARAMETER LIST
*********************************************************************
*                                                                   *
* VOLUME NOT IN LIBRARY PARAMETERS: ALL FIELDS ARE INPUT ONLY AND   *
*                                   CAN NOT BE MODIFIED BY          *
*                                   INSTALLATION EXIT               *
*                                                                   *
*********************************************************************
UXNPARM  DS    0D           CBRUXVNL PARAMETER SECTION
UXNWHERE DS    XL1          WHERE THE ERROR WAS FOUND
*                             1  JOB STEP SETUP PROCESSING
*                             2  DEVICE ALLOCATION PROCESSING
*                             3  LIBRARY MOUNT PROCESSING
UXNERROR DS    XL1          ERROR INDICATOR
*                             1  VOLUME RECORD NOT IN TCDB
*                             2  VOLUME IS SHELF RESIDENT
*                             3  VOLUME IN DIFFERENT LIBRARY
*                             4  VOLUME EJECT PENDING AND
*                                EJECT CANNOT BE CANCELED
         DS    CL6          RESERVED
UXNLIB   DS    CL8          LIBRARY NAME IN WHICH THE VOLUME SHOULD
*                             BE ENTERED OR BLANKS
UXNLDEV  DS    CL8          LIBRARY DEVICE TYPE OR BLANKS
UXNLCON  DS    CL8          LIBRARY CONSOLE NAME OR BLANKS
UXNLTYP  DS    CL1          LIBRARY LOGICAL TYPE OR BLANK
*                             'R' FOR AUTOMATED LIBRARY
*                             'M' FOR MANUAL LIBRARY
         DS    CL7          RESERVED
UXNLDESC DS    CL120        LIBRARY DESCRIPTION OR BLANKS
UXNVOLSR DS    CL6          VOLUME SERIAL NUMBER
UXNSUPPT DS    XL1          SUPPORT FLAGS
UXNJINFO EQU   X'80'          ON IF JOB INFORMATION PROVIDED
*                              (JOB STEP SETUP INVOCATION)
*                            FLAG X'40' IS RESERVED
         DS    CL1          RESERVED
UXNLIBRS DS    CL8          LIBRARY NAME IN WHICH THE VOLUME
*                             RESIDES OR "SHELF" OR BLANKS
UXNUSEA  DS    CL1          VOLUME USE ATTRIBUTE OR BLANKS
*                             'P' FOR PRIVATE
*                             'S' FOR SCRATCH
UXNWPROT DS    CL1          WRITE PROTECTION STATUS OR BLANK
*                             'Y' FOR WRITE-PROTECTED
*                             'N' FOR NOT WRITE-PROTECTED
UXNCHKPT DS    CL1          CHECKPOINT VOLUME INDICATOR OR BLANK
*                             'Y' FOR CHECKPOINT VOLUME
*                             'N' FOR NOT CHECKPOINT VOLUME
UXNLOC   DS    CL1          VOLUME LOCATION OR BLANK
*                             'L' FOR LIBRARY-RESIDENT
*                             'S' FOR SHELF-RESIDENT
```

Figure 22. Volume Not in Library Installation Exit Parameter List—CBRUXNPL (Part 1 of 5)

```
UXNTDSI  DS    0F           TAPE DEVICE SELECTION INFORMATION
UXNREC   DS    XL1          TAPE RECORDING TECHNOLOGY OR ZERO
UXNMEDIA DS    XL1          MEDIA TYPE OR ZERO
UXNCOMP  DS    XL1          COMPACTION OR ZERO
UXNSPEC  DS    XL1          SPECIAL ATTRIBUTE OR ZERO
UXNGROUP DS    CL8          STORAGE GROUP NAME OR BLANKS
UXNSHLOC DS    CL32         SHELF LOCATION OR BLANKS
UXNOWNER DS    CL64         VOLUME OWNER INFORMATION  OR BLANKS
         DS    CL8          RESERVED
UXNCREAT DS    CL10         VOLUME RECORD CREATION DATE YYYY-MM-DD
*                             OR BLANKS
UXNENTEJ DS    CL10         LAST ENTRY OR EJECTION DATE YYYY-MM-DD
*                             OR BLANKS
UXNMOUNT DS    CL10         LAST MOUNTED DATE           YYYY-MM-DD
*                             OR BLANKS
UXNWRITE DS    CL10         LAST WRITTEN DATE           YYYY-MM-DD
*                             OR BLANKS
UXNEXPIR DS    CL10         VOLUME EXPIRATION DATE      YYYY-MM-DD
*                             OR BLANKS
         DS    CL10         RESERVED
         DS    CL4          RESERVED
*********************************************************************
*                                                                   *
*     JOB INFORMATION AVAILABLE WHEN INVOKED FOR                    *
*     JOB STEP SETUP PROCESSING (UXNWHERE=UXNSETUP)                 *
*                                                                   *
*********************************************************************
*                                                                   *
*     JOB INFORMATION FIELDS ARE INPUT ONLY FIELDS                  *
*                                                                   *
*********************************************************************
UXNJOB   DS    0CL120       JOB INFORMATION
UXNJOBNM DS    CL8          JOB NAME
UXNSTPNM DS    CL8          STEP NAME
UXNPRGNM DS    CL8          PROGRAM NAME
UXNDDNM  DS    CL8          DD NAME
UXNDSN   DS    CL44         DATASET NAME
UXNUNIT  DS    CL8          UNIT NAME
*********************************************************************
* UXNDISP FIELDS CONTAIN STANDARD JCL DISPOSITION PARAMETERS        *
*   (DISPOSITION SUBPARAMETERS WILL REFLECT THE JOB                 *
*    SPECIFICATIONS, ZEROES, IF NOT SPECIFIED, OR IN SOME CASES,    *
*    DEFAULT SETTINGS RATHER THAN ZEROES)                           *
*********************************************************************
UXNDISP  DS    0CL17        DISPOSITION (DISP=...)
UXNDISP1 DS    CL3            1ST SUBPARAMETER, STATUS
UXNDISP2 DS    CL7            2ND SUBPARAMETER, NORMAL
UXNDISP3 DS    CL7            3RD SUBPARAMETER, ABNORMAL
*
UXNFLAGS DS    XL1          JOB INFORMATION FLAGS
UXNCATLG EQU   X'80'          ON IF VOLSER OBTAINED FROM CATALOG
         DS    CL2          RESERVED
UXNDEVTP DS    CL4          DEVICE TYPE FROM CATALOG
*                             (PROVIDED IF UXNCATLG IS ON)
         DS    CL12         RESERVED
UXNEND   DS    0D           END OF CBRUXVNL PARAMETER SECTION
         SPACE 1
UXNPLLEN EQU   * - UXNPL    LENGTH OF THE PARAMETER LIST
```

Figure 22. Volume Not in Library Installation Exit Parameter List—CBRUXNPL (Part 2 of 5)

```
*********************************************************************
*                                                                   *
*        RETURN CODES                                               *
*                                                                   *
*********************************************************************
UXNNORML EQU   0           PERFORM NORMAL PROCESSING
UXNRETRY EQU   4           RETRY THE FAILING OPERATION
UXNFAIL  EQU   8           CANCEL THE JOB STEP
UXNDONT  EQU   16          DO NOT CALL THE VOLUME NOT IN LIBRARY
*                            INSTALLATION EXIT AGAIN AND PERFORM
*                            NORMAL PROCESSING
         SPACE 1
*********************************************************************
*                                                                   *
*        WHERE CONSTANTS (UXNWHERE)                                 *
*                                                                   *
*********************************************************************
UXNSETUP EQU   1           DURING JOB SETUP PROCESSING
UXNALLOC EQU   2           DURING DEVICE ALLOCATION PROCESSING
UXNLBMNT EQU   3           DURING LIBRARY MOUNT PROCESSING
         SPACE 1
*********************************************************************
*                                                                   *
*        ERROR CONSTANTS (UXNERROR)                                 *
*                                                                   *
*********************************************************************
UXNNTCDB EQU   1           VOLUME RECORD NOT IN TCDB
UXNSHELF EQU   2           VOLUME IS SHELF RESIDENT
UXNDFRNT EQU   3           VOLUME IN DIFFERENT LIBRARY
UXNEJECT EQU   4           VOLUME EJECT PENDING AND
*                            EJECT CANNOT BE CANCELED
         SPACE 1
*********************************************************************
*                                                                   *
*        LIBRARY LOGICAL TYPE CONSTANTS (UXNLTYP)                   *
*                                                                   *
*********************************************************************
UXNAUTO  EQU   C'R'         AUTOMATED/REAL LIBRARY
UXNMAN   EQU   C'M'         MANUAL LIBRARY
         SPACE 1
*********************************************************************
*                                                                   *
*        USE ATTRIBUTE CONSTANTS (UXNUSEA)                          *
*                                                                   *
*********************************************************************
UXNPRIV  EQU   C'P'         PRIVATE USE ATTRIBUTE
UXNSCRT  EQU   C'S'         SCRATCH USE ATTRIBUTE
         SPACE 1
*********************************************************************
*                                                                   *
*        LOCATION CONSTANTS (UXNLOC)                                *
*                                                                   *
*********************************************************************
UXNLBRY  EQU   C'L'         LIBRARY RESIDENT
UXNSHLF  EQU   C'S'         SHELF RESIDENT
         SPACE 1
*********************************************************************
*                                                                   *
*        TAPE DEVICE SELECTION INFORMATION (TDSI) CONSTANTS         *
*                                                                   *
```

Figure 22. Volume Not in Library Installation Exit Parameter List—CBRUXNPL (Part 3 of 5)

```
*********************************************************************
*        CONSTANTS TO DEFINE TAPE RECORDING TECHNOLOGY              *
*********************************************************************
UXNNOREC EQU    0           RECORDING TECHNOLOGY UNKNOWN OR
*                             UNSPECIFIED
UXN18TRK EQU    1           READ/WRITE ON AN 18 TRACK DEVICE
UXN36TRK EQU    2           READ/WRITE ON A 36 TRACK DEVICE
UXN128TRK EQU   3           READ/WRITE ON A 128 TRACK DEVICE
UXN256TRK EQU   4           READ/WRITE ON A 256 TRACK DEVICE
UXN384TRK EQU   5           READ/WRITE ON A 384 TRACK DEVICE
UXNEFMT1  EQU   6           READ/WRITE ON ENTERPRISE FORMAT 1
*                             (EFMT1) DEVICE
UXNEFMT2  EQU   7           READ/WRITE ON ENTERPRISE FORMAT 2
*                             (EFMT2) DEVICE
UXNEEFMT2 EQU   8           READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*                             (EEFMT2) DEVICE
UXNEFMT3  EQU   9           READ/WRITE ON ENTERPRISE
*                             FORMAT 3 (EFMT3) DEVICE
UXNEEFMT3 EQU   10          READ/WRITE ON ENTERPRISE
*                             ENCRYPTED FORMAT 3 (EEFMT3) DEVICE
UXNEFMT4  EQU   11          READ/WRITE ON ENTERPRISE FORMAT 4
*                             (EFMT4) DEVICE
UXNEEFMT4 EQU   12          READ/WRITE ON ENTERPRISE ENCRYPTED
*                             FORMAT 4 (EEFMT4) DEVICE

*********************************************************************
*        CONSTANTS TO DEFINE MEDIA TYPE                             *
*********************************************************************
UXNNOMED EQU    0           MEDIA TYPE UNKNOWN OR UNSPECIFIED
UXNMED1  EQU    1           MEDIA1 - CARTRIDGE SYSTEM TAPE
UXNMED2  EQU    2           MEDIA2 - ENHANCED CAPACITY CARTRIDGE
*                             SYSTEM TAPE
UXNMED3  EQU    3           MEDIA3 - HIGH PERFORMANCE CARTRIDGE
*                             TAPE
UXNMED4  EQU    4           MEDIA4 - EXTENDED HIGH PERFORMANCE
*                             CARTRIDGE TAPE
UXNMED5  EQU    5           MEDIA5 - ENTERPRISE TAPE CARTRIDGE
UXNMED6  EQU    6           MEDIA6 - ENTERPRISE WORM TAPE
*                             CARTRIDGE
UXNMED7  EQU    7           MEDIA7 - ENTERPRISE ECONOMY TAPE
*                             CARTRIDGE
UXNMED8  EQU    8           MEDIA8 - ENTERPRISE ECONOMY WORM TAPE
*                             CARTRIDGE
UXNMED9  EQU    9           MEDIA9 - ENTERPRISE EXTENDED TAPE
*                             CARTRIDGE
UXNMED10 EQU    10          MEDIA10 - ENTERPRISE EXTENDED WORM TAPE
*                             CARTRIDGE
UXNMED11 EQU    11          MEDIA11 - ENTERPRISE ADVANCED
*                             TAPE CARTRIDGE
UXNMED12 EQU    12          MEDIA12 - ENTERPRISE ADVANCED
*                             WORM TAPE CARTRIDGE
UXNMED13 EQU    13          MEDIA13 - ENTERPRISE ADVANCED
*                             ECONOMY TAPE CARTRIDGE
*********************************************************************
*        CONSTANTS TO DEFINE COMPACTION                             *
* (THE MEANING OF THE COMPACTION FIELD HAS CHANGED FROM TYPE OF     *
*  COMPACTION TO COMPACTION YES/NO - UXNIDRC AND UXNCOMPT CAN BE    *
*  USED INTERCHANGEABLY)                                            *
*********************************************************************
UXNCMPNS EQU    0           COMPACTION UNKNOWN OR NOT SET
UXNNOCMP EQU    1           NO COMPACTION
UXNIDRC  EQU    2           COMPACTION
UXNCOMPT EQU    2           COMPACTION
```

Figure 22. Volume Not in Library Installation Exit Parameter List—CBRUXNPL (Part 4 of 5)

```
*********************************************************************
*        CONSTANTS TO DEFINE SPECIAL ATTRIBUTE                      *
*********************************************************************
UXNNOSPC EQU   0            VOLUME HAS NO SPECIAL ATTRIBUTE
UXNRDCOM EQU   1            VOLUME WILL BE MOUNTED FOR READ ONLY -
*                             ALL READ-COMPATIBLE DEVICES MAY BE
*                             SELECTED
         SPACE 1
*********************************************************************
*                                                                   *
*         MISCELLANEOUS CONSTANTS                                   *
*                                                                   *
*********************************************************************
UXNPLSP  EQU   230          SUBPOOL NUMBER
UXNYES   EQU   C'Y'         YES
UXNNO    EQU   C'N'         NO
UXNBLANK EQU   C' '         BLANK
```

Figure 22. Volume Not in Library Installation Exit Parameter List—CBRUXNPL (Part 5 of 5)

Storage is obtained below the line, from subpool 230, user key, for the installation exit parameter list.

Volume not in library installation exit return codes for job step processing

The following return codes can be passed back to OAM from CBRUXVNL for job step setup processing:

Code **Meaning**

0 Perform normal processing.

The system allocates a stand-alone tape drive capable of handling the requested volume. If the required device type is not installed, the job or dynamic allocation fails.

4 Retry the failing operation.

Locate the requested tape volume, using the tape management system inventory or other sources, and enter it into any tape library connected to the system on which the requesting job is running.

The system rereads the tape volume record for the specified tape volume. If the tape volume record exists in the TCDB and the record indicates that the volume is library-resident, the system proceeds with normal library-resident tape volume processing. If the tape volume record exists but indicates that the tape volume is still shelf-resident, the CBR3646D message is issued to allow the operator to retry or cancel the job request.

Note: CBRUXVNL is mostly used for old data sets, but new data sets can specify a specific volume serial number. When this occurs and the volume is entered into a tape library at the direction of CBRUXVNL, the library name is subsequently made available to the ACS routines. The ACS routines must assign a storage class and a tape storage group to the request; otherwise, the request fails.

8 Cancel.

The job step or dynamic allocation is canceled.

16 Do not call the exit again.

CBRUXVNL is not invoked again until reactivated. The system allocates a stand-alone tape drive. If there is no stand-alone tape drive capable of handling the tape volume request, the job or dynamic allocation fails.

Volume Not in Library Installation Exit Return Codes for Device Allocation

The following return codes can be passed back to OAM from CBRUXVNL for device allocation processing:

Code	Meaning
0	Perform normal processing. The job step or dynamic allocation fails.
4	Retry the failing operation. Locate the requested tape volume, using the tape management system inventory or other sources, and enter it into the specific tape library in which it was previously resident when the job step was set up. The system rereads the tape volume record for the specified tape volume. If the tape volume record exists in the TCDB and the record indicates that the volume is library-resident, the system proceeds with normal library-resident tape volume processing. If the tape volume record does not exist or the tape volume record exists but indicates that the tape volume is still shelf-resident, the CBR3646D message is issued allowing the operator to retry or cancel the job request.
8	Cancel. The system cancels the job step or dynamic allocation.
16	Do not call the exit again. The job step or dynamic allocation fails. The installation exit is not called again until it is reactivated.

Volume not in library installation exit return codes for library mount processing

The following return codes can be passed back to OAM from CBRUXVNL for library mount processing:

Code	Meaning
0	Perform normal processing. The job step or dynamic allocation is failed.
4	Retry the failing operation. Locate the requested volume, using the tape management system inventory or other sources, and reenter the volume into the tape library identified by the UXNLIB field of the installation exit parameter list. If the tape volume record still indicates that the tape volume is shelf-resident or the volume was entered into the wrong library, the CBR3646D message is issued. This message indicates which library the CBRUXVNL volume should be entered into and prompts the operator to retry or cancel the job request.
8	Cancel the job step.

The job step or dynamic allocation fails.

16 Do not call the exit again.

The job step or dynamic allocation fails. The exit is not called again.

If the installation returns a return code 16, indicating that the exit not be invoked again, or the installation exit is deactivated as the result of an abnormal termination or an invalid return code, the exit can be reactivated by stopping and restarting the OAM address space, or by issuing the LIBRARY RESET,CBRUXVNL command.

Volume Not in Library Installation Exit (CBRUXVNL) Usage Requirements

The volume not in library installation exit must reside in load module CBRUXVNL. It is invoked by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation.

Since the volume not in library installation exit (CBRUXVNL) receives control through an MVS LINK macro, the addressing mode on entry to the exit may be either 24-bit or 31-bit addressing mode. Also, the installation exit can be executed above or below the 16-megabyte line. The addressing mode and the residency mode are determined by whatever AMODE (for addressing mode) or RMODE (for residency mode) characteristics are assigned to the load module when it is created by the MVS Linkage Editor and Loader or the MVS Program Binder.

Because the exit may be invoked in a key other than the job key:

- All storage dynamically acquired by the exit must be obtained from subpool 227, 228, 229, 230, 231, or 241.
- The exit must be written as a reentrant program and the resulting load module must be link-edited on the system as REENTRANT.

The following characteristics describe the execution environment in which the volume not in library installation exit is invoked:

- Task mode (not SRB mode)
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The 24-bit or 31-bit addressing mode depending on AMODE characteristics assigned when load module was created
- APF-authorized load module or in an APF-authorized library
- Primary ASC mode (not AR mode)
- Enabled for I/O external interrupts
- PSW key of the caller might not match the job key
- State of the caller

Note: Because of the environment in which this exit can be given control, invoking dynamic allocation from within this exit is not supported and can lead to an abend.

Mapping macro CBRUXNPL must be included by the installation exit.

Appendix A. SAMPLIB Members

This appendix contains sample library members that you can modify to suit your own business requirements.

Sample Library Members

This appendix contains information on sample library members for the following:

- CBRSPLCS, which is an example program that invokes the CBRXLCS programming interface.
- CBRUXCUA, CBRUXENT, CBRUXEJC, and CBRUXVNL installation exits. For more information on the specific installation exit that is illustrated in each of these SAMPLIB members, see Chapter 7, "Installation Exits," on page 213.
- CBRAPROC that is used to create member OAM in SYS1.PROCLIB.
- CBRSPSIM, CBRSPPIM, CBRSPPIP, CBRSPSXP, and CBRSPPXP, which are JCL samples that can be used for creating import or export list volumes.

The installation exits, as supplied by DFSMSrmm, are linked in SMP/E as reentrant. Installation exits CBRUXCUA and CBRUXVNL must be coded and link-edited on the system as reentrant. If multiple tape libraries are defined to the system, CBRUXENT and CBRUXEJC must also be coded and link-edited on the system as reentrant. To demonstrate this, and to provide multiple library support, the sample jobs for CBRUXCUA, CBRUXVNL, CBRUXENT, and CBRUXEJC are all coded as reentrant. The linkage editor parameters found in the prolog are used for each sample job. If you choose to code the installation exits as nonreentrant, you need to create the JCL to link-edit the exits as nonreentrant.

Note: These SAMPLIB members are available to you as part of z/OS. Refer to them as examples for exits you may write to suit your own storage administration plan objectives.

Additionally, there are five sample JCL examples that are provided to illustrate the format and required files for both the import and export list volume. The JCL is commented with the expected format of each of the required files followed by some sample data, if applicable. The following JCL samples are shipped in SYS1.SAMPLIB:

- CBRSPSIM for import list volume (scratch request). See "SAMPLIB member CBRSPSIM" on page 311
- CBRSPPIM for import list volume (private request). See "SAMPLIB member CBRSPPIM" on page 314
- CBRSPPIP for import list volume (private request). Illustrates IMPORT LIST 02 format for outboard policy management specifications. See "SAMPLIB member CBRSPPIP" on page 317.
- CBRSPSXP for export list volume (scratch request). See "SAMPLIB member CBRSPSXP" on page 321
- CBRSPPXP for export list volume (private request). See "SAMPLIB Member CBRSPPXP" on page 324

Both scratch and private examples are provided; however, in order to allocate a scratch volume in a target library in an installation with multiple libraries, the ACS

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routines need to direct the device allocation for the scratch mount to a specific library. To accomplish this, use an exclusive storage group for each library. This ensures that based on the storage group selected by the ACS routines, the target library for the export or import operation will be the library selected for the scratch mount request. This is necessary since the import or export list volume must reside in the same library as the logical volumes intended for import or export processing.

To initiate the import or export operation from within the JCL, the specific volser examples invoke the CBRXLCS FUNC=EXPORT or FUNC=IMPORT functions using the CBRSPLCS sample program.

SAMPLIB member CBRSPLCS

This SAMPLIB member is an example of a program that uses the CBRXLCS macro interface.

```
SPLCS    TITLE 'CBRSPLCS - SAMPLE INSTALLATION MANAGEMENT PACKAGE'
CBRSPLCS START 0                   SAMPLE INSTALLATION MGMT PACKAGE
         SPACE 2
**** START OF SPECIFICATIONS ****************************************
*                                                                   *
*    MODULE NAME:       CBRSPLCS                                    *
*                                                                   *
*    DESCRIPTIVE NAME:  SAMPLE INSTALLATION MANAGEMENT PACKAGE FOR  *
*                       AUTOMATED TAPE LIBRARIES                    *
*                                                                   *
*    FUNCTION:                                                      *
*      MODULE CBRSPLCS IS PART OF THE SAMPLE INSTALLATION           *
*      MANAGEMENT PACKAGE FOR AUTOMATED TAPE LIBRARIES.  IT HANDLES *
*      REQUESTS ENTERED VIA AN INPUT TRANSACTION DATASET:           *
*        1. EJECT A VOLUME FROM A LIBRARY                           *
*        2. CHANGE A VOLUME USE ATTRIBUTE TO SCRATCH                *
*        3. CHANGE A VOLUME USE ATTRIBUTE TO PRIVATE                *
*        4. INITIATE AN IMPORT OPERATION                            *
*        5. INITIATE AN EXPORT OPERATION                            *
*        6. PERFORM CARTRIDGE ENTRY INTO AN MTL (MCE)               *
*                                                                   *
*      CBRSPLCS DEMONSTRATES THE USE OF THE FOLLOWING FUNCTIONS:    *
*        1. THE "QUERY VOLUME RESIDENCE" FUNCTION OF CBRXLCS, USED  *
*           TO DETERMINE WHETHER A VOLUME RESIDES IN A LIBRARY.     *
*        2. THE "CHANGE USE ATTRIBUTE" FUNCTION OF CBRXLCS, USED    *
*           TO CHANGE THE USE ATTRIBUTE OF A VOLUME TO SCRATCH OR   *
*           TO PRIVATE.                                             *
*        3. THE "EJECT" FUNCTION OF CBRXLCS, USED TO EJECT A VOLUME *
*           FROM A LIBRARY, USING EITHER THE CONVENIENCE OUTPUT     *
*           STATION OR THE HIGH CAPACITY OUTPUT STATION.            *
*        4. THE ABILITY TO PASS 16 CHARACTERS OF INFORMATION TO     *
*           THE CHANGE USE ATTRIBUTE INSTALLATION EXIT AND TO THE   *
*           CARTRIDGE EJECT INSTALLATION EXIT.  THE CHARACTER STRING*
*           PASSED HERE CONTAINS AN AUTHORIZATION CODE, SO THAT THE *
*           EXIT CAN DETERMINE THE SOURCE OF THE REQUEST.           *
*        5. THE "IMPORT" FUNCTION OF CBRXLCS INITIATES AN IMPORT    *
*           OPERATION FOR A VOLUME OR VOLUMES INTO A LIBRARY OR     *
*           TO CANCEL AN IMPORT OPERATION THAT'S ALREADY IN         *
*           PROCESS.                                                *
*        6. THE "EXPORT" FUNCTION OF CBRXLCS INITIATES AN EXPORT    *
*           OPERATION FOR A VOLUME OR VOLUMES FROM A LIBRARY OR     *
*           TO CANCEL AN EXPORT OPERATION THAT'S ALREADY IN         *
*           PROCESS.                                                *
*        7. THE "MCE" FUNCTION ILLUSTRATES ENTERING A VOLUME        *
*           INTO AN MTL (MANUAL TAPE LIBRARY).                      *
*                                                                   *
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 1 of 14)

```
*                                                                     *
*    NOTES:                                                           *
*                                                                     *
*      CHARACTER CODE:        EBCDIC                                  *
*                                                                     *
*      RESTRICTIONS:          NONE                                    *
*                                                                     *
*      REGISTER CONVENTIONS:                                          *
*        R0  - STANDARD LINKAGE REGISTER                              *
*            - REASON CODE REGISTER                                   *
*            - WORK REGISTER                                          *
*        R1  - STANDARD LINKAGE REGISTER                              *
*            - WORK REGISTER                                          *
*        R2  - NOT USED                                               *
*        R3  - NOT USED                                               *
*        R4  - NOT USED                                               *
*        R5  - NOT USED                                               *
*        R6  - NOT USED                                               *
*        R7  - NOT USED                                               *
*        R8  - NOT USED                                               *
*        R9  - LINKAGE REGISTER TO INTERNAL SUBROUTINES               *
*        R10 - NOT USED                                               *
*        R11 - NOT USED                                               *
*        R12 - CBRSPLCS BASE REGISTER                                 *
*        R13 - STANDARD LINKAGE REGISTER                              *
*            - SAVE AREA ADDRESS                                      *
*        R14 - STANDARD LINKAGE REGISTER                              *
*            - RETURN POINT ADDRESS                                   *
*            - WORK REGISTER                                          *
*        R15 - STANDARD LINKAGE REGISTER                              *
*            - ENTRY POINT ADDRESS                                    *
*            - RETURN CODE REGISTER                                   *
*            - WORK REGISTER                                          *
*                                                                     *
*    MODULE TYPE:           CONTROL SECTION                          *
*                                                                     *
*      PROCESSOR:           ASSEMBLER H                              *
*                                                                     *
*      ATTRIBUTES:                                                    *
*                                                                     *
*        LOCATION:          JOB PACK AREA                            *
*        STATE:             PROBLEM                                  *
*        AMODE:             24                                       *
*        RMODE:             24                                       *
*        KEY:               8                                        *
*        MODE:              TASK                                     *
*        SERIALIZATION:     UNLOCKED                                 *
*        TYPE:              SERIALLY REUSABLE                        *
*        AUTHORIZATION:     APF AUTHORIZED                           *
*                                                                     *
*      LINKAGE:             STANDARD LINKAGE CONVENTIONS             *
*                                                                     *
*      CALLING SEQUENCE:                                              *
*        CBRSPLCS IS INVOKED DIRECTLY FROM A JCL EXEC STATEMENT.      *
*                                                                     *
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 2 of 14)

```
*      INPUT:                                                       *
*        INPUT TRANSACTIONS ARE CONTAINED IN DATASET INDD.  EACH    *
*        TRANSACTION CONTAINS THE FOLLOWING INFORMATION:            *
*          1. A TRANSACTION CODE, WHICH INDICATES THE REQUESTED     *
*             FUNCTION:  EJECT, CHANGE THE USE ATTRIBUTE TO SCRATCH,*
*             CHANGE THE USE ATTRIBUTE TO PRIVATE, IMPORT,          *
*             EXPORT, OR MCE                                        *
*          2. A TRANSACTION MODIFIER, WHICH INDICATES WHETHER TO    *
*             VERIFY THAT THE VOLUME RESIDES IN A LIBRARY BEFORE    *
*             ATTEMPTING THE FUNCTION IN THE TRANSACTION CODE.  NOTE*
*             THAT CUA MAY BE PERFORMED ON A SHELF-RESIDENT VOLUME, *
*             PROVIDED THAT THERE IS A TAPE VOLUME RECORD IN THE    *
*             TAPE CONFIGURATION DATA BASE, AND THEREFORE THAT THE  *
*             MODIFIER MAY BE USED TO PREVENT THIS.  THE TRANSACTION*
*             MODIFIER IS IGNORED FOR MCE PROCESSING.               *
*          3. THE VOLUME SERIAL NUMBER.                             *
*          4. FOR A REQUEST TO CHANGE THE USE ATTRIBUTE TO PRIVATE, *
*             THE STORAGE GROUP NAME.  THIS MAY BE SUPPLIED AS      *
*             BLANKS.  THE CUA INSTALLATION EXIT MAY THEN SUPPLY A  *
*             NON-BLANK VALUE OR LEAVE THE BLANK STORAGE GROUP NAME *
*             UNCHANGED.                                            *
*          5. FOR AN EJECT REQUEST, A CODE TO SELECT EITHER THE     *
*             CONVENIENCE OUTPUT STATION OR THE HIGH CAPACITY OUTPUT*
*             STATION.                                              *
*          6. FOR AN IMPORT REQUEST, A CODE TO INITIATE A CANCEL    *
*             TO TERMINATE THE IMPORT FUNCTION.                     *
*          7. FOR AN EXPORT REQUEST, A CODE TO INITIATE A CANCEL    *
*             TO TERMINATE THE EXPORT FUNCTION.                     *
*          8. FOR A MANUAL CARTRIDGE ENTRY REQUEST:                 *
*             A. THE REQUIRED EIGHT CHARACTER LIBRARY NAME INTO     *
*                WHICH THE VOLUME IS TO BE ENTERED, LEFT-JUSTIFIED  *
*                IN THE FIELD AND PADDED ON THE RIGHT WITH          *
*                BLANKS.                                            *
*             B. A REQUIRED ONE CHARACTER SEPARATOR (BLANK)         *
*             C. AN OPTIONAL 1 CHARACTER MEDIA TYPE, SPECIFIED AS   *
*                1 - F.                                             *
*                                                                   *
*      OUTPUT:                                                      *
*        A MESSAGE DESCRIBING THE RESULTS OF PROCESSING IS BUILT    *
*        FOLLOWING THE INPUT TRANSACTION.  THE COMBINED TRANSACTION *
*        AND MESSAGE ARE THEN WRITTEN TO DATASET OUTDD AND TO THE   *
*        TAPE POOL AND TAPE LIBRARY CONSOLE DESTINATIONS.           *
*                                                                   *
*      EXIT NORMAL:                                                 *
*        RETURN TO THE CALLER WITH RETURN CODE ZERO.                *
*                                                                   *
*      EXIT ERROR:  NONE                                            *
*                                                                   *
*    EXTERNAL REFERENCES:                                           *
*                                                                   *
*      ROUTINES:  NONE                                              *
*                                                                   *
*      CONTROL BLOCKS:  NONE                                        *
*                                                                   *
*    EXECUTABLE MACROS:                                             *
*      CBRXLCS                                                      *
*      CLOSE                                                        *
*      GET                                                          *
*      OPEN                                                         *
*      PUT                                                          *
*      RETURN                                                       *
*      SAVE                                                         *
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 3 of 14)

```
*      WTO                                                            *
*                                                                     *
*    MESSAGES:  NONE                                                  *
*                                                                     *
*    ABEND CODES:  NONE                                               *
*                                                                     *
**** END OF SPECIFICATIONS *************************************************
         TITLE 'STANDARD REGISTER DEFINITIONS'
*---------------------------------------------------------------------*
*                                                                     *
*        STANDARD REGISTER DEFINITIONS                                *
*                                                                     *
*---------------------------------------------------------------------*
R0       EQU   0                   GENERAL REGISTER 0
R1       EQU   1                   GENERAL REGISTER 1
R2       EQU   2                   GENERAL REGISTER 2
R3       EQU   3                   GENERAL REGISTER 3
R4       EQU   4                   GENERAL REGISTER 4
R5       EQU   5                   GENERAL REGISTER 5
R6       EQU   6                   GENERAL REGISTER 6
R7       EQU   7                   GENERAL REGISTER 7
R8       EQU   8                   GENERAL REGISTER 8
R9       EQU   9                   GENERAL REGISTER 9
R10      EQU   10                  GENERAL REGISTER 10
R11      EQU   11                  GENERAL REGISTER 11
R12      EQU   12                  GENERAL REGISTER 12
R13      EQU   13                  GENERAL REGISTER 13
R14      EQU   14                  GENERAL REGISTER 14
R15      EQU   15                  GENERAL REGISTER 15
         TITLE 'CBRLCSPL - LCS EXTERNAL SERVICES PARAMETER LIST'
         CBRLCSPL  ,               LCS EXTERNAL SERVICES PARM LIST
         TITLE 'CBRSPLCS - SAMPLE INSTALLATION MANAGEMENT PACKAGE'
*---------------------------------------------------------------------*
*                                                                     *
*        CBRSPLCS ENTRY POINT                                         *
*                                                                     *
*---------------------------------------------------------------------*
CBRSPLCS CSECT ,                   SAMPLE INSTALLATION MGMT PACKAGE
CBRSPLCS AMODE 24
CBRSPLCS RMODE 24
         SAVE  (14,12),,           SAVE CALLER'S REGISTERS AND       +
               'CBRSPLCS&SYSDATE   MARK ENTRY POINT
         LR    R12,R15             COPY ENTRY POINT ADDRESS
         USING CBRSPLCS,R12        CBRSPLCS BASE REGISTER
         ST    R13,SAVE+4          BACKWARD CHAIN SAVE AREAS
         LA    R0,SAVE             CBRSPLCS SAVE AREA ADDRESS
         ST    R0,8(,R13)          FORWARD CHAIN SAVE AREAS
         LR    R13,R0              SET CBRSPLCS SAVE AREA ADDRESS
         SPACE 2
*---------------------------------------------------------------------*
*                                                                     *
*        OPEN BOTH DATA CONTROL BLOCKS                                *
*                                                                     *
*---------------------------------------------------------------------*
         OPEN  (INDCB,(INPUT),OUTDCB,(OUTPUT))  OPEN BOTH DCBS
         SPACE 2
*---------------------------------------------------------------------*
*                                                                     *
*        READ AND PROCESS THE INPUT TRANSACTION REQUEST DATASET       *
*                                                                     *
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 4 of 14)

```
*-------------------------------------------------------------------*
CUA1000  DS    0H
         GET   INDCB,TRANSACT       READ FIRST/NEXT TRANSACTION
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        VERIFY THAT THE VOLUME RESIDES IN A LIBRARY, IF REQUESTED  *
*                                                                   *
*-------------------------------------------------------------------*
         CLI   TRANCODE,TRANMCE     MANUAL CARTRIDGE ENTRY?
         BE    CUA6000              YES, SKIP VERIFY
         CLI   TRANMOD,TRANVER      VERIFY VOLUME IN LIBRARY?
         BNE   CUA2000              NO. GO CHECK REQUEST TYPE
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARAMETER LIST
         CBRXLCS  TYPE=TAPE,        QUERY VOLUME RESIDENCE CALL        +
               FUNC=QVR,                                               +
               VOLUME=TRANVOL,                                         +
               MF=(E,LCSLIST)
         LTR   R15,R15              VOLUME IN LIBRARY?
         BZ    CUA2000              YES. GO CHECK REQUEST TYPE
         C     R15,=A(LCSWARN)      WARNING RETURN CODE?
         BNE   CUA1100              NO. FORMAT ERROR MESSAGE
         C     R0,=A(LCSFNLRS)      VOLUME NOT LIBRARY RESIDENT?
         BNE   CUA1100              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'NOT IN LIBRARY'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA1100  DS    0H
         MVC   ERRFUNC,=CL5'QVR'    SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        EJECT A VOLUME FROM ITS LIBRARY, IF REQUESTED              *
*                                                                   *
*-------------------------------------------------------------------*
CUA2000  DS    0H
         CLI   TRANCODE,TRANEJCT    EJECT VOLUME FROM LIBRARY?
         BNE   CUA3000              NO. CHECK CHANGE USE ATTRIBUTE
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARAMETER LIST
         CLI   TRANDEST,TRANBULK    BULK EJECT REQUEST?
         BNE   CUA2100              NO. ISSUE EJECT REQUEST
         CBRXLCS  BULKEJCT=YES,     EJECT TO BULK OUTPUT STATION       +
               MF=(M,LCSLIST)
CUA2100  DS    0H
         CBRXLCS  TYPE=TAPE,        EJECT VOLUME FROM LIBRARY          +
               FUNC=EJECT,                                             +
               VOLUME=TRANVOL,                                         +
               EXITINFO=PASSTHRU,                                      +
               MF=(E,LCSLIST)
         LTR   R15,R15              EJECT SUCCESSFULLY SCHEDULED?
         BNZ   CUA2200              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'EJECT SCHEDULED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA2200  DS    0H
         MVC   ERRFUNC,=CL5'EJECT'  SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 5 of 14)

```
*--------------------------------------------------------------------*
*                                                                    *
*        CHANGE THE VOLUME USE ATTRIBUTE, IF REQUESTED               *
*                                                                    *
*--------------------------------------------------------------------*
CUA3000  DS    0H
         CLI   TRANCODE,TRANCHGP    CHANGE USE ATTRIBUTE TO PRIVATE?
         BNE   CUA3100              NO. CHECK CHANGE TO SCRATCH
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARAMETER LIST
         CBRXLCS  USE=PRIVATE,      CHANGE USE ATTRIBUTE TO PRIVATE    +
               GRPNAME=TRANSGRP,      STORAGE GROUP NAME OR BLANKS     +
               MF=(M,LCSLIST)
         B     CUA3200              GO INVOKE LCS EXTERNAL SERVICES
CUA3100  DS    0H
         CLI   TRANCODE,TRANCHGS    CHANGE USE ATTRIBUTE TO SCRATCH?
         BNE   CUA4000              NO. INVALID TRANSACTION CODE
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARAMETER LIST
         CBRXLCS  USE=SCRATCH,      CHANGE USE ATTRIBUTE TO SCRATCH    +
               MF=(M,LCSLIST)
CUA3200  DS    0H
         CBRXLCS  TYPE=TAPE,        CHANGE USE ATTRIBUTE CALL          +
               FUNC=CUA,                                               +
               VOLUME=TRANVOL,                                         +
               EXITINFO=PASSTHRU,                                      +
               MF=(E,LCSLIST)
         LTR   R15,R15              USE ATTRIBUTE CHANGED?
         BNZ   CUA3300              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'USE ATTRIBUTE CHANGED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA3300  DS    0H
         C     R15,=A(LCSWARN)      WARNING RETURN CODE?
         BNE   CUA3500              NO. FORMAT ERROR MESSAGE
         C     R0,=A(LCSWVAS)       VOLUME ALREADY SCRATCH?
         BE    CUA3400              YES. FORMAT NOT CHANGED MESSAGE
         C     R0,=A(LCSWVAP)       VOLUME ALREADY PRIVATE?
         BNE   CUA3500              NO. FORMAT ERROR MESSAGE
CUA3400  DS    0H
         MVC   TRANMSG,=CL45'USE ATTRIBUTE NOT CHANGED'  SET TRANS RESP
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA3500  DS    0H
         MVC   ERRFUNC,=CL5'CUA'    SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 6 of 14)

```
*--------------------------------------------------------------------*
*                                                                    *
*        IMPORT FUNCTION                                             *
*                                                                    *
*--------------------------------------------------------------------*
CUA4000  DS    0H
         CLI   TRANCODE,TRANIMP     IMPORT VOL INTO A VTS LIBRARY
         BNE   CUA5000              NO. CHECK FOR EXPORT
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARM LIST
         CLI   TRANCOPT,TRANCAN     CANCEL IMPORT REQUEST?
         BNE   CUA4100              IMPORT VOL INTO A VTS LIBRARY
         CBRXLCS  TYPE=TAPE,        CANCEL IMPORT REQUEST             +
               FUNC=IMPORT,                                           +
               VOLUME=TRANVOL,                                        +
               CANCEL=YES,                                            +
               MF=(E,LCSLIST)
         LTR   R15,R15              IMPORT CANCEL SUCCESSFULLY?
         BNZ   CUA4200              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'IMPORT CANCELED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA4100  DS    0H
         CBRXLCS  TYPE=TAPE,        IMPORT VOLUME INTO A VTS LIBRARY   +
               FUNC=IMPORT,                                           +
               VOLUME=TRANVOL,                                        +
               MF=(E,LCSLIST)
         LTR   R15,R15              IMPORT SUCCESSFULLY?
         BNZ   CUA4200              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'IMPORT SCHEDULED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA4200  DS    0H
         MVC   ERRFUNC,=CL5'IMP'    SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        EXPORT FUNCTION                                             *
*                                                                    *
*--------------------------------------------------------------------*
CUA5000  DS    0H
         CLI   TRANCODE,TRANEXP     EXPORT VOLUME FROM LIBRARY?
         BNE   CUA6000              NO. CHECK FOR MCE
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARM LIST
         CLI   TRANCOPT,TRANCAN     CANCEL EXPORT REQUEST
         BNE   CUA5100              EXPORT VOL FROM A VTS LIBRARY
         CBRXLCS  TYPE=TAPE,        CANCEL EXPORT REQUEST             +
               FUNC=EXPORT,                                           +
               VOLUME=TRANVOL,                                        +
               CANCEL=YES,                                            +
               MF=(E,LCSLIST)
         LTR   R15,R15              EXPORT CANCEL SUCCESSFULLY?
         BNZ   CUA5200              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'EXPORT CANCELED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 7 of 14)

```
         B     CUA1000              GET NEXT TRANSACTION
CUA5100  DS    0H
         CBRXLCS  TYPE=TAPE,        EXPORT VOLUME FROM A VTS LIBRARY   +
               FUNC=EXPORT,                                            +
               VOLUME=TRANVOL,                                         +
               MF=(E,LCSLIST)
         LTR   R15,R15              EXPORT SUCCESSFULLY?
         BNZ   CUA5200              NO. FORMAT ERROR MESSAGE
         MVC   TRANMSG,=CL45'EXPORT SCHEDULED'  SET TRANS RESPONSE
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
CUA5200  DS    0H
         MVC   ERRFUNC,=CL5'EXP'    SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        MCE (MANUAL CARTRIDGE ENTRY)                               *
*                                                                   *
*        THIS ROUTINE WAS CREATED WITH THE MTL CHANGES              *
*-------------------------------------------------------------------*
CUA6000  DS    0H
         CLI   TRANCODE,TRANMCE     MANUAL CARTRIDGE ENTRY?
         BNE   CUA7000              NO, INVALID TRANSACTION CODE
         BAL   R9,GETVOLST          GET STORAGE FOR VOLUMELIST
*
*        *-------------------------------------------------*
*        *           INITIALIZE VOLUME LIST HEADER         *
*        *-------------------------------------------------*
         L     R2,MCEADDR           ADDRESS OF LCSV FOR MCE
         USING LCSV,R2              ADDRESSIBILITY TO LCSV
*
         LA    R8,LCSVEND+LCSMLEND  CALC LEN OF HEADER & VOLIST
         ST    R8,LCSVBUF           STORE INTO LCSV
*
         LA    R8,1                 NUMBER OF VOLUMES IN LIST
         ST    R8,LCSVCNT           STORE INTO LCSV
                                                                  *
         LA    R8,LCSMLEND          LEN OF SINGLE ENTRY VOLUME LST
         ST    R8,LCSVLEN           STORE INTO LCSV
*
         LA    R8,LCSVEND(,R2)      ADDR OF BEGINNING OF VOL LIST
         ST    R8,LCSVADDR          STORE INTO LCSV
*
*        *-------------------------------------------------*
*        *           INITIALIZE VOLUME LIST ITSELF         *
*        *-------------------------------------------------*
         LR    R3,R8                ADDRESS OF VOLUME LIST
         USING LCSMLIST,R3          ADDRESSIBILITY TO LCSV
*
         MVC   LCSMVOL(6),TRANVOL   VOLSER TO LIST
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 8 of 14)

```
*
*        *-------------------------------------------------*
*        *     PROCESS THE MEDIA TYPE                      *
*        *-------------------------------------------------*
         CLI   TRANMEDT,X'40'       MEDIA TYPE NOT SPECIFIED?
         BE    CUA6100              BR IF NOT SPEC'D, WILL DEFAULT
*
         TM    TRANMEDT,X'F0'       IS HIGH NIBBLE ALL ONES?
         BNO   CUA6800              BR IF NO, CANT BE NUMERIC
*
         MVC   LCSMMED(1),TRANMEDT  MOVE MEDIATYPE CHAR INTO VLIST
         NI    LCSMMED,X'0F'        ZERO HIGH NIBBLE
*
CUA6100  EQU   *
         BAL   R9,CUACOPY           COPY MODEL TO LCS PARM LIST
*
         CBRXLCS  TYPE=TAPE,        MCE REQUEST                      +
               FUNC=MCE,            MANUAL CARTRIDGE ENTRY           +
               LIBNAME=TRANLIBN,    LIBRARY NAME PASSED TO US        +
               VOLLIST=(R2),        PTR TO VOLUME HEADER & LIST      +
               MF=(E,LCSLIST)
*
         DROP  R2
         DROP  R3
*
         LTR   R15,R15              SUCCESSFUL ENTRY?
         BNZ   CUA6200              NO. FORMAT ERROR MESSAGE
*
         MVC   TRANMSG,=CL45'VOLUME SUCCESSFULLY ENTERED'
         B     CUA6900              COMPLETE PROCESSING
*
CUA6200  EQU   *
         C     R15,=A(LCSWARN)      WARNING RETURN CODE?
         BNE   CUA6500              NO. FORMAT ERROR MESSAGE
         C     R0,=A(LCSWSTMP)      SCRATCH THRESHOLD MSG FAILURE?
         BE    CUA6300              YES, FORMAT MESSAGE
         C     R0,=A(LCSWSCNU)      LIB SCRATCH COUNT NOT UPDATED
         BNE   CUA6500              NO. FORMAT ERROR MESSAGE
*
         MVC   TRANMSG,=CL45'LIBRARY SCRATCH COUNT NOT UPDATED'
         B     CUA6900              COMPLETE PROCESSING
*
CUA6300  EQU   *
         MVC   TRANMSG,=CL45'SCRATCH THRESHOLD PROCESSING FAILURE'
         B     CUA6900              COMPLETE PROCESSING
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 9 of 14)

```
 *
CUA6500  EQU   *
         MVC   ERRFUNC,=CL5'MCE'    SET ERROR FUNCTION
         BAL   R9,CUACODES          FORMAT RETURN AND REASON CODES
         B     CUA6900              COMPLETE PROCESSING
*
CUA6800  EQU   *
         MVC   TRANMSG,=CL45'INVALID MEDIATYPE SPECIFIED'
*
CUA6900  EQU   *
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         BAL   R9,RELVOLST          RELEASE THE GOTTEN VOLUME LIST
         B     CUA1000              GET NEXT TRANSACTION
*
         EJECT ,
*------------------------------------------------------------------------*
*                                                                        *
*        INVALID TRANSACTION CODE REQUESTED                              *
*                                                                        *
*------------------------------------------------------------------------*
CUA7000  DS    0H
         MVC   TRANMSG,=CL45'INVALID TRANSACTION CODE'  SET TRANS RESP
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
*------------------------------------------------------------------------*
*                                                                        *
*        CLEAN UP AND RETURN TO THE CALLER                               *
*                                                                        *
*------------------------------------------------------------------------*
EXIT     DS    0H
         CLOSE (INDCB,,OUTDCB)      CLOSE BOTH DATA CONTROL BLOCKS
         L     R13,SAVE+4           RESTORE CALLER'S SAVE AREA ADDRESS
         RETURN  (14,12),           RESTORE CALLER'S REGISTERS, THEN   +
               RC=0                   RETURN TO CALLER
         EJECT ,
*------------------------------------------------------------------------*
*                                                                        *
*        COPY THE MODEL LCS PARAMETER LIST TO THE ACTUAL LIST            *
*                                                                        *
*------------------------------------------------------------------------*
CUACOPY  DS    0H
         LA    R0,LCSMODEL          ADDRESS OF SOURCE
         LA    R1,LCSPLENG          LENGTH OF SOURCE
         LA    R14,LCSLIST          ADDRESS OF TARGET
         LR    R15,R1               LENGTH OF TARGET
         MVCL  R14,R0               COPY MODEL TO LCS PARAMETER LIST
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 10 of 14)

```
         BR    R9                  RETURN TO CALLER
         EJECT ,
*------------------------------------------------------------------*
*                                                                  *
*        FORMAT THE RETURN AND REASON CODES FOR PRINTING           *
*                                                                  *
*------------------------------------------------------------------*
CUACODES DS    0H
         CVD   R15,PRETCODE         CONVERT TO PACKED DECIMAL
         UNPK  ZRETCODE,PRETCODE    CONVERT TO ZONED DECIMAL
         OI    ZRETCODE+3,X'F0'     CORRECT FINAL ZONE
         CVD   R0,PRSNCODE          CONVERT TO PACKED DECIMAL
         UNPK  ZRSNCODE,PRSNCODE    CONVERT TO ZONED DECIMAL
         OI    ZRSNCODE+3,X'F0'     CORRECT FINAL ZONE
         MVC   TRANMSG,RETREAS      MOVE TEXT TO RESPONSE AREA
         BR    R9                   RETURN TO CALLER
         EJECT ,
*------------------------------------------------------------------*
*                                                                  *
*        GET AND ZERO OUT THE VOLUME LIST FOR THE MCE CALL         *
*                                                                  *
*------------------------------------------------------------------*
GETVOLST EQU   *
         LA    R8,LCSVEND+LCSMLEND  CALC AMOUNT OF STORAGE TO GET
*
         STORAGE OBTAIN,            INVOKE STORAGE MACRO             +
               LENGTH=(R8),         AMOUNT TO GET                    +
               ADDR=MCEADDR,        VARIABLE FOR RETURNED ADDRESS    +
               COND=YES,            CONDITIONAL SO DON'T ABEND       +
               RTCD=STGRTCD         RETURN CODE VARIABLE
*
         LTR   R15,R15              VIRTUAL STORAGE ACQUIRED?
         BNZ   GETFAILD             BR, IF STORAGE NOT ACQUIRED
*
         LA    R2,1(,R1)            POINT 1 PAST BEGIN OF STORAGE
         LR    R3,R8                LENGTH TO CLEAR
         BCTR  R8,0                 LENGTH - 1
         LR    R4,R1                POINT TO BEGINNING OF STORAGE
         SR    R5,R5                ZERO OUT
*
         MVCL  R2,R4                CLEAR THE AUTODATA AREA
*
         BR    R9                   RETURN TO CALLER OF GETVOLST
*
GETFAILD EQU   *
         MVC   TRANMSG,=CL45'OBTAIN FAILURE'  SET TRANS RESPONSE
RELFAILD EQU   *
         BAL   R9,STGCODES          FORMAT RETURN AND REASON CODES
         BAL   R9,CUARESP           WRITE TRANSACTION RESPONSE
         B     CUA1000              GET NEXT TRANSACTION
         EJECT ,
*------------------------------------------------------------------*
*                                                                  *
*              RELEASE THE VOLUME LIST FOR THE MCE CALL            *
*                                                                  *
*------------------------------------------------------------------*
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 11 of 14)

```
RELVOLST EQU   *
*
         L     R2,MCEADDR           ADDRESS OF LCSV
         USING LCSV,R2              ADDRESSIBILITY TO LCSV
*
         L     R2,LCSVBUF           LENGTH OF RELEASE
*
         STORAGE RELEASE,           INVOKE STORAGE MACRO               +
               LENGTH=(R2),         AMOUNT TO RELEASE                  +
               ADDR=MCEADDR,        VARIABLE FOR RETURNED ADDRESS      +
               COND=YES,            CONDITIONAL RELEASE                +
               RTCD=STGRTCD         RETURN CODE VARIABLE
*
         LTR   R15,R15              VIRTUAL STORAGE ACQUIRED?
         BZR   R9                   BR, IF STORAGE RELEASED
*
         MVC   TRANMSG,=CL45'RELEASE FAILURE'  SET TRANS RESPONSE
         B     RELFAILD
*
         DROP  R2
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        FORMAT FAILED STORAGE RETURN AND REASON CODES FOR PRINTING  *
*                                                                    *
*--------------------------------------------------------------------*
STGCODES DS    0H
         L     R15,STGRTCD          GET FAILING RETURN CODE
         CVD   R15,STGRCDEC         CONVERT TO PACKED DECIMAL

UNPK  ZRETCODE,STGRCDEC    CONVERT TO ZONED DECIMAL
         OI    ZRETCODE+3,X'F0'     CORRECT FINAL ZONE
         CVD   R0,PRSNCODE          CONVERT TO PACKED DECIMAL
         MVC   TRANMSG,RETREAS      MOVE TEXT TO RESPONSE AREA
         BR    R9                   RETURN TO CALLER
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        WRITE THE TRANSACTION RESPONSE                              *
*                                                                    *
*--------------------------------------------------------------------*
CUARESP  DS    0H
         PUT   OUTDCB,TRANSACT      WRITE TRANSACTION RESPONSE
         WTO   TEXT=TRANLEN,        WRITE RESPONSE TO OPERATOR        +
               ROUTCDE=(3,5)          SEND TO TAPE POOL, TAPE LIBRARY
         BR    R9                   RETURN TO CALLER
         TITLE 'CONSTANTS AND WORK AREAS'
*--------------------------------------------------------------------*
*                                                                    *
*        CONSTANTS AND WORK AREAS                                    *
*                                                                    *
*--------------------------------------------------------------------*
         LTORG ,                    LITERAL CONSTANTS
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        DATA CONTROL BLOCKS                                         *
*                                                                    *
*--------------------------------------------------------------------*
INDCB    DCB   DDNAME=INDD,         INPUT:  TRANSACTION REQUESTS       +
               DSORG=PS,                                              +
               MACRF=GM,                                              +
               EODAD=EXIT
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 12 of 14)

```
         EJECT ,
OUTDCB   DCB   DDNAME=OUTDD,        OUTPUT:  RESULT NOTIFICATION       +
               MACRF=PM,                                               +
               DSORG=PS,                                               +
               RECFM=FB,                                               +
               LRECL=80,                                               +
               BLKSIZE=400
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        CBRSPLCS TRANSACTION RECORD AND RESPONSE AREA               *
*                                                                   *
*-------------------------------------------------------------------*
TRANLEN  DC    AL2(L'TRANSACT)      LENGTH FOR WTO TEXT
TRANSACT DS    0CL80                TRANSACTION RECORD
TRANCODE DS    CL1                  TRANSACTION CODE
TRANEJCT EQU   C'E'                 EJECT VOLUME FROM LIBRARY
TRANCHGP EQU   C'P'                 CHANGE VOLUME USE ATTRIBUTE TO
*                                     PRIVATE
TRANCHGS EQU   C'S'                 CHANGE VOLUME USE ATTRIBUTE TO
*                                     SCRATCH
TRANIMP  EQU   C'I'                 IMPORT FUNCTION
TRANEXP  EQU   C'X'                 EXPORT FUNCTION
TRANMCE  EQU   C'M'                 MANUAL CARTRIDGE ENTRY
TRANMOD  DS    CL1                  TRANSACTION CODE MODIFIER
TRANVER  EQU   C'V'                 VERIFY VOLUME RESIDES IN LIBRARY
*                                     BEFORE EXECUTING REQUEST
             DS    CL1                SEPARATOR
TRANVOL  DS    CL6                  VOLUME SERIAL NUMBER
         DS    CL1                  SEPARATOR
TRANSPEC DS    CL25                 REQUEST-SPECIFIC AREA
         ORG   TRANSPEC             VOLUME EJECT SECTION
TRANDEST DS    CL1                  EJECT DESTINATION
TRANCONV EQU   C'C'                 CONVENIENCE OUTPUT STATION
TRANBULK EQU   C'B'                 HIGH CAPACITY OUTPUT STATION
         ORG   TRANSPEC             IMPORT/EXPORT SECTION
TRANCOPT DS    CL1                  CANCEL AREA
TRANCAN  EQU   C'C'                 CANCEL REQUEST
         ORG   TRANSPEC             CHANGE USE ATTRIBUTE SECTION
TRANSGRP DS    CL8                  STORAGE GROUP NAME FOR CHANGE TO
*                                     PRIVATE
         ORG   TRANSPEC             MCE SECTION
TRANLIBN DS    CL8                  LIBRARY NAME INTO WHICH VOLUME
*                                     IS TO BE ENTERED
         DS    CL1                  SEPARATOR
TRANMEDT DS    CL1                  OPTIONAL MEDIA TYPE OF VOLUME
         ORG   ,                    RESTORE LOCATION COUNTER
TRANMSG  DS    CL45                 TRANSACTION COMPLETION MESSAGE
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        CBRXLCS PARAMETER LISTS                                    *
*                                                                   *
*-------------------------------------------------------------------*
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 13 of 14)

```
         CBRXLCS  MF=(L,LCSLIST)    LCS EXTERNAL SERVICES PARM LIST
         SPACE 2
         CBRXLCS  MF=(L,LCSMODEL)   LCS EXTERNAL SERVICES MODEL LIST
         EJECT ,

*------------------------------------------------------------------------*
*                                                                        *
*        MISCELLANEOUS WORK AREAS                                        *
*                                                                        *
*------------------------------------------------------------------------*
SAVE     DC    18F'0'               STANDARD SAVE AREA
         SPACE 2
PRETCODE DC    D'0'                 CBRXLCS RETURN CODE - PACKED DEC
PRSNCODE DC    D'0'                 CBRXLCS REASON CODE - PACKED DEC
         SPACE 2
RETREAS  DS    0CL45
ERRFUNC  DC    CL5' '               QVR, CUA, EJECT, IMP, EXP, OR MCE
         DC    CL15' RETURN CODE = '
ZRETCODE DC    CL4' '               CBRXLCS RETURN CODE - ZONED DEC
         DC    CL16', REASON CODE = '
ZRSNCODE DC    CL4' '               CBRXLCS REASON CODE - ZONED DEC
         DC    CL1'.'
         SPACE 2
PASSTHRU DC    CL16'SIMP'           PASSTHRU VALUE FOR EJECT, CUA
         SPACE 2
MCEADDR  DC    A(0)                 ADDR OF GOTTEN MCE STORAGE
STGRTCD  DC    F'0'                 RETURN CODE FOR STORAGE CALL
STGRCDEC DC    D'0'                 PACKED DECIMAL STORAGE RC
         SPACE 2
         END   CBRSPLCS
```

Figure 23. Sample Installation Management Package—CBRSPLCS (Part 14 of 14)

SAMPLIB member CBRSPUXC

This SAMPLIB member is a sample change use attribute installation exit.

```
UXCUA    TITLE 'CBRUXCUA - SAMPLE CHANGE USE ATTRIBUTE INST. EXIT'
CBRUXCUA START 0          SAMPLE CHANGE USE ATTRIBUTE INSTALLATION EXIT
         SPACE 2
**** START OF SPECIFICATIONS ****************************************
*                                                                     *
*    MODULE NAME:       CBRUXCUA                                     *
*                                                                     *
*    DESCRIPTIVE NAME:  SAMPLE CHANGE USE ATTRIBUTE INSTALLATION     *
*                       EXIT                                         *
*                                                                     *
*    FUNCTION:                                                        *
*      MODULE CBRUXCUA IS INVOKED EACH TIME A REQUEST IS MADE TO      *
*      CHANGE THE VOLUME USE ATTRIBUTE OF AN SMS-MANAGED TAPE         *
*      VOLUME.  CBRUXCUA MAY REFUSE TO ALLOW THE VOLUME USE           *
*      ATTRIBUTE TO BE CHANGED, OR UPDATE CERTAIN FIELDS IN THE TAPE  *
*      VOLUME RECORD, OR APPROVE THE CHANGE USE ATTRIBUTE REQUEST     *
*      WITHOUT CHANGE.                                                *
*                                                                     *
*      CBRUXCUA DEMONSTRATES THE USE OF THE FOLLOWING FUNCTIONS:      *
*      1. SETTING THE "REJECT" RETURN CODE TO PREVENT A CHANGE IN     *
*         THE VOLUME USE ATTRIBUTE.                                   *
*      2. USING THE INFORMATION IN VARIOUS FIELDS IN THE TAPE VOLUME  *
*         RECORD.                                                     *
*      3. PASSING INFORMATION TO CBRUXCUA USING THE LIBRARY           *
*         DESCRIPTION FIELD, AS SET BY THE ISMF LIBRARY MANAGEMENT    *
*         APPLICATION.                                                *
*      4. PASSING INFORMATION TO CBRUXCUA USING THE CBRXLCS           *
*         FUNC(CUA) PROGRAMMING INTERFACE.                            *
*                                                                     *
*    NOTES:                                                           *
*                                                                     *
*      DEPENDENCIES:          MVS/SP VERSION 4.3.0                    *
*                             DFSMS/MVS 1.1.0                         *
*                                                                     *
*      CHARACTER CODE:        EBCDIC                                  *
*      RESTRICTIONS:          NONE                                    *
*                                                                     *
*      REGISTER CONVENTIONS:                                          *
*        R0  - WORK REGISTER                                          *
*        R1  - STANDARD LINKAGE REGISTER                              *
*            - PARAMETER LIST ADDRESS                                 *
*            - WORK REGISTER                                          *
*        R2  - NOT USED                                               *
*        R3  - NOT USED                                               *
*        R4  - NOT USED                                               *
*        R5  - NOT USED                                               *
*        R6  - NOT USED                                               *
*        R7  - NOT USED                                               *
*        R8  - CBRUXCUA WORKING STORAGE BASE REGISTER                 *
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 1 of 7)

```
*        R9  - RETURN CODE WORK REGISTER                              *
*        R10 - LIBRARY DESCRIPTION BASE REGISTER                      *
*        R11 - UXCPL BASE REGISTER                                    *
*        R12 - CBRUXCUA BASE REGISTER                                 *
*        R13 - STANDARD LINKAGE REGISTER                              *
*            - SAVE AREA ADDRESS                                      *
*        R14 - STANDARD LINKAGE REGISTER                              *
*            - RETURN POINT ADDRESS                                   *
*            - WORK REGISTER                                          *
*        R15 - STANDARD LINKAGE REGISTER                              *
*            - ENTRY POINT ADDRESS                                    *
*            - RETURN CODE                                            *
*            - WORK REGISTER                                          *
*                                                                     *
*    MODULE TYPE:             CONTROL SECTION                         *
*                                                                     *
*      PROCESSOR:             ASSEMBLER H                             *
*                                                                     *
*      ATTRIBUTES:                                                    *
*                                                                     *
*        LOCATION:            JOB PACK AREA                           *
*        STATE:               SUPERVISOR                              *
*        AMODE:               31                                      *
*        RMODE:               ANY                                     *
*        KEY:                 CALLER'S                                *
*        MODE:                TASK                                    *
*        SERIALIZATION:       UNLOCKED                                *
*        TYPE:                REUSABLE                                *
*                             REENTRANT                               *
*                             REFRESHABLE                             *
*        AUTHORIZATION:       APF AUTHORIZED                          *
*                                                                     *
*      LINKAGE:               STANDARD LINKAGE CONVENTIONS            *
*                                                                     *
*      CALLING SEQUENCE:                                              *
*        CBRUXCUA IS INVOKED USING THE MVS LINK MACRO.                *
*                                                                     *
*      INPUT:                                                         *
*        AT ENTRY TO CBRUXCUA, REGISTER 1 CONTAINS THE ADDRESS OF     *
*        THE CHANGE USE ATTRIBUTE INSTALLATION EXIT PARAMETER LIST.   *
*                                                                     *
*      OUTPUT:                                                        *
*        A RETURN CODE IS PLACED IN REGISTER 15:                      *
*          CODE  MEANING                                              *
*            0   CHANGE THE VOLUME USE ATTRIBUTE AS REQUESTED.  NO    *
*                CHANGES HAVE BEEN MADE TO THE TAPE VOLUME RECORD.    *
*            4   CHANGE THE VOLUME USE ATTRIBUTE AS REQUESTED.  ONE   *
*                OR MORE FIELDS IN THE TAPE VOLUME RECORD HAVE BEEN   *
*                CHANGED.                                             *
*            8   DO NOT ALLOW THE VOLUME USE ATTRIBUTE TO BE          *
*                CHANGED.                                             *
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 2 of 7)

```
*           12   NOT USED.                                              *
*           16   DO NOT INVOKE THE CHANGE USE ATTRIBUTE INSTALLATION *
*                EXIT AGAIN.  ALLOW ALL REQUESTS TO CHANGE THE       *
*                VOLUME USE ATTRIBUTE.                                 *
*                                                                      *
*      EXIT NORMAL:                                                    *
*        RETURN TO THE CALLER WITH ONE OF THE RETURN CODES DESCRIBED *
*        ABOVE.                                                        *
*                                                                      *
*      EXIT ERROR:  NONE                                               *
*                                                                      *
*    EXTERNAL REFERENCES:                                              *
*                                                                      *
*      ROUTINES:  NONE                                                 *
*                                                                      *
*      CONTROL BLOCKS:                                                 *
*        CBRUXCPL - CHANGE USE ATTRIBUTE INSTALLATION                  *
*                   EXIT PARAMETER LIST                   - R/W      *
*                                                                      *
*    EXECUTABLE MACROS:                                                *
*      FREEMAIN                                                        *
*      GETMAIN                                                         *
*      RETURN                                                          *
*      SAVE                                                            *
*                                                                      *
*    MESSAGES:  NONE                                                   *
*                                                                      *
*    ABEND CODES:  NONE                                                *
*                                                                      *
*** END OF SPECIFICATIONS *****************************************
         TITLE 'CBRUXCPL - CHANGE USE ATTRIBUTE INST EXIT PARAM LIST'
         CBRUXCPL  ,               CHANGE USE ATTR INST EXIT PLIST
         TITLE 'STANDARD REGISTER DEFINITIONS'
*--------------------------------------------------------------------*
*                                                                    *
*        STANDARD REGISTER DEFINITIONS                               *
*                                                                    *
*--------------------------------------------------------------------*
R0       EQU   0                   GENERAL REGISTER 0
R1       EQU   1                   GENERAL REGISTER 1
R2       EQU   2                   GENERAL REGISTER 2
R3       EQU   3                   GENERAL REGISTER 3
R4       EQU   4                   GENERAL REGISTER 4
R5       EQU   5                   GENERAL REGISTER 5
R6       EQU   6                   GENERAL REGISTER 6
R7       EQU   7                   GENERAL REGISTER 7
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 3 of 7)

```
R8       EQU   8                   GENERAL REGISTER 8
R9       EQU   9                   GENERAL REGISTER 9
R10      EQU   10                  GENERAL REGISTER 10
R11      EQU   11                  GENERAL REGISTER 11
R12      EQU   12                  GENERAL REGISTER 12
R13      EQU   13                  GENERAL REGISTER 13
R14      EQU   14                  GENERAL REGISTER 14
R15      EQU   15                  GENERAL REGISTER 15
         TITLE 'LIBRARY DESCRIPTION FIELD FORMAT'
*--------------------------------------------------------------------*
*                                                                    *
*        LIBRARY DESCRIPTION FIELD FORMAT                            *
*                                                                    *
*        NOTE:  THIS IS INTENDED AS AN EXAMPLE OF THE KIND OF        *
*               INFORMATION THE INSTALLATION CAN PASS TO THE EXIT    *
*               VIA THE LIBRARY DESCRIPTION FIELD, WHICH IS SET      *
*               USING THE ISMF LIBRARY MANAGEMENT APPLICATION.       *
*--------------------------------------------------------------------*
LIBDESC  DSECT ,                   LIBRARY DESCRIPTION FIELD
LIBDDSGN DS    CL8                 DEFAULT STORAGE GROUP NAME
         DS    CL1                 SEPARATOR
LIBDPRIV DS    CL1                 ALLOW PREVIOUSLY UNKNOWN PRIVATE
*                                    VOLUME TO BE ENTERED
*                                    'Y' - ALLOW BOTH PRIVATE AND
*                                          SCRATCH VOLUMES TO BE
*                                          ENTERED
*                                    'N' - ALLOW ONLY SCRATCH
*                                          VOLUMES TO BE ENTERED
         DS    CL1                 SEPARATOR
LIBDRDCM DS    CL1                 SET READ-COMPATIBLE ATTRIBUTE
*                                    FOR PREVIOUSLY UNKNOWN MEDIA1
*                                    PRIVATE VOLUME
*                                    'Y' - SET ATTRIBUTE
*                                    'N' - DO NOT SET ATTRIBUTE
         DS    CL1                 SEPARATOR
LIBDAUTH DS    CL1                 AUTHORIZATION REQUIRED FOR
*                                    CARTRIDGE EJECT
*                                    'Y' - AUTHORIZATION REQUIRED
*                                    'N' - AUTH NOT REQUIRED
         DS    CL106               AVAILABLE
         TITLE 'CBRUXCUA WORKING STORAGE'
*--------------------------------------------------------------------*
*                                                                    *
*        CBRUXCUA WORKING STORAGE                                    *
*                                                                    *
*--------------------------------------------------------------------*
CUAWORK  DSECT ,                   CBRUXCUA WORKING STORAGE
SAVE     DS    18F                 CBRUXCUA SAVE AREA
         SPACE 2
WORKEND  DS    0D                  END OF CBRUXCUA WORKING STORAGE
WORKLEN  EQU   *-CUAWORK           CBRUXCUA WORKING STORAGE LENGTH
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 4 of 7)

```
         TITLE 'CBRUXCUA - SAMPLE CHANGE USE ATTRIBUTE INST EXIT'
*--------------------------------------------------------------------*
*                                                                    *
*        CBRUXCUA ENTRY POINT                                        *
*                                                                    *
*--------------------------------------------------------------------*
CBRUXCUA CSECT ,                   SAMPLE CHANGE USE ATTR INST EXIT
CBRUXCUA AMODE 31
CBRUXCUA RMODE ANY
         SAVE  (14,12),,           SAVE CALLER'S REGISTERS AND
               'CBRUXCUA&SYSDATE'    MARK ENTRY POINT
         LR    R12,R15             COPY ENTRY POINT ADDRESS
         USING CBRUXCUA,R12        CBRUXCUA BASE REGISTER
         LR    R11,R1              COPY PARAMETER ADDRESS
         USING UXCPL,R11           CHANGE USE ATTR INST EXIT PARM LIST
         GETMAIN  RU,              GETMAIN WORKING STORAGE FROM
               LV=WORKLEN,           SUBPOOL 230 TO GET PSW KEY
               SP=230                STORAGE
         LR    R8,R1               SAVE WORKING STORAGE ADDRESS
         USING CUAWORK,R8          CBRUXCUA WORKING STORAGE
         LR    R14,R1              START ADDRESS OF TARGET AREA
         LA    R15,WORKLEN         TARGET LENGTH
         LR    R0,R1               START ADDRESS OF SOURCE AREA
         SR    R1,R1               ZERO SOURCE LENGTH AND PAD BYTE
         MVCL  R14,R0              CLEAR WORKING STORAGE
         ST    R13,SAVE+4          BACKWARD CHAIN SAVE AREAS
         LA    R0,SAVE             CBRUXCUA SAVE AREA ADDRESS
         ST    R0,8(,R13)          FORWARD CHAIN SAVE AREAS
         LR    R13,R0              SET CBRUXCUA SAVE AREA ADDRESS
         LA    R10,UXCLDESC        ADDRESS OF LIBRARY DESCRIPTION
         USING LIBDESC,R10         LIBRARY DESCRIPTION FIELD
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        PRESET RETURN CODE ZERO                                     *
*                                                                    *
*--------------------------------------------------------------------*
         LA    R9,UXCNOCHG         CHANGE USE ATTRIBUTE WITHOUT
*                                     CHANGING TAPE VOLUME RECORD
         SPACE 2
*--------------------------------------------------------------------*
*                                                                    *
*        IF THE VOLUME USE ATTRIBUTE WILL NOT CHANGE, ALLOW THE      *
*        FUNCTION TO CONTINUE.  THE INVOKER OF CUA IS PROBABLY ISMF  *
*        VOLUME ALTER, AND THE PURPOSE IS TO ENSURE THAT THE USE     *
*        ATTRIBUTE AND THE LIBRARY MANAGER CATEGORY MATCH.           *
*                                                                    *
*--------------------------------------------------------------------*
         CLC   UXCCUSEA,UXCUSEA    OLD ATTRIBUTE = NEW ATTRIBUTE?
         BE    EXIT                YES. RETURN TO CALLER
         SPACE 2
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 5 of 7)

```
*-------------------------------------------------------------------*
*                                                                   *
*        IF THE VOLUME IS SHELF-RESIDENT, DO NOT ALLOW THE VOLUME   *
*        USE ATTRIBUTE TO BE CHANGED.                               *
*                                                                   *
*        SET THE REJECT RETURN CODE, AND EXIT.                      *
*                                                                   *
*-------------------------------------------------------------------*
         CLC   UXCLIB,=CL8'SHELF'   SHELF-RESIDENT VOLUME?
         BNE   CUA2000              NO. CHECK CHANGE TO SCRATCH
         LA    R9,UXCFAIL           SET CHANGE USE ATTRIBUTE REQUEST
*                                    DENIED RETURN CODE
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        IF THE USE ATTRIBUTE IS TO BE CHANGED TO SCRATCH, AND IF   *
*        THE REQUEST IS FROM THE PROGRAMMED INTERFACE (USING THE    *
*        CBRXLCS MACRO), ALLOW THE REQUEST.                         *
*                                                                   *
*-------------------------------------------------------------------*
CUA2000  DS    0H
         CLI   UXCUSEA,UXCSCRT      CHANGE TO SCRATCH?
         BNE   CUA3000              NO. CHECK STORAGE GROUP NAME
         CLC   UXCEXITI,PASSTHRU    EJECT AUTHORIZED BY PROGRAMMED
*                                    INTERFACE?
         BE    EXIT                 YES. RETURN TO CALLER
         SPACE 2
 *-------------------------------------------------------------------*
*                                                                   *
*        THE REQUEST IS NOT FROM THE PROGRAMMED INTERFACE.  ALLOW   *
*        THE CHANGE TO SCRATCH ONLY WHEN THE VOLUME IS NOT WRITE    *
*        PROTECTED AND IS NOT A SECURE CHECKPOINT VOLUME.           *
*                                                                   *
*-------------------------------------------------------------------*
         CLI   UXCWPROT,UXCYES      WRITE PROTECTED VOLUME?
         BE    CUA2100              YES. REJECT CUA REQUEST
         CLI   UXCCHKPT,UXCYES      SECURE CHECKPOINT VOLUME?
         BNE   EXIT                 NO. RETURN TO CALLER
CUA2100  DS    0H
         LA    R9,UXCFAIL           SET CHANGE USE ATTRIBUTE REQUEST
*                                    DENIED RETURN CODE
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        THE USE ATTRIBUTE IS TO BE CHANGED TO PRIVATE.             *
*                                                                   *
*        IF THE STORAGE GROUP NAME IS BLANK, SET THE DEFAULT STORAGE *
*        GROUP NAME FROM THE LIBRARY DESCRIPTION.                   *
*                                                                   *

*-------------------------------------------------------------------*
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 6 of 7)

```
CUA3000  DS    0H
         CLC   UXCGROUP,=CL8' '     BLANK STORAGE GROUP NAME?
         BNE   EXIT                 NO. RETURN TO CALLER
         LA    R9,UXCCHG            ALLOW CHANGE USE ATTRIBUTE WITH
*                                     TAPE VOLUME RECORD CHANGED
         MVC   UXCGROUP,LIBDDSGN    SET DEFAULT STORAGE GROUP NAME
         EJECT ,
*------------------------------------------------------------------*
*                                                                  *
*        RETURN TO THE CALLER                                      *
*                                                                  *
*------------------------------------------------------------------*
EXIT     DS    0H
         L     R13,SAVE+4           RESTORE CALLER'S SAVE AREA ADDRESS
         FREEMAIN  RU,              RELEASE WORKING STORAGE
               LV=WORKLEN,
               A=(R8),
               SP=230
         LR    R15,R9               SET RETURN CODE
         RETURN  (14,12),           RESTORE CALLER'S REGISTERS, THEN
              RC=(15)                RETURN TO CALLER
         TITLE 'CBRUXCUA CONSTANTS'
*------------------------------------------------------------------*
*                                                                  *
*        CBRUXCUA CONSTANTS                                        *
*                                                                  *
*------------------------------------------------------------------*
         LTORG ,                    LITERAL CONSTANTS
         SPACE 2
PASSTHRU DC    CL16'SIMP'           PASSTHRU VALUE TO AUTHORIZE CUA
         SPACE 2
         END   CBRUXCUA
```

Figure 24. Sample Change Use Attribute Installation Exit—CBRSPUXC (Part 7 of 7)

SAMPLIB member CBRSPUXE

This SAMPLIB member is a sample cartridge entry installation exit.

```
UXENT    TITLE 'CBRUXENT - SAMPLE CARTRIDGE ENTRY INSTALLATION EXIT'
CBRUXENT START 0                    SAMPLE CARTRIDGE ENTRY INST EXIT
         SPACE 2
**** START OF SPECIFICATIONS ****************************************
*                                                                   *
*    MODULE NAME:       CBRUXENT                                    *
*                                                                   *
*    DESCRIPTIVE NAME:  SAMPLE CARTRIDGE ENTRY INSTALLATION EXIT    *
*                                                                   *
*    FUNCTION:                                                      *
*      MODULE CBRUXENT IS INVOKED EACH TIME A CARTRIDGE IS ENTERED  *
*      INTO A TAPE LIBRARY.  CBRUXENT MAY REFUSE TO ALLOW THE       *
*      CARTRIDGE TO BE ENTERED, OR UPDATE CERTAIN FIELDS IN THE TAPE *
*      VOLUME RECORD, OR APPROVE THE CARTRIDGE ENTRY WITHOUT CHANGE, *
*      OR LEAVE THE CARTRIDGE FOR PROCESSING BY SOME OTHER SYSPLEX.  *
*                                                                   *
*      CBRUXENT DEMONSTRATES THE USE OF THE FOLLOWING FUNCTIONS:    *
*      1. SETTING THE "IGNORE" RETURN CODE TO LEAVE AN ENTERED      *
*         VOLUME IN THE LIBRARY MANAGER INSERT CATEGORY SO THAT IT  *
*         MAY BE PROCESSED FOR ENTRY BY ANOTHER SYSPLEX.            *
*      2. SETTING THE "REJECT" RETURN CODE TO PREVENT A VOLUME FROM *
*         BEING ENTERED INTO THE LIBRARY.                           *
*      3. USING THE SHELF LOCATION AND OWNER INFORMATION FIELDS IN  *
*         THE TAPE VOLUME RECORD.                                   *
*      4. PASSING INFORMATION TO CBRUXENT USING THE LIBRARY         *
*         DESCRIPTION FIELD, AS SET BY THE ISMF LIBRARY MANAGEMENT  *
*         APPLICATION.                                              *
*      5. SETTING THE READ-COMPATIBLE ATTRIBUTE, TO ALLOW A PRIVATE *
*         VOLUME RECORDED IN 18-TRACK MODE TO BE MOUNTED ON A       *
*         36-TRACK DRIVE FOR READ-ONLY USAGE.                       *
*                                                                   *
*    NOTES:                                                         *
*                                                                   *
*      DEPENDENCIES:          MVS/SP VERSION 4.3.0                 *
*                             DFSMS/MVS 1.1.0                      *
*                                                                   *
*      CHARACTER CODE:        EBCDIC                               *
*                                                                   *
*      RESTRICTIONS:          NONE                                 *
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 1 of 8)

```
*                                                                     *
*      REGISTER CONVENTIONS:                                          *
*        R0  - WORK REGISTER                                          *
*        R1  - STANDARD LINKAGE REGISTER                              *
*            - PARAMETER LIST ADDRESS                                 *
*            - WORK REGISTER                                          *
*        R2  - NOT USED                                               *
*        R3  - NOT USED                                               *
*        R4  - NOT USED                                               *
*        R5  - NOT USED                                               *
*        R6  - NOT USED                                               *
*        R7  - NOT USED                                               *
*        R8  - BASE REGISTER FOR WORKING STORAGE                      *
*        R9  - RETURN CODE WORK REGISTER                              *
*        R10 - LIBRARY DESCRIPTION BASE REGISTER                      *
*        R11 - UXEPL BASE REGISTER                                    *
*        R12 - CBRUXENT BASE REGISTER                                 *
*        R13 - STANDARD LINKAGE REGISTER                              *
*            - SAVE AREA ADDRESS                                      *
*        R14 - STANDARD LINKAGE REGISTER                              *
*            - RETURN POINT ADDRESS                                   *
*        R15 - STANDARD LINKAGE REGISTER                              *
*            - ENTRY POINT ADDRESS                                    *
*            - RETURN CODE                                            *
*                                                                     *
*    MODULE TYPE:             CONTROL SECTION                       *
*                                                                     *
*      PROCESSOR:             ASSEMBLER H                           *
*                                                                     *
*      ATTRIBUTES:                                                    *
*                                                                     *
*        LOCATION:            JOB PACK AREA                         *
*        STATE:               PROBLEM                               *
*        AMODE:               31  - MAY BE 24 IF NECESSARY          *
*        RMODE:               ANY - MAY BE 24 IF NECESSARY          *
*        KEY:                 5 (DATA MANAGEMENT)                   *
*        MODE:                TASK                                  *
*        SERIALIZATION:       UNLOCKED                              *
*        TYPE:                REUSABLE                              *
*                             REENTRANT                             *
*                             REFRESHABLE                           *
*        AUTHORIZATION:       APF AUTHORIZED                        *
*                                                                     *
*      LINKAGE:               STANDARD LINKAGE CONVENTIONS          *
*                                                                     *
*      CALLING SEQUENCE:                                              *
*        CBRUXENT IS INVOKED IN THE OAM ADDRESS SPACE USING THE MVS   *
*        LINK MACRO.                                                  *
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 2 of 8)

```
*                                                                     *
*      INPUT:                                                         *
*        AT ENTRY TO CBRUXENT, REGISTER 1 CONTAINS THE ADDRESS OF     *
*        THE CARTRIDGE ENTRY INSTALLATION EXIT PARAMETER LIST.        *
*                                                                     *
*      OUTPUT:                                                        *
*        A RETURN CODE IS PLACED IN REGISTER 15:                      *
*          CODE  MEANING                                              *
*            0   ENTER THE CARTRIDGE INTO THE LIBRARY.  THE TAPE      *
*                VOLUME RECORD IS UNCHANGED.                          *
*            4   ENTER THE CARTRIDGE INTO THE LIBRARY.  ONE OR MORE   *
*                FIELDS IN THE TAPE VOLUME RECORD HAVE BEEN CHANGED.  *
*            8   DO NOT ALLOW THE CARTRIDGE TO BE ENTERED INTO THE    *
*                LIBRARY.  EJECT THE CARTRIDGE IMMEDIATELY.           *
*           12   IGNORE THE REQUEST TO ENTER THE CARTRIDGE INTO THE   *
*                LIBRARY.  LEAVE THE CARTRIDGE IN THE INSERT          *
*                CATEGORY FOR PROCESSING BY ANOTHER SYSPLEX.          *
*           16   DO NOT INVOKE THE CARTRIDGE ENTRY INSTALLATION EXIT  *
*                AGAIN.  ALLOW ALL CARTRIDGES TO BE ENTERED WITHOUT   *
*                CHANGES TO THEIR TAPE VOLUME RECORDS.                *
*                                                                     *
*      EXIT NORMAL:                                                   *
*        RETURN TO THE CALLER WITH ONE OF THE RETURN CODES DESCRIBED  *
*        ABOVE.                                                       *
*                                                                     *
*      EXIT ERROR:  NONE                                              *
*                                                                     *
*    EXTERNAL REFERENCES:                                             *
*                                                                     *
*      ROUTINES:  NONE                                                *
*                                                                     *
*      CONTROL BLOCKS:                                                *
*        CBRUXEPL - CARTRIDGE ENTRY INSTALLATION EXIT                 *
*                   PARAMETER LIST                          - R/W     *
*                                                                     *
*    EXECUTABLE MACROS:                                               *
*      RETURN                                                         *
*      SAVE                                                           *
*                                                                     *
*    MESSAGES:  NONE                                                  *
*                                                                     *
*    ABEND CODES:  NONE                                               *
*                                                                     *
**** END OF SPECIFICATIONS *****************************************
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 3 of 8)

```
         TITLE 'CBRUXEPL - CARTRIDGE ENTRY INST EXIT PARAMETER LIST'
         CBRUXEPL  ,               CART ENTRY INST EXIT PARM LIST
         TITLE 'STANDARD REGISTER DEFINITIONS'
*------------------------------------------------------------------*
*                                                                  *
*        STANDARD REGISTER DEFINITIONS                             *
*                                                                  *
*------------------------------------------------------------------*
R0       EQU   0                   GENERAL REGISTER 0
R1       EQU   1                   GENERAL REGISTER 1
R2       EQU   2                   GENERAL REGISTER 2
R3       EQU   3                   GENERAL REGISTER 3
R4       EQU   4                   GENERAL REGISTER 4
R5       EQU   5                   GENERAL REGISTER 5
R6       EQU   6                   GENERAL REGISTER 6
R7       EQU   7                   GENERAL REGISTER 7
R8       EQU   8                   GENERAL REGISTER 8
R9       EQU   9                   GENERAL REGISTER 9
R10      EQU   10                  GENERAL REGISTER 10
R11      EQU   11                  GENERAL REGISTER 11
R12      EQU   12                  GENERAL REGISTER 12
R13      EQU   13                  GENERAL REGISTER 13
R14      EQU   14                  GENERAL REGISTER 14
R15      EQU   15                  GENERAL REGISTER 15
        TITLE 'CBRUXENT WORKING STORAGE'
*------------------------------------------------------------------*
*                                                                  *
*        CBRUXENT WORKING STORAGE                                  *
*                                                                  *
*------------------------------------------------------------------*
ENTWORK  DSECT ,                    XXA
SAVE     DS    18F                  CBRUXENT SAVE AREA
WORKEND  DS    0D                   XXA
WORKLEN  EQU   *-ENTWORK            XXA
         SPACE 2
         TITLE 'LIBRARY DESCRIPTION FIELD FORMAT'
*------------------------------------------------------------------*
*                                                                  *
*        LIBRARY DESCRIPTION FIELD FORMAT                          *
*                                                                  *
*        NOTE:  THIS IS INTENDED AS AN EXAMPLE OF THE KIND OF      *
*               INFORMATION THE INSTALLATION CAN PASS TO THE EXIT  *
*               VIA THE LIBRARY DESCRIPTION FIELD, WHICH IS SET    *
*               USING THE ISMF LIBRARY MANAGEMENT APPLICATION.     *
*------------------------------------------------------------------*
LIBDESC  DSECT ,                    LIBRARY DESCRIPTION FIELD
LIBDDSGN DS    CL8                  DEFAULT STORAGE GROUP NAME
         DS    CL1                  SEPARATOR
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 4 of 8)

```
LIBDPRIV DS    CL1                 ALLOW PREVIOUSLY UNKNOWN PRIVATE
*                                    VOLUME TO BE ENTERED
*                                    'Y' - ALLOW BOTH PRIVATE AND
*                                          SCRATCH VOLUMES TO BE
*                                          ENTERED
*                                    'N' - ALLOW ONLY SCRATCH
*                                          VOLUMES TO BE ENTERED
         DS    CL1                 SEPARATOR
LIBDRDCM DS    CL1                 SET READ-COMPATIBLE ATTRIBUTE
*                                    FOR PREVIOUSLY UNKNOWN MEDIA1
*                                    PRIVATE VOLUME
*                                    'Y' - SET ATTRIBUTE
*                                    'N' - DO NOT SET ATTRIBUTE
         DS    CL1                 SEPARATOR
LIBDAUTH DS    CL1                 AUTHORIZATION REQUIRED FOR
*                                    CARTRIDGE EJECT
*                                    'Y' - AUTHORIZATION REQUIRED
*                                    'N' - AUTH NOT REQUIRED
         DS    CL106               AVAILABLE
         TITLE 'CBRUXENT - SAMPLE CARTRIDGE ENTRY INSTALLATION EXIT'
*--------------------------------------------------------------------*
*                                                                    *
*        CBRUXENT ENTRY POINT                                        *
*                                                                    *
*--------------------------------------------------------------------*
CBRUXENT CSECT ,                   SAMPLE CARTRIDGE ENTRY INST EXIT
CBRUXENT AMODE 31
CBRUXENT RMODE ANY
         SAVE  (14,12),,           SAVE CALLER'S REGISTERS AND       +
               'CBRUXENT&SYSDATE'    MARK ENTRY POINT
         LR    R12,R15             COPY ENTRY POINT ADDRESS
         USING CBRUXENT,R12        CBRUXENT BASE REGISTER
         LR    R11,R1              COPY PARAMETER ADDRESS
         USING UXEPL,R11           CHANGE USE ATTR INST EXIT PARM LIST
         GETMAIN  RU,              GETMAIN WORKING STORAGE FROM       +
               LV=WORKLEN,           SUBPOOL 0 TO GET PSW KEY         +
               SP=0                  STORAGE
         LR    R8,R1               SAVE WORKING STORAGE ADDRESS
         USING ENTWORK,R8          CBRUXENT WORKING STORAGE
         LR    R14,R1              START ADDRESS OF TARGET AREA
         LA    R15,WORKLEN         TARGET LENGTH
         LR    R0,R1               START ADDRESS OF SOURCE AREA
         SR    R1,R1               ZERO SOURCE LENGTH & PAD BYTE
         MVCL  R14,R0              CLEAR WORKING STORAGE
         ST    R13,SAVE+4          BACKWARD CHAIN SAVE AREAS
         LA    R0,SAVE             CBRUXENT SAVE AREA ADDRESS
         ST    R0,8(,R13)          FORWARD CHAIN SAVE AREAS
         LR    R13,R0              SET CBRUXENT SAVE AREA ADDRESS
         LA    R10,UXELDESC        ADDRESS OF LIBRARY DESCRIPTION
         USING LIBDESC,R10         LIBRARY DESCRIPTION FIELD
         SPACE 2
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 5 of 8)

```
*-------------------------------------------------------------------*
*                                                                   *
*        PRESET RETURN CODE ZERO                                    *
*                                                                   *
*-------------------------------------------------------------------*
         LA    R9,UXENOCHG          ENTER CARTRIDGE WITHOUT CHANGING
*                                     TAPE VOLUME RECORD
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        CHECK FOR A VOLUME WHICH BELONGS TO ANOTHER SYSPLEX        *
*                                                                   *
*-------------------------------------------------------------------*
         CLI   UXEVOLSR,C'0'        FIRST VOLSER CHARACTER NUMERIC?
         BL    ENT1000              NO. CHECK VOLSER PREV UNKNOWN
         LA    R9,UXEIGNOR          IGNORE CARTRIDGE ENTRY - LEAVE
*                                     VOLUME FOR ANOTHER SYSPLEX
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        CHECK FOR A PREVIOUSLY UNKNOWN VOLUME.                     *
*                                                                   *
*        IF THE VOLUME USE ATTRIBUTE IS PRIVATE, ALLOW THE CARTRIDGE *
*        TO BE ENTERED ONLY IF SPECIFICALLY AUTHORIZED IN THE       *
*        LIBRARY DESCRIPTION.                                       *
*                                                                   *
*-------------------------------------------------------------------*
ENT1000  DS    0H
         CLC   UXECREAT,=CL10' '    BLANK RECORD CREATION DATE?
         BNE   ENT2000              NO. RECORD ALREADY EXISTED
         LA    R9,UXECHG            ALLOW CARTRIDGE ENTRY WITH TAPE
*                                     VOLUME RECORD CHANGED
         MVC   UXEOWNER,=CL64'TUCSON PROGRAMMING CENTER'  SET LOCALLY
*                                     OWNED VOLUME
         CLI   UXEUSEA,UXESCRT      SCRATCH USE ATTRIBUTE?
         BE    EXIT                 YES. RETURN TO CALLER
         CLI   LIBDPRIV,UXEYES      ALLOW PRIVATE VOLUME ENTRY?
         BE    ENT1100              YES. SET STORAGE GROUP NAME
         LA    R9,UXEFAIL           SET CARTRIDGE ENTRY REQUEST DENIED
*                                     RETURN CODE
         B     EXIT                 RETURN TO CALLER
         SPACE 2
*-------------------------------------------------------------------*
*                                                                   *
*        A PREVIOUSLY UNKNOWN PRIVATE VOLUME IS BEING ENTERED.      *
*                                                                   *
*        SET THE STORAGE GROUP NAME AND THE READ-COMPATIBLE         *
*        ATTRIBUTE USING INFORMATION FROM THE LIBRARY DESCRIPTION.  *
*                                                                   *
*-------------------------------------------------------------------*
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 6 of 8)

```
ENT1100  DS    0H
         MVC   UXEGROUP,LIBDDSGN    SET DEFAULT STORAGE GROUP NAME
         CLI   UXEMEDIA,UXEMED1     MEDIA TYPE MEDIA1?
         BNE   EXIT                 NO. RETURN TO CALLER
         CLI   UXEREC,UXE18TRK      18-TRACK RECORDING TECHNOLOGY?
         BNE   EXIT                 NO. RETURN TO CALLER
         CLI   LIBDRDCM,UXEYES      SET READ COMPATIBILITY FOR MEDIA1?
         BNE   EXIT                 NO. RETURN TO CALLER
         MVI   UXESPEC,UXERDCOM     SET READ-COMPATIBLE ATTRIBUTE
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        THE TAPE VOLUME RECORD ALREADY EXISTS FOR THE CARTRIDGE     *
*        BEING ENTERED.                                              *
*                                                                    *
*        IF THE SHELF LOCATION INDICATES THAT THE VOLUME MUST RESIDE *
*        ON THE SHELF, OR THE VOLUME OWNER IS NOT CURRENT IN PAYING  *
*        LIBRARY RENT, THE CARTRIDGE DOES NOT BELONG IN THE LIBRARY. *
*                                                                    *
*        SET THE REJECT RETURN CODE, AND EXIT.                       *
*                                                                    *
*--------------------------------------------------------------------*
ENT2000  DS    0H
         CLC   UXESHLOC,=CL32'TO THINE OWN SHELF BE TRUE'  MUST VOLUME
*                                  REMAIN ON SHELF?
         BE    ENT2100              YES. SET REJECT RETURN CODE
         CLC   UXEOWNER,=CL64'JOHN Q. DEADBEAT'  HAS OWNER PAID BILL?
         BNE   ENT3000              YES. CHECK TAPE VOLUME REC CHANGES
ENT2100  DS    0H
         LA    R9,UXEFAIL           SET CARTRIDGE ENTRY REQUEST DENIED
*                                    RETURN CODE
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        IF THE VOLUME USE ATTRIBUTE IS PRIVATE, THE MEDIA TYPE IS   *
*        MEDIA1 (CARTRIDGE SYSTEM TAPE), AND THE TAPE RECORDING      *
*        TECHNOLOGY IS 18-TRACK, THE VOLUME IS INTENDED FOR USE IN   *
*        READ-ONLY MODE.  SET THE READ-COMPATIBLE SPECIAL ATTRIBUTE. *
*                                                                    *
*--------------------------------------------------------------------*
ENT3000  DS    0H
         CLI   UXEUSEA,UXEPRIV      PRIVATE USE ATTRIBUTE?
         BNE   EXIT                 NO. RETURN TO CALLER
         CLI   UXEMEDIA,UXEMED1     MEDIA TYPE MEDIA1?
         BNE   EXIT                 NO. RETURN TO CALLER
         CLI   UXEREC,UXE18TRK      18-TRACK RECORDING TECHNOLOGY?
         BNE   EXIT                 NO. RETURN TO CALLER
         LA    R9,UXECHG            ALLOW CARTRIDGE ENTRY WITH TAPE
*                                    VOLUME RECORD CHANGED
         MVI   UXESPEC,UXERDCOM     SET READ-COMPATIBLE ATTRIBUTE
         EJECT ,
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 7 of 8)

```
*-------------------------------------------------------------------*
*                                                                   *
*        RETURN TO THE CALLER                                       *
*                                                                   *
*-------------------------------------------------------------------*
EXIT     DS    0H
         L     R13,SAVE+4           RESTORE CALLER'S SAVE AREA ADDRESS
         FREEMAIN RU,                                               +
               LV=WORKLEN,                                          +
               A=(R8),                                              +
               SP=0
         LR    R15,R9               SET RETURN CODE
         RETURN  (14,12),           RESTORE CALLER'S REGISTERS, THEN
               RC=(15)                RETURN TO CALLER
         SPACE 2
         END   CBRUXENT
```

Figure 25. Sample Cartridge Entry Installation Exit—CBRSPUXE (Part 8 of 8)

SAMPLIB member CBRSPUXJ

This SAMPLIB member is a sample cartridge eject installation exit.

```
UXEJC    TITLE 'CBRUXEJC - SAMPLE CARTRIDGE EJECT INSTALLATION EXIT'
CBRUXEJC START 0                   SAMPLE CARTRIDGE EJECT INST EXIT
         SPACE 2
**** START OF SPECIFICATIONS ****************************************
*                                                                   *
*    MODULE NAME:       CBRUXEJC                                    *
*                                                                   *
*    DESCRIPTIVE NAME:  SAMPLE CARTRIDGE EJECT INSTALLATION EXIT    *
*                                                                   *
*    FUNCTION:                                                      *
*      MODULE CBRUXEJC IS INVOKED EACH TIME A REQUEST IS MADE TO    *
*      EJECT A CARTRIDGE FROM A TAPE LIBRARY.  CBRUXEJC MAY REFUSE  *
*      TO ALLOW THE CARTRIDGE TO BE EJECTED, OR UPDATE CERTAIN      *
*      FIELDS IN THE TAPE VOLUME RECORD, OR APPROVE THE CARTRIDGE   *
*      EJECT WITHOUT CHANGE.                                        *
*                                                                   *
*      CBRUXEJC DEMONSTRATES THE USE OF THE FOLLOWING FUNCTIONS:    *
*      1. SETTING THE "REJECT" RETURN CODE TO PREVENT A VOLUME FROM *
*         BEING EJECTED FROM THE LIBRARY.                           *
*      2. USING THE SHELF LOCATION AND OWNER INFORMATION FIELDS IN  *
*         THE TAPE VOLUME RECORD.                                   *
*      3. PASSING INFORMATION TO CBRUXEJC USING THE LIBRARY         *
*         DESCRIPTION FIELD, AS SET BY THE ISMF LIBRARY MANAGEMENT  *
*         APPLICATION.                                              *
*      4. PASSING INFORMATION TO CBRUXEJC USING THE CBRXLCS         *
*         FUNC(EJECT) PROGRAMMING INTERFACE.                        *
*      5. CHANGING THE VOLUME USE ATTRIBUTE AND THE TAPE VOLUME     *
*         RECORD DISPOSITION.                                       *
*                                                                   *
*    NOTES:                                                         *
*                                                                   *
*      DEPENDENCIES:          z/OS                                  *
*                                                                   *
*      CHARACTER CODE:        EBCDIC                                *
*                                                                   *
*      RESTRICTIONS:          NONE                                  *
*                                                                   *
*      REGISTER CONVENTIONS:                                        *
*        R0  - WORK REGISTER                                        *
*        R1  - STANDARD LINKAGE REGISTER                            *
*            - PARAMETER LIST ADDRESS                               *
*            - WORK REGISTER                                        *
*        R2  - NOT USED                                             *
*        R3  - NOT USED                                             *
*        R4  - NOT USED                                             *
*        R5  - NOT USED                                             *
*        R6  - NOT USED                                             *
*        R7  - NOT USED                                             *
*        R8  - BASE REGISTER FOR WORKING STORAGE                    *
*        R9  - RETURN CODE WORK REGISTER                            *
*        R10 - LIBRARY DESCRIPTION BASE REGISTER                    *
*        R11 - UXJPL BASE REGISTER                                  *
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 1 of 7)

```
*        R12 - CBRUXEJC BASE REGISTER                                  *
*        R13 - STANDARD LINKAGE REGISTER                               *
*            - SAVE AREA ADDRESS                                       *
*        R14 - STANDARD LINKAGE REGISTER                               *
*            - RETURN POINT ADDRESS                                    *
*        R15 - STANDARD LINKAGE REGISTER                               *
*            - ENTRY POINT ADDRESS                                     *
*            - RETURN CODE                                             *
*                                                                      *
*    MODULE TYPE:             CONTROL SECTION                          *
*                                                                      *
*      PROCESSOR:             ASSEMBLER H                              *
*                                                                      *
*      ATTRIBUTES:                                                     *
*                                                                      *
*        LOCATION:            JOB PACK AREA                            *
*        STATE:               PROBLEM                                  *
*        AMODE:               31  - MAY BE 24 IF NECESSARY             *
*        RMODE:               ANY - MAY BE 24 IF NECESSARY             *
*        KEY:                 5 (DATA MANAGEMENT)                      *
*        MODE:                TASK                                     *
*        SERIALIZATION:       UNLOCKED                                 *
*        TYPE:                REUSABLE                                 *
*                             REENTRANT                                *
*                             REFRESHABLE                              *
*        AUTHORIZATION:       APF AUTHORIZED                           *
*                                                                      *
*      LINKAGE:               STANDARD LINKAGE CONVENTIONS             *
*                                                                      *
*      CALLING SEQUENCE:                                               *
*        CBRUXEJC IS INVOKED IN THE OAM ADDRESS SPACE USING THE MVS    *
*        LINK MACRO.                                                   *
*                                                                      *
*      INPUT:                                                          *
*        AT ENTRY TO CBRUXEJC, REGISTER 1 CONTAINS THE ADDRESS OF      *
*        THE CARTRIDGE EJECT INSTALLATION EXIT PARAMETER LIST.         *
*                                                                      *
*      OUTPUT:                                                         *
*        A RETURN CODE IS PLACED IN REGISTER 15:                       *
*          CODE  MEANING                                               *
*            0   EJECT/EXPORT THE VOLUME FROM THE LIBRARY.  THE        *
*                TAPE VOLUME RECORD IS UNCHANGED.                      *
*            4   EJECT/EXPORT THE VOLUME FROM THE LIBRARY.  ONE OR     *
*                MORE FIELDS IN THE TAPE VOLUME RECORD HAVE BEEN       *
*                CHANGED.                                              *
*            8   DO NOT ALLOW THE CARTRIDGE TO BE EJECTED FROM THE     *
*                LIBRARY.                                              *
*           12   IGNORE EXPORT COMPLETION.                             *
*           16   DO NOT INVOKE THE CARTRIDGE EJECT INSTALLATION EXIT   *
*                AGAIN.  ALLOW ALL VOLUMES TO BE EJECTED/EXPORTED      *
*                WITHOUT CHANGES TO THEIR TAPE VOLUME RECORDS.         *
*                                                                      *
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 2 of 7)

```
*      EXIT NORMAL:                                                  *
*        RETURN TO THE CALLER WITH ONE OF THE RETURN CODES DESCRIBED *
*        ABOVE.                                                      *
*                                                                    *
*      EXIT ERROR:  NONE                                             *
*                                                                    *
*    EXTERNAL REFERENCES:                                            *
*                                                                    *
*      ROUTINES:  NONE                                               *
*                                                                    *
*      CONTROL BLOCKS:                                               *
*        CBRUXJPL - CARTRIDGE EJECT INSTALLATION EXIT                *
*                   PARAMETER LIST                        - R/W      *
*                                                                    *
*    EXECUTABLE MACROS:                                              *
*      RETURN                                                        *
*      SAVE                                                          *
*                                                                    *
*    MESSAGES:  NONE                                                 *
*                                                                    *
*    ABEND CODES:  NONE                                              *
*                                                                    *
*  $L1=MTLSOFT  1F0 082500 TUCLJS:  REMOVED TIME MACRO CODE          *
*                                   (OW43042 FIN/KFI0168)            *
**** END OF SPECIFICATIONS ***********************************************
         TITLE 'CBRUXJPL - CARTRIDGE EJECT INST EXIT PARAMETER LIST'
         CBRUXJPL  ,               CART EJECT INST EXIT PARM LIST
         TITLE 'STANDARD REGISTER DEFINITIONS'
*--------------------------------------------------------------------*
*                                                                    *
*        STANDARD REGISTER DEFINITIONS                               *
*                                                                    *
*--------------------------------------------------------------------*
R0       EQU   0                   GENERAL REGISTER 0
R1       EQU   1                   GENERAL REGISTER 1
R2       EQU   2                   GENERAL REGISTER 2
R3       EQU   3                   GENERAL REGISTER 3
R4       EQU   4                   GENERAL REGISTER 4
R5       EQU   5                   GENERAL REGISTER 5
R6       EQU   6                   GENERAL REGISTER 6
R7       EQU   7                   GENERAL REGISTER 7
R8       EQU   8                   GENERAL REGISTER 8
R9       EQU   9                   GENERAL REGISTER 9
R10      EQU   10                  GENERAL REGISTER 10
R11      EQU   11                  GENERAL REGISTER 11
R12      EQU   12                  GENERAL REGISTER 12
R13      EQU   13                  GENERAL REGISTER 13
R14      EQU   14                  GENERAL REGISTER 14
R15      EQU   15                  GENERAL REGISTER 15
         TITLE 'CBRUXEJC WORKING STORAGE'
*--------------------------------------------------------------------*
*                                                                    *
*      CBRUXEJC WORKING STORAGE                                      *
*                                                                    *
*--------------------------------------------------------------------*
EJCWORK  DSECT ,
SAVE     DS    18F
WORKEND  DS    0D
WORKLEN  EQU   *-EJCWORK
         SPACE 2
         TITLE 'LIBRARY DESCRIPTION FIELD FORMAT'
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 3 of 7)

```
*-------------------------------------------------------------------*
*                                                                   *
*        LIBRARY DESCRIPTION FIELD FORMAT                           *
*                                                                   *
*        NOTE:  THIS IS INTENDED AS AN EXAMPLE OF THE KIND OF       *
*               INFORMATION THE INSTALLATION CAN PASS TO THE EXIT   *
*               VIA THE LIBRARY DESCRIPTION FIELD, WHICH IS SET     *
*               USING THE ISMF LIBRARY MANAGEMENT APPLICATION.      *
*                                                                   *
*-------------------------------------------------------------------*
LIBDESC  DSECT ,                  LIBRARY DESCRIPTION FIELD
LIBDDSGN DS    CL8                DEFAULT STORAGE GROUP NAME
         DS    CL1                SEPARATOR
LIBDPRIV DS    CL1                ALLOW PREVIOUSLY UNKNOWN PRIVATE
*                                   VOLUME TO BE ENTERED
*                                   'Y' - ALLOW BOTH PRIVATE AND
*                                         SCRATCH VOLUMES TO BE
*                                         ENTERED
*                                   'N' - ALLOW ONLY SCRATCH
*                                         VOLUMES TO BE ENTERED
         DS    CL1                SEPARATOR
LIBDRDCM DS    CL1                SET READ-COMPATIBLE ATTRIBUTE
*                                   FOR PREVIOUSLY UNKNOWN MEDIA1
*                                   PRIVATE VOLUME
*                                   'Y' - SET ATTRIBUTE
*                                   'N' - DO NOT SET ATTRIBUTE
         DS    CL1                SEPARATOR
LIBDAUTH DS    CL1                AUTHORIZATION REQUIRED FOR
*                                   CARTRIDGE EJECT
*                                   'Y' - AUTHORIZATION REQUIRED
*                                   'N' - AUTH NOT REQUIRED
         DS    CL106              AVAILABLE
         TITLE 'CBRUXEJC - SAMPLE CARTRIDGE EJECT INSTALLATION EXIT'
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 4 of 7)

```
*-------------------------------------------------------------------*
*                                                                   *
*        CBRUXEJC ENTRY POINT                                       *
*                                                                   *
*-------------------------------------------------------------------*
CBRUXEJC CSECT ,                   SAMPLE CARTRIDGE EJECT INST EXIT
CBRUXEJC AMODE 31
CBRUXEJC RMODE ANY
         SAVE  (14,12),,           SAVE CALLER'S REGISTERS AND       +
               'CBRUXEJC&SYSDATE     MARK ENTRY POINT
         LR    R12,R15             COPY ENTRY POINT ADDRESS
         USING CBRUXEJC,R12        CBRUXEJC BASE REGISTER
         LR    R11,R1              COPY PARAMETER ADDRESS
         USING UXJPL,R11           CART EJECT INST EXIT PARM LIST
         GETMAIN  RU,              GETMAIN WORKING STORAGE FROM      +
               LV=WORKLEN,           SUBPOOL 0 TO GET PSW KEY        +
               SP=0                  STORAGE
         LR    R8,R1               SAVE WORKING STORAGE ADDRESS
         USING EJCWORK,R8          CBRUXEJC WORKING STORAGE
         LR    R14,R1              START ADDRESS OF TARGET AREA
         LA    R15,WORKLEN         TARGET LENGTH
         LR    R0,R1               START ADDRESS OF SOURCE AREA
         SR    R1,R1               ZERO SOURCE LENGTH & PAD BYTE
         MVCL  R14,R0              CLEAR WORKING STORAGE
         ST    R13,SAVE+4          BACKWARD CHAIN SAVE AREAS
         LA    R0,SAVE             CBRUXEJC SAVE AREA ADDRESS
         ST    R0,8(,R13)          FORWARD CHAIN SAVE AREAS
         LR    R13,R0              SET CBRUXEJC SAVE AREA ADDRESS
         LA    R10,UXJLDESC        ADDRESS OF LIBRARY DESCRIPTION
         USING LIBDESC,R10         LIBRARY DESCRIPTION FIELD
         SPACE 2
*-------------------------------------------------------------------*
*                                                                   *
*        PRESET RETURN CODE ZERO                                    *
*                                                                   *
*-------------------------------------------------------------------*
         LA    R9,UXJNOCHG         EJECT CARTRIDGE WITHOUT CHANGING
*                                   TAPE VOLUME RECORD
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        IF THE VOLUME OWNER IS ENTITLED TO LEAVE VOLUMES IN THE    *
*        LIBRARY ON A PERMANENT BASIS, OR THE SHELF LOCATION SHOWS  *
*        PERMANENT LIBRARY RESIDENCE, DO NOT ALLOW THE CARTRIDGE TO *
*        BE EJECTED.                                                *
*                                                                   *
*        SET THE REJECT RETURN CODE, AND EXIT.                      *
*                                                                   *
*-------------------------------------------------------------------*
         CLC   UXJOWNER,=CL64'CONAN THE LIBRARIAN'  PRIVILEGED OWNER?
         BE    EJC1100             YES. SET REJECT RETURN CODE
         CLC   UXJSHLOC,=CL32'UNSHELFISH'  MUST VOLUME REMAIN IN
*                                   LIBRARY?
         BNE   EJC2000             NO. CHECK AUTHORIZATION REQUIRED
EJC1100  DS    0H
         LA    R9,UXJFAIL          SET CARTRIDGE EJECT REQUEST DENIED
*                                   RETURN CODE
         B     EXIT                RETURN TO CALLER
         EJECT ,
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 5 of 7)

```
*-------------------------------------------------------------------*
*                                                                   *
*        CHECK FOR EJECT AUTHORIZATION REQUIRED.                    *
*                                                                   *
*        USING INFORMATION FROM THE LIBRARY DESCRIPTION, DETERMINE  *
*        WHETHER THE EJECT REQUEST REQUIRES AUTHORIZATION VIA THE   *
*        PROGRAMMED INTERFACE PASS-THROUGH VALUE.                   *
*                                                                   *
*-------------------------------------------------------------------*
EJC2000  DS    0H
         CLI   LIBDAUTH,UXJYES      AUTHORIZATION REQUIRED?
         BNE   EJC3000              NO. CHECK VOLUME USE ATTRIBUTE
         CLC   UXJEXITI,PASSTHRU    EJECT AUTHORIZED BY PROGRAMMED
*                                     INTERFACE?
         BE    EJC3000              YES. CHECK VOLUME USE ATTRIBUTE
         LA    R9,UXJFAIL           SET CARTRIDGE EJECT REQUEST DENIED
*                                     RETURN CODE
         B     EXIT                 RETURN TO CALLER
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        EJECT IS ALLOWED.                                          *
*                                                                   *
*        FOR A PRIVATE VOLUME, MAKE SURE THE VOLUME RECORD          *
*        IS KEPT.                                                   *
*                                                                   *
*        THIS SAMPLE EXIT NO LONGER COMPARES THE VOLUME'S           *
*        EXPIRATION DATE TO TODAY'S DATE TO DETERMINE IF THE        *
*        RECORD SHOULD BE KEPT.  INSTEAD, ALL PRIVATE VOLUME        *
*        RECORDS ARE ASSIGNED THE "KEEP" RECORD DISPOSITION.        *
*                                                                   *
*-------------------------------------------------------------------*
EJC3000  DS    0H
         CLI   UXJUSEA,UXJPRIV      PRIVATE USE ATTRIBUTE?
         BNE   EJC4000              NO. PURGE TAPE VOLUME RECORD
         CLI   UXJVDISP,UXJKEEP     RECORD DISPOSITION KEEP?
         BE    EJC5000              YES. CHECK SHELF LOCATION SUPPLIED
         LA    R9,UXJCHG            ALLOW CARTRIDGE EJECT WITH TAPE
*                                     VOLUME RECORD CHANGED
         MVI   UXJVDISP,UXJKEEP     MAKE SURE VOLUME RECORD IS KEPT
         B     EJC5000              CHECK SHELF LOCATION SUPPLIED
         SPACE 2
*-------------------------------------------------------------------*
*                                                                   *
*        A SCRATCH VOLUME IS TO BE EJECTED.                         *
*                                                                   *
*        MAKE SURE THAT THE TAPE VOLUME RECORD IS PURGED AFTER THE  *
*        VOLUME HAS BEEN EJECTED.     NOTE THAT THE "TAPE VOLUME    *
*        RECORD CHANGED" RETURN CODE MUST BE SET IF THE CURRENT     *
*        DISPOSITION IS KEEP.                                       *
*                                                                   *
*-------------------------------------------------------------------*
EJC4000  DS    0H
         CLI   UXJVDISP,UXJPURGE    RECORD DISPOSITION PURGE?
         BE    EJC5000              YES. CHECK SHELF LOCATION SUPPLIED
         LA    R9,UXJCHG            ALLOW CARTRIDGE EJECT WITH TAPE
*                                     VOLUME RECORD CHANGED
         MVI   UXJVDISP,UXJPURGE    MAKE SURE VOLUME RECORD IS PURGED
         EJECT ,
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 6 of 7)

```
*-------------------------------------------------------------------*
*                                                                   *
*        IF THE SHELF LOCATION IS BLANK, THE OPERATOR DID NOT SUPPLY  *
*        ONE IN RESPONSE TO MESSAGE CBR2601A.  SET A STANDARD SHELF   *
*        LOCATION VALUE.                                            *
*                                                                   *
*-------------------------------------------------------------------*
EJC5000  DS    0H
         CLC   UXJSHLOC,=CL32' '    SHELF LOCATION KNOWN?
         BNE   EXIT                 YES. RETURN TO CALLER
         LA    R9,UXJCHG            ALLOW CARTRIDGE EJECT WITH TAPE
*                                     VOLUME RECORD CHANGED
         CLI   UXJUSEA,UXJPRIV      PRIVATE VOLUME?
         BE    EJC5100              YES. SET PRIVATE SHELF LOCATION
         MVC   UXJSHLOC,=CL32'SCRATCH STORAGE RACK'  SET SCRATCH
*                                     SHELF LOCATION
         B     EXIT                 RETURN TO CALLER
EJC5100  DS    0H
         MVC   UXJSHLOC,=CL32'PRIVATE STORAGE ROOM'  SET PRIVATE
*                                     SHELF LOCATION
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        RETURN TO THE CALLER                                       *
*                                                                   *
*-------------------------------------------------------------------*
EXIT     DS    0H
         L     R13,SAVE+4           RESTORE CALLER'S SAVE AREA ADDRESS
         FREEMAIN RU,                                              +
               LV=WORKLEN,                                         +
               A=(R8),                                             +
               SP=0
         LR    R15,R9               SET RETURN CODE
         RETURN  (14,12),           RESTORE CALLER'S REGISTERS, THEN   +
               RC=(15)                RETURN TO CALLER
*-------------------------------------------------------------------*
*                                                                   *
*        CBRUXEJC CONSTANTS                                         *
*                                                                   *
*-------------------------------------------------------------------*
         LTORG ,                    LITERAL CONSTANTS
         SPACE 2
PASSTHRU DC    CL16'SIMP'           PASSTHRU VALUE TO AUTHORIZE EJECT
         SPACE 2
         END   CBRUXEJC
```

Figure 26. Sample Cartridge Eject Installation Exit—CBRSPUXJ (Part 7 of 7)

SAMPLIB member CBRSPUXV

This SAMPLIB member is a sample volume not in library installation exit.

```
UXVNL    TITLE 'CBRUXVNL - VOLUME NOT IN LIBRARY INSTALLATION EXIT'
CBRUXVNL START 0                   VOLUME NOT IN LIBRARY INST EXIT
         SPACE 2
**** START OF SPECIFICATIONS ****************************************
*                                                                   *
*    MODULE NAME:       CBRUXVNL                                    *
*                                                                   *
*    DESCRIPTIVE NAME:  SAMPLE VOLUME NOT IN LIBRARY INSTALLATION   *
*                       EXIT                                        *
*                                                                   *
*********************************************************************
*                                                                   *
*      THIS SAMPLE INSTALLATION EXIT MAY BE USED TO PROVIDE VOLUME  *
*      NOT IN LIBRARY RECOVERY WHILE THE CUSTOMER IS DEVELOPING AN  *
*      EXIT WHICH IS MORE CLOSELY TAILORED TO INSTALLATION NEEDS.   *
*                                                                   *
*      A DEFAULT VERSION OF CBRUXVNL IS DISTRIBUTED AS PART OF      *
*      DFSMSrmm.                                                    *
*                                                                   *
*********************************************************************
*                                                                   *
*    FUNCTION:                                                      *
*      MODULE CBRUXVNL IS INVOKED TO ALLOW THE INSTALLATION TO      *
*      ENTER A TAPE VOLUME INTO A LIBRARY DURING PROCESSING FOR     *
*      THE JOB STEP WHICH REQUIRES THE VOLUME.                      *
*                                                                   *
*      THE EXIT IS ENTERED AT THE FOLLOWING TIMES:                  *
*                                                                   *
*        1. JOB STEP SETUP PROCESSING                               *
*                                                                   *
*           THE DEVICE AND VOLUME REQUIREMENTS FOR THE JOB STEP ARE *
*           BEING DETERMINED.                                       *
*                                                                   *
*           THE VOLUME MAY HAVE ONE OF THREE STATES:                *
*             A. THE VOLUME IS KNOWN TO BE SHELF-RESIDENT.  THERE IS*
*                A TAPE VOLUME RECORD FOR THE VOLUME IN THE TAPE    *
*                CONFIGURATION DATA BASE.                           *
*             B. THE VOLUME IS KNOWN TO BE AN EXPORTED LOGICAL      *
*                VOLUME. THERE IS A TAPE VOLUME RECORD IN THE       *
*                TAPE CONFIGURATION DATABASE WITH STACKED=VOLSER    *
*                IN THE SHELF LOCATION FIELD.                       *
*             C. THE VOLUME IS UNKNOWN TO THE SYSTEM.  THERE IS NO  *
*                TAPE VOLUME RECORD FOR THE VOLUME IN THE TCDB, THE *
*                VOLUME IS NOT A CURRENTLY MOUNTED DASD VOLUME, AND *
*                THE VOLUME IS NOT AN SMS-MANAGED DASD VOLUME.      *
*                                                                   *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 1 of 13)

```
*           IF THE EXIT CAUSES THE VOLUME TO BE ENTERED INTO A TAPE   *
*           LIBRARY:                                                  *
*             A. FOR AN EXISTING DATASET, THE REQUEST WILL BE         *
*                SMS-MANAGED MOUNTABLE, AND A LIBRARY-RESIDENT TAPE   *
*                DRIVE WILL BE ALLOCATED.                             *
*             B. FOR A NEW DATASET, THE LIBRARY NAME IS PASSED TO     *
*                THE ACS FILTER ROUTINES:                             *
*                1. IF THE FILTER ROUTINES DO NOT MAKE THE REQUEST    *
*                   SMS-MANAGED MOUNTABLE, A NON-LIBRARY-RESIDENT     *
*                   TAPE DRIVE IS ALLOCATED.  WHEN A MOUNT REQUEST    *
*                   IS LATER ISSUED, THE VOLUME WILL HAVE TO BE       *
*                   EJECTED FROM THE LIBRARY BEFORE IT CAN BE         *
*                   MOUNTED ON THE DRIVE.                             *
*                2. IF THE FILTER ROUTINES MAKE THE REQUEST           *
*                   SMS-MANAGED MOUNTABLE, AND THE LIBRARY INTO       *
*                   WHICH THE VOLUME WAS ENTERED IS NOT INCLUDED IN   *
*                   ANY OF THE SELECTED TAPE STORAGE GROUPS, SMS      *
*                   FAILS THE JOB.                                    *
*                3. IF THE FILTER ROUTINES MAKE THE REQUEST           *
*                   SMS-MANAGED MOUNTABLE, AND THE LIBRARY INTO       *
*                   WHICH THE VOLUME WAS ENTERED IS INCLUDED IN ONE   *
*                   OF THE SELECTED TAPE STORAGE GROUPS, A LIBRARY-   *
*                   RESIDENT TAPE DRIVE WILL BE ALLOCATED.            *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 2 of 13)

```
*                                                                     *
*          IF THE EXIT TAKES NO ACTION:                               *
*            A. FOR AN EXISTING DATASET, THE REQUEST WILL BE          *
*               NON-SMS-MANAGED, AND A NON-LIBRARY-RESIDENT TAPE      *
*               DRIVE WILL ULTIMATELY BE ALLOCATED.                   *
*            B. FOR A NEW DATASET, A NULL LIBRARY NAME IS PASSED TO   *
*               THE ACS FILTER ROUTINES:                              *
*               1. IF THE FILTER ROUTINES MAKE THE REQUEST SMS-       *
*                  MANAGED MOUNTABLE, SMS FAILS THE JOB.              *
*               2. IF THE FILTER ROUTINES DO NOT MAKE THE REQUEST     *
*                  SMS-MANAGED MOUNTABLE, A NON-LIBRARY-RESIDENT      *
*                  TAPE DRIVE IS ALLOCATED.                           *
*                                                                     *
*       2. DEVICE ALLOCATION PROCESSING                               *
*                                                                     *
*          JOB STEP SETUP PROCESSING HAS DESIGNATED THE REQUEST AS    *
*          SMS-MANAGED MOUNTABLE, BUT THE VOLUME HAS BEEN EJECTED     *
*          FROM ITS LIBRARY.                                          *
*                                                                     *
*          THE VOLUME STATES ARE THE SAME AS FOR JOB STEP SETUP       *
*          PROCESSING.                                                *
*                                                                     *
*          IN A JES2 ENVIRONMENT, IF THE EXIT CAUSES THE VOLUME TO    *
*          BE ENTERED INTO ANY TAPE LIBRARY, THEN A LIBRARY-          *
*          RESIDENT TAPE DRIVE WILL BE ALLOCATED.                     *
*                                                                     *
*          IN A JES3 ENVIRONMENT, THE EXIT MUST CAUSE THE VOLUME TO   *
*          BE ENTERED INTO THE SAME LIBRARY IN WHICH IT RESIDED       *
*          DURING JOB STEP SETUP PROCESSING.  IN THIS CASE, A         *
*          LIBRARY-RESIDENT TAPE DRIVE WILL BE SUCCESSFULLY           *
*          ALLOCATED.  IF THE EXIT CAUSES THE VOLUME TO BE ENTERED    *
*          INTO A DIFFERENT LIBRARY, THEN THE JOB STEP WILL FAIL.     *
*                                                                     *
*          IF THE EXIT TAKES NO ACTION, THEN THE JOB STEP WILL        *
*          FAIL.                                                      *
*                                                                     *
*       3. LIBRARY MOUNT PROCESSING                                   *
*                                                                     *
*          THE SYSTEM IS ATTEMPTING TO MOUNT THE VOLUME ON A          *
*          LIBRARY-RESIDENT TAPE DRIVE.                               *
*                                                                     *
*          THE VOLUME MAY HAVE ONE OF FIVE STATES:                    *
*            A. THE VOLUME IS KNOWN TO BE SHELF-RESIDENT.  THERE IS   *
*               A TAPE VOLUME RECORD FOR THE VOLUME IN THE TCDB.      *
*            B. THE VOLUME IS KNOWN TO RESIDE IN A DIFFERENT          *
*               LIBRARY.  THERE IS A TAPE VOLUME RECORD FOR THE       *
*               VOLUME IN THE TCDB.                                   *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 3 of 13)

```
*            C. THE VOLUME IS KNOWN TO RESIDE IN THE CORRECT        *
*               LIBRARY, BUT VOLUME EJECTION IS ALREADY IN PROGRESS  *
*               AND CANNOT BE CANCELED.  THERE IS CURRENTLY A TAPE   *
*               VOLUME RECORD IN THE TCDB, BUT THIS MAY BE PURGED    *
*               WHEN VOLUME EJECTION COMPLETES.                      *
*            D. THE VOLUME IS UNKNOWN TO THE SYSTEM.  THERE IS NO    *
*               TAPE VOLUME RECORD FOR THE VOLUME IN THE TCDB.       *
*            E. THE VOLUME IS KNOWN TO BE AN EXPORTED LOGICAL        *
*               VOLUME. THERE IS A TAPE VOLUME RECORD IN THE         *
*               TAPE CONFIGURATION DATABASE WITH STACKED=VOLSER      *
*               IN THE SHELF LOCATION FIELD.                         *
*                                                                    *
*          NOTE: IF A LOGICAL VOLUME IS EXPORT PENDING OR IN         *
*          PROCESS OF BEING EXPORTED, THE VOLUME NOT IN LIBRARY      *
*          INSTALLATION EXIT WILL NOT BE INVOKED. FOR THE EXIT       *
*          TO BE INVOKED FOR A LOGICAL VOLUME, IT MUST HAVE          *
*          COMPLETED THE EXPORT PROCESS.                             *
*                                                                    *
*          IF THE EXIT CAUSES THE VOLUME TO BE ENTERED INTO THE      *
*          TAPE LIBRARY WHERE THE DRIVE RESIDES, THE VOLUME MOUNT    *
*          WILL BE RETRIED.                                          *
*                                                                    *
*          IF THE EXIT TAKES NO ACTION, THEN THE JOB STEP WILL       *
*          FAIL.                                                     *
*                                                                    *
*                                                                    *
*    NOTES:                                                          *
*                                                                    *
*      CHARACTER CODE:        EBCDIC                                 *
*                                                                    *
*      RESTRICTIONS:          NONE                                   *
*                                                                    *
*      REGISTER CONVENTIONS:                                         *
*        R0  - WORK REGISTER                                         *
*        R1  - STANDARD LINKAGE REGISTER                             *
*            - PARAMETER LIST ADDRESS                                *
*            - WORK REGISTER                                         *
*        R2  - NOT USED                                              *
*        R3  - NOT USED                                              *
*        R4  - NOT USED                                              *
*        R5  - NOT USED                                              *
*        R6  - NOT USED                                              *
*        R7  - NOT USED                                              *
*        R8  - SHFLOCFD BASE REGISTER                                *
*        R9  - RETURN CODE WORK REGISTER                             *
*        R10 - CBRUXVNL WORKING STORAGE BASE REGISTER                *
*        R11 - UXNPL BASE REGISTER                                   *
*        R12 - CBRUXVNL BASE REGISTER                                *
*        R13 - STANDARD LINKAGE REGISTER                             *
*            - SAVE AREA ADDRESS                                     *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 4 of 13)

```
*        R14 - STANDARD LINKAGE REGISTER                              *
*            - RETURN POINT ADDRESS                                   *
*            - WORK REGISTER                                          *
*        R15 - STANDARD LINKAGE REGISTER                              *
*            - ENTRY POINT ADDRESS                                    *
*            - RETURN CODE                                            *
*            - WORK REGISTER                                          *
*                                                                     *
*    MODULE TYPE:             CONTROL SECTION                        *
*                                                                     *
*      PROCESSOR:             ASSEMBLER H                            *
*                                                                     *
*      ATTRIBUTES:                                                    *
*                                                                     *
*        LOCATION:            JOB PACK AREA SUBPOOL 252              *
*        STATE:               CALLER'S                               *
*        AMODE:               31                                     *
*        RMODE:               ANY                                    *
*        KEY:                 CALLER'S                               *
*                             MAY BE DIFFERENT FROM JOB KEY          *
*        MODE:                TASK                                   *
*        SERIALIZATION:       UNLOCKED                               *
*        TYPE:                REUSABLE                               *
*                             REENTRANT                              *
*                             REFRESHABLE                            *
*        AUTHORIZATION:       APF AUTHORIZED                         *
*                                                                     *
*      LINKAGE:               STANDARD LINKAGE CONVENTIONS           *
*                                                                     *
*      CALLING SEQUENCE:                                              *
*        CBRUXVNL IS INVOKED USING THE MVS LINK MACRO.                *
*                                                                     *
*      INPUT:                                                         *
*        AT ENTRY TO CBRUXVNL, REGISTER 1 CONTAINS THE ADDRESS OF     *
*        THE VOLUME NOT IN LIBRARY INSTALLATION EXIT PARAMETER LIST.  *
*        THE PARAMETER LIST FORMAT IS GIVEN BY MAPPING MACRO          *
*        CBRUXNPL.                                                    *
*                                                                     *
*      OUTPUT:                                                        *
*        A RETURN CODE IS PLACED IN REGISTER 15:                      *
*          CODE  MEANING                                              *
*            0   CONTINUE NORMAL PROCESSING OF THIS REQUEST.  NO      *
*                CHANGE HAS BEEN MADE TO TAPE VOLUME RESIDENCE.       *
*            4   RETRY THE CURRENT OPERATION.  THE TAPE VOLUME HAS    *
*                BEEN ENTERED INTO THE APPROPRIATE LIBRARY.           *
*            8   CANCEL THE JOB IMMEDIATELY.                          *
*           12   NOT USED.                                            *
*           16   DO NOT INVOKE THE VOLUME NOT IN LIBRARY             *
*                INSTALLATION EXIT AGAIN.  CONTINUE NORMAL            *
*                PROCESSING OF THE CURRENT REQUEST.  NO CHANGE HAS    *
*                BEEN MADE TO TAPE VOLUME RESIDENCE.                  *
*                                                                     *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 5 of 13)

```
*      EXIT NORMAL:                                                  *
*        RETURN TO THE CALLER WITH ONE OF THE RETURN CODES DESCRIBED *
*        ABOVE.                                                      *
*                                                                    *
*      EXIT ERROR:  NONE                                             *
*                                                                    *
*    EXTERNAL REFERENCES:                                            *
*                                                                    *
*      ROUTINES:  NONE                                               *
*                                                                    *
*      CONTROL BLOCKS:                                               *
*        CBRUXNPL - VOLUME NOT IN LIBRARY INSTALLATION               *
*                   EXIT PARAMETER LIST                  - R/O       *
*                                                                    *
*    EXECUTABLE MACROS:                                              *
*      FREEMAIN                                                      *
*      GETMAIN                                                       *
*      RETURN                                                        *
*      SAVE                                                          *
*      WAIT                                                          *
*      WTO                                                           *
*      WTOR                                                          *
*                                                                    *
*    MESSAGES:  VNL001 VOLUME NOT IN LIBRARY EXIT                    *
*                      VOLUME (VOLSER) UNKNOWN TO SYSTEM             *
*                                      ON STACKED (VOLSER)           *
*                                      SHELF-RESIDENT                *
*                                      EJECT IN PROGRESS             *
*                                      IN LIBRARY (LIBNAME)          *
*                      DURING JOB STEP SETUP                         *
*                             DEVICE ALLOCATION                      *
*                             LIBRARY MOUNT                          *
*                      ENTER INTO ANY LIBRARY                        *
*                                 LIBRARY (LIBNAME)                  *
*                                                                    *
*               VNL002 REPLY 'CONT', 'RETRY', 'CANCEL', OR 'DISABLE' *
*                                                                    *
*    ABEND CODES:  NONE                                              *
**** END OF SPECIFICATIONS ***********************************************
         TITLE 'CBRUXNPL - VOLUME NOT IN LIBRARY EXIT PARAMETER LIST'
         CBRUXNPL  ,               VOLUME NOT IN LIBRARY PARAMETERS
         TITLE 'STANDARD REGISTER DEFINITIONS'
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 6 of 13)

```
*-------------------------------------------------------------------*
*                                                                   *
*        STANDARD REGISTER DEFINITIONS                              *
*                                                                   *
*-------------------------------------------------------------------*
R0       EQU   0                   GENERAL REGISTER 0
R1       EQU   1                   GENERAL REGISTER 1
R2       EQU   2                   GENERAL REGISTER 2
R3       EQU   3                   GENERAL REGISTER 3
R4       EQU   4                   GENERAL REGISTER 4
R5       EQU   5                   GENERAL REGISTER 5
R6       EQU   6                   GENERAL REGISTER 6
R7       EQU   7                   GENERAL REGISTER 7
R8       EQU   8                   GENERAL REGISTER 8
R9       EQU   9                   GENERAL REGISTER 9
R10      EQU   10                  GENERAL REGISTER 10
R11      EQU   11                  GENERAL REGISTER 11
R12      EQU   12                  GENERAL REGISTER 12
R13      EQU   13                  GENERAL REGISTER 13
R14      EQU   14                  GENERAL REGISTER 14
R15      EQU   15                  GENERAL REGISTER 15

        TITLE 'SHELF LOCATION FIELD FORMAT'
*-------------------------------------------------------------------*
*                                                                   *
*         SHELF LOCATION FIELD FORMAT. THE FOLLOWING DSECT          *
*         MAPS TO THE DEFAULT SHELF LOCATION FIELD.                 *
*                                                                   *
*-------------------------------------------------------------------*
SHFLOCFD DSECT ,                   MAPS THE TCDB SHELF LOC FIELD
STKVOLTX DS    CL8                 STACKED= VOLUME TEXT
STKVOLSR DS    CL6                 VOLSER FOR THE STACKED VOLUME
         DS    CL18                AVAILABLE
         SPACE 2
         TITLE 'CBRUXVNL WORKING STORAGE'
*-------------------------------------------------------------------*
*                                                                   *
*        CBRUXVNL WORKING STORAGE                                   *
*                                                                   *
*-------------------------------------------------------------------*
VNLWORK  DSECT ,                   CBRUXVNL WORKING STORAGE
         SPACE 2
SAVE     DS    18F                 CBRUXVNL SAVE AREA
         SPACE 2
*-------------------------------------------------------------------*
*                                                                   *
*        MULTI-LINE WTO PARAMETER LIST                              *
*                                                                   *
*-------------------------------------------------------------------*
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 7 of 13)

```
WTOLIST  WTO   TEXT=((,C),(,D),(,D),(,DE)),                            +
               ROUTCDE=(3,5),                                         +
               CONSNAME=,                                             +
               MF=L
WTOLISTL EQU   *-WTOLIST
         SPACE 2
*-----------------------------------------------------------------------*
*                                                                       *
*        MULTI-LINE WTO TEXT LINES                                      *
*                                                                       *
*-----------------------------------------------------------------------*
CTRLLINE DS    0F                  MLWTO CONTROL LINE
         DS    AL2                 LENGTH OF MESSAGE TEXT
         DS    C'VNL001 VOLUME NOT IN LIBRARY EXIT'
CTRLLEN  EQU   *-CTRLLINE          LENGTH OF CONTROL LINE
         SPACE 2
VOLLINE  DS    0F                  VOLUME INFORMATION LINE
         DS    AL2                 LENGTH OF MESSAGE TEXT
         DS    C'VOLUME '
VOLSER   DS    CL6                 MISSING VOLUME SERIAL NUMBER
         DS    C' '
VOLSTATE DS    CL19'UNKNOWN TO SYSTEM  '  ERROR ASSOCIATED WITH VOLUME
VOLLEN   EQU   *-VOLLINE           LENGTH OF VOLUME INFORMATION LINE
         SPACE 2
VOLLOGCL DS    0CL19               WHERE THE LOGICAL VOLUME LIVES
         DS    C'ON STACKED '
VOLSTKVS DS    CL6                 VOLSER FOR THE STACKED VOLUME
         DS    CL2' '
         SPACE 2
VOLLIBER DS    0CL19               VOLUME IN WRONG LIBRARY ERROR
         DS    C'IN LIBRARY '
VOLCLIB  DS    CL8                 LIBRARY WHERE VOLUME RESIDES
         SPACE 2
STAGLINE DS    0F                  PROCESSING STAGE LINE
         DS    AL2                 LENGTH OF MESSAGE TEXT
         DS    C'DURING '
STAGE    DS    CL17'JOB STEP SETUP   '  PROCESSING STAGE
STAGLEN  EQU   *-STAGLINE          LENGTH OF PROCESSING STAGE LINE
         SPACE 2
ACTLINE  DS    0F                  ACTION REQUIRED LINE
         DS    AL2                 LENGTH OF MESSAGE TEXT
         DS    C'ENTER INTO '
ACTLIB   DS    CL16'ANY LIBRARY     '  TARGET LIBRARY IDENTIFICATION
ACTLEN   EQU   *-ACTLINE           LENGTH OF ACTION REQUIRED LINE
         SPACE 2
ACTSPLIB DS    0CL16               SPECIFIC TARGET LIBRARY TEXT
         DS    C'LIBRARY '
ACTTLIB  DS    CL8                 TARGET LIBRARY NAME
         SPACE 2
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 8 of 13)

```
*--------------------------------------------------------------------*
*                                                                    *
*        WTOR PARAMETER LIST AND RELATED FIELDS                      *
*                                                                    *
*--------------------------------------------------------------------*
WTORLIST WTOR  TEXT=(,,,),                                          +
               ROUTCDE=(3,5),                                       +
               CONSNAME=,                                           +
               MF=L
WTORLSTL EQU   *-WTORLIST
         SPACE 2
WTORECB  DS    F                   WTOR EVENT CONTROL BLOCK
WTORREP  DS    CL7                 WTOR REPLY AREA
         SPACE 2
WORKEND  DS    0D                  END OF CBRUXVNL WORKING STORAGE
WORKLEN  EQU   *-VNLWORK           CBRUXVNL WORKING STORAGE LENGTH
         TITLE 'CBRUXVNL - VOLUME NOT IN LIBRARY INSTALLATION EXIT'
*--------------------------------------------------------------------*
*                                                                    *
*        CBRUXVNL ENTRY POINT                                        *
*                                                                    *
*--------------------------------------------------------------------*
CBRUXVNL CSECT ,                   VOLUME NOT IN LIBRARY INST EXIT
CBRUXVNL AMODE 31
CBRUXVNL RMODE ANY
         SAVE  (14,12),,           SAVE CALLER'S REGISTERS AND       +
               'CBRUXVNL&SYSDATE'    MARK ENTRY POINT
         LR    R12,R15             COPY ENTRY POINT ADDRESS
         USING CBRUXVNL,R12        CBRUXVNL BASE REGISTER
         LR    R11,R1              COPY PARAMETER ADDRESS
         USING UXNPL,R11           VOLUME NOT IN LIBRARY PARAMETERS
         LA    R8,UXNSHLOC         ADDRESS OF THE TCDB SHELF LOC
         USING SHFLOCFD,R8         SHELF LOCATION FIELD
         GETMAIN  RU,              GETMAIN WORKING STORAGE FROM      +
               LV=WORKLEN,           SUBPOOL 230 TO GET PSW KEY      +
               SP=230                STORAGE
         LR    R10,R1              SAVE WORKING STORAGE ADDRESS
         USING VNLWORK,R10         CBRUXVNL WORKING STORAGE
         LR    R14,R1              START ADDRESS OF TARGET AREA
         LA    R15,WORKLEN         TARGET LENGTH
         LR    R0,R1               START ADDRESS OF SOURCE AREA
         SR    R1,R1               ZERO SOURCE LENGTH AND PAD BYTE
         MVCL  R14,R0              CLEAR WORKING STORAGE
         ST    R13,SAVE+4          BACKWARD CHAIN SAVE AREAS
         LA    R0,SAVE             CBRUXVNL SAVE AREA ADDRESS
         ST    R0,8(,R13)          FORWARD CHAIN SAVE AREAS
         LR    R13,R0              SET CBRUXVNL SAVE AREA ADDRESS
         EJECT ,
*********************************************************************
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 9 of 13)

```
*********************************************************************
*                                                                   *
*        AT THIS POINT, A CALL TO THE INSTALLATION TAPE MANAGEMENT  *
*        SYSTEM SHOULD BE MADE TO GATHER INFORMATION ABOUT THE      *
*        VOLUME.                                                    *
*                                                                   *
*********************************************************************
*********************************************************************
         EJECT ,
*-------------------------------------------------------------------*
*                                                                   *
*        COPY THE MODEL WTO PARAMETER LIST TO DYNAMIC STORAGE       *
*                                                                   *
*-------------------------------------------------------------------*
         MVC   WTOLIST(WTOLISTL),WTOMODEL  WTO PARAMETER LIST
         MVC   CTRLLINE(CTRLLEN),CTRLMODL  MLWTO CONTROL LINE
         MVC   VOLLINE(VOLLEN),VOLMODL     VOLUME INFORMATION LINE
         MVC   STAGLINE(STAGLEN),STAGMODL  PROCESSING STAGE LINE
         MVC   ACTLINE(ACTLEN),ACTMODL     ACTION REQUIRED LINE
         SPACE 2
*-------------------------------------------------------------------*
*                                                                   *
*        COMPLETE THE TEXT INSERTS FOR THE MULTI-LINE WTO           *
*                                                                   *
*-------------------------------------------------------------------*
         MVC   VOLSER,UXNVOLSR      SET VOLUME SERIAL NUMBER
         CLI   UXNERROR,UXNNTCDB    VOLUME UNKNOWN TO SYSTEM?
         BE    VNL1600              YES. GO CHECK PROCESSING STAGE
         CLI   UXNERROR,UXNSHELF    VOLUME SHELF-RESIDENT?
         BE    VNL1200              YES. GO SET INSERT
         CLI   UXNERROR,UXNEJECT    VOLUME EJECT IN PROGRESS?
         BE    VNL1400              YES. GO SET INSERT
         MVC   VOLLIBER,=CL19'IN LIBRARY LIB-NAME'  WRONG LIBRARY
         MVC   VOLCLIB,UXNLIBRS     LIBRARY WHERE VOLUME NOW RESIDES
         MVC   VOLSTATE,VOLLIBER    SET DIFFERENT LIBRARY INSERT
         B     VNL1600              GO CHECK PROCESSING STAGE
VNL1200  DS    0H
         CLC   STKVOLTX,=CL8'STACKED=' COMPARE SHELF LOC FIELD
         BE    VNL1300              YES. GO SET SHELF LOCATION
         MVC   VOLSTATE,=CL19'SHELF-RESIDENT'
         B     VNL1600              GO CHECK PROCESSING STAGE
VNL1300  DS    0H
         MVC   VOLLOGCL,=CL19'ON STACKED VOLSER  '  STACKED VOLUME
         MVC   VOLSTKVS,STKVOLSR
         MVC   VOLSTATE,VOLLOGCL
         B     VNL1600              GO CHECK PROCESSING STAGE
VNL1400  DS    0H
         MVC   VOLSTATE,=CL19'EJECT IN PROGRESS'
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 10 of 13)

```
VNL1600  DS    0H
         CLI   UXNWHERE,UXNSETUP    JOB STEP SETUP PROCESSING?
         BE    VNL2000              YES. GO SET ACTION
         CLI   UXNWHERE,UXNALLOC    DEVICE ALLOCATION PROCESSING?
         BE    VNL1800              YES. GO SET INSERT
         MVC   STAGE,=CL17'LIBRARY MOUNT'  SET LIBRARY MOUNT INSERT
         B     VNL2000              GO SET ACTION
VNL1800  DS    0H
         MVC   STAGE,=CL17'DEVICE ALLOCATION'  SET ALLOCATION INSERT
VNL2000  DS    0H
         CLC   UXNLIB,=CL8' '       TARGET LIBRARY UNKNOWN?
         BE    VNL3000              YES. GO ISSUE MLWTO
         MVC   ACTSPLIB,=CL16'LIBRARY LIB-NAME'  TARGET LIBRARY TEXT
         MVC   ACTTLIB,UXNLIB       LIBRARY WHERE VOLUME NEEDED
         MVC   ACTLIB,ACTSPLIB      SET TARGET LIBRARY INSERT
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        ISSUE THE MULTI-LINE WTO                                    *
*                                                                    *
*--------------------------------------------------------------------*
VNL3000  DS    0H
         SR    R0,R0                CLEAR R0 BEFORE MULTI-LINE WTO
         WTO   TEXT=(CTRLLINE,VOLLINE,STAGLINE,ACTLINE),              +
               CONSNAME=UXNLCON,                                      +
               MF=(E,WTOLIST)
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        ISSUE THE WTOR                                              *
*                                                                    *
*--------------------------------------------------------------------*
         MVC   WTORLIST(WTORLSTL),WTORMODL  COPY WTOR PARAMETER LIST
         SR    R15,R15              GET CONSTANT ZERO
         ST    R15,WTORECB          CLEAR WTOR ECB
         MVC   WTORREP,=CL7' '      SET WTOR REPLY AREA TO BLANKS
         SR    R0,R0                CLEAR R0 BEFORE WTOR
         WTOR  TEXT=(WTORLINE,WTORREP,L'WTORREP,WTORECB),             +
               CONSNAME=UXNLCON,                                      +
               MF=(E,WTORLIST,EXTENDED)
         WAIT  1,                   WAIT FOR OPERATOR REPLY          +
               ECB=WTORECB
         SPACE 2
*--------------------------------------------------------------------*
*                                                                    *
*        CHECK THE OPERATOR REPLY                                    *
*                                                                    *
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 11 of 13)

```
*--------------------------------------------------------------------*
         OC    WTORREP,=CL7' '      CONVERT RESPONSE TO UPPER CASE
         LA    R9,UXNNORML          SET CONTINUE RETURN CODE
         CLC   WTORREP,=CL7'CONT'   CONTINUE (VOLUME NOT ENTERED)?
         BE    VNLEXIT              YES. EXIT WITH PRESET RETURN CODE
         LA    R9,UXNRETRY          SET RETRY RETURN CODE
         CLC   WTORREP,=CL7'RETRY'  RETRY (VOLUME ENTERED)?
         BE    VNLEXIT              YES. EXIT WITH PRESET RETURN CODE
         LA    R9,UXNFAIL           SET CANCEL RETURN CODE
         CLC   WTORREP,=CL7'CANCEL' CANCEL JOB STEP?
         BE    VNLEXIT              YES. EXIT WITH PRESET RETURN CODE
         LA    R9,UXNDONT           SET DISABLE EXIT RETURN CODE
         CLC   WTORREP,=CL7'DISABLE'  DISABLE EXIT?
         BNE   VNL3000              NO. REISSUE MLWTO AND WTOR
         EJECT ,
*--------------------------------------------------------------------*
*                                                                    *
*        RETURN TO THE CALLER                                        *
*                                                                    *
*--------------------------------------------------------------------*
VNLEXIT  DS    0H
         L     R13,SAVE+4           RESTORE CALLER'S SAVE AREA ADDRESS
         FREEMAIN  RU,              RELEASE WORKING STORAGE           +
               LV=WORKLEN,                                           +
               A=(R10),                                              +
               SP=230
         LR    R15,R9               SET RETURN CODE
         RETURN  (14,12),           RESTORE CALLER'S REGISTERS, THEN  +
               RC=(15)                RETURN TO CALLER
         TITLE 'CBRUXVNL CONSTANTS'
*--------------------------------------------------------------------*
*                                                                    *
*        CBRUXVNL CONSTANTS                                          *
*                                                                    *
*--------------------------------------------------------------------*
         SPACE 2
         LTORG ,                    LITERAL CONSTANTS
         SPACE 2
*--------------------------------------------------------------------*
*                                                                    *
*        MODEL MULTI-LINE WTO PARAMETER LIST                         *
*                                                                    *
*--------------------------------------------------------------------*
WTOMODEL WTO   TEXT=((,C),(,D),(,D),(,DE)),                          +
               ROUTCDE=(3,5),                                        +
               CONSNAME=,                                            +
               MF=L
         SPACE 2
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 12 of 13)

```
*--------------------------------------------------------------------*
*                                                                    *
*        MODEL MULTI-LINE WTO TEXT LINES                             *
*                                                                    *
*--------------------------------------------------------------------*
CTRLMODL DC    0F'0'               MLWTO CONTROL LINE MODEL
         DC    AL2(CTRLMLEN-2)
         DC    C'VNL001 VOLUME NOT IN LIBRARY EXIT'
CTRLMLEN EQU   *-CTRLMODL
         SPACE 2
VOLMODL  DC    0F'0'               VOLUME INFORMATION LINE MODEL
         DC    AL2(VOLMLEN-2)
         DC    C'VOLUME '
         DC    C'VOLSER'
         DC    C' '
         DC    CL19'UNKNOWN TO SYSTEM  '
VOLMLEN  EQU   *-VOLMODL
         SPACE 2
STAGMODL DC    0F'0'               PROCESSING STAGE LINE MODEL
         DC    AL2(STAGMLEN-2)
         DC    C'DURING '
         DC    CL17'JOB STEP SETUP   '
STAGMLEN EQU   *-STAGMODL
         SPACE 2
ACTMODL  DC    0F'0'               ACTION REQUIRED LINE MODEL
         DC    AL2(ACTMLEN-2)
         DC    C'ENTER INTO '
         DC    CL16'ANY LIBRARY     '
ACTMLEN  EQU   *-ACTMODL
         SPACE 2
*--------------------------------------------------------------------*
*                                                                    *
*        MODEL WTOR PARAMETER LIST                                   *
*                                                                    *
*--------------------------------------------------------------------*
WTORMODL WTOR  TEXT=(,,,),                                          +
               ROUTCDE=(3,5),                                       +
               CONSNAME=,                                           +
               MF=L
         SPACE 2
*--------------------------------------------------------------------*
*                                                                    *
*        MODEL WTOR TEXT LINE                                        *
*                                                                    *
*--------------------------------------------------------------------*
WTORLINE DC    0F'0'               WTOR MESSAGE TEXT
         DC    AL2(WTORLEN-2)
         DC    C'VNL002 REPLY ''CONT'', ''RETRY'', ''CANCEL'', OR ''DIS+
               ABLE'''
WTORLEN  EQU   *-WTORLINE
         SPACE 2
         END   CBRUXVNL
```

Figure 27. Sample Volume Not in Library Installation Exit—CBRSPUXV (Part 13 of 13)

SAMPLIB member CBRAPROC

This SAMPLIB member is an example of a program that allows you to create the OAM member in the PROCLIB.

```
//CBRAPROC JOB  MSGLEVEL=(1,1),MSGCLASS=A
//*******************************************************************
//*
//*  $SEG(CBRAPROC) COMP(OSMC) PROD(OAM):
//*
//*  OAM Update PROCLIB Job (for OAM procedure).
//*
//*  This job creates a procedure in PROCLIB that can be used
//*  to start OAM.
//*
//*  NOTE: If the DB2* load module library containing DSNALI is
//*        not in the LNKLST concatenation, either include
//*        the DB2 load module library in the SYS1.LINKLIB
//*        concatenation (LNKLSTxx) or add a STEPLIB DD to
//*        this PROCEDURE.
//*******************************************************************
//         EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD   SYSOUT=A
//SYSUT2   DD   DSNAME=SYS1.PROCLIB,DISP=SHR
//SYSIN    DD   DATA
./         ADD   NAME=OAM,LEVEL=01,SOURCE=0,LIST=ALL
./      NUMBER   NEW1=10,INCR=10
//OAM PROC OSMC=YES,MAXS=2,UNLOAD=9999,EJECT=LRW,RESTART=YES
//IEFPROC EXEC PGM=CBROAM,REGION=0M,
// PARM=('OSMC=&OSMC,APLAN=CBROAM,MAXS=&MAXS,UNLOAD=&UNLOAD,'
         'EJECT=&EJECT,RESTART=&RESTART')
//SYSABEND DD SYSOUT=A
./      ENDUP
/*
```

Figure 28. Sample CBRAPROC Program That Creates the OAM Member in PROCLIB

SAMPLIB member CBRSPSIM

This SAMPLIB JCL writes the two required files on the import list volume using a scratch volume and import list format 01.

```
//CBRSPSIM  JOB 1,'IMPORT',MSGLEVEL=(1,1)
//*******************************************************************
//*
//*  $SEG(CBRSPSIM) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A SCRATCH VOLUME TO WRITE THE
//*  IMPORT LIST VOLUME.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATASET NAMES ARE FICTIONAL.
//*
//*******************************************************************
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE IMPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL SCRATCH VOLUME, CREATE THE IMPORT LIST VOLUME WITH
//* THE 2 REQUIRED FILES.  IN ORDER TO ENSURE THAT A SCRATCH VOLUME
//* IS ALLOCATED IN THE TARGET LIBRARY FOR THE IMPORT OPERATION,
//* THE ACS ROUTINES NEED TO HAVE LOGIC TO ALLOCATE A TAPE
//* DRIVE IN THE TARGET LIBRARY.  ONE WAY TO ACCOMPLISH THIS IS TO
//* HAVE A STORAGE GROUP UNIQUE TO EACH VTS LIBRARY PROVIDING A
//* 1 TO 1 RELATIONSHIP BETWEEN STORAGE GROUP AND LIBRARY.
//* THE ACS ROUTINES WOULD THEN NEED TO KEY OFF OF SOMETHING
//* UNIQUE IN THE DD STATEMENT (DATASET NAME, DATACLASS SPECIFICATION,
//* UNIT SPECIFICATION, ETC ...) TO GET THE CORRECT STORAGE GROUP
//* AND THE RIGHT TARGET LIBRARY SELECTED.
//*******************************************************************
//* FILE SEQUENCE 1:  LIST OF VOLUMES TO IMPORT
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE SPECIFIED AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT LIST 01
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* FOLLOWING THE IMPORT LIST FILE IDENTIFYING RECORD, THE LIST OF
//* FILE RECORDS CONTAIN A MAXIMUM OF THREE FIELDS SEPARATED BY
//* DELIMITERS.  THE THREE FIELDS CONSIST OF THE STACKED VOLSER, THE
//* LOGICAL VOLSER AND THE IMPORT OPTION.  THEY MUST APPEAR IN THAT
//* ORDER SEPARATED BY FIELD DELIMITERS.  BOTH THE LOGICAL VOLSER
//* AND THE IMPORT OPTION ARE OPTIONAL.
//*-----------------------------------------------------------------
//* THE STACKED VOLSER FIELD IS 1-6 CHARACTERS LONG.
//* THIS IS THE STACKED VOLUME CONTAINING THE LOGICAL VOLUMES TO
//* IMPORT.
```

Figure 29. CBRSPSIM SAMPLIB Job for Writing an Import List Volume to a Scratch Volume (Part 1 of 3)

```
//*-------------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
//*-------------------------------------------------------------------
//* THE LOGICAL VOLSER FIELD IS 6 CHARACTERS LONG.  IF THE
//* FIELD IS ALL BLANKS, ALL LOGICAL VOLUMES ON THE SPECIFIED
//* STACKED VOLUME WILL BE IMPORTED.
//*-------------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
//*-------------------------------------------------------------------
//* THE IMPORT OPTION CAN BE OMITTED (BLANK) WHICH INDICATES THAT
//* THE DATA CONTENTS OF THE LOGICAL VOLUME IS COPIED INTO THE VTS
//* SUBSYSTEM AND A DATA FRAGMENT FILE ENTRY AND LIBRARY MANAGER
//* RECORD ARE ALSO CREATED.  THE OPTION SPECIFIED CAN BE "SCRATCH"
//* WHICH INDICATES THAT ONLY A DATA FRAGMENT FILE ENTRY AND LIBRARY
//* MANAGER RECORD ARE CREATED (DATA CONTENTS NOT COPIED), OR THE
//* OPTION SPECIFIED CAN BE "INITIALIZE" WHICH INDICATES THAT ONLY
//* THE LIBRARY MANAGER RECORD FOR THE VOLUME IS CREATED.  IF A
//* LOGICAL VOLSER IS NOT INCLUDED WITH THE STACKED VOLSER, THE
//* IMPORT OPTION SPECIFIED APPLIES TO ALL LOGICAL VOLUMES ON THE
//* STACKED VOLUME.
//*-------------------------------------------------------------------
//* FOR MORE DETAILED INFORMATION ON THE REQUIRED FORMAT
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT2   DD DSN=HILEVELQ.IMPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSUT1   DD *
IMPORT LIST 01
STKD01,LOGCL1
STKD02,LOGCL2
STKD03
/*
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 2:  IMPORT STATUS FILE
//*-------------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE SPECIFIED AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT STATUS 01
//*-------------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
```

Figure 29. CBRSPSIM SAMPLIB Job for Writing an Import List Volume to a Scratch Volume (Part 2 of 3)

```
//*-------------------------------------------------------------------
//* CHECK THIS FILE AFTER THE IMPORT OPERATION IS COMPLETED FOR
//* INDIVIDUAL VOLUME IMPORT RESULTS.
//*-------------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
IMPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.IMPSTATS,
//            VOL=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,CATLG),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//
```

Figure 29. CBRSPSIM SAMPLIB Job for Writing an Import List Volume to a Scratch Volume (Part 3 of 3)

SAMPLIB member CBRSPPIM

This SAMPLIB JCL writes the two required files on the import list volume using a private volume and import list format 01.

```
//CBRSPPIM  JOB 1,'IMPORT',MSGLEVEL=(1,1)
//*******************************************************************
/*
//*  $SEG(CBRSPPIM) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A PRIVATE VOLUME TO WRITE THE
//*  IMPORT LIST VOLUME AND INITIATE THE IMPORT OPERATION.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATA SET NAMES ARE FICTIONAL.
//*
//*******************************************************************
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE IMPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL PRIVATE VOLUME (IMP001), CREATE THE IMPORT LIST
//* VOLUME WITH THE 2 REQUIRED FILES.
//*******************************************************************
```

Figure 30. CBRSPPIM SAMPLIB Job for Writing an Import List to a Private Volume and Initiating Import Operations (Part 1 of 3)

```
//* FILE SEQUENCE 1:  LIST OF VOLUMES TO IMPORT
//*-------------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT LIST 01
//*-------------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-------------------------------------------------------------------
//* FOLLOWING THE IMPORT LIST FILE IDENTIFYING RECORD, THE LIST OF
//* FILE RECORDS CONTAIN A MAXIMUM OF THREE FIELDS SEPARATED BY
//* DELIMITERS.  THE THREE FIELDS CONSIST OF THE STACKED VOLSER, THE
//* LOGICAL VOLSER AND THE IMPORT OPTION.  THEY MUST APPEAR IN THAT
//* ORDER SEPARATED BY FIELD DELIMITERS.  BOTH THE LOGICAL VOLSER
//* AND THE IMPORT OPTION ARE OPTIONAL.
//*-------------------------------------------------------------------
//* THE STACKED VOLSER FIELD IS 1-6 CHARACTERS LONG.
//* THIS IS THE STACKED VOLUME CONTAINING LOGICAL VOLUMES
//* TO BE IMPORTED.
//*-------------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
//*-------------------------------------------------------------------
//* THE LOGICAL VOLSER FIELD IS 6 CHARACTERS LONG.  IF THE
//* FIELD IS ALL BLANKS, ALL LOGICAL VOLUMES ON THE SPECIFIED
//* STACKED VOLUME WILL BE IMPORTED.
//*-------------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
//*-------------------------------------------------------------------
//* THE IMPORT OPTION CAN BE OMITTED (BLANK) WHICH INDICATES THAT
//* THE DATA CONTENTS OF THE LOGICAL VOLUME IS COPIED INTO THE VTS
//* SUBSYSTEM AND A DATA FRAGMENT FILE ENTRY AND LIBRARY MANAGER
//* RECORD ARE ALSO CREATED.  THE OPTION SPECIFIED CAN BE "SCRATCH"
//* WHICH INDICATES THAT ONLY A DATA FRAGMENT FILE ENTRY AND LIBRARY
//* MANAGER RECORD ARE CREATED (DATA CONTENTS NOT COPIED), OR THE
//* OPTION SPECIFIED CAN BE "INITIALIZE" WHICH INDICATES THAT ONLY
//* THE LIBRARY MANAGER RECORD FOR THE VOLUME IS CREATED.  IF A
//* LOGICAL VOLSER IS NOT INCLUDED WITH THE STACKED VOLSER, THE
//* IMPORT OPTION SPECIFIED APPLIES TO ALL LOGICAL VOLUMES ON THE
//* THE STACKED VOLUME.
//*-------------------------------------------------------------------
//* FOR MORE DETAILED INFORMATION ON THE REQUIRED FORMAT
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
IMPORT LIST 01
STKD01,LOGCL1
STKD02,LOGCL2
STKD03
/*
```

Figure 30. CBRSPPIM SAMPLIB Job for Writing an Import List to a Private Volume and Initiating Import Operations (Part 2 of 3)

```
//SYSUT2   DD DSN=HILEVELQ.IMPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN,,,SER=IMP001),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 2:  IMPORT STATUS FILE
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT STATUS 01
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* CHECK THIS FILE AFTER THE IMPORT OPERATION IS COMPLETED FOR
//* INDIVIDUAL VOLUME IMPORT RESULTS.
//*-----------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
IMPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.IMPSTATS,
//            VOL=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*****************************************************************
//* THE FOLLOWING STEP CAN BE USED TO INITIATE THE IMPORT
//* OPERATION AT THE LIBRARY.  USING THE CBRSPLCS SAMPLE PROGRAM
//* FROM SAMPLIB, CODE THE VOLSER NAME THAT WAS USED TO CREATE THE
//* IMPORT LIST VOLUME IN THE INPUT TRANSACTION RECORD.  REFER TO
//* THE CBRSPLCS SAMPLE PROGRAM FOR THE CORRECT SYNTAX FOR
//* INITIATING AN IMPORT OPERATION.  ONCE THE TRANSACTION RECORD
//* HAS BEEN CREATED, THE FOLLOWING STEP CAN BE UNCOMMENTED TO
//* INITIATE THE IMPORT OPERATION.
//*
//* NOTE:  THE FOLLOWING STEP COULD ALSO BE MODIFIED TO EXECUTE
//*        AN INSTALLATION'S UTILITY CAPABLE OF ISSUING THE
//*        LIBRARY IMPORT,VOLSER OPERATOR COMMAND.
//*
//*****************************************************************
//*STEP3    EXEC PGM=CBRSPLCS,COND=(4,LT)
//*SYSPRINT DD SYSOUT=*
//*INDD     DD DSN=HILEVELQ.TRANSIN.IMPORT,DISP=OLD
//*OUTDD    DD DSN=HILEVELQ.TRANSOUT.IMPORT,UNIT=SYSDA,
//*            SPACE=(TRK,(1,1)),DISP=(NEW,CATLG)
//*SYSIN    DD DUMMY
//*
//
```

Figure 30. CBRSPPIM SAMPLIB Job for Writing an Import List to a Private Volume and Initiating Import Operations (Part 3 of 3)

SAMPLIB member CBRSPPIP

This SAMPLIB JCL writes the two required files on the import list volume using a private volume and import list format 02.

```
//CBRSPPIP  JOB 1,'IMPORT',MSGLEVEL=(1,1)
//*******************************************************************
//*
//*  $SEG(CBRSPPIP) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A PRIVATE VOLUME TO WRITE THE
//*  IMPORT LIST VOLUME USING FORMAT 02, OUTBOARD POLICY
//*  MANAGEMENT SPECIFICATIONS TO OVERRIDE OR SET POLICIES.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATASET NAMES ARE FICTIONAL.
//*
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE IMPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL PRIVATE VOLUME (IMP001), CREATE THE IMPORT LIST
//* VOLUME WITH THE 2 REQUIRED FILES.
//*******************************************************************
//* FILE SEQUENCE 1:  LIST OF VOLUMES TO IMPORT
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT LIST 02
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* FOLLOWING THE IMPORT LIST FILE IDENTIFYING RECORD, OUTBOARD POLICY
//* MANAGEMENT OPTIONS CAN BE SPECIFIED, STARTING IN THE FIRST COLUMN.
//* THE OPTIONS1 SPECIFICATIONS APPLY TO ALL LOGICAL VOLUMES BEING
//* IMPORTED WITH THIS JCL, HOWEVER, POLICY NAMES SPECIFIED ON THE
//* LIST OF FILE RECORDS OVERRIDE ANY OTHER POLICY NAME SPECIFICATIONS.
//*
//*  OPTIONS1,{FAILIMPORT|CREATENAME|USEDEFAULT},SG=W,SC=X,MC=Y,DC=Z
//*
//*   KEYWORDS FAILIMPORT, CREATENAME AND USEDEFAULT DEFINE ACTIONS
//*   TO BE TAKEN IF THE POLICY NAME DOES NOT EXIST AT THE LIBRARY:
//*   IF SPECIFYING OPTIONS1, AT LEAST ONE OF THESE KEYWORDS MUST BE
//*   SPECIFIED:
//*    FAILIMPORT - FAILS THE IMPORT OF THE LOGICAL VOLUME IF ANY OF
//*     ITS POLICY NAMES IS NOT PRE-DEFINED IN THE LIBRARY.
//*    CREATENAME - AUTOMATICALLY CREATES THE POLICY CONSTRUCT
//*     DEFINITION AT THE LIBRARY, ASSIGNING DEFAULT ACTIONS.
//*    USEDEFAULT - ASSIGNS DEFAULT POLICIES (BLANKS) FOR POLICY NAMES
//*     THAT ARE NOT PRE-DEFINED IN THE LIBRARY.
```

Figure 31. CBRSPPIP SAMPLIB Job for Writing an Import List using Outboard Policy Management Options and Specifications (Part 1 of 4)

```
//*
//* IF NO OPTIONS1 IS SPECIFIED, THE NEXT LINE FOLLOWING THE IMPORT
//* LIST FILE BEGINS WITH THE LIST OF FILE RECORDS AND THE DEFAULT
//* ACTION IS CREATENAME.
//*   POLICY NAME SPECIFICATIONS:
//*    SG= SPECIFIES THE OUTBOARD POLICY NAME FOR STORAGE GROUP.
//*    SC= SPECIFIES THE OUTBOARD POLICY NAME FOR STORAGE CLASS.
//*    MC= SPECIFIES THE OUTBOARD POLICY NAME FOR MANAGEMENT CLASS.
//*    DC= SPECIFIES THE OUTBOARD POLICY NAME FOR DATA CLASS.
//*    ONE OR MORE OF THE ABOVE POLICY NAME OPTIONS CAN BE
//*    SPECIFIED IN ANY ORDER.  THE POLICY NAME FIELD IS 1-8
//*    CHARACTERS LONG. "*RESET*" IS USED TO DEFINE A POLICY NAME
//*    OF BLANKS, THE DEFAULT POLICY NAME.
//*    SPECIFYING ONE OR MORE OF THE POLICIES ON THE OPTIONS1 LINE
//*    APPLIES TO ALL THE LOGICAL VOLUMES BEING IMPORTED.  THESE VALUES
//*    OVERRIDE POLICY NAMES STORED ON THE EXPORT OPERATION FOR THE
//*    LOGICAL VOLUME, HOWEVER, THE OUTBOARD POLICY NAMES SPECIFIED
//*    NEXT TO THE FILE RECORDS OVERRIDE THE OPTIONS1 POLICY
//*    NAME SPECIFICATIONS.
//*--------------------------------------------------------------------
//* FOLLOWING THE REQUIRED IMPORT LIST FILE IDENTIFYING RECORD AND
//* THE OPTIONAL OPTIONS1 LINE IS THE LIST OF FILE RECORDS.  THIS LIST
//* CONSISTS OF FIELDS SEPARATED BY COMMA DELIMITERS.
//* FOLLOWING ARE EXAMPLES OF VALID SYNTAX FOR FILE RECORDS:
//*
//*  STACKD
//*  STACKD,LOGICL
//*  STACKD,LOGICL,OPTION
//*  STACKD,,OPTION
//*  STACKD,LOGICL,OPTION,SG=NAME,SC=NAME,MC=NAME,DC=*RESET*
//*  STACKD,LOGICAL,,SG=NAME,SC=NAME,MC=NAME,DC=NAME
//*  STACKD,,,SG=NAME,SC=*RESET*,MC=NAME,DC=NAME
//*  STACKD,LOGICL,OPTION,SG=NAME
//*  STACKD,LOGICL,OPTION,DC=NAME,SC=NAME,MC=NAME
//*
//* ONLY THE STACKED VOLSER, STACKD, IS REQUIRED. ALL OTHER FIELDS ARE
//* OPTIONAL.  ALL SPECIFICATIONS ARE SEPARATED BY A COMMA.
//* A COMMA IS REQUIRED FOR OMITTED LOGICAL VOLUME OR IMPORT OPTION
//* SPECIFICATIONS IF OTHER SPECIFICATIONS FOLLOW.
//*--------------------------------------------------------------------
//* ONE OR MORE POLICY SPECIFICATIONS (SG=,SC=,MC=,DC=) CAN BE
//* SPECIFIED IN ANY ORDER.  POLICY NAMES SPECIFIED ON THE LIST
//* OF FILE RECORDS OVERRIDE THE POLICIES SPECIFIED ON THE OPTIONS1
//* LINE AND THE POLICIES STORED WHEN THE LOGICAL VOLUME WAS EXPORTED.
//* HOWEVER, THE OPTIONS1 ACTION (FAILIMPORT, CREATENAME,OR USEDEFAULT)
//* APPLIES TO ALL POLICY SPECIFICATIONS FOR THIS IMPORT OPERATION.
//*--------------------------------------------------------------------
//* THE STACKED VOLSER FIELD IS 1-6 CHARACTERS LONG.
//* THIS IS THE STACKED VOLUME CONTAINING LOGICAL VOLUMES
//* TO BE IMPORTED.
//*--------------------------------------------------------------------
//* THE LOGICAL VOLSER FIELD IS 6 CHARACTERS LONG.  IF THE
//* FIELD IS ALL BLANKS, ALL LOGICAL VOLUMES ON THE SPECIFIED
//* STACKED VOLUME WILL BE IMPORTED.
```

Figure 31. CBRSPPIP SAMPLIB Job for Writing an Import List using Outboard Policy Management Options and Specifications (Part 2 of 4)

```
//*-------------------------------------------------------------------
//* THE IMPORT OPTION CAN BE OMITTED (BLANK) WHICH INDICATES THAT
//* THE DATA CONTENTS OF THE LOGICAL VOLUME IS COPIED INTO THE VTS
//* SUBSYSTEM AND A DATA FRAGMENT FILE ENTRY AND LIBRARY MANAGER
//* RECORD ARE ALSO CREATED.  THE OPTION SPECIFIED CAN BE "SCRATCH"
//* WHICH INDICATES THAT ONLY A DATA FRAGMENT FILE ENTRY AND LIBRARY
//* MANAGER RECORD ARE CREATED (DATA CONTENTS NOT COPIED), OR THE
//* OPTION SPECIFIED CAN BE "INITIALIZE" WHICH INDICATES THAT ONLY
//* THE LIBRARY MANAGER RECORD FOR THE VOLUME IS CREATED.  IF A
//* LOGICAL VOLSER IS NOT INCLUDED WITH THE STACKED VOLSER, THE
//* IMPORT OPTION SPECIFIED APPLIES TO ALL LOGICAL VOLUMES ON
//* THE STACKED VOLUME.
//*-------------------------------------------------------------------
//* THE SG= FIELD IS 8 CHARACTERS LONG OR LESS.
//*-------------------------------------------------------------------
//* THE SC= FIELD IS 8 CHARACTERS LONG OR LESS.
//*-------------------------------------------------------------------
//* THE MC= FIELD IS 8 CHARACTERS LONG OR LESS.
//*-------------------------------------------------------------------
//* THE DC= FIELD IS 8 CHARACTERS LONG OR LESS.
//*-------------------------------------------------------------------
//* FOR MORE DETAILED INFORMATION ON THE REQUIRED FORMAT
//* REFER TO THE TOTALSTORAGE ENTERPRISE AUTOMATED TAPE LIBRARY
//* 3494 OPERATOR GUIDE.
//*******************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
IMPORT LIST 02
OPTIONS1,CREATENAME,SG=TAPESG1,SC=SCLASS1,DC=*RESET*
STKD01,LOGCL1,,SG=TAPESG2,DC=DCMED1
STKD02,LOGCL2,SCRATCH,SG=TAPESGX
STKD03,,,MC=COPY2
/*
//SYSUT2   DD DSN=HILEVELQ.IMPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN,,,SER=IMP001),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 2:  IMPORT STATUS FILE
//*-------------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* IMPORT STATUS 01
//*-------------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-------------------------------------------------------------------
//* CHECK THIS FILE AFTER THE IMPORT OPERATION IS COMPLETED FOR
//* INDIVIDUAL VOLUME IMPORT RESULTS.
//*-------------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE, REFER TO
//* THE TOTALSTORAGE ENTERPRISE AUTOMATED TAPE LIBRARY 3494
//* OPERATOR GUIDE.
```

Figure 31. CBRSPPIP SAMPLIB Job for Writing an Import List using Outboard Policy Management Options and Specifications (Part 3 of 4)

```
//*******************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
IMPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.IMPSTATS,
//            VOL=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*****************************************************************
//* THE FOLLOWING STEP CAN BE USED TO INITIATE THE IMPORT
//* OPERATION AT THE LIBRARY.  USING THE CBRSPLCS SAMPLE PROGRAM
//* FROM SAMPLIB, CODE THE VOLSER NAME THAT WAS USED TO CREATE THE
//* IMPORT LIST VOLUME IN THE INPUT TRANSACTION RECORD.  REFER TO
//* THE CBRSPLCS SAMPLE PROGRAM FOR THE CORRECT SYNTAX FOR
//* INITIATING AN IMPORT OPERATION.  ONCE THE TRANSACTION RECORD
//* HAS BEEN CREATED, THE FOLLOWING STEP CAN BE UNCOMMENTED TO
//* INITIATE THE IMPORT OPERATION.
//*
//* NOTE:  THE FOLLOWING STEP COULD ALSO BE MODIFIED TO EXECUTE
//*        AN INSTALLATION'S UTILITY CAPABLE OF ISSUING THE
//*        LIBRARY IMPORT,VOLSER OPERATOR COMMAND.
//*
//*****************************************************************
//*STEP3    EXEC PGM=CBRSPLCS,COND=(4,LT)
//*SYSPRINT DD SYSOUT=*
//*INDD     DD DSN=HILEVELQ.TRANSIN.IMPORT,DISP=OLD
//*OUTDD    DD DSN=HILEVELQ.TRANSOUT.IMPORT,UNIT=SYSDA,
//*            SPACE=(TRK,(1,1)),DISP=(NEW,CATLG)
//*SYSIN    DD DUMMY
//*
//
```

Figure 31. CBRSPPIP SAMPLIB Job for Writing an Import List using Outboard Policy Management Options and Specifications (Part 4 of 4)

SAMPLIB member CBRSPSXP

This SAMPLIB JCL writes the three required files on the export list volume using a scratch volume.

```
//CBRSPSXP  JOB 1,'EXPORT',MSGLEVEL=(1,1)
//*******************************************************************
//*
//*  $SEG(CBRSPSXP) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A SCRATCH VOLUME TO WRITE THE
//*  EXPORT LIST VOLUME.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATASET NAMES ARE FICTIONAL.
//*
//*******************************************************************
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE EXPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL SCRATCH VOLUME, CREATE THE EXPORT LIST VOLUME WITH
//* THE 3 REQUIRED FILES.  IN ORDER TO ENSURE THAT A SCRATCH VOLUME
//* IS ALLOCATED IN THE TARGET LIBRARY FOR THE EXPORT OPERATION,
//* THE ACS ROUTINES NEED TO HAVE LOGIC TO ALLOCATE A TAPE
//* DRIVE IN THE TARGET LIBRARY.  ONE WAY TO ACCOMPLISH THIS IS TO
//* HAVE A STORAGE GROUP UNIQUE TO EACH VTS LIBRARY PROVIDING A
//* 1 TO 1 RELATIONSHIP BETWEEN STORAGE GROUP AND LIBRARY.
//* THE ACS ROUTINES WOULD THEN NEED TO KEY OFF OF SOMETHING
//* UNIQUE IN THE DD STATEMENT (DATASET NAME, DATACLASS SPECIFICATION,
//* UNIT SPECIFICATION, ETC ...) TO GET THE CORRECT STORAGE GROUP
//* AND THE RIGHT TARGET LIBRARY SELECTED.
//*******************************************************************
//* FILE SEQUENCE 1:  EXPORT LIST VOLUME FILE WITH LIST OF VOLUMES
//*   TO BE EXPORTED ALONG WITH THEIR DESTINATIONS.  ALL VOLUMES
//*   WITH THE SAME DESTINATION WILL BE GROUPED TOGETHER ON
//*   THE SAME SET OF STACKED VOLUMES.
//*-----------------------------------------------------------------
```

Figure 32. Sample JCL for an Export List Volume Using a Scratch Volume (Part 1 of 3)

```
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE SPECIFIED AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT LIST 01
//*--------------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*--------------------------------------------------------------------
//* FOLLOWING THE EXPORT LIST FILE IDENTIFYING RECORD, THE LIST OF
//* FILE RECORDS CONTAIN TWO FIELDS SEPARATED BY A DELIMITER.  THE
//* FIELDS, VOLSER AND DESTINATION, MUST APPEAR IN THAT ORDER
//* SEPARATED BY A FIELD DELIMITER.
//*--------------------------------------------------------------------
//* THE VOLSER FIELD IS 6 CHARACTERS LONG.
//*--------------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
//*--------------------------------------------------------------------
//* THE DESTINATION FIELD FOR THE LOGICAL VOLUME IS 1-16 CHARACTERS
//* LONG.  A BLANK DESTINATION IS ALSO VALID.
//*--------------------------------------------------------------------
//* FOR MORE DETAILED INFORMATION ON THE REQUIRED FORMAT
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*********************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT2   DD DSN=HILEVELQ.EXPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSUT1   DD *
EXPORT LIST 01
VOLSR1,DISASTER
VOLSR2,DISASTER
VOLSR3,BACKUP
VOLSR4,BACKUP
VOLSR5
/*
//SYSIN   DD  DUMMY
//*
//*********************************************************************
//* FILE SEQUENCE 2:  RESERVED FILE (FOR FUTURE USE).
//*--------------------------------------------------------------------
//* THE RESERVED FILE MUST BE PRESENT, HOWEVER ITS LENGTH OR
//* CONTENTS IS NOT CHECKED OR USED.
//*********************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
RESERVED FILE
/*
```

Figure 32. Sample JCL for an Export List Volume Using a Scratch Volume (Part 2 of 3)

```
//SYSUT2   DD DSN=HILEVELQ.RESERVED,
//            VOL=(,RETAIN,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 3:  EXPORT STATUS FILE
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT STATUS 01
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* CHECK THIS FILE AFTER THE EXPORT OPERATION IS COMPLETED FOR
//* INDIVIDUAL VOLUME EXPORT RESULTS.
//*-----------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP3    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
EXPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.EXPSTATS,
//            VOLUME=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(3,SL),
//            DISP=(NEW,CATLG),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//
```

Figure 32. Sample JCL for an Export List Volume Using a Scratch Volume (Part 3 of 3)

SAMPLIB Member CBRSPPXP

This SAMPLIB JCL writes the three required files on the export list volume using a private volume.

```
//CBRSPPXP  JOB 1,'EXPORT',MSGLEVEL=(1,1)
//*******************************************************************
//*
//*  $SEG(CBRSPPXP) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A PRIVATE VOLUME TO WRITE THE
//*  EXPORT LIST VOLUME AND INITIATE THE EXPORT OPERATION.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATASET NAMES ARE FICTIONAL.
//*
//*******************************************************************
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE EXPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL PRIVATE VOLUME (EXP001), CREATE THE EXPORT LIST
//* VOLUME WITH THE 3 REQUIRED FILES.
//*******************************************************************
//* FILE SEQUENCE 1:  EXPORT LIST VOLUME FILE WITH LIST OF VOLUMES
//*   TO BE EXPORTED ALONG WITH THEIR DESTINATIONS.  ALL VOLUMES
//*   WITH THE SAME DESTINATION WILL BE GROUPED TOGETHER ON
//*   THE SAME SET OF STACKED VOLUMES.
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT LIST 01
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* FOLLOWING THE EXPORT LIST FILE IDENTIFYING RECORD, THE LIST OF
//* FILE RECORDS CONTAIN TWO FIELDS SEPARATED BY A DELIMITER.  THE
//* FIELDS, VOLSER AND DESTINATION, MUST APPEAR IN THAT ORDER
//* SEPARATED BY A FIELD DELIMITER.
//*-----------------------------------------------------------------
//* THE VOLSER FIELD IS 6 CHARACTERS LONG.
//*-----------------------------------------------------------------
//* THE FIELD DELIMITER MUST BE A COMMA.
```

Figure 33. Sample JCL for an Export List Volume Using a Private Volume (Part 1 of 3)

```
//*-------------------------------------------------------------------
//* THE DESTINATION FIELD FOR THE LOGICAL VOLUME IS 1-16 CHARACTERS
//* LONG.  A BLANK DESTINATION IS ALSO VALID.
//*-------------------------------------------------------------------
//* FOR MORE DETAILED INFORMATION ON THE REQUIRED FORMAT
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
EXPORT LIST 01
VOLSR1,DISASTER
VOLSR2,DISASTER
VOLSR3,BACKUP
VOLSR4,BACKUP
VOLSR5
/*
//SYSUT2   DD DSN=HILEVELQ.EXPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN,,,SER=EXP001),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 2:  RESERVED FILE (FOR FUTURE USE).
//*-------------------------------------------------------------------
//* THE RESERVED FILE MUST BE PRESENT, HOWEVER ITS LENGTH OR
//* CONTENTS IS NOT CHECKED OR USED.
//*******************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
RESERVED FILE
/*
//SYSUT2   DD DSN=HILEVELQ.RESERVED,
//            VOL=(,RETAIN,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 3:  EXPORT STATUS FILE
//*-------------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT STATUS 01
```

Figure 33. Sample JCL for an Export List Volume Using a Private Volume (Part 2 of 3)

```
//*-------------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-------------------------------------------------------------------
//* CHECK THIS FILE AFTER THE EXPORT OPERATION IS COMPLETED FOR
//* INDIVIDUAL VOLUME EXPORT RESULTS.
//*-------------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE
//* REFER TO THE IBM TOTALSTORAGE ENTERPRISE AUTOMATED TAPE
//* LIBRARY (3494) OPERATOR GUIDE.
//*******************************************************************
//STEP3    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
EXPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.EXPSTATS,
//            VOLUME=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(3,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*****************************************************************
//* THE FOLLOWING STEP CAN BE USED TO INITIATE THE EXPORT
//* OPERATION AT THE LIBRARY.  USING THE CBRSPLCS SAMPLE PROGRAM
//* FROM SAMPLIB, CODE THE VOLSER NAME THAT WAS USED TO CREATE THE
//* EXPORT LIST VOLUME IN THE INPUT TRANSACTION RECORD.  REFER TO
//* THE CBRSPLCS SAMPLE PROGRAM FOR THE CORRECT SYNTAX FOR
//* INITIATING AN EXPORT OPERATION.  ONCE THE TRANSACTION RECORD
//* HAS BEEN CREATED, THE FOLLOWING STEP CAN BE UNCOMMENTED TO
//* INITIATE THE EXPORT OPERATION.
//*
//* NOTE:  THE FOLLOWING STEP COULD ALSO BE MODIFIED TO EXECUTE
//*        AN INSTALLATION'S UTILITY CAPABLE OF ISSUING THE
//*        LIBRARY EXPORT,VOLSER OPERATOR COMMAND.
//*
//*****************************************************************
//*STEP4    EXEC PGM=CBRSPLCS,COND=(4,LT)
//*SYSPRINT DD SYSOUT=*
//*INDD     DD DSN=HILEVELQ.TRANSIN.EXPORT,DISP=OLD
//*OUTDD    DD DSN=HILEVELQ.TRANSOUT.EXPORT,UNIT=SYSDA,
//*            SPACE=(TRK,(1,1)),DISP=(NEW,CATLG)
//*SYSIN    DD DUMMY
//*
//
```

Figure 33. Sample JCL for an Export List Volume Using a Private Volume (Part 3 of 3)

SAMPLIB member CBRSPX03

This SAMPLIB JCL writes the three required files on the export list volume using a private volume and export list format 03. Export list format 03 is only valid with the TS7700 Virtualization Engine and is used for copy export.

```
//CBRSPX03  JOB 1,'EXPORT',MSGLEVEL=(1,1)
//*******************************************************************
//*
//*  $SEG(CBRSPX03) COMP(SAM) PROD(OAM):
//*
//*  SAMPLE JOB THAT USES A PRIVATE VOLUME TO WRITE THE
//*  EXPORT LIST VOLUME USING FORMAT 03 AND INITIATE
//*  THE EXPORT OPERATION. EXPORT LIST FILE FORMAT 03 IS
//*  USED WITH THE COPY EXPORT SUPPORT AND IS ONLY
//*  VALID WITH THE TS7700 VIRTUALIZATION ENGINE.
//*
//*  BEFORE RUNNING THIS JOB, YOU MUST ALTER THE JCL.
//*  THIS JCL IS AN EXAMPLE.  THE VOLUME SERIAL NUMBERS AND
//*  DATASET NAMES ARE FICTIONAL.
//*
//*  CHANGE ACTIVITY:
//*    $L0=HYDRA13 1J0 032607 TUCPSS: OA20065 TS7700/HYDRA R13
//*
//*******************************************************************
//*******************************************************************
//* DO NOT USE COMPACTION WHEN WRITING THE EXPORT LIST VOLUME FILES.
//*******************************************************************
//* USING A LOGICAL PRIVATE VOLUME (EXP001), CREATE THE EXPORT LIST
//* VOLUME WITH THE 3 REQUIRED FILES.
//*******************************************************************
//* FILE SEQUENCE 1:  EXPORT LIST VOLUME FILE USED IN A COPY
//*   EXPORT OPERATION SPECIFYING THE PHYSICAL VOLUME POOL BEING
//*   EXPORTED.
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT LIST 03
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
//*-----------------------------------------------------------------
//* FOLLOWING THE EXPORT LIST FILE IDENTIFYING RECORD, THE REQUIRED
//* EXPORT PARAMETERS ARE DEFINED IN THE SECOND RECORD AND MUST
//* BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN THE FIRST COLUMN:
//* EXPORT PARAMETERS PHYSICAL POOL TO EXPORT:xx
//*-----------------------------------------------------------------
//* xx IS A TWO BYTE FIELD WHERE xx IS THE PHYSICAL VOLUME POOL
//* THAT CONTAINS THE LOGICAL VOLUMES TO EXPORT.
//*-----------------------------------------------------------------
//* FOLLOWING THE EXPORT PARAMETERS RECORD, EXPORT OPTIONS CAN BE
//* SPECIFIED IN THE OPTION1 RECORD, STARTING IN THE FIRST COLUMN.
```

Figure 34. Sample JCL for an Export List Volume Using a Private Volume and Export List Format 03 (Part 1 of 3)

```
//*
//* OPTIONS1,EJECT,COPY
//*
//*   IF SPECIFYING OPTIONS1, AT LEAST ONE OF THESE KEYWORDS MUST BE
//*   SPECIFIED:
//*
//*     EJECT - MOVE EXPORTED STACKED VOLUMES DIRECTLY TO THE EJECT
//*             CATEGORY INSTEAD OF THE EXPORT-HOLD CATEGORY
//*      COPY - SPECIFIES THAT THIS EXPORT REQUEST WILL BE PERFORMED
//*             USING A COPY EXPORT OPERATION.
//*
//*   WITH VERSON 03 IF THE "COPY" EXPORT TYPE IS NOT SPECIFIED
//*   IN AN OPTIONS1 RECORD, IT IS ASSUMED.
//*
//* MULTIPLE SPECIFICATIONS MUST BE SEPARATED BY A COMMA DELIMITER
//* AND CAN APPEAR IN ANY ORDER.
//*
//*******************************************************************
//STEP1    EXEC PGM=IEBGENER
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
EXPORT LIST 03
EXPORT PARAMETERS PHYSICAL POOL TO EXPORT:05
OPTIONS1,EJECT,COPY
/*
//SYSUT2   DD DSN=HILEVELQ.EXPLIST,
//            UNIT=3490,LABEL=(,SL),
//            DISP=(NEW,KEEP),VOL=(,RETAIN,,,SER=EXP001),
//            DCB=(RECFM=FB,BLKSIZE=80,LRECL=80,TRTCH=NOCOMP)
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 2:  RESERVED FILE (FOR FUTURE USE).
//*-----------------------------------------------------------------
//* THE RESERVED FILE MUST BE PRESENT, HOWEVER ITS LENGTH OR
//* CONTENTS IS NOT CHECKED OR USED.
//*******************************************************************
//STEP2    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
RESERVED FILE
/*
//SYSUT2   DD DSN=HILEVELQ.RESERVED,
//            VOL=(,RETAIN,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(2,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*******************************************************************
//* FILE SEQUENCE 3:  EXPORT STATUS FILE
//*-----------------------------------------------------------------
//* THE FILE IDENTIFIER AND VERSION NUMBER IS DEFINED IN THE FIRST
//* RECORD AND MUST BE EXACTLY AS ILLUSTRATED BELOW, STARTING IN
//* THE FIRST COLUMN:
//* EXPORT STATUS 01
//*-----------------------------------------------------------------
//* AN OPTIONAL 16 CHARACTER USER FIELD CAN FOLLOW THE VERSION NUMBER
//* WITH A BLANK SPACE SEPARATING THE FIELDS.
```

Figure 34. Sample JCL for an Export List Volume Using a Private Volume and Export List Format 03 (Part 2 of 3)

```
//*-------------------------------------------------------------------
//* CHECK THIS FILE AFTER THE EXPORT OPERATION IS COMPLETED FOR
//* COPY EXPORT RESULTS.
//*-------------------------------------------------------------------
//* FOR DETAILED INFORMATION ON THE STATUS FILE, REFER TO THE
//* TAPE LIBRARY OPERATOR GUIDE.
//*******************************************************************
//STEP3    EXEC PGM=IEBGENER,COND=(4,LT)
//SYSPRINT  DD  SYSOUT=*
//SYSUT1   DD *
EXPORT STATUS 01
/*
//SYSUT2   DD DSN=HILEVELQ.EXPSTATS,
//            VOLUME=(,,REF=*.STEP1.SYSUT2),
//            UNIT=3490,LABEL=(3,SL),
//            DISP=(NEW,KEEP),
//            DCB=*.STEP1.SYSUT2
//SYSIN   DD  DUMMY
//*
//*****************************************************************
//* THE FOLLOWING STEP CAN BE USED TO INITIATE THE EXPORT
//* OPERATION AT THE LIBRARY.  USING THE CBRSPLCS SAMPLE PROGRAM
//* FROM SAMPLIB, CODE THE VOLSER NAME THAT WAS USED TO CREATE THE
//* EXPORT LIST VOLUME IN THE INPUT TRANSACTION RECORD.  REFER TO
//* THE CBRSPLCS SAMPLE PROGRAM FOR THE CORRECT SYNTAX FOR
//* INITIATING AN EXPORT OPERATION.  ONCE THE TRANSACTION RECORD
//* HAS BEEN CREATED, THE FOLLOWING STEP CAN BE UNCOMMENTED TO
//* INITIATE THE EXPORT OPERATION.
//*
//* NOTE:  THE FOLLOWING STEP COULD ALSO BE MODIFIED TO EXECUTE
//*        AN INSTALLATION'S UTILITY CAPABLE OF ISSUING THE
//*        LIBRARY EXPORT,VOLSER OPERATOR COMMAND.
//*
//*****************************************************************
//*STEP4    EXEC PGM=CBRSPLCS,COND=(4,LT)
//*SYSPRINT DD SYSOUT=*
//*INDD     DD DSN=HILEVELQ.TRANSIN.EXPORT,DISP=OLD
//*OUTDD    DD DSN=HILEVELQ.TRANSOUT.EXPORT,UNIT=SYSDA,
//*            SPACE=(TRK,(1,1)),DISP=(NEW,CATLG)
//*SYSIN    DD DUMMY
//*
```

Figure 34. Sample JCL for an Export List Volume Using a Private Volume and Export List Format 03 (Part 3 of 3)

Appendix B. Using ISMF panels to define and monitor your configuration

This topic discusses typical ISMF functions for defining and monitoring the SMS configuration and tape volumes associated with your tape library:

- "Defining a tape library" on page 331.
- "Displaying tape library attributes" on page 341.
- "Redefining a Tape Library" on page 346.
- "Altering a Tape Library" on page 348.
- "Copying Tape Library Definitions" on page 351.
- "Deleting a Tape Library Definition" on page 352.
- "Creating a list of tape libraries" on page 362.
- "Auditing volumes in an automated tape library" on page 366.
- "Altering the volume record" on page 369.
- "Ejecting a Volume from a Tape Library" on page 374.

ISMF for the storage administrator

The Interactive Storage Management Facility (ISMF) supports the system administrator in managing tape libraries and tape volumes through the use of panels and line operator commands. These panels and commands are used to list, define, display, and alter the tape library and tape volume attributes that make up the installation's SMS configuration.

The following series of panels illustrate examples of using ISMF to list, define, display, and alter information concerning the automated and manual tape library through the use of ISMF panels and line operators.

Defining a tape library

ISMF provides a library management function to allow the storage administrator to use a series of panels to define the tape libraries needed for their installation.

To define a tape library, select option 10, LIBRARY MANAGEMENT, from the ISMF Primary Option Menu (as shown in Figure 35 on page 332) to start the library management dialog.

Note: When defining the libraries associated with the Peer-to-Peer VTS Subsystem, remember to define the composite library along with the associated distributed libraries. From an ISMF define perspective, each library is defined as a separate tape library. Their association is established once

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communication is made to the library.

```
  Panel  Help
------------------------------------------------------------------------------
                ISMF PRIMARY OPTION MENU - z/OS DFSMS V1 R13
Selection or Command ===>

0  ISMF Profile              - Specify ISMF User Profile
1  Data Set                  - Perform Functions Against Data Sets
2  Volume                    - Perform Functions Against Volumes
3  Management Class          - Specify Data Set Backup and Migration Criteria
4  Data Class                - Specify Data Set Allocation Parameters
5  Storage Class             - Specify Data Set Performance and Availability
6  Storage Group             - Specify Volume Names and Free Space Thresholds
7  Automatic Class Selection - Specify ACS Routines and Test Criteria
8  Control Data Set          - Specify System Names and Default Criteria
9  Aggregate Group           - Specify Data Set Recovery Parameters
  10 Library Management        - Specify Library and Drive Configurations
11 Enhanced ACS Management   - Perform Enhanced Test/Configuration Management
C  Data Collection           - Process Data Collection Function
G  Report Generation         - Create Storage Management Reports
L  List                      - Perform Functions Against Saved ISMF Lists
P  Copy Pool                 - Specify Pool Storage Groups for Copies
R  Removable Media Manager   - Perform Functions Against Removable Media
X  Exit                      - Terminate ISMF
Use HELP Command for Help; Use END Command or X to Exit.
```

Figure 35. ISMF Primary Option Menu Panel

When you select option 10, Library Management, the Library Management Selection Menu is displayed, as shown in Figure 36.

Note: Since this manual deals with OAM's relationship with tape libraries, only the tape option is discussed. For more information on OAM's role with optical libraries, see *z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support*.

```
  Panel  Help
------------------------------------------------------------------------------
                    LIBRARY MANAGEMENT SELECTION MENU
Enter Selection or Command ===>  __

 1  Optical Library          - Optical Library Configuration
 2  Optical Drive            - Optical Drive Configuration
 3  Tape Library             - Tape Library Configuration









Use HELP Command for Help; Use END Command to Exit.
```

Figure 36. Library Management Selection Menu Panel

Selecting option 3, Tape Library, and hitting ENTER displays the Tape Library Application Selection panel (see Figure 37 on page 333).

Note: For example purposes, a CDS name of SCDS.TEMP.PRIMARY, and library names of LIB1 and LIB2 are used in the panels in this appendix.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                      TAPE LIBRARY APPLICATION SELECTION
Command ===>_

To Perform Library Operations, Specify:

  CDS Name . . . . . . . 'SCDS.TEMP.PRIMARY'
                           (1 to 44 character data set name or 'ACTIVE')
  Library Name . . . . . LIB1   (For Tape Library List, fully or
                                 Partially Specified or * for all)

Select one of the following options:
  3  1. LIST    - Generate a list of Libraries
     2. DISPLAY - Display a Library
     3. DEFINE  - Define a Library
     4. ALTER   - Alter a Library

If List option is chosen,
   Enter "/" to selection option  _ Respecify View Criteria
                                  _ Respecify Sort Criteria

Use ENTER Command to Perform Selection;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 37. Tape Library Application Selection Panel

To begin the library definition process:

1. Enter a CDS NAME.
2. Enter a LIBRARY NAME.
3. Select option 3, DEFINE.

Notes:

1. The letter “V” is reserved exclusively as the first character in a VOLCAT volume serial number. It readily identifies the volume serial number as belonging to a VOLCAT. To avoid confusion with the VOLCAT naming conventions, you may not use the letter “V” as the first character of a tape library name. Additionally, tape library names may not begin with numeric characters. You may use alphabetics and the special characters “$”, “@”, and “#” for the first character of a tape library name. You may use alphabetic, numeric, and the aforementioned special characters for the remainder of a tape library name.
2. After the first library definition, ISMF primes CDS NAME and LIBRARY NAME with the last used reference values on the Tape Library Application Selection panel. The default CDS NAME is the single-quoted word ‘ACTIVE’, which represents the currently active configuration.

Choosing option 3, DEFINE, displays the TAPE LIBRARY DEFINE panel with all the input fields set to blank. You can enter a definition for LIB1, as shown in the sample Figure 38 on page 334 and Figure 39 on page 334.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 1 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB1

To Define Library, Specify:

  Description ==> Automated tape library 0001C in
              ==> building 031
  Library ID . . . . . . . . . . . 0001C     (00001 to FFFFF)
  Console Name . . . . . . . . . . LIB1CON
  Entry Default Data Class . . . . DCATLDS
  Entry Default Use Attribute  . . P         (P=PRIVATE or S=SCRATCH)
  Eject Default  . . . . . . . . . K         (P=PURGE or K=KEEP)




Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 38. Tape Library Define Panel (Page 1 of 4)

```
   Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 2 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB1

Media Type:                 Scratch Threshold
  Media1: . . . . . . . . . .    100   (0 to 999999)
  Media2: . . . . . . . . . .    150   (0 to 999999)
  Media3: . . . . . . . . . .    100   (0 to 999999)
  Media4: . . . . . . . . . .      0   (0 to 999999)
  Media5: . . . . . . . . . .      0   (0 to 999999)
  Media6: . . . . . . . . . .      0   (0 to 999999)
  Media7: . . . . . . . . . .      0   (0 to 999999)
  Media8: . . . . . . . . . .      0   (0 to 999999)
  Media9: . . . . . . . . . .      0   (0 to 999999)
  Media10:  . . . . . . . . .      0   (0 to 999999)
  Media11:  . . . . . . . . .      0   (0 to 999999)
  Media12:  . . . . . . . . .      0   (0 to 999999)
  Media13:  . . . . . . . . .      0   (0 to 999999)

Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 39. Tape Library Define Panel (Page 2 of 4)

SCDS NAME and **LIBRARY NAME** are output fields that contain the SCDS and library name you specified in the Tape Library Management Application Selection panel.

Specify the following information for the tape library definition in the tape configuration database and in the current source control data set.

DESCRIPTION
A 120-byte field used for entering a description of the library definition. There are no restrictions on its content.

LIBRARY ID Establishes the connection between the software-assigned library

name and the tape drives that belong to the library. A valid value is entered as five hexadecimal digits. For an ATLDS, it is defined at the library by the customer engineer and must also match what is optionally specified in the HCD LIBRARY-ID parameter. This value is returned by the control unit in response to a read device characteristics command. For an MTL, it must match what was specified in the HCD LIBRARY-ID parameter. Valid values are 00001 – FFFFF; a default value of 00000 is not allowed.

CONSOLE NAME

Specifies the name of the MVS console associated with the tape library being defined. The console name provides precise routing of console messages pertaining to a specific library. When the console name is not specified on the Tape Library Define panel, console name routing support is not provided. The console name is passed to the installation exits for their use. To use console name message routing, the console name defined on this panel must also be defined in the CONSOL*xx* member of the PARMLIB (see the discussion on page 80 for more information on this PARMLIB member). A valid value is entered as two to eight characters. Valid characters are alphanumeric, #, @, or $; the first character must be nonnumeric.

ENTRY DEFAULT DATA CLASS

Specifies the data class to be used to determine the interchange attributes for private volumes entered into the tape library. No other attributes of the data class are used. You can use the cartridge entry installation exit (CBRUXENT) to assign appropriate interchange values that override the default data class specifications.

Note: The specified data class name is not automatically assigned or used as the default data class policy name for outboard policy management.

ENTRY DEFAULT USE ATTRIBUTE

Specifies the default volume use attribute for the cartridges entered into the library being defined.

P Indicates PRIVATE for the entry default use attribute. These tape cartridges can be used to satisfy specific volume requests.

S Indicates SCRATCH for the entry default use attribute. These tape cartridges can be used to satisfy nonspecific volume requests.

EJECT DEFAULT

Specifies the default action for the TCDB volume record when a tape cartridge is ejected from the library being defined.

P Indicates PURGE for the eject default parameter. The volume record is deleted from the TCDB.

K Indicates KEEP for the eject default parameter. The volume record is kept in the TCDB.

Note: No matter which disposition is specified, the volume record in the ATLDS library manager inventory is deleted upon cartridge ejection.

When the first define panel is complete, use the DOWN command to display the second part of the Tape Library Define panel (Figure 39 on page 334). Continue with the definition for library LIB1 by completing part two of the Tape Library Define panel.

SCRATCH THRESHOLD

Specify the minimum acceptable number of scratch volumes for *each* media type in the library being defined. The following are recognized media types:

MEDIA1 IBM Cartridge System Tape. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA2 IBM Enhanced Capacity Cartridge System Tape. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA3 IBM High Performance Cartridge Tape. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA4 IBM Extended High Performance Cartridge Tape. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA5 IBM Enterprise Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA6 IBM Enterprise WORM Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA7 IBM Enterprise Economy Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA8 IBM Enterprise Economy WORM Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA9 IBM Enterprise Extended Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA10 IBM Enterprise Extended WORM Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA11 IBM Enterprise Advanced Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA12 IBM Enterprise Advanced WORM Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

MEDIA13 IBM Enterprise Advanced Economy Tape Cartridge. The number must be in the range of 0 to 999999. The default value of this parameter is 0.

When the number of scratch volumes in the library falls below the scratch volume threshold for that media type, operator action message **CBR3660A** is issued requesting that scratch volumes of the required media type be entered into the library. When the number of scratch volumes exceeds twice the scratch volume threshold for that media type, the message is deleted.

Attention: It is recommended that a scratch threshold be set for *all* media types used within a tape library. If a media type is not being used, the default threshold value of zero (threshold=0) should be used.

Related reading: For more information about setting the scratch threshold, see "Scratch Threshold Setting and Scratch Allocation Implications" on page 61.

When the second define panel is complete, use the DOWN command to display the third part of the Tape Library Define panel (Figure 40). Continue with the definition for library LIB1 by completing part three of the Tape Library Define panel. You may also need to use part four of the Tape Library Define panel (Figure 41 on page 338).

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 3 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB1

  Initial Online Status (Yes, No, or Blank):
    SYS1     ===> YES  SYS2     ===>      SYS3     ===>      SYS4     ===>
    SYS5     ===>      SYS6     ===>      SYS7     ===>
Warning:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group. It is strongly recommended that
  the tape library be connected to individual systems only.

Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 40. Tape Library Define Panel (Page 3 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                              TAPE LIBRARY DEFINE                 Page 4 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB1

  Initial Online Status (Yes, No, or Blank):









Warning:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group. It is strongly recommended that
  the tape library be connected to individual systems only.

Use ENTER to Perform Verification; Use UP Command to View previous Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 41. Tape Library Define Panel (Page 4 of 4)

Note: You can exit the Tape Library Define panel at any time without saving tape library attributes by issuing the CANCEL command.

Specify the following information on this panel:

INITIAL ONLINE STATUS
Specifies how the library being defined will be associated to each system or system group in the SMS complex each time this SCDS is activated. The following are valid values:
- Online (YES)
- Offline (NO)
- Not connected (blank)

A tape library can be connected to any combination of one or more of the systems or system groups defined in the CDS base, but it is strongly recommended that the tape libraries be connected to systems rather than system groups. When a tape library is connected to a system group, the user loses the ability to vary the tape library online or offline to the individual systems in the system group. The ISMF Tape Library panels support both system names and system group names.

The system administrator defining the libraries does not need to be logged on to one of the systems in the SMS complex to define the libraries in that complex—both the TCDB and the SCDS can be moved after being created. However, both the SCDS and the TCDB for the SMS complex being defined must be available to the system administrator during the library definition process.

The definition for the tape library does not take affect until the SCDS to which it is defined is activated. Once the library is defined within the SCDS and the record for the library is updated in the TCDB, the attributes assigned to the last defined library for the SCDS are displayed on the Tape Library Application Selection menu and the Tape Library Define panel as defaults. These values can be modified to define other libraries as needed.

After you complete the definition of LIB1, the Tape Library Application Selection menu (Figure 37 on page 333) is displayed again, and you can define your second tape library as follows:

1. Enter a LIBRARY NAME (LIB2)
2. Press ENTER

Note: Since LIB1 was the last library defined, the SCDS to which it belongs is primed to display in the SCDS NAME field on this panel (assuming the SCDS was reactivated since the definition of LIB1). If you wish to change the SCDS NAME, you may do so here; otherwise, the library (LIB2) that is currently being defined will reside in the same SCDS as LIB1.

The Tape Library Define panels (Figure 42, Figure 43 on page 340, Figure 44 on page 340, and Figure 45 on page 341) are again displayed, and you enter the appropriate information for LIB2.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 1 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB2

To Define Library, Specify:

  Description ==> Automated tape library 0001C in
              ==> building 031
  Library ID . . . . . . . . . . . . 0002C     (00001 to FFFFF)
  Console Name . . . . . . . . . . . LIB2CON
  Entry Default Data Class . . . . . DCMTLDS
  Entry Default Use Attribute  . . P          (P=PRIVATE or S=SCRATCH)
  Eject Default  . . . . . . . . . . K          (P=PURGE or K=KEEP)




Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 42. Tape Library Define Panel (Page 1 of 4

```
   Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 2 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB2

Media Type:                  Scratch Threshold
  Media1: . . . . . . . . . . .    100   (0 to 999999)
  Media2: . . . . . . . . . . .    150   (0 to 999999)
  Media3: . . . . . . . . . . .    100   (0 to 999999)
  Media4: . . . . . . . . . . .      0   (0 to 999999)
  Media5: . . . . . . . . . . .      0   (0 to 999999)
  Media6: . . . . . . . . . . .      0   (0 to 999999)
  Media7: . . . . . . . . . . .      0   (0 to 999999)
  Media8: . . . . . . . . . . .      0   (0 to 999999)
  Media9: . . . . . . . . . . .      0   (0 to 999999)
  Media10:  . . . . . . . . . .      0   (0 to 999999)



Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 43. Tape Library Define Panel (Page 2 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DEFINE                 Page 3 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB2

  Initial Online Status (Yes, No, or Blank):
    SYS1     ===> YES  SYS2     ===>      SYS3     ===>      SYS4     ===>
    SYS5     ===> YES  SYS6     ===>      SYS7     ===>
Warning:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group. It is strongly recommended that
  the tape library be connected to individual systems only.

Use ENTER to Perform Verification; Use DOWN Command to View next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 44. Tape Library Define Panel (Page 3 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                              TAPE LIBRARY DEFINE                 Page 4 of 4
Command ===>

SCDS Name  . : SCDS.TEMP.PRIMARY
Library Name : LIB2

  Initial Online Status (Yes, No, or Blank):









Warning:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group. It is strongly recommended that
  the tape library be connected to individual systems only.

Use ENTER to Perform Verification; Use UP Command to View previous Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 45. Tape Library Define Panel (Page 4 of 4)

After completing these library definitions, you have two libraries—one ATLDS library, LIB1, along with an MTL library, LIB2—defined in the SMS configuration. Defining a tape library using the Tape Library Define panels adds a library record to the TCDB along with the library definition into the specified SCDS.

Displaying tape library attributes

A storage administrator can display the attributes of a tape library dataserver by:

1. Select option 2, DISPLAY, on the Tape Library Application Selection panel (Figure 37 on page 333).
2. Press ENTER.

Figure 46 on page 342 shows the first of the two TAPE LIBRARY DISPLAY panels that are displayed.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DISPLAY                Page 1 of 2
Command ===>_

CDS Name . . . : SCDS.TEMP.PRIMARY
Library Name . :LIB1          Device Type  . :3495-L50
Library Type . :AUTOMATED     Library ID . . :0001C
Description  . :Automated tape library 0001C in building 031


Console Name  . . . . . . . :LIB1CON
Entry Default Data Class  . :DCATLDS
Entry Default Use Attribute :PRIVATE
Eject Default . . . . . . . :KEEP

Media Type:         Media1   Media2   Media3   Media4   Media5
Scratch Threshold:     100      150      100        0        0
Scratch Number:       1250      725     1100        0        0
Media Type:         Media6   Media7   Media8   Media9   Media10
Scratch Threshold:     100      150      100        0        0
Scratch Number:       1250      725     1100        0        0
Media Type:         Media11  Media12  Media13
Scratch Threshold:       50      100      500
Scratch Number:         250      150     1000
Use DOWN Command to View Next Panel;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 46. Tape Library Display Panel (Page 1 of 2)

The following fields are displayed:

CDS NAME The name of the control data set to which this library is associated.

LIBRARY NAME
The name you specified in the library definition on the Tape Library Management Application Selection panel.

LIBRARY TYPE
The type of library. Valid types are: AUTOMATED and MANUAL.

DEVICE TYPE
The device type associated with the library:
- *dddd-mmm* (for an automated tape library including a virtual tape library), where *dddd* is the device type of the library, and *mmm* is the model. For a composite library that is part of a multi-cluster grid, the distributed libraries should be displayed for the underlying machine and model types. “GRID” might be displayed for the composite library’s device type
- MANUAL (for a Manual Tape Library)
- -------- the value is not available.
- ???????? the value cannot be displayed due to an error.

LIBRARY ID Establishes the connection between the software-assigned library name and the tape drives that belong to the library. A valid value is entered as five-hexadecimal digits. For an ATLDS, it is defined at the library by the customer engineer and must also match what is optionally specified in the HCD LIBRARY-ID parameter. This value is returned by the control unit in response to a read device characteristics command. For an MTL, it must match what was specified in the HCD LIBRARY-ID parameter. Valid values are 00001 - FFFFF; a default value of 00000 is not allowed.

DESCRIPTION
This is a 120-byte field that the installation uses to describe the

library. There are no restrictions on its content.

CONSOLE NAME
The name of the MVS console associated with the tape library being defined. The console name provides for precise routing of console messages pertaining to a specific library. When the console name is not specified, console name routing support is not provided. The console name is passed to the installation exits for their use.

ENTRY DEFAULT DATA CLASS
Specifies the data class to be used to determine the interchange attributes for private volumes entered into the tape library. No other attributes of the data class are used. You can use the cartridge entry installation exit (CBRUXENT) to assign appropriate interchange values that override the default data class specifications.

Note: The specified data class name is not automatically assigned or used as the default data class policy name for outboard policy management.

ENTRY DEFAULT USE ATTRIBUTE
The default volume use attribute for the cartridges entered into the library.

PRIVATE These tape cartridges can be used to satisfy specific volume requests.

SCRATCH These tape cartridges can be used to satisfy nonspecific volume requests.

EJECT DEFAULT
The default action for the TCDB volume record when a tape cartridge is ejected from the library being defined.

PURGE The volume record is deleted from the TCDB.

KEEP The volume record is kept in the TCDB.

Note: No matter which disposition is specified, the volume record in the ATLDS library manager inventory is deleted upon cartridge ejection.

MEDIA TYPE The following are recognized media types:

MEDIA1 IBM Cartridge System Tape

MEDIA2 IBM Enhanced Capacity Cartridge System Tape

MEDIA3 IBM High Performance Cartridge Tape

MEDIA4 IBM Extended High Performance Cartridge Tape

MEDIA5 IBM Enterprise Tape Cartridge

MEDIA6 IBM Enterprise WORM Tape Cartridge

MEDIA7 IBM Enterprise Economy Tape Cartridge

MEDIA8 IBM Enterprise Economy WORM Tape Cartridge

MEDIA9 IBM Enterprise Extended Tape Cartridge.

MEDIA10 IBM Enterprise Extended WORM Tape Cartridge.

MEDIA11 IBM Enterprise Advanced Tape Cartridge.

MEDIA12 IBM Enterprise Advanced WORM Tape Cartridge.

MEDIA13 IBM Enterprise Advanced Economy Tape Cartridge.

SCRATCH THRESHOLD
The minimum acceptable number of scratch volumes for each media type in the library.

SCRATCH NUMBER
The number of tape cartridges available to satisfy nonspecific volume requests.

Figure 47 shows the second part of the Tape Library Display panel.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY DISPLAY                Page 2 of 2
Command ===>

CDS Name . . . :SCDS.TEMP.PRIMARY
Library Name . :LIB1
Library Type . :AUTOMATED
Device Type  . :3495-L50
Library ID . . :0001C

Number of Slots  . :16260
Empty Slots  . . . :2050
Initial Online Status :
  *SYSPLX01:      *SYSPLX02:      *SYSPLX03:      *SYSPLX04:
   SYSSTM01:YES    SYSSTM08:       SYSSTM15:       SYSSTM22:
   SYSSTM02:       SYSSTM09:       SYSSTM16:       SYSSTM23:
   SYSSTM03:       SYSSTM10:       SYSSTM17:       SYSSTM24:
   SYSSTM04:YES    SYSSTM11:       SYSSTM18:       SYSSTM25:
   SYSSTM05:       SYSSTM12:       SYSSTM19:       SYSSTM26:
   SYSSTM06:       SYSSTM13:       SYSSTM20:       SYSSTM27:
   SYSSTM07:       SYSSTM14:       SYSSTM21:       SYSSTM28:
Use UP Command to View Previous Panel;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 47. Tape Library Display Panel (Page 2 of 2)

The following fields are displayed:

NUMBER OF SLOTS
The number of tape cartridge slots within the tape library. This number is always zero for an MTL.

EMPTY SLOTS
The number of tape cartridge slots that are empty and available within the tape library. This number is always zero for an MTL.

INITIAL ONLINE STATUS
The status of whether this tape library should be:
- Online (YES)
- Offline (NO)
- Not connected (blank)

to each system or system group in the SMS complex when the SCDS is activated. As the online/offline status is changed with the SMS VARY, LIBRARY command, the current status is maintained in the ACDS but not in the base SCDS. Thus, the status values in the base SCDS may not be current.

The system and system group names shown are the actual names taken from the base configuration record of the CDS. The number of system and

system group names shown can vary between one and thirty-two. The display shows the difference between system names and system group names by preceding each system group name by an asterisk.

Redefining a Tape Library

The storage administrator can redefine a tape library by specifying a tape library that has a record in the TCDB, but no corresponding library definition in this SCDS. The Tape Library Redefine panels (Figure 48, Figure 49 on page 347, Figure 50 on page 347, and Figure 51 on page 348) are displayed when the storage administrator selects option 3, DEFINE, on the Tape Library Application Selection panel, and there is already a tape library record for this library name in the TCDB. The library is redefined since most of the information describing the library already resides in the TCDB and does not have to be re-entered.

When the redefine panel is first shown, message DGTLM020—ATTRIBUTES PRIMED appears to emphasize that a redefine is taking place. When END is pressed, a record is added to the new SCDS. The TCDB is updated only if one of the relevant fields on a redefine panel is changed. The changes are not effective until the updated SCDS is activated.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          TAPE LIBRARY REDEFINE            ATTRIBUTES PRIMED
Command ===>_

SCDS Name  . :SCDS.TEMP2.PRIMARY
Library Name :LIB1
Library Type :AUTOMATED
Device Type  :3495-L50

To Redefine Library, Specify:
  Description ===> Automated tape library 0001C in
              ===> building 031

  Library ID . . . . . . . . . . . 0001C     (00001 to FFFFF)
     Note: Library ID changes will be reflected in the TCDB without having the
           configuration with the Library Name activated.
  Console Name . . . . . . . . . . LIB1CON
  Entry Default Data class . . . .
  Entry Default Use Attribute  . . P         (P=PRIVATE or S=SCRATCH)
  Eject Default  . . . . . . . . . K         (P=PURGE or K=KEEP)



Use ENTER to Perform Verification; Use DOWN Command to View Next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 48. Tape Library Redefine Panel (Page 1 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY REDEFINE           ATTRIBUTES PRIMED
Command ===>_

SCDS Name  . :SCDS.TEMP2.PRIMARY
Library Name :LIB1
Library Type :AUTOMATED
Device Type  :3495-L50


Media Type:                 Scratch Threshold             Scratch Number
  Media1  . . . . . . . . . . 100      (0 to 999999)         1250
  Media2  . . . . . . . . . . 150      (0 to 999999)         725
  Media3  . . . . . . . . . . 100      (0 to 999999)         1100
  Media4  . . . . . . . . . . 0        (0 to 999999)         0
  Media5  . . . . . . . . . . 0        (0 to 999999)         0
  Media6  . . . . . . . . . . 0        (0 to 999999)         0
  Media7  . . . . . . . . . . 0        (0 to 999999)         0
  Media8  . . . . . . . . . . 0        (0 to 999999)         0
  Media9  . . . . . . . . . . 0        (0 to 999999)         0
  Media10 . . . . . . . . . . 0        (0 to 999999)         0
  Media11 . . . . . . . . . . 0        (0 to 999999)         0
  Media12 . . . . . . . . . . 0        (0 to 999999)         0
  Media13 . . . . . . . . . . 0        (0 to 999999)         0

Use ENTER to Perform Verification; Use DOWN Command to View Next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 49. Tape Library Redefine Panel (Page 2 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY REDEFINE           ATTRIBUTES PRIMED
Command ===>

SCDS Name  . . . :SCDS.TEMP2.PRIMARY
Library Name . . :LIB1
Library Type . . :AUTOMATED             * SYS GROUP= Sysplex minus systems in
Device Type  . . :3495-L50              sysplex explicitly defined SCDS
Library ID . . . :0001C
Number of Slots  :16260                 Empty Slots . . :2050
  Initial Online Status (Yes, No, or Blank):
*SYSPLX01 ===>      *SYSPLX02 ===>      *SYSPLX03 ===>     *SYSPLX04 ===>
 SYSSTM01 ===> YES   SYSSTM04 ===> YES   SYSSTM07 ===>      SYSSTM10 ===>
 SYSSTM02 ===>       SYSSTM05 ===>       SYSSTM08 ===>      SYSSTM11 ===>
 SYSSTM03 ===>       SYSSTM06 ===>       SYSSTM09 ===>      SYSSTM12 ===>

WARNING:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group.  It is strongly recommended that
  the tape library be connected to individual systems only.
Use ENTER to Perform Verification; Use UP/DOWN Command to View Other Panels;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 50. Tape Library Redefine Panel (Page 3 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                           TAPE LIBRARY REDEFINE            ATTRIBUTES PRIMED
Command ===>

SCDS Name . . :SCDS.TEMP2.PRIMARY
Library Name  :LIB1
Library Type  :AUTOMATED               * SYS GROUP = Sysplex minus systems in
Device Type . :3495-L50                sysplex explicitly defined in SCDS.
Library ID  . :0001C
Number of Slots :16260                 Empty Slots  . :2050
  Initial Online Status (Yes, No, or Blank):
 SYSSTM13 ===> YES   SYSSTM17 ===> YES   SYSSTM21 ===>      SYSSTM25 ===>
 SYSSTM14 ===>       SYSSTM18 ===>       SYSSTM22 ===>      SYSSTM26 ===>
 SYSSTM15 ===>       SYSSTM19 ===>       SYSSTM23 ===>      SYSSTM27 ===>
 SYSSTM16 ===>       SYSSTM20 ===>       SYSSTM24 ===>      SYSSTM28 ===>

WARNING:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group.  It is strongly recommended that
  the tape library be connected to individual systems only.
Use ENTER to Perform Verification; Use UP Command to View Previous Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 51. Tape Library Redefine Panel (Page 4 of 4)

The following fields are primed from the TCDB when the Tape Library Redefine panels are displayed:

- DESCRIPTION
- LIBRARY ID
- CONSOLE NAME
- SCRATCH THRESHOLD

The following fields are maintained in the SCDS and not in the TCDB. Since there is no SCDS definition to supply these values for redefine, the redefine panel displays the following primed values:

- ENTRY DEFAULT DATA CLASS (blanks)
- ENTRY DEFAULT USE ATTRIBUTE (PRIVATE)
- EJECT DEFAULT (KEEP)
- INITIAL ONLINE STATUS
  - NO for the system the user is logged on to (if that system is included in this SCDS)
  - blanks for all other systems

Note: If identical values in different CDSs are needed, the COPY line operator on the TAPE LIBRARY LIST panel should be used.

Altering a Tape Library

The Tape Library Alter panels are displayed when a storage administrator selects option 4, ALTER, on the Tape Library Application Selection panel or enters the alter line operator on the Tape Library List panel (see Figure 65 on page 362 through Figure 71 on page 365).

You can use the Tape Library Alter option to alter the attributes of an existing tape library. Altering a library results in updating the library definition within the specified SCDS and the attributes stored in the TCDB.

You can alter the tape library, LIB1, to change its definition in the tape configuration database by using the Tape Library Alter panel. To alter the tape library, start from the Tape Library Application Selection panel, shown in Figure 37 on page 333:

1. Specify the name of the SCDS containing the tape library you want to change (SCDS.TEMP.PRIMARY).
2. Specify the tape library name (LIB1).
3. Select option 4, ALTER.

ISMF displays the Tape Library Alter panels shown in Figure 52, Figure 53 on page 350, Figure 54 on page 350, and Figure 55 on page 351.

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY ALTER                  Page 1 of 4
Command ===>_

SCDS Name  . :SCDS.TEMP.PRIMARY
Library Name :LIB1
Library Type :AUTOMATED
Device Type  :3495-L50

To ALTER Library, Specify:
  Description ===> Automated tape library 0001C in
              ===> building 031

  Library ID . . . . . . . . . . . . 0001C     (00001 to FFFFF)
     Note: Library ID changes will be reflected in the TCDB without having the
           configuration with the Library Name activated.
  Console Name . . . . . . . . . . . LIB1CON
  Entry Default Data Class . . . . . DCATLDS
  Entry Default Use Attribute  . . . P         (P=PRIVATE or S=SCRATCH)
  Eject Default  . . . . . . . . . . K         (P=PURGE or K=KEEP)



Use ENTER to Perform Verification; Use DOWN Command to View Next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 52. Tape Library Alter Panel (Page 1 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY ALTER                  Page 2 of 4
Command ===>_

SCDS Name  . :SCDS.TEMP.PRIMARY
Library Name :LIB1
Library Type :AUTOMATED
Device Type  :3495-L50


Media Type:                Scratch Threshold             Scratch Number
  Media1  . . . . . . . . . . . 100      (0 to 999999)         1250
  Media2  . . . . . . . . . . . 150      (0 to 999999)         725
  Media3  . . . . . . . . . . . 100      (0 to 999999)         1100
  Media4  . . . . . . . . . . . 0        (0 to 999999)         0
  Media5  . . . . . . . . . . . 0        (0 to 999999)         0
  Media6  . . . . . . . . . . . 0        (0 to 999999)         0
  Media7  . . . . . . . . . . . 0        (0 to 999999)         0
  Media8  . . . . . . . . . . . 0        (0 to 999999)         0
  Media9  . . . . . . . . . . . 0        (0 to 999999)         0
  Media10 . . . . . . . . . . . 0        (0 to 999999)         0
  Media11 . . . . . . . . . . . 0        (0 to 999999)         0
  Media12 . . . . . . . . . . . 0        (0 to 999999)         0
  Media13 . . . . . . . . . . . 0        (0 to 999999)         0

Use ENTER to Perform Verification; Use DOWN Command to View Next Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 53. Tape Library Alter Panel (Page 2 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY ALTER                  Page 3 of 4
Command ===>

SCDS Name  . . . :SCDS.TEMP.PRIMARY
Library Name . . :LIB1
Library Type . . :AUTOMATED           * SYS GROUP = Sysplex minus systems in
Device Type  . . :3495-L50            sysplex explicitly defined SCDS
Library ID . . . :0001C
Number of Slots  :16260               Empty Slots  . . :2050

  Initial Online Status (Yes, No, or Blank):
   *SYSPLX01 ===>      *SYSPLX02 ===>      *SYSPLX03 ===>     *SYSPLX04 ===>
    SYSSTM01 ===> YES   SYSSTM04 ===> YES   SYSSTM07 ===>      SYSSTM10 ===>
    SYSSTM02 ===>       SYSSTM05 ===>       SYSSTM08 ===>      SYSSTM11 ===>
    SYSSTM03 ===>       SYSSTM06 ===>       SYSSTM09 ===>      SYSSTM12 ===>
WARNING:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group.  It is strongly recommended that
  the tape library be connected to individual systems only.
Use ENTER to Perform Verification; Use UP/DOWN Command to View Other Panels;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 54. Tape Library Alter Panel (Page 3 of 4)

```
  Panel  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY ALTER                  Page 4 of 4
 Command ===>

 SCDS Name . . :SCDS.TEMP.PRIMARY
 Library Name  :LIB1
 Library Type  :AUTOMATED              * SYS GROUP = Sysplex minus systems in
 Device Type . :3495-L50               sysplex explicitly defined in SCDS
 Library ID  . : 0001C
 Number of Slots :16260                Empty Slots:      2050
   Initial Online Status (Yes, No, or Blank):
  SYSSTM13 ===> YES   SYSSTM17 ===> YES   SYSSTM21 ===>      SYSSTM25 ===>
  SYSSTM14 ===>       SYSSTM18 ===>       SYSSTM22 ===>      SYSSTM26 ===>
  SYSSTM15 ===>       SYSSTM19 ===>       SYSSTM23 ===>      SYSSTM27 ===>
  SYSSTM16 ===>       SYSSTM20 ===>       SYSSTM24 ===>      SYSSTM28 ===>

WARNING:
  When you connect a tape library to a system group rather than a system,
  you lose the ability to vary that library online or offline to the
  individual systems in the system group.  It is strongly recommended that
  the tape library be connected to individual systems only.

Use ENTER to Perform Verification; Use UP Command to View Previous Panel;
Use HELP Command for Help; Use END Command to Save and Exit; CANCEL to Exit.
```

Figure 55. Tape Library Alter Panel (Page 4 of 4)

The following fields can be altered:

- DESCRIPTION
- LIBRARY ID
- CONSOLE NAME
- ENTRY DEFAULT DATA CLASS
- ENTRY DEFAULT USE ATTRIBUTE
- EJECT DEFAULT
- INITIAL ONLINE STATUS

Copying Tape Library Definitions

You can copy existing tape library definitions and modify them to create new tape library definitions through the use of two methods.

One method is to use the attributes assigned to the last tape library defined. These fields are primed by ISMF from the last library definition. You can modify the attributes to define a new tape library and the new tape library is added to the SCDS and the tape configuration database.

Another method of copying existing tape library definitions to create new tape library definitions is to use the COPY line operator from the Tape Library List panel (see Figure 65 on page 362 through Figure 71 on page 365). You enter the COPY line operator in the LINE OPERATOR column next to the tape library you wish to copy. Press ENTER to copy the existing tape library attributes and the COPY ENTRY panel is displayed (see Figure 56 on page 352).

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                          COPY ENTRY PANEL

Command ===>

  Definition will be copied from:

    Data Set Name . :'SCDS.TEMP.PRIMARY'
    Definition Name : LIB1
    Definition Type : TAPE LIBRARY

  Specify "Copy To" Definition:

    Data Set Name . .   'SCDS.TEMP2.PRIMARY'
                                (1 to 46 characters)

    Definition Name . .           (1 to 8 characters, fully specified)

    Enter "/" to select option  _ Perform Alter


 Use ENTER to Perform Copy;
 Use HELP Command for Help; Use END Command to Exit.
```

Figure 56. Copy Entry Panel

Identifying the From and To Sources for Copying

The *from* DATA SET NAME field identifies the source that you are copying. It is primed with the value you specified on the Tape Library Application Selection panel. The *from* DEFINITION NAME field identifies the name of the tape library that you are copying. This field is primed with the value from the LIBRARY NAME field of the Tape Library List panel.

The *to* DATA SET NAME field identifies the target SCDS of the copy. It must be a name of an SCDS. It is primed with the value of the *from* DATA SET NAME if the *from* DATA SET NAME contains an SCDS name. It is primed with blanks if the *from* DATA SET NAME is 'ACTIVE'. The *to* DEFINITION NAME field identifies the name of the tape library you wish to define. It is primed with blanks.

In the PERFORM ALTER field, you indicate if you want to change some of the attributes of the copy you are creating. If you specify **Y** for YES, you go to the pertinent Alter panel. If you specify **N** for NO, you remain on the COPY ENTRY PANEL, where you can perform another copy or return to the original library list panel.

When copying a tape library definition from one SCDS into another SCDS, you do not need to select the PERFORM ALTER option. In the case where a tape library definition is copied within the same SCDS, you must choose the PERFORM ALTER option because tape libraries in the same SCDS must differ from one definition to another.

When you have specified the values, press ENTER to perform the copy.

Deleting a Tape Library Definition

Deleting a tape library definition removes the definition for that tape library from the specified SCDS and, upon activation of that SCDS, the tape library data server is unavailable to the system. Deleting a tape library dataserver has no effect on the

TCDB because there may be other SCDSs that still contain the tape library data server. In order to delete a tape library from the TCDB, IDCAMS with the DELETE LIBENTRY parameters must be used.

As part of the tape library definition deletion, all storage group constructs in the SCDS that are defined as including the library undergoing deletion are updated to remove that library from the storage group definition. When the last library is deleted from a tape storage group, the invalid tape storage group definition remains in the SCDS. The SCDS will not validate until all invalid tape storage group definitions are either deleted or altered so that they contain at least one tape library.

From the Tape Library List panel (see Figure 65 on page 362 through Figure 71 on page 365):

1. Enter DELETE in the LINE OPERATOR column next to the tape library you wish to delete.
2. Press ENTER.

   The Confirm Delete Request panel, Figure 57, is displayed.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                          CONFIRM DELETE REQUEST
Command ===>

  To Confirm Deletion on the following Tape Library:

     Tape Library Name  :LIB1
     Residing in SCDS . :'SCDS.TEMP.PRIMARY'


  Specify the following:
     Enter "/" to select option   _ Perform Deletion









Use ENTER to Perform Operation;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 57. Confirm Delete Request Panel

3. Confirm that the displayed library is the one that you want to delete. If it is, enter **Y** for YES, or **N** for NO.
4. Press ENTER.

The Tape Library List appears with '*DELETE' in the LINE OPERATOR column next to the deleted library.

Monitoring and maintaining tape volumes

The ISMF Volume function assists in the maintenance and verification of the tape volumes within the automated and manual tape library through the use of the Mountable Tape Volume Application available from the Tape Library application Selection panel.

Using the Mountable Tape Volume Application, storage administrators can use line operators or ISMF commands to perform inventory tasks against tape libraries and the library-resident volumes residing in them. These functions can be performed using the Mountable Tape Volume Application:

- **AUDIT** a volume, a list of volumes, or a tape library.
- **ALTER** the use attribute, storage group, shelf location, or owner information of a volume or list of volumes.
- **EJECT** a single tape volume (for information on using the EJECT line operator, see "Ejecting a Volume from a Tape Library" on page 374).

Note: If the library in which the volume resides supports outboard policy management, the assigned storage class name, management class name, and data class name are not maintained in the tape configuration database, nor are they displayed through the mountable tape volume application. Use the DISPLAY SMS, VOLUME command or the LCS external services QVR function to obtain this information.

ISMF mountable tape volume application

The ISMF Mountable Tape Volume Application allows you to create, save, and restore lists of tape cartridge volumes. A selection panel allows you to generate a list based on any combination of the following criteria (wildcards are supported):

- A fully or partially specified volume serial number
- A fully or partially specified storage group name
- A fully or partially specified tape library name

You can use the **View**, **Sort**, and **Hide** functions to further customize your volume lists.

Note: If the TCDB is being shared across multiple z/OS system levels, volume levels containing TDSI information that is not understood by the level of the software on the system will not be displayed when a volume list is requested from ISMF. This prevents the z/OS system from processing volume records containing TDSI information that is not understood by the system.

Generating a Mountable Tape Volume List

There are actually two options available from the ISMF Primary Option menu that can be used to assist you in generating a Mountable Tape Volume List. Both approaches are discussed in the following information.

Follow these steps to display the Mountable Tape Volume Selection Entry panel using the Library Management option of the ISMF Primary Option Menu.

1. Select option 10, Library Management, from the ISMF Primary Option Menu (see Figure 35 on page 332). ISMF displays the Library Management Selection menu (see Figure 36 on page 332).
2. Select option 3, TAPE LIBRARY. This in turn, displays the Tape Library Application Selection panel (Figure 37 on page 333).

   Note: Depending on the information provided on this screen, selecting option 1, LIST, and pressing ENTER can either display a list that includes a single library, a fully or partially specified library, or a list of all the libraries associated with the SCDS primed on the Tape Library Application Selection panel.
3. When the library list is displayed, type the line operator command LISTVOL next to the library name or names for which you need a volume listing.

Follow these steps to bring up the Mountable Tape Volume Selection Entry panel from the VOLUME option of the ISMF Primary Option Menu.

1. Select option 2, VOLUME, from the ISMF Primary Option Menu (see Figure 35 on page 332). ISMF displays the Volume List Selection Menu (see Figure 58).

```
  Panel  Help
------------------------------------------------------------------------------
                          VOLUME LIST SELECTION MENU

Enter Selection or Command ===>


  1 DASD                     - Generate a list of DASD volumes
  2 Mountable Optical        - Generate a list of Mountable Optical volumes
  3 Mountable Tape           - Generate a list of Mountable Tape volumes









Use HELP Command for Help; Use END Command to Exit.
```

Figure 58. Volume List Selection Menu Panel

2. Select option 3, MOUNTABLE TAPE, which prompts the display of Mountable Tape Volume Selection Entry Panel (Figure 59).

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                MOUNTABLE TAPE VOLUME SELECTION ENTRY PANEL
Command ===>

Select Source to Generate Volume List  . . 2    (1 - Saved list, 2 - New list)

    1  Generate from a Saved List
         List Name . .

    2  Generate a New List from Criteria Below
         Volume Serial Number . . .  *          (fully or partially specified)
         Library Name . . . . . . .  *          (fully or partially specified)
         Storage Group Name . . . .  *          (fully or partially specified)

        Enter "/" to select option   _ Respecify View Criteria
                                     _ Respecify Sort Criteria




Use ENTER to Perform Selection;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 59. Mountable Tape Volume Selection Entry Panel

This panel allows you to generate a volume list.

When option 1, SAVED LIST, is selected, you enter the name of the saved list in the **LIST NAME** field under option *1 GENERATE FROM A SAVED LIST*. A previously saved list is displayed.

When option 2, NEW LIST, is chosen, a new list is built using the selection criteria you described in the *GENERATE A NEW LIST FROM CRITERIA BELOW* data columns. *z/OS DFSMS Using the Interactive Storage Management Facility* describes all the columns in the Mountable Tape Volume Selection Entry Panel. Complete the following fields for option 2 (default):

VOLUME SERIAL NUMBER
Enter a full or partial serial number of the volume or volumes to include in the list. The default value is an asterisk. The volume serial number must consist entirely of upper case alphabetics A–Z and numerics 0–9.

To include a single volume, enter a fully qualified volume serial number of 1 to 6 characters: VOLUME SERIAL NUMBER ===> **SYS001**

For a partially qualified volume serial number, use asterisks as global volume serial number characters or percent signs as place holders. For example, to include a range of volumes, enter a partially qualified volume serial number by using one or two asterisks as global volume serial number characters: VOLUME SERIAL NUMBER ===> **T*9***

Use a single asterisk to specify all mounted volumes that fit your other selection criteria: VOLUME SERIAL NUMBER ===> * This field is primed with the last value used. The default value is an asterisk.

LIBRARY NAME
Enter the 1 to 8 character name of a tape library, or a partially qualified name. This field is primed with the last value used. The default value is an asterisk.

STORAGE GROUP NAME
Enter the 1 to 8 character name of an SMS storage group, in the same way as you would for a volume serial number. This field is primed with the last value used. The default value is an asterisk.

RESPECIFY VIEW CRITERIA
This field is used to specify whether or not to invoke the Mountable Tape Volume View Entry panel before displaying the sort or list panel. Values are **Y** or **N**.

RESPECIFY SORT CRITERIA
This field is used to specify whether or not to invoke the Mountable Tape Volume View Sort panel before displaying the list. Values are **Y** or **N**.

Final Step: Generating the List

After entering the information you want on the Mountable Tape Volume Selection Entry panel, you are ready to generate the list. Press ENTER to display the volumes that meet your selection criteria. If you specified view or sort criteria, the VIEW or SORT panels are displayed before the volume list.

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MOUNTABLE TAPE VOLUME LIST
Command ===>                                                SCROLL ===> PAGE
                                                        Entries 1-11 of 11
Enter Line Operators Below:                            Data Columns 3-7 of 20

    LINE       VOLUME  USE      VOLUME              CHECKPT  LIBRARY  STORAGE
    OPERATOR   SERIAL  ATTR     ERROR STATUS        VOLUME   NAME     GRP NAME
   ---(1)----  -(2)--  --(3)--  -------(4)--------  --(5)--  --(6)--- --(7)---
               VOL01   PRIVATE  I/O ERROR           NO       SHELF    TAPE1
               VOL02   SCRATCH  UNEXPIRED SCRATCH   ---      SHELF    *SCRTCH*
               VOL101  SCRATCH  NO ERROR           NO       SHELF    *SCRTCH*
               VOL102  SCRATCH  PASSWORD CONFLICT   NO       LIB1     *SCRTCH*
               VOL103  SCRATCH  SECURITY CONFLICT   NO       LIB2     *SCRTCH*
               VOL104  PRIVATE  SCRATCH IN USE      ---      LIB2     TAPE1
               VOL105  PRIVATE  VOLSER MISMATCH     NO       LIB1     TAPE1
               VOL106  SCRATCH  CHECKPOINT CONFLICT  YES      LIB2     *SCRTCH*
               VOL107  SCRATCH  WRITE CONFLICT      YES      LIB1     *SCRTCH*
               VOL108  PRIVATE  NOT IN SLOT         NO       LIB1     TAPE1
               VOL109  PRIVATE  NO ERROR            NO       LIB1     TAPE1
   ----------  ------  -----------  BOTTOM  OF  DATA  -----  ----     -------
```

Figure 60. Mountable Tape Volume List Panel (part 1 of 5).

LINE OPERATOR
This is the input column used to specify the line operator that is invoked against the volumes listed in column 2 of the same row.

VOLUME SERIAL NUMBER
Specifies the mountable tape volume serial number.

USE ATTR
Use characteristics of the volume:

PRIVATE A tape cartridge that can only be used by referencing its serial number and usually contains data.

SCRATCH A tape cartridge that can be used to satisfy a nonspecific mount request.

??????? The values cannot be displayed due to an error.

VOLUME ERROR STATUS
Shows the error status of individual tape volumes.

CHECKPT VOLUME
Checkpoint volume indicator. Values are YES, NO, or --- (when blank).

LIBRARY NAME
The name of the library in which the tape volume resides. SHELF is used for volumes outside the library.

STORAGE GRP NAME
The storage group to which the volume is assigned, *SCRTCH*, or -------- (when blank).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MOUNTABLE TAPE VOLUME LIST
Command ===>                                                 SCROLL ===> PAGE
                                                         Entries 1-14 of 14
Enter Line Operators Below:                             Data Columns 8-12 of 20

    LINE       VOLUME  MEDIA     RECORDING   COMPACTION  SPECIAL    LAST
    OPERATOR   SERIAL  TYPE      TECHNOLOGY              ATTRIBUTE  WRITTEN DATE
   ---(1)----  -(2)--  --(8)--   ---(9)----  ---(10)---- --(11)---  ----(12)----
               VOL01   MEDIA1    18TRACK     YES         RDCOMPAT   1994/12/17
               VOL02   MEDIA2    36TRACK     NO          --------   1995/03/22
               VOL101  MEDIA3    128TRACK    YES         --------   1996/08/30
               VOL102  MEDIA2    36TRACK     NO          --------   1994/09/21
               VOL103  MEDIA2    36TRACK     NO          --------   1995/11/03
               VOL104  MEDIA1    18TRACK     YES         RDCOMPAT   1995/03/07
               VOL105  MEDIA3    128TRACK    YES         --------   1997/04/26
               VOL106  MEDIA1    18TRACK     NO          --------   1995/01/11
               VOL107  MEDIA1    36TRACK     YES         --------   1994/02/24
               VOL108  MEDIA3    128TRACK    YES         --------   1996/10/31
               VOL109  MEDIA4    384TRACK    YES         --------   2001/12/29
               VOL110  MEDIA5    EFMT1       ---         --------   2004/07/09
               VOL111  MEDIA9    EFMT2       YES         --------   2005/08/30
               VOL112  MEDIA10   EFMT2       ---         --------   2005/08/30
               VOL113  MEDIA9    EEFMT2      YES         --------   2006/08/30
               VOL114  MEDIA10   EEFMT2      ---         --------   2006/08/30
    ----------  ------  -----------  BOTTOM  OF  DATA    --------   ------------
```

Figure 61. Mountable Tape Volume List Panel (part 2 of 5).

MEDIA TYPE

This data column indicates the type of media of the volume. The valid values are:

MEDIA1 IBM Cartridge System Tape

MEDIA2 IBM Enhanced Capacity Cartridge System Tape

MEDIA3 IBM High Performance Cartridge Tape

MEDIA4 IBM Extended High Performance Cartridge Tape

MEDIA5 IBM Enterprise Tape Cartridge.

MEDIA6 IBM Enterprise WORM Tape Cartridge.

MEDIA7 IBM Enterprise Economy Tape Cartridge.

MEDIA8 IBM Enterprise Economy WORM Tape Cartridge.

MEDIA9 IBM Enterprise Extended Tape Cartridge.

MEDIA10 IBM Enterprise Extended WORM Tape Cartridge.

MEDIA11 IBM Enterprise Advanced Tape Cartridge.

MEDIA12 IBM Enterprise Advanced WORM Tape Cartridge.

MEDIA13 IBM Enterprise Advanced Economy Tape Cartridge.

RECORDING TECHNOLOGY

This data column indicates the number of recording tracks on the tape. Valid values are as follows:

18TRACK 18-track recording technology

36TRACK 36-track recording technology

128TRACK 128-track recording technology

256TRACK 256-track recording technology

384TRACK 384-track recording technology

EFMT1 Enterprise Format 1 recording technology

EFMT2 Enterprise Format 2 recording technology

EEFMT2 Enterprise Encrypted Format 2 recording technology

EFMT3 Enterprise Format 3 recording technology

EEFMT3 Enterprise Encrypted Format 3 recording technology

EFMT4 Enterprise Format 4 recording technology

EEFMT4 Enterprise Encrypted Format 4 recording technology

-------- Recording technology not specified

???????? Recording technology unknown

COMPACTION

This field indicates whether or not the tape data sets are compacted on this volume. Valid values are:

YES Data sets on the tape volume are compacted.

NO Data sets on the tape volume are not compacted.

--- The value is not specified.

??? The values cannot be displayed due to an error.

SPECIAL ATTRIBUTE

This data column indicates special attributes defined for the volume. Valid values are:

RDCOMPAT Read compatible, which means on subsequent allocations the system should attempt to use read compatible devices.

-------- The value is not specified.

LAST WRITTEN DATE

The date when a data set was last opened for output on the volume in the form of YYYY/MM/DD, where YYYY is the year, MM is the month of the year, and DD is the day of the month.

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MOUNTABLE TAPE VOLUME LIST
Command ===>                                                  SCROLL ===> PAGE
                                                        Entries 1-11 of 11
Enter Line Operators Below:                            Data Columns 13-16 of 20

    LINE       VOLUME  LAST        LAST ENTER/  VOLUME       VOLUME
    OPERATOR   SERIAL  MOUNT DATE  EJECT DATE   EXPIRE DATE  CREATE DATE
   ---(1)----  -(2)--  ---(13)---  ---(14)----  ---(15)----  ---(16)----
               VOL01   1994/12/17  1995/02/05   2050/10/31   1994/01/14
               VOL02   1995/03/22  1995/05/19   2050/10/31   1994/12/04
               VOL101  1996/08/30  1996/10/08   2050/10/31   1996/04/30
               VOL102  1994/09/21  1994/11/12   2050/10/31   1994/03/11
               VOL103  1995/11/03  1996/04/15   2050/10/31   1995/08/21
               VOL104  1995/03/07  1995/04/12   2050/10/31   1994/09/01
               VOL105  1997/01/26  1997/02/17   2050/10/31   1996/11/17
               VOL106  1995/01/11  1996/11/30   2050/10/31   1994/07/29
               VOL107  1994/05/09  1994/10/28   2050/10/31   1994/01/11
               VOL108  1994/02/24  1995/06/02   2050/10/31   1994/01/01
               VOL109  1996/10/31  1997/01/31   2050/10/31   1996/07/15
   ----------  ------  ----------   BOTTOM  OF  DATA -----   -----------
```

Figure 62. Mountable Tape Volume List Panel (part 3 of 5).

LAST MOUNT DATE
The date when the volume was last mounted and successfully opened in the form of YYYY/MM/DD, where YYYY is the year, MM is the month of the year, and DD is the day of the month.

LAST ENTER/EJECT DATE
The date when the tape volume was last entered into, or ejected from, a library. If the volume location is SHELF, then the date specified is the date the volume was ejected from the library. If the volume location is LIBRARY, then the date specified is the date the volume was entered into the library. The form for this date is YYYY/MM/DD, where YYYY is the year, MM is the month of the year, and DD is the day of the month.

VOLUME EXPIRE DATE
The latest expiration date among the data sets on the volume. The form for this date is YYYY/MM/DD, where YYYY is the year, MM is the month of the year, and DD is the day of the month.

VOLUME CREATE DATE
The date when the volume record was created. The form for this date is YYYY/MM/DD, where YYYY is the year, MM is the month of the year, and DD is the day of the month.

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MOUNTABLE TAPE VOLUME LIST
Command ===>                                                 SCROLL ===> PAGE
                                                          Entries 1-11 of 11
Enter Line Operators Below:                              Data Columns 17-19 of 20

    LINE       VOLUME  WRITE    VOLUME
    OPERATOR   SERIAL  PROTECT  LOCATION             SHELF LOCATION
   ---(1)----  -(2)--  -(17)--  --(18)--  --------------(19)--------------
               VOL01   NO       SHELF     FREE FORM LOCATION
               VOL02   ---      SHELF     SHELF LOCATION #1
               VOL101  NO       SHELF     --------------------------------
               VOL102  NO       LIBRARY   CABINET 02 SHELF 04 NUMBER 11
               VOL103  NO       LIBRARY   OFFSITE
               VOL104  ---      LIBRARY   SHELF 1
               VOL105  NO       LIBRARY   SHELF 2
               VOL106  YES      LIBRARY   --------------------------------
               VOL107  YES      LIBRARY   SHELF 3
               VOL108  NO       LIBRARY   SHELF 4
               VOL109  NO       LIBRARY   SHELF 5
   ----------  ------  -----------  BOTTOM  OF  DATA ---------------------
```

Figure 63. Mountable Tape Volume List Panel (part 4 of 5).

WRITE PROTECT
The tape volume write protection status. Valid values are YES, NO, or --- (when blank).

VOLUME LOCATION
Information concerning whether the tape volume is library- or shelf-resident.

SHELF LOCATION
Information about tape cartridge residence outside a library.

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                          MOUNTABLE TAPE VOLUME LIST
Command ===>                                                 SCROLL ===> PAGE
                                                          Entries 1-11 of 11
Enter Line Operators Below:                              Data Columns 20-20 of 20

     LINE       VOLUME
     OPERATOR   SERIAL                    OWNER INFORMATION
    ---(1)----  -(2)--  -------------------------(20)-------------------------
                VOL01   THIS IS FREEFORM INFORMATION ABOUT THE OWNER OF THIS CAR
                VOL02   THE FORMAT OF THIS COLUMN IS DETERMINED BY INSTALLATION
                VOL101  ------------------------------------------------------
                VOL102  ------------------------------------------------------
                VOL103  COLUMN1.............COLUMN2.....................COLUM
                VOL104  OWNER INFORMATION #1
                VOL105  OWNER INFORMATION #2
                VOL106  OWNER INFORMATION #3
                VOL107  OWNER INFORMATION #4
                VOL108  OWNER INFORMATION #5
                VOL109  OWNER INFORMATION #6
    ----------  ------  -----------  BOTTOM  OF  DATA  ------------------------
```

Figure 64. Mountable Tape Volume List Panel (part 5 of 5).

OWNER INFORMATION
Identifies the volume owner. This field only displays a maximum of 56 out of 64 characters per line on the panel.

Creating a list of tape libraries

Generating a tape library list allows you to audit all the volumes within the selected tape library. You may generate a library list in much the same way that the volume list is created. Follow the same directions as in “Final Step: Generating the List” on page 356 to generate the library list.

Once you have generated the library list, the tape library list panels are displayed (Figure 65 through Figure 71 on page 365). See “Displaying tape library attributes” on page 341 for descriptions of the attributes on these panels.

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY LIST
Command ===>                                                SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 3-7 of 34
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

     LINE       LIBRARY   DEVICE    LIBRARY    LIBRARY  CONSOLE   ENTRY DEF
     OPERATOR   NAME      TYPE      TYPE       ID       NAME      DATA CLASS
     ---(1)---- --(2)---  --(3)---  ---(4)---  --(5)--  --(6)---  ---(7)----
                LIB1      3495-L50  AUTOMATED  0001C    LIB1CON   DCATLDS
                LIB2      MANUAL    MANUAL     0002C    LIB2CON   DCMTLDS
                --------  --------  ---------  -----    --------  ----------
                --------  --------  ---------  -----    --------  ----------
                --------  --------  ---------  -----    --------  ----------
                --------  --------  ---------  -----    --------  ----------
                --------  --------  ---------  -----    --------  ----------
                --------  --------  ---------  -----    --------  ----------
    ----------  --------  ------  BOTTOM  OF  DATA  ------  --------  ------
```

Figure 65. Tape Library List Panel (part 1 of 7).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY LIST
Command ===>                                                SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 8-13 of 34
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

   LINE       LIBRARY   ENTRY DEF  EJECT    NUM     EMPTY   MEDIA1   MEDIA1
   OPERATOR   NAME      USE ATTR   DEFAULT  SLOTS   SLOTS   SCR NUM  SCR THR
  ---(1)----  --(2)---  ---(8)---  --(9)--  -(10)-  -(11)-  -(12)--  -(13)--
              LIB1      PRIVATE    KEEP      16260    2050     1250      100
              LIB2      PRIVATE    KEEP          0       0     2100      100
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
              --------  -------    ----     ------  ------   ------  -------
  ----------  --------  ------  BOTTOM  OF  DATA  ------  --------  --------
```

Figure 66. Tape Library List Panel (part 2 of 7).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                              TAPE LIBRARY LIST
Command ===>                                                  SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 14-19 of 342
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

     LINE       LIBRARY   MEDIA2   MEDIA2   MEDIA3    MEDIA3   MEDIA4   MEDIA4
     OPERATOR   NAME      SCR NUM  SCR THR  SCR NUM   SCR THR  SCR NUM  SCR THR
    ---(1)----  --(2)---  -(14)--  -(15)--  -(16)--   -(17)--  -(18)--  -(19)--
                LIB1          725      150     1100       100  -------  -------
                LIB2         1750      150        0         0  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
    ----------  --------  ------  BOTTOM  OF  DATA    -------  -------  -------
```

Figure 67. Tape Library List Panel (part 3 of 7).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                              TAPE LIBRARY LIST
Command ===>                                                  SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 20-25 of 34
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

     LINE       LIBRARY   MEDIA5   MEDIA5   MEDIA6    MEDIA6   MEDIA7   MEDIA7
     OPERATOR   NAME      SCR NUM  SCR THR  SCR NUM   SCR THR  SCR NUM  SCR THR
    ---(1)----  --(2)---  -(20)--  -(21)--  -(22)--   -(23)--  -(24)--  -(25)--
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
    ----------  --------  ------  BOTTOM  OF  DATA    -------  -------  -------
```

Figure 68. Tape Library List Panel (part 4 of 7).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY LIST
Command ===>                                                 SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 26-31 of 34
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

     LINE       LIBRARY   MEDIA8   MEDIA8   MEDIA9   MEDIA9    MEDIA10  MEDIA10
     OPERATOR   NAME      SCR NUM  SCR THR  SCR NUM  SCR THR   SCR NUM  SCR THR
    ---(1)----  --(2)---  -(26)--  -(27)--  -(28)--  -(29)--   -(30)--  -(31)--
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
                --------   ------  -------  -------   -------  -------  -------
    ----------  --------  ------  BOTTOM  OF  DATA    -------  -------  -------
```

Figure 69. Tape Library List Panel (part 5 of 6).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                            TAPE LIBRARY LIST
Command ===>                                                 SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 32-37 of 34
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

LINE       LIBRARY   MEDIA11  MEDIA11  MEDIA12  MEDIA12   MEDIA13  MEDIA13
OPERATOR   NAME      SCR NUM  SCR THR  SCR NUM  SCR THR   SCR NUM  SCR THR
---(1)----  --(2)---  -(32)--  -(33)--  -(34)--  -(35)--   -(36)--  -(37)--
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
            --------   ------  -------  -------   -------  -------  -------
----------  --------  ------  BOTTOM  OF  DATA    -------  -------  -------
```

Figure 70. Tape Library List Panel (part 6 of 7).

```
  Panel  List  Utilities  Scroll  Help
------------------------------------------------------------------------------
                              TAPE LIBRARY LIST
Command ===>                                                 SCROLL ===> PAGE
                                                          Entries 1-11 of 24
                                                          Data Columns 38-40 of 40
CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:

     LINE       LIBRARY   LAST MOD  LAST DATE   LAST TIME
     OPERATOR   NAME      USERID    MODIFIED    MODIFIED
    ---(1)----  --(2)---  -(38)---  ---(39)--   --(40)---
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
                --------  -------   ----------  --------
    ----------  --------  ------  BOTTOM  OF  DATA  ----
```

Figure 71. Tape Library List Panel (part 7 of 7).

Viewing and sorting a list

You can sort and tailor a list with the View, Sort, and Hide options on the Mountable Tape Volume List or the Tape Library List panels. *z/OS DFSMS Using the Interactive Storage Management Facility* discusses the View, Sort, and Hide options in more detail.

Auditing volumes in an automated tape library

From the ISMF panels, you can use the AUDIT line operator or the ISMF AUDIT command to verify the location of the tape volumes in your tape libraries.

AUDIT provides three auditing scopes:
- Single volume audit (invoked by the AUDIT line operator)
- Volume list audit (invoked by the AUDIT command)
- Library audit (invoked by the AUDIT line operator

Note: The audit functions are not supported in an MTL.

AUDIT can be invoked as an ISMF line operator on the Mountable Tape Volume List panel (single volume audit) or from the Tape Library List panel (library audit).

AUDIT can also be invoked as an ISMF command to audit all eligible volumes on the Mountable Tape Volume List (volume list audit). ISMF is an important part of the audit scheme because it allows you to start with an entire tape volume list, and then by using sorting and filtering capabilities, you can reduce that list to a subset of volumes; for example, all the volumes in a single storage group. You can then use the AUDIT command to request an audit of all volumes in that subset list.

Note: In an environment with multiple systems at different z/OS software levels but sharing a common TCDB, library audits should be performed on the system with the highest software level of z/OS. A library audit on a lower level z/OS software level does not include higher release level volumes if they are media types unknown to the lower level software.

You may want to use the following criteria when filtering a volume list:
- Fully or partially qualified volume serial number
- Fully or partially qualified storage group name
- Fully or partially qualified library name
- Other criteria using ISMF VIEW, SORT, and HIDE

Before scheduling an audit request for an automated tape library, ensure that the following criteria is met:
- The library must be defined in the SMS configuration.
- The library must be online, operational, and not pending offline.
- For an automated tape library dataserver, the library must *not* be in manual mode and the vision system must be operative.

Verifying External Volume Labels Using the ATLDS Vision System

The library vision system on an ATLDS verifies the external label on the volume at the physical location specified in the library manager data base. The cartridge is not mounted and read, only the external label is verified. The following actions are performed when an audit is requested against volumes in an automated tape library dataserver:
- The system verifies that the tape volume has an entry in the library manager.
- The visual system verifies that the tape volume is in its assigned location in the automated tape library dataserver.
- The vision system verifies that the external cartridge label of the tape volume is present and readable.
- The system verifies that the tape is accessible in the automated tape library dataserver.

Verifying VTS logical volume entries in the library manager

Because a logical volume may or may not yet exist on a physical piece of media (a stacked volume), the following actions are performed when an audit is requested against logical volumes in the virtual tape server.

- The system verifies that the logical volume has an entry in the library manager.
- If the logical volume resides on a physical piece of media, the vision system verifies that the physical volume is in its assigned location in the automated tape library dataserver.
- The vision system verifies that the external cartridge label of the physical volume is present and readable.

Verifying Volumes in a 3584 Tape Library

Audit verification of a physical volume or of a logical volume whose virtual tape server resides in a 3584 tape library does not result in the library physically scanning the volume's label. Instead, the library manager queries the 3584 Library database to confirm that it has the volume in the expected cell. For a logical volume, the physical volume on which the logical volume resides is queried.

Using the AUDIT command or line operator

To perform a volume list audit from the MOUNTABLE TAPE VOLUME LIST panel, use the AUDIT command on the command line of the ISMF panel.

To perform a library audit from the TAPE LIBRARY LIST panel use the AUDIT line operator next to the tape library name. When you specify a library audit, all volume serial numbers known to that library by the host are audited.

Because a library audit and a volume list audit might take a long time to complete, a confirmation panel is displayed whenever these audits are requested. This panel gives you the opportunity to confirm or cancel the audit request. To confirm, type in **Y**, then press ENTER. See Figure 72 for the Confirm Audit Request panel.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                            CONFIRM AUDIT REQUEST

Command ===>

  Number of Volumes to be Audited: 5



Specify the Following:
   Enter "/" to select option   _ Perform Audit



   Note: If audit is performed, audit requests will be interspersed with other
         requests, with the audit request having low priority.




Use ENTER to Perform Operation;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 72. Confirm Audit Request Panel

Note: The audit operation can be a lengthy process. During AUDIT execution, other activity in the library is *not* quiesced and AUDIT requests are prioritized lower than other requested functions. It may take *several* hours

for you to receive notification that a full library audit or an extensive volume list audit has completed. Therefore, when scheduling an audit, take work load and time factors into consideration.

Receiving AUDIT completion messages

When you invoke the AUDIT line operator or AUDIT command successfully, AUDIT SCHEDULED is displayed on the Mountable Tape Volume List. A completion message indicating success or failure of the audit is sent to the storage administrator. In the case of using the AUDIT line operator, if the volume is successfully scheduled for an audit, the volume has ***AUDIT** displayed in the line operator column. Audits that are not successfully scheduled have **¬AUDIT** or **?AUDIT** in the line operator column.

When you receive an audit completion message, you can use the **REFRESH** command to update the MOUNTABLE TAPE VOLUME LIST or the TAPE LIBRARY LIST with the same selection criteria. The results of the audit are shown in the VOLUME ERROR STATUS column and you also receive a message with the error results.

Identifying Audit Discrepancies

If discrepancies are found when performing an audit, they are related to you by the following means:

- Scheduling error messages for full library audits are issued to your TSO logon session, unless the scheduling error occurred before any volumes from the library being successfully scheduled and that error was severe enough to prevent any other volumes in the library from also being scheduled. This early detected severe error is reported on the ISMF panel through the help facilities offered by ISMF. Messages contain the volume serial number (if known) of the volume for which the error was found and text that indicates the type of error found in attempting to validate an audit request.

  If the scope of the audit is volume list or single volume, scheduling errors are not reported to your TSO logon session. These errors are indicated on return to the ISMF panel from which the AUDIT request was initiated and can be interrogated by using the message and help facilities offered through the ISMF panels. See *z/OS DFSMSdfp Storage Administration* for more information about the ISMF message and help facilities.
- Errors incurred while attempting to perform the physical audit for any of the three audit scopes, (single volume, volume list, or full library) are reported to your TSO logon session.
- After auditing a volume, the error status field (ERRSTAT) of the tape configuration database (TCDB) volume record is updated.
- As notification that the audit has been completed and that the error status fields can be reviewed, a completion message is sent to you.

  Note: The volume error status field contains only the last error found; no history is kept.

Detecting Software Errors

If a software error (such as an internal label error) exists before an AUDIT and the AUDIT detects no errors, the software error is retained and *not* updated. Only one value is retained in the volume error status field. No history of errors is maintained for this field. If no software error exists before the AUDIT, the volume error status field is updated with the new volume error status.

No attempts are made to fix the problems at the time of detection because, based on the error found, the software is unable to determine exactly what the corrective action should be.

If you end the TSO session before the audit completes, messages are stored in the broadcast data set and are displayed the next time you initiate your TSO session.

Altering the volume record

ISMF allows you to alter the use attribute, storage group, shelf location, and owner information of a single tape volume or a volume list through the use of the ALTER line operator or the ISMF ALTER command. These commands are used from the Mountable Tape Volume List panel (see Figure 60 on page 357).

ISMF is an important part of the alter scheme when used in conjunction with the ALTER command because it allows you to start with an entire tape volume list, and then by using sorting and filtering capabilities, you can reduce that list to a subset of volumes; for example, all the volumes in a single storage group. You can then use the ALTER command against the subset list to change information for *all* the volumes on the list at once. In an ATLDS, you can also use the ALTER command to take the volume out of the error category in the library manager inventory.

Using the ALTER command or line operator

When you invoke the ALTER command on the MOUNTABLE TAPE VOLUME LIST panel, the same values for use attribute, storage group, shelf location, and owner information are assigned to ALL the volumes in the list.

The Mountable Tape Volume Alter Entry Panel (Figure 73) is displayed.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                  MOUNTABLE TAPE VOLUME ALTER ENTRY PANEL
Command ===>


Number of Volumes to be Altered: 10

Specify New Values for the Following Fields (Blank means no change):

  Use Attribute  . .      (P - Private, S - Scratch, or blank)

  Storage Group  . .

  Shelf Location . .

  Owner Information
    ===>




Use ENTER to Perform ALTER;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 73. Alter from the Mountable Tape Volume Alter Entry Panel

When the ALTER line operator is entered from the Mountable Tape Volume List panel, the Mountable Tape Volume Alter Entry Panel (see Figure 74 on page 370) is displayed to allow the storage administrator to enter the new values for the specific volume requested. The following four screen examples provide more

information regarding the ALTER function for a specific tape volume.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                  MOUNTABLE TAPE VOLUME ALTER ENTRY PANEL
Command ===>

Tape Volume :EMB001

Specify New Values for the Following Fields:       (leave as-is if no change)

Use Attribute: Old Value   :PRIVATE
               New Value . . P          (P - Private or S - Scratch)

Storage Group: Old Value   :
               New Value . .

Shelf Location:Old Value   :
               New Value . .

Owner Information:
    Old Value:
New Value  . .

Use ENTER to Perform ALTER;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 74. Mountable Tape Volume Alter Entry Panel Displayed (ALTER Request)

Adding Values to the Tape Volume Information

If, when the volume was entered into the library, no values were specified for storage group name, shelf-location, or owner information, the OLD VALUE fields on this panel are blank and the tape volume record reflects blanks in these fields in the TCDB. The storage administrator then adds the values for owner information, storage group, and shelf location into the NEW VALUE field and hits ENTER. The fields are updated in the TCDB, and the next time the volume is displayed, the new information appears in the OLD VALUE fields. The NEW VALUE field is primed with the same information as well (see Figure 75).

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                  MOUNTABLE TAPE VOLUME ALTER ENTRY PANEL
Command ===>

Tape Volume:EMB001

Specify New Values for the Following fields:      (leave as-is if no change)

Use Attribute: Old Value   :PRIVATE
               New Value . . P        (P - Private or S - Scratch)

Storage Group: Old Value   :MTLGRP1
               New Value . . MTLGRP1

Shelf Location:Old Value   :EILEENS DESK
               New Value . . EILEENS DESK

Owner Information:
    Old Value:EILEEN
New Value  . . EILEEN

Use ENTER to Perform ALTER;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 75. Both OLD VALUE and NEW VALUE Reflect the Values Assigned to the Volume

Changing Values Associated with a Tape Volume

If the storage administrator types blanks over the NEW VALUE for storage group, shelf location, or owner information, the corresponding field in the tape volume record is set to blank and the NEW VALUE field shows as blank the next time the record in displayed. See Figure 76.

```
  Panel  Utilities  Help
-------------------------------------------------------------------------------
                   MOUNTABLE TAPE VOLUME ALTER ENTRY PANEL
Command ===>

Tape Volume:EMB001

Specify New Values for the Following Fields:      (leave as-is if no change)

Use Attribute: Old Value   :PRIVATE
                New Value . . P        (P - Private or S - Scratch)

Storage Group: Old Value   :
                New Value . .

Shelf Location:Old Value   :EILEENS DESK
                New Value . . EILEENS DESK

Owner Information:
    Old Value:EILEEN
New Value  . . EILEEN

Use ENTER to Perform ALTER;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 76. NEW VALUE Blanked Out for Storage Group

Note that both the OLD VALUE and the NEW VALUE for storage group are now blank. To add a storage group again, the storage administrator indicates the new value for storage group in the NEW VALUE field and hits ENTER (see Figure 77).

```
  Panel  Utilities  Help
-------------------------------------------------------------------------------
                   MOUNTABLE TAPE VOLUME ALTER ENTRY PANEL
Command ===>

Tape Volume:EMB001

Specify New Values for the Following Fields:       (leave as-is if no change)

Use Attribute: Old Value   :PRIVATE
                New Value . .           (P - Private or S - Scratch)

Storage Group: Old Value   :
                New Value . . MTLGRP2

Shelf Location:Old Value   :EILEENS DESK
                New Value . . EILEENS DESK

Owner Information:
    Old Value:EILEEN
New Value  . . EILEEN

Use ENTER to Perform ALTER;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 77. New Storage Group Assigned After Storage Group was Altered to Blank

Validating New Values through ISMF

ISMF validates the NEW VALUE input for the use attribute to allow only 'P' or 'S'. The NEW VALUE input for storage group is validated on the same selection entry panel; however, blanks are acceptable in this field.

ISMF does not validate the existence of the storage group in the active configuration; however, if the tape volume is library-resident, OAM provides the validation to ensure the following:

- The volume's storage group is defined in the current ACDS as a tape storage group.
- The volume's library is defined in the specified storage group.
- The volume's library is defined in the current ACDS as a valid tape library.

Note: If the tape volume is shelf-resident, only the first check is made.

Detecting Errors with New Values

If OAM detects an error in any of the above conditions, neither the use attribute nor the storage group is changed. Shelf location and owner information are not prevented from being altered even though an error is detected.

When an error occurs during the ALTER function, a message is stored in the message history for the entry. The storage administrator can issue the message line operator to obtain the error information.

Confirming an Alter Request

When the storage administrator presses ENTER to perform the alter, the Confirm Alter Request panel (Figure 78) is immediately displayed. The number of volumes that will be altered is displayed. The storage administrator must confirm the alter request by changing **N** to **Y** and pressing ENTER.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                            CONFIRM ALTER REQUEST
Command ===>


Number of Volumes to be Altered:10



   Enter "/" to select option   _ Perform Alter









Use ENTER to Perform Operation;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 78. Confirm Alter Request Confirmation Panel

Changing the Use Attribute from Private to Scratch

If the storage administrator uses the ALTER command to specify a NEW VALUE of scratch for the use attribute and any of the volumes on the list are private with an expiration date that has not yet passed, the Private to Scratch Confirmation Panel (Figure 79) is displayed for *each* volume whose expiration date has not yet passed.

Note: When DFSMSrmm is installed, any attempt to alter the use attribute from private to scratch will be rejected.

```
  Panel  Utilities  Help
------------------------------------------------------------------------------
                    PRIVATE TO SCRATCH CONFIRMATION PANEL
Command ===>


                      Confirm Alter of Volume: EMB001

        Currently this Volume is Private and
        Its Expiration Date has not yet Passed.

Enter "/" to select option   _  Do you still want to change it to scratch?

        You may specify that all private volumes on
        the list should be changed to scratch whether
        or not their expiration dates have passed.
        If you do, the volumes will be changed without
        redisplaying this confirmation panel.

Enter "/" to select option   _  Allow All Private Volumes to be
                                Changed to Scratch?

Use ENTER to Perform Operation;
Use HELP Command for Help; Use END Command to Exit.
```

Figure 79. Private to Scratch Confirmation Panel

If the response is "/" on either confirmation panel, OAM changes the following items:

- The use attribute is changed to **S** in the TCDB.
- The storage group name is set to ***SCRTCH*** in the TCDB.
- The expiration date in the TCDB is blanked out.
- The volume error status is reset to NO ERROR in the TCDB.
- The library manager category of the cartridge is changed from private to scratch (ATLDS only).

Note: The change use attribute installation exit (CBRUXCUA) is invoked whenever there is an attempt to change the use attribute for a tape volume. It may override the request or change the values. See "Change Use Attribute Installation Exit (CBRUXCUA)" on page 213 for more information on this installation exit.

Changing the Use Attribute from Scratch to Private

When the ALTER line operator or the ALTER command changes the use attribute for a single tape volume or a list of tape volumes to private, the following items are performed:

- The use attribute is changed to **P** in the TCDB.
- The volume error status is reset to NO ERROR in the TCDB.
- The category of the cartridge or cartridges is changed from scratch to private (ATLDS only).

The changes to the TCDB volume record are performed immediately. When the line operator or command is complete, the user is returned to the Mountable Tape Volume List panel with the appropriate success or failure message. If the volume or volumes were successfully changed, the ISMF REFRESH command may be used to display the new values in the tape volume record.

Ejecting a Volume from a Tape Library

A single library-resident tape volume can be ejected from a tape library dataserver through the use of the ISMF EJECT line operator. The EJECT line operator is used from the MOUNTABLE TAPE VOLUME LIST application (Figure 60 on page 357). The line operator is typed next to a specific volume, causing the volume to be ejected from the tape library.

Note: For logical volumes in the fast ready category at the VTS, ejecting the volume deletes the logical volume from the VTS. If a logical volume is not in the fast category, the volume must be exported from the library.

Specifying Optional EJECT Line Operator Parameters

There are two optional parameters associated with the EJECT line operator. The first optional parameter specifies **K** for KEEP or **P** for PURGE. This parameter determines whether the tape volume record should be kept or deleted in the TCDB once the tape volume is ejected. No matter which disposition is specified, the volume record in the library manager inventory is deleted. If the parameter is not specified, the EJECT DEFAULT for the tape library is used. This parameter can be overridden by the cartridge eject installation exit (CBRUXEJC), which is invoked to approve or deny the EJECT request. See "Cartridge Eject Installation Exit (CBRUXEJC)" on page 236 for more information regarding this installation exit.

The second optional parameter **B** specifies that the tape cartridge is to be placed in the high-capacity output station instead of the convenience output station. If this parameter is not specified or the high-capacity output station is not configured, the cartridge is placed in the convenience output station.

This keyword is only valid for automated tape library dataservers. The keyword is ignored for tape volumes ejected from a manual tape library.

Note: The EJECT line operator is only valid for tape volumes that are library-resident.

Appendix C. Accessibility

Publications for this product are offered in Adobe Portable Document Format (PDF) and should be compliant with accessibility standards. If you experience difficulties when using PDF files, you may view the information through the z/OS Internet Library website or the z/OS Information Center. If you continue to experience problems, send an email to mhvrcfs@us.ibm.com or write to:

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Department H6MA, Building 707
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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.

z/OS information

z/OS information is accessible using screen readers with the BookServer or Library Server versions of z/OS books in the Internet library at:

`http://www.ibm.com/systems/z/os/zos/bkserv/`

One exception is command syntax that is published in railroad track format, which is accessible using screen readers with the Information Center, as described in "Dotted decimal syntax diagrams."

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users accessing the 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

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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 indicate 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.

  Notes:

  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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Glossary

The terms in this glossary are defined as they pertain to the Object Access Method.

This glossary may include terms and definitions from:

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- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Electrotechnical Commission (ISO/IEC JTC2/SC1).
- IBM Dictionary of Computing, New York: McGraw-Hill, 1994.

A

ACS. Automatic class selection.

access method services. The facility used to define and reproduce VSAM key-sequenced data sets (KSDS), and to manage ICF and VSAM catalogs.

ACDS. Active control data set.

active control data set (ACDS). A VSAM linear data set that contains a copy of an active configuration and subsequent updates. All systems in an SMS complex use the ACDS identified in the IGDSMSxx member of the PARMLIB to manage storage.

ATLDS. Automated tape library dataserver.

attribute. A named property of an entity.

automated mode. The mode of operation of an ATLDS in which host requests for mounts and demounts are performed with no operator action.

automated tape library dataserver. A hardware device that automates the retrieval, storage, and control of tape cartridges.

automatic class selection (ACS). Routines that determine the data class, management class, storage class, and storage group for a JCL DD statement. The storage administrator is responsible for establishing ACS routines appropriate to an installation's storage requirements.

B

base configuration information. Part of an SMS configuration, it contains the default management class, default unit, and default device geometry. It also identifies the systems, system groups, or both that an SMS configuration is to manage.

bulk input. The process of adding a large number of tape cartridges to the ATLDS.

bulk output. The process of removing a large number of tape cartridges from the ATLDS.

C

CAF. Call attachment facility.

cartridge. See *tape cartridge*.

cartridge eject. The act of physically removing a tape cartridge, usually under robot control, by placing it in an output station. The software logically removes the cartridge by deleting or updating the tape volume record in the tape configuration database. For a manual or virtual tape library, the act of logically removing a tape cartridge from the tape library by deleting or updating the tape volume record in the tape configuration database.

cartridge entry. The process of logically adding a tape cartridge to the library by creating or updating the tape volume record in the tape configuration database. The cartridge entry process includes the assignment of the cartridge to a scratch or private category in the library.

cartridge loader. An optional feature for the 3480 tape drive. It allows the automatic loading of tape cartridges which have been placed into a loading rack. Manual loading of single tape cartridges is also possible.

category. A logical subset of volumes in a tape library. A category may be assigned by the library manager (for example, the insert category), or by the software (for example, the private or scratch categories).

CDS. Control data set.

cluster. The physical elements of a TS7740/TS7720 Virtualization Engine (3957) that consists of the virtualization component, the cache controller and the cache drawer and as appropriate, the underlying physical library, media, and drives. The term cluster is used synonymously with the term "distributed library".

COMMDS. Communication data set.

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communication data set (COMMDS). The primary mean of communication among systems in an SMS complex. Shared among the systems in the SMS complex, the COMMDS is a VSAM linear data set that contains the name of the ACDS and current utilization statistics for each system-managed volume.

compatibility mode. Mode of running DFSMS/MVS V1R3 or subsequent releases in which no more than eight unique system or system group names are supported in the SMS configuration. When running in this mode, the system may share configurations and communication data sets with systems running down level releases of DFSMS/MVS or DFP. Otherwise, configurations and communication data sets may not be shared.

composite library. The virtual view of a 3494 Peer-to-Peer VTS (3494) or of a TS7740/TS7720 Virtualization Engine(s) to the host. In general, host communications with the library are at the composite level with the virtual volumes and drives being defined to the composite library. A composite library is made up of one or more clusters (distributed libraries).

console name. Specifies the name of the MVS console associated with the library being defined. The console name provides precise routing of console messages pertaining to a specific library.

container. A receptacle in which one or more exported logical volumes can be stored. A stacked volume containing one or more logical volumes and residing outside a virtual tape server library is considered to be the container for those volumes.

control data set (CDS). With respect to SMS, a VSAM linear data set containing configurational, operational, or communication information. SMS uses three types of control data sets: the source control data set (SCDS), the active control data set (ACDS), and the communication data set (COMMDS).

convenience input. The process of adding a small number of cartridges to the ATLDS without interrupting automated operations.

convenience output. The process of removing a small number of cartridges from the ATLDS without interrupting automated operation.

copy export. The operation to remove a secondary copy of the logical volumes from one of the TS7740 Virtualization Engines (3957-V0x). At the end of this operation, the primary copy of the data still resides in the library.

D

Data deduplication. A technology used to reduce the amount of space required to store data on disk. The TS7680 provides an inline data deduplication solution on System z. The TS7680 searches for redundancy in the data as it is being stored. It only stores unique data, but tracks all references, maintaining full quality of the data.

default policy. Outboard policy with default actions. A default policy name consists of blanks. Default actions most likely perform actions that emulate a library with no outboard policy management support.

DFSMS. Data Facility Storage Management Subsystem. An operating environment that helps automate and centralize the management of storage. To manage storage, DFSMS provides the storage administrator with control over data class, management class, storage class, storage group, and automatic class selection routine definitions.

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. Data Facility Storage Management Subsystem data set services. A component of DFSMS that provides data movement, copy, backup and space management functions.

DFSMShsm. Data Facility Storage Management Subsystem hierarchical storage management. A component of DFSMS that provides backup, recovery, migration and space management functions.

DFSMSrmm. Data Facility Storage Management Subsystem removable media manager. A component of DFSMS that manages removable media, both inside and outside libraries.

disk-only VTS. A virtual tape solution, such as the TS7720 Virtualization Engine, that has no backend physical tape. All of the data written to the TS7720 resides in cache.

distributed library. The underlying physical library associated with a Peer-to-Peer VTS (3494) and with a TS7740/TS7720 Virtualization Engine (3957), the term distributed library is used synonymously with the term "cluster".

DOM. Delete operator message. When a situation indicated by a message changes or is satisfied, the message to the operator is deleted from the console.

E

eject. The process used to remove a volume from a system-managed library. For an automated tape library dataserver, the volume is removed from its cell location and moved to the output station. For a manual tape library, the volume is not moved, but the tape configuration database is updated to show the volume no longer resides in the manual tape library.

ESTAE. Extended specify task abnormal exit.

export. The operation to remove one or more logical volumes from a virtual tape server library. First, the list of logical volumes to export must be written on an export list volume and then, the export operation itself must be initiated.

exported logical volume. A logical volume that has gone through the export process and now resides on a stacked volume outside a virtual tape server library.

export list volume. A logical volume containing export operation instructions for the library. This may include a list of the logical volumes to export or other pertinent information.

external label. The machine and human-readable label attached to the outside of a tape cartridge. The label contains the volume serial number of the tape volume.

G

GB. Gigabyte.

GDPS. Geographically Dispersed Parallel Sysplex.

Geographically Dispersed Parallel Sysplex (GDPS). An application that integrates Parallel Sysplex technology and remote copy technology to enhance application availability and improve disaster recovery. GDPS topology is a Parallel Sysplex cluster spread across two sites, with all critical data mirrored between the sites. GDPS manages the remote copy configuration and storage subsystem(s), automates Parallel Sysplex operational tasks, and automates failure recovery from a single point of control.

gigabyte (GB). A unit of measure for storage capacity. One gigabyte equals 1 073 741 824 bytes.

global resource serialization (GRS). A component of MVS/ESA which provides an access control mechanism used to ensure the integrity of resources in a multisystem environment.

grid. A grid is a combination of clusters (distributed libraries), connected together to form a business continuity solution. It provides for automatic (policy based) replication of logical volumes across multiple clusters.

GRS. Global resource serialization.

H

Hardware configuration dialog (HCD). A user-friendly dialog for interacting with MVS for device configuration.

HCD. Hardware configuration dialog.

hybrid configuration. A multi-cluster grid configuration consisting of a TS7720 Virtualization Engine (disk-only) and a TS7740 Virtualization Engine (with back store tape).

I

image copy. An exact reproduction of all or part of an image.

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 one or more existing modules 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.

ICF. Integrated catalog facility.

ID. Identification, identifier.

IDRC. Improved data recording capability.

import. The operation to enter previously exported logical volumes residing on a stacked volume into a virtual tape server library. First, the list of logical volumes to import must be written on an import list volume and the stacked volumes must be entered, then, the import operation itself must be initiated.

import list volume. A virtual tape server logical volume containing the list of logical volumes to import. This list can contain individual logical volumes to import or it can contain a list of stacked volumes in which all logical volumes on the stacked volume are imported.

imported logical volume. An exported logical volume that has gone through the import process and can be referenced as a tape volume within a virtual tape server library. An imported logical volume originates from a stacked volume that went through the export process.

integrated catalog facility (ICF). In the Data Facility Product (DFP), a facility that provides for integrated catalog facility catalogs.

integrated catalog facility catalog. In the Data Facility Product (DFP), a catalog that consists of a basic catalog structure, which contains information about VSAM and non-VSAM data sets, and at least one VSAM volume data set, which contains information about VSAM data sets only.

Interactive Storage Management Facility (ISMF). An ISPF application that provides an interactive set of space 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.

IODF. An input/output definition file (IODF) is a VSAM linear data set that contains I/O definition information. This information includes processor I/O definitions and operating system I/O definitions. A single IODF can contain several processor and several operating system I/O definitions.

ISPF. Interactive System Productivity Facility.

ISMF. Interactive Storage Management Facility.

ISO. International Organization for Standardization.

K

KB. Kilobyte.

kilobyte (KB). A unit of measure for storage capacity. One kilobyte equals 1 024 bytes.

L

LCS. Library Control System.

LCSPL. LCS External Services parameter list.

Library Control System (LCS). The component of OAM that is used in the support of tape libraries.

library manager. The software application that controls all operations in an ATLDS.

library manager database. A database which contains entries for all cartridges in an ATLDS. Each entry contains volume serial number, category, physical location, and volume status information.

library record. The library record contains information related to the library such as library name and logical type. The library record resides within the tape configuration database.

linkage editor. A computer program for creating load modules from one or more object modules or load modules by resolving cross references among the modules and, if necessary, adjusting addresses.

link-edit. To create a loadable computer program by means of a linkage editor.

logical volume. Logical volumes have a many-to-one association with physical tape media and are used indirectly by MVS applications. They reside in a virtual tape server or on exported stacked volumes. Applications can access the data on these volumes only when the volumes reside in a virtual tape server that makes the data available by means of its tape volume cache or after the data has been copied to a physical volume through the use of special utilities.

logical worm. Write-once, read-many (WORM) function provided in the TS7700 Virtualization Engine. A logical volume (MEDIA1 or MEDIA2) is designated as WORM, not by the usage of a special WORM media type, but when it is first mounted and written from load point. WORM functionality is enabled at the TS7700 through data class policy definitions.

M

manual cartridge entry processing. The process by which a volume is added to the tape configuration database when it is added to a manual tape library. DFSMSrmm can initiate this process.

manual mode. The mode of operation of an ATLDS that allows the operator to locate and move the cartridges to and from drives and cells under the direction of the library manager. The robot is not operating.

manual tape library. An installation-defined set of stand-alone tape drives and the set of tape volumes that can be mounted on those drives.

MB. Megabyte.

MEDIA1. Cartridge System Tape.

MEDIA2. Enhanced Capacity Cartridge System Tape.

MEDIA3. High Performance Cartridge Tape.

MEDIA4. Extended High Performance Cartridge Tape.

MEDIA5. Enterprise Tape Cartridge.

MEDIA6. Enterprise WORM Tape Cartridge.

MEDIA7. Enterprise Economy Tape Cartridge.

MEDIA8. Enterprise Economy WORM Tape Cartridge.

MEDIA9. Enterprise Extended Tape Cartridge

MEDIA10. Enterprise Extended WORM Tape Cartridge

MEDIA11. Enterprise Advanced Tape Cartridge

MEDIA12. Enterprise Advanced WORM Tape Cartridge

MEDIA13. Enterprise Advanced Economy Tape Cartridge

Megabyte (MB). A unit of measure for storage capacity. One megabyte equals 1 048 576 bytes.

mount. A host-linked operation which results in a tape cartridge being physically inserted into a tape drive.

MTL. Manual Tape Library.

multi-cluster grid. One or more interconnected clusters (distributed libraries) that together form a grid. The clusters in a grid can be at the production site and also at a remote site for two and three site protection.

O

OAM. Object Access Method.

Object Access Method (OAM). A DFSMSdfp component used in the support of tape libraries.

offline. To make a tape library or a tape drive logically unavailable to a system.

online. To make a tape library or a tape drive logically available to a system.

OAM Storage Management Component (OSMC). 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 Storage and Retrieval (OSR). Component of OAM that stores, retrieves, and deletes objects. OSR stores objects in the storage hierarchy and maintains the information about these objects in DB2 databases.

OSMC. OAM Storage Management Component.

OSR. Object Storage and Retrieval.

outboard. Indicates that a function or action is performed by the tape library, not by the host system software.

outboard policy management. A method of managing tape volumes that defines actions for volume policies at the library instead of at the host.

P

partitioning. Dividing the resources in a tape library (tape drives and tape volumes) among multiple systems or sysplexes, or both for their exclusive use. Each partition may be viewed as a logical library with each logical library (TCDBplex) represented by one TCDB.

paused mode. The mode of operation of an ATLDS where all host commands that require movement of cartridges are queued until the library is returned to automated mode. The robot is not operating. This mode allows the operator to enter the enclosure area briefly to correct a problem, add cartridges to the bulk input station, or remove cartridges from the bulk output station.

Peer-to-Peer Virtual Tape Server (PtP VTS). A 3494 VTS configuration where copies of data in newly created or updated tape volumes are automatically created or updated in each of two interconnected VTSs. This dual-volume copy functionality improves data availability and data recovery, while being transparent to user applications and host processor resources. See also *Virtualization Engine*.

Peer-to-Peer VTS data. The 3494 Peer-to-Peer VTS data (PTPDATA) function allows an installation or application to obtain operational mode settings and device-related information from the PTP VTS library.

Peer-to-Peer VTS library. Multiple 3494 VTS subsystems and their associated tape libraries coupled together to form one subsystem and library image to the host. See also *Virtualization Engine*.

Peer-to-Peer VTS mode control. The 3494 Peer-to-Peer VTS mode control (PTPMC) function allows an installation or application to change current operating modes of the library.

performance scaling. Formatting a tape so that less than its full capacity is used. Formatting a tape to its optimal performance capacity decreases the amount of time required to access the data on the tape. A tape that is formatted to its optimal performance capacity can later be reused and formatted to its full capacity. Performance scaling applies only to MEDIA5, MEDIA9, and MEDIA11 tape cartridge media.

performance segmentation. Formatting a tape into two segments. The fast segment is written to first, providing a performance benefit. Once the fast segment is filled, the other segment is used, which has slower access. Performance segmentation applies only to MEDIA5, MEDIA9, and MEDIA11 tape cartridge media.

physical library. In relationship to a virtual tape server, a physical library is a hardware enclosure consisting of one or more virtual tape server libraries with each virtual tape server being identified to the host as a separate library. Restrictions by the library manager may be set on an individual library basis or on a physical library basis as is the case with import.

physical volume. A volume that has a one-to-one association with physical tape media and which is used directly by MVS applications. It may reside in an automated tape library dataserver or be kept on shelf storage either at vault sites or within the data center where it can be mounted on stand-alone tape drives.

physical volume pool. A set of stacked volumes in the VTS that may be grouped together because of common characteristics.

policy action. Actions defined outboard at the tape library for policies that are assigned to tape library volumes as volume attributes. Specific types of actions are defined to policy types (storage group, storage class, management class, or data class).

policy construct. Name of an SMS construct that is used outboard as a policy name and is assigned to a library-resident tape volume. Policy actions are defined at the library and are not known to the host.

private tape volume. A volume assigned to specific individuals or functions.

PTPDATA. Peer-to-Peer VTS data.

PTPMC. Peer-to-Peer VTS mode control.

PtP VTS. Peer-to-Peer Virtual Tape Server.

R

recording format. For a tape volume, the format of the data on the tape; for example, 18, 36, 128, 256, 384 tracks, EFMT1 (Enterprise Format 1), EFMT2 (Enterprise Format 2), EEFMT2 (Enterprise Encrypted Format 2), EFMT3 (Enterprise Format 3), EEFMT3 (Enterprise Encrypted Format 3), EFMT4 (Enterprise Format 4), or EEFMT4 (Enterprise Encrypted Format 4).

reentrant. The attribute of a program or routine that allows the same copy of a program or routine to be used concurrently by two or more tasks.

removable media. Volumes that can be removed from the hardware devices where they are read and written, for example, tape cartridges and optical disks.

S

SCDS. Source control data set.

scratch pool. The collection of tape cartridges from which requests for scratch tapes can be satisfied.

scratch tape volume. An unassigned tape volume.

shelf-resident tape volume. A tape volume that resides outside of a tape library.

stacked volume. A volume that has a one-to-one association with physical tape media and which is used in a virtual tape server to store logical volumes. A stacked volume is not used by MVS applications but by the virtual tape server and its associated utilities. It may be removed from a virtual tape server to allow transportation of logical volumes to a vault or to another virtual tape server.

Storage Management Subsystem. See *DFSMS.*

System Modification Program/Extended. Basic tool for installing software changes in programming systems. It controls these changes at the element (module or macro) level, which helps protect system integrity.

SMSplex. A group of one or more systems that share a common set of SMS control data sets: the active control data set (ACDS) and the communications data set (COMMDS).

T

tape cartridge. A case containing a reel of magnetic tape that can be put into a tape unit without stringing the tape between reels.

tape configuration database (TCDB). An ICF user catalog marked as a volume catalog (VOLCAT) containing tape volume and tape library records.

tape library dataserver. A set of related tape drives and the set of tape volumes which may be mounted on those drives.

tape storage group. A tape storage group is a collection of tape volumes which contain private user data. Each volume normally resides in one of up to eight tape libraries that are associated with the tape storage group. A volume becomes part of the tape storage group when it is mounted to satisfy a scratch volume request for the storage group, or when it is entered into one of the tape libraries and assigned to the storage group by the cartridge entry process. The volume is removed from the storage group when it is returned to scratch after the data sets on it have expired.

tape volume. A reel of magnetic tape.

TCDB. Tape configuration database.

TCDBplex. A group of one or more systems or sysplexes, or both which share the same tape configuration database. The individual systems in the TCDBplex share access to one or more tape library dataservers, and to a common pool of scratch volumes in each tape library. They may also share access to the set of private volumes in each tape library.

TDSI. Tape device selection information.

V

vary offline. To change the status of a tape library or a tape drive from online to offline. When a library or drive is offline, no data may be accessed on tape volumes through the offline drive or the drives in the offline library.

vary online. To change the status of a tape library or a tape drive from offline to online.

virtual tape server (VTS). This subsystem, integrated into the IBM TotalStorage Enterprise Automated Tape Library (3494 or 3584), combines the random access and high performance characteristics of DASD with outboard hierarchical storage management and virtual tape devices and tape volumes. See also *Virtualization Engine*.

Virtualization Engine. The IBM System Storage TS7700 Virtualization Engine (3957). Members of the TS7700 product family include the TS7740 Virtualization Engine (3957-V0x) as well as the disk-only TS7720 Virtualization Engine (3957-VEx). It replaces the IBM TotalStorage 3494 Virtual Tape Server. The existing virtual tape server (VTS) concepts also apply to the virtualization engine.

virtual volume. A tape volume that resides in a tape volume cache of a virtual tape server. Whether the volume resides in the tape volume cache as a virtual volume or on a stacked volume as a logical volume is transparent to the host.

vision system. An intelligent pattern recognition system that consists of a camera and lamps mounted on the gripper assemblies, the vision system controller, and the vision monitor. The vision system scans the external labels on cartridges to provide positive cartridge identification.

volume attributes. Attributes of volumes in a tape library. These include volume category, type of volume, and assigned policy construct names.

volume catalog. An ICF user catalog containing the volume and library entries associated with tape libraries.

volume category. In software, a category at the library in which the host software places volumes with a common attribute.

volume record. A record containing information related to a volume, such as volume serial number, library name, and storage group. The volume record resides within the tape configuration database.

volume type. Uniquely identifies the type of volume. Tape volume types include physical, logical, stacked logical, imported logical, and exported logical volumes.

VTS. Virtual tape server, such as the IBM TotalStorage 3494 Virtual Tape Server. See also *Virtualization Engine*.

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Product Number: 5694-A01

Printed in USA

SC35-0427-10