

z/OS  
3.2

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





**Note**

Before using this information and the product it supports, read the information in [“Notices” on page 285](#).

This edition applies to IBM® z/OS® 3.2 (5655-ZOS) and to all subsequent releases and modifications until otherwise indicated in new editions.

Last updated: 2025-09-30

© **Copyright International Business Machines Corporation 1993, 2025.**

US Government Users Restricted Rights – Use, duplication or disclosure restricted by GSA ADP Schedule Contract with IBM Corp.



---

# Contents

<b>Figures.....</b>	<b>ix</b>
<b>Tables.....</b>	<b>xiii</b>
<b>About this book.....</b>	<b>xv</b>
Required product knowledge.....	xv
z/OS information.....	xv
How to read syntax diagrams.....	xv
<b>How to provide feedback to IBM.....</b>	<b>xvii</b>
<b>Summary of changes.....</b>	<b>xix</b>
Summary of changes for z/OS 3.2.....	xix
Summary of changes for z/OS 3.1.....	xix
<b>Chapter 1. Introduction to tape library management.....</b>	<b>1</b>
Automated tape storage.....	1
Automated tape library dataserver (ATLDS).....	1
Manual tape storage.....	2
Manual tape library (MTL).....	2
Object access method support for tape libraries.....	2
ISMF role with tape libraries.....	3
Installation storage management policy overview.....	4
System groups in an SMS configuration.....	4
Storage groups and automated class selections routines.....	5
Understanding the pre-ACS routine exit.....	5
Integrated catalog facility (ICF) and the tape configuration database.....	6
RACF considerations for the VOLCAT.....	6
Allocation Considerations with the VOLCAT.....	7
MVS hardware configuration definition.....	7
Types of tape volumes.....	7
Private tape management.....	7
Scratch tape management.....	7
Scratch tape management in an MTL.....	8
VTS stacked tape management.....	8
VTS outboard policy management.....	8
Duplicate volume management.....	8
TotalStorage Automated Tape Library (3495) system attachment.....	8
High capacity input and output facility.....	9
External high-capacity input and output facility.....	9
Manual mode terminal.....	10
Library manager application.....	10
Convenience input and output facility.....	10
TotalStorage Automated Tape Library (3494) system attachment.....	10
Cartridge storage cells.....	11
Tape systems.....	11
Convenience input and output station.....	12
High capacity input/output facility.....	12
Library manager application.....	12



System Storage Automated Tape Library (3584) system attachment.....	12
Integrated library manager.....	12
Virtual tape server (3494) system of the ATLDS.....	13
Emulating 3490-type virtual tape devices.....	13
Emulating 3490-type virtual volumes.....	14
Larger logical volume sizes.....	14
VTS system import and export functions.....	15
Tape volume cache.....	15
Storage management of the tape volume cache.....	15
Improved cache management.....	15
Deleting expired virtual tape server logical volume data.....	16
Secure data erase.....	16
Maintaining data fragments from migrated volumes.....	16
Fast response for nonspecific mount requests.....	16
Using the 3590 and 3592 storage capacity.....	17
Logical library partitioning.....	17
Operator interface.....	17
Logical volume inventory.....	17
Physical volume pooling.....	17
Selective dual copy.....	18
Bulk Volume Information Retrieval (BVIR) facility.....	18
Peer-to-Peer Virtual Tape Server (3494).....	18
Geographically dispersed parallel sysplex support for peer-to-peer VTS.....	19
Selective peer-to-peer copy mode.....	20
Selective peer-to-peer dual copy.....	20
TS7700 Virtualization Engine.....	21
TS7740 Virtualization Engine (3957-V0x).....	21
TS7720 Virtualization Engine (3957-VEA and VEB).....	22
TS7760 Virtualization Engine (3957-VEC).....	23
TS7770 Virtualization Engine (3957-VED).....	23
TS7770 Virtualization Engine (3948-VED).....	23
Logical WORM Considerations.....	24
Compression enhancements.....	24
Control Unit Initiated Recovery (CUIR) for Tape.....	25
Copy mode options.....	26
TS7700 library operational states.....	26
TS7680 tape virtualization.....	28
Cache management .....	29
Load balancing .....	29
Entering a tape cartridge into a tape library.....	29
Cartridge entry processing without an online device.....	30
Importing logical volumes into a 3494 VTS system.....	30
Checking the volume serial number for uniqueness.....	33
Using global resource serialization with cartridge entry processing.....	34
Using global resource serialization in a manual tape library.....	34
Tape volume requirements.....	34
Volume serial number restrictions.....	35
Ejecting a tape cartridge from a tape library.....	36
Ejecting a logical Volume from a VTS.....	37
Exporting logical volumes from a 3494 VTS system.....	37
Copy export from the TS7700 Virtualization Engine.....	39
Using global resource serialization with export processing.....	41
<b>Chapter 2. Planning for the tape library support.....</b>	<b>43</b>
Analyzing your hardware environment.....	43
Hardware.....	43
WORM considerations.....	48



Manual tape library hardware considerations.....	49
Managing multiple media formats.....	49
Tape device selection information.....	50
Demand allocation with system-managed tape.....	52
Load balancing considerations.....	52
Balanced mode in the TS7700 Virtualization Engine.....	53
Tape encryption support.....	57
Performance scaling considerations.....	59
Performance segmentation considerations.....	59
Using the tape configuration database (TCDB) to manage tape volumes.....	59
Software volume categories.....	60
Scratch threshold setting and scratch allocation implications.....	60
TCDB volume error status field and software error category in an automated tape library.....	62
TCDB volume error status field and the MTL.....	63
TCDB volume expiration date.....	63
Console name message routing.....	63
Sharing a tape library among multiple systems.....	64
Partitioning tape libraries among multiple sysplexes (systems).....	66
Sharing tape volumes between an SMSplex and a non-MVS platform.....	69
DFSMSrmm support for sharing a tape library dataserver.....	69
<b>Chapter 3. Installing your tape library support.....</b>	<b>71</b>
Verifying prerequisites.....	71
Manual tape library considerations.....	71
TDSI coexistence considerations.....	71
Considerations when running z/OS as a guest under z/VM.....	71
Tape library installation checklist.....	72
Installation procedures.....	73
Building the library inventory.....	73
Changing system libraries.....	73
Updating the PROCLIB.....	80
Creating the global resource serialization environment.....	81
Creating the tape configuration database.....	82
Creating the hardware configuration.....	84
IPLing the system.....	84
Creating the SMS definitions.....	85
Creating the installation exit routines.....	86
Validating the configuration.....	86
Activating the SMS configuration.....	86
Starting the OAM address space.....	86
Varying the library online.....	87
Displaying and setting the cartridge loader media type.....	87
Running the job stream.....	87
Outboard policy management installation recommendations.....	87
Outboard policy management test environments.....	89
Outboard policy management migration and expected actions.....	89
Tape subsystem (device pool) limitation.....	90
Library subsystem modifications.....	90
Adding subsystems to a library.....	90
Moving subsystems within a library.....	91
Deleting subsystems from a library.....	92
<b>Chapter 4. Defining and monitoring your configuration.....</b>	<b>93</b>
Monitoring and maintaining the tape configuration.....	93
Typical library management functions.....	93
Monitoring and maintaining SMS library definitions.....	95
Changing z/OS construct definitions.....	95



Outboard policy management definitions.....	95
Maintaining tape storage group definitions.....	95
Changing ACS routines.....	95
Establishing recovery procedures.....	95
Recovering volume catalogs.....	96
Recreating library entries.....	96
Recreating volume entries.....	96
Disaster recovery site considerations.....	96
Selective write protect for disaster recovery (DR) test.....	97
TCDB procedure for retrieving data from a disabled IBM automated tape library.....	97
Altering private tape configuration database records.....	97
Changing from SMS-managed to non-SMS-managed requests.....	98
Changing the use attribute of scratch volumes.....	98
Using the sample exit for volume not in library (CBRUXVNL).....	99
Library manager database volume list.....	99
Returning the library manager to an operational status.....	99

## **Chapter 5. Operating the OAM address space..... 101**

Overview of operator tasks.....	101
Message format conventions.....	102
RACF support for the LIBRARY command.....	102
Starting OAM.....	104
Varying a tape library online or offline.....	105
Restarting OAM.....	106
Varying tape drives online or offline.....	107
Ejecting a specific Tape Volume.....	107
Specifying the shelf location.....	108
Auditing a volume.....	109
Entering a tape volume into an MTL.....	109
Importing tape volumes into a VTS.....	110
Exporting tape volumes from a VTS.....	111
Requesting information from the TS7700 Virtualization Engine.....	111
Required parameters.....	112
Optional parameters.....	112
Disabling category count scratch transition processing.....	113
Re-enabling category count scratch transition processing.....	113
Disabling installation exit processing.....	113
Reenabling installation exit processing.....	114
Displaying the cartridge loader scratch media type.....	115
Setting the cartridge loader scratch media type.....	115
Assigning categories to ATLDS cartridge loaders.....	116
Assigning media types to MTL cartridge loaders.....	116
Media selection in an ATLDS.....	117
Media selection in an MTL.....	117
Assigning policy names outboard.....	117
Required parameters.....	118
Optional parameters.....	118
Construct validity checking.....	119
Displaying OAM status.....	119
Displaying OAM configuration information.....	121
OTIS Operator Command.....	122
Displaying SETTLIB parameters.....	122
Displaying library status.....	123
Displaying library connectivity.....	124
Displaying library detail status.....	125
Displaying tape drive status.....	129
Displaying storage group status.....	136



Displaying tape volume status.....	138
Displaying outstanding OAM messages.....	145
Stopping OAM.....	145
Capturing OAM diagnostic data.....	145
Querying active and waiting OAM tape library requests.....	147
Querying device services library information (DEVSERV QLIB).....	150
<b>Chapter 6. Library control system (LCS) external services.....</b>	<b>151</b>
LCS external services overview.....	151
Change use attribute (CUA).....	151
Manual cartridge entry (MCE).....	151
Cartridge eject (EJECT).....	151
Query volume residence (QVR).....	152
Test volume eligibility (TVE).....	152
Export logical volumes (EXPORT).....	152
Import logical volumes (IMPORT).....	152
Peer-to-Peer mode control (PTPMC).....	152
Peer-to-Peer data (PTPDATA).....	152
Obtain library name information (OLN).....	153
LCS external services functions.....	153
Changing the use attribute of a volume.....	153
Entering cartridges into a manual tape library.....	159
Ejecting a tape cartridge.....	164
Querying the residence of a volume.....	167
Testing the eligibility of a volume.....	172
Exporting logical volumes from a VTS.....	174
Importing logical volumes into a VTS.....	176
Changing library operating modes (peer-to-peer VTS mode control).....	177
Obtaining operational mode settings (peer-to-peer VTS data).....	180
Obtaining library name information (OLN).....	182
CBRXLCS macro interface.....	185
Using the CBRXLCS macro in an assembler environment.....	185
CBRXLCS return codes.....	186
CBRXLCS execution environment.....	187
LCS external services parameter list (CBRLCSPL macro).....	187
Tape data information (CBRTDI macro).....	195
Tape volume information (CBRTVI macro).....	196
Tape device selection information (CBRTDSI macro).....	200
<b>Chapter 7. Installation exits.....</b>	<b>203</b>
Change use attribute installation exit (CBRUXCUA).....	203
Outboard policy management considerations.....	206
Job processing considerations .....	206
Change use attribute installation exit parameter list (CBRUXCPL).....	207
Change use attribute installation exit (CBRUXCUA) return codes.....	210
Change use attribute installation exit (CBRUXCUA) usage requirements.....	210
Cartridge entry installation exit (CBRUXENT).....	211
Outboard policy management processing when calling the entry exit.....	214
Outboard policy management processing when returning from the entry exit.....	215
Cartridge entry installation exit parameter list (CBRUXEPL).....	215
Cartridge entry installation exit (CBRUXENT) return codes.....	218
Cartridge entry installation exit (CBRUXENT) usage requirements.....	219
Cartridge eject installation exit (CBRUXEJC).....	219
Failed eject notification processing.....	221
Export completion processing.....	221
Cartridge eject installation exit parameter list (CBRUXJPL).....	222
Volume not in library installation exit (CBRUXVNL).....	226



Invoking the installation exit.....	226
Processing options for the installation exit.....	227
Logical volume considerations.....	227
Entering tape volumes in the library using the installation exit.....	227
Possible error conditions.....	228
Job step setup.....	228
Device allocation.....	230
Library mount processing.....	231
Volume not in library installation exit parameter list (CBRUXNPL).....	232
Volume not in library installation exit (CBRUXVNL) return codes for job step processing.....	236
Volume not in library installation exit (CBRUXVNL) return codes for device allocation.....	236
Volume not in library installation exit (CBRUXVNL) return codes for library mount processing.....	237
Volume not in library installation exit (CBRUXVNL) usage requirements.....	237
<b>Appendix A. SAMPLIB members.....</b>	<b>239</b>
SAMPLIB member CBRAPROC.....	241
<b>Appendix B. Using ISMF panels to define and monitor your configuration.....</b>	<b>243</b>
ISMF for the storage administrator.....	243
Defining a tape library.....	243
Displaying tape library attributes.....	252
Redefining a tape library.....	255
Altering a tape library.....	258
Copying tape library definitions.....	260
Deleting a tape library definition.....	261
Monitoring and maintaining tape volumes.....	262
ISMF mountable tape volume application.....	262
Creating a list of tape libraries.....	269
Auditing volumes in an automated tape library.....	273
Altering the volume record.....	276
Ejecting a volume from a tape library.....	280
<b>Appendix C. Accessibility.....</b>	<b>283</b>
<b>Notices.....</b>	<b>285</b>
Terms and conditions for product documentation.....	286
IBM Online Privacy Statement.....	287
Policy for unsupported hardware.....	287
Minimum supported hardware.....	287
Programming interface information.....	288
Trademarks.....	288
<b>Glossary.....</b>	<b>289</b>
<b>Index.....</b>	<b>301</b>



---

# Figures

1. IBM TotalStorage Enterprise Automated Tape Library (3495).....	9
2. IBM TotalStorage Enterprise Automated Tape Library (3494) L10 frame.....	11
3. Sharing a Tape Library among multiple systems.....	65
4. Partitioning a Tape Library.....	67
5. CBRXLCS CUA assembler macro syntax.....	153
6. CBRXLCS MCE assembler macro syntax.....	159
7. CBRXLCS EJECT assembler macro syntax.....	164
8. CBRXLCS QVR assembler macro syntax.....	167
9. CBRXLCS TVE assembler macro syntax.....	172
10. CBRXLCS EXPORT assembler macro syntax.....	174
11. CBRXLCS IMPORT assembler macro syntax.....	176
12. Peer-to-Peer VTS mode control (PTPMC) assembler macro syntax.....	178
13. Peer-to-Peer VTS data (PTPDATA) assembler macro syntax.....	180
14. Obtain Library name information (OLN) assembler macro syntax.....	182
15. Sample CBRAPROC program that creates the OAM member in PROCLIB.....	241
16. ISMF Primary Option Menu Panel.....	244
17. Library Management Selection Menu Panel.....	244
18. Tape Library Application Selection Panel.....	245
19. Tape Library Define Panel (Page 1 of 4).....	246
20. Tape Library Define Panel (Page 2 of 4).....	246
21. Tape Library Define Panel (Page 3 of 4).....	249
22. Tape Library Define Panel (Page 4 of 4).....	249
23. Tape Library Define Panel (Page 1 of 4).....	250



24. Tape Library Define Panel (Page 2 of 4).....	251
25. Tape Library Define Panel (Page 3 of 4).....	251
26. Tape Library Define Panel (Page 4 of 4).....	252
27. Tape Library Display Panel (Page 1 of 2).....	252
28. Tape Library Display Panel (Page 2 of 2).....	255
29. Tape Library Redefine Panel (Page 1 of 4).....	256
30. Tape Library Redefine Panel (Page 2 of 4).....	256
31. Tape Library Redefine Panel (Page 3 of 4).....	257
32. Tape Library Redefine Panel (Page 4 of 4).....	257
33. Tape Library Alter Panel (Page 1 of 4).....	258
34. Tape Library Alter Panel (Page 2 of 4).....	259
35. Tape Library Alter Panel (Page 3 of 4).....	259
36. Tape Library Alter Panel (Page 4 of 4).....	260
37. Copy Entry Panel.....	261
38. Confirm Delete Request Panel.....	262
39. Volume List Selection Menu Panel.....	263
40. Mountable Tape Volume Selection Entry Panel.....	264
41. Mountable Tape Volume List Panel (part 1 of 5).....	265
42. Mountable Tape Volume List Panel (part 2 of 5).....	266
43. Mountable Tape Volume List Panel (part 3 of 5).....	268
44. Mountable Tape Volume List Panel (part 4 of 5).....	269
45. Mountable Tape Volume List Panel (part 5 of 5).....	269
46. Tape Library List Panel (part 1 of 7).....	270
47. Tape Library List Panel (part 2 of 7).....	270
48. Tape Library List Panel (part 3 of 7).....	271



49. Tape Library List Panel (part 4 of 7).....	271
50. Tape Library List Panel (part 5 of 6).....	272
51. Tape Library List Panel (part 6 of 7).....	272
52. Tape Library List Panel (part 7 of 7).....	273
53. Confirm Audit Request Panel.....	275
54. Alter from the Mountable Tape Volume Alter Entry Panel.....	276
55. Mountable Tape Volume Alter Entry Panel displayed (ALTER request).....	277
56. Both OLD VALUE and NEW VALUE reflect the values assigned to the Volume.....	277
57. NEW VALUE blanked out for storage group.....	278
58. New storage group assigned after storage group was altered to blank.....	278
59. Confirm Alter Request Confirmation Panel.....	279
60. Private to Scratch Confirmation Panel.....	280







---

# Tables

1. Environmental considerations for a peer-to-peer VTS running under GDPS.....	19
2. APARs supplying additional host support for specific releases of TS7700.....	21
3. Messages for TS7700 library operational states.....	27
4. Methods for ejecting cartridges from a tape library.....	36
5. Tape storage configurations.....	44
6. Software volume categories.....	60
7. Change use attribute return and reason codes.....	158
8. TDSI processing for MCE—Volume exists.....	162
9. TDSI processing for MCE—No volume record exists for volume.....	162
10. Manual cartridge entry return and reason codes.....	163
11. Cartridge eject return and reason codes.....	166
12. Return and reason code meanings for the EJECTOPT=QUERY keyword.....	167
13. Query Volume residence return and reason codes.....	170
14. Test Volume eligibility return and reason codes.....	173
15. EXPORT return and reason codes.....	175
16. IMPORT return and reason codes.....	176
17. PTPMC return and reason codes.....	180
18. PTPDATA return and reason codes.....	181
19. OLN function fields.....	184
20. OLN return and reason codes.....	185
21. Parameters passed to the installation exit—CBRUXCUA.....	204
22. Fields passed to the installation exit—CBRUXENT.....	211
23. Fields passed to the installation exit—CBRUXEJC.....	220



24. CBRUXVNL input during job step setup—No TCDB volume record.....	229
25. CBRUXVNL input during job step setup—Existing TCDB volume record.....	229
26. CBRUXVNL input during job step setup—Job information fields.....	230
27. CBRUXVNL input during device allocation—No TCDB volume record.....	230
28. CBRUXVNL input during device allocation—Existing TCDB volume record.....	231
29. CBRUXVNL input library mount processing—No TCDB volume record.....	231
30. CBRUXVNL input library mount processing—Existing TCDB volume record.....	232



## 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)

## z/OS information

---

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

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

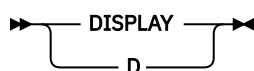
## How to read syntax diagrams

---

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.

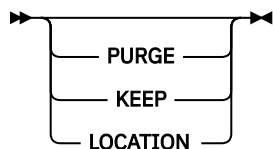


- Where you can choose from two or more keywords, the choices are stacked one above the other. If one choice within the stack lies on the main path, a keyword is required, and you must choose one. In the following example you must choose either DETAIL or STATUS.





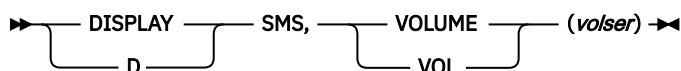
- If a stack is placed below the main path, a keyword is optional, and you can choose one or none. In the following example, PURGE, KEEP, and LOCATION are optional keywords. You can choose any one of the three.



- 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.



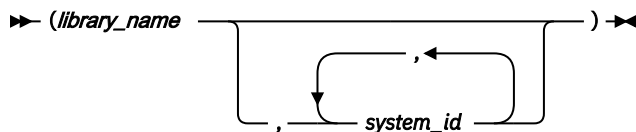
You would code this as follows:

```
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 provide feedback to IBM

---

We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information. For more information, see [How to send feedback to IBM](#).







## Summary of changes

---

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

**Note:** IBM z/OS policy for the integration of service information into the z/OS product documentation library is documented on the z/OS Internet Library under [IBM z/OS Product Documentation Update Policy](http://www.ibm.com/docs/en/zos/latest?topic=zos-product-documentation-update-policy) ([www.ibm.com/docs/en/zos/latest?topic=zos-product-documentation-update-policy](http://www.ibm.com/docs/en/zos/latest?topic=zos-product-documentation-update-policy)).

## Summary of changes for z/OS 3.2

---

The following content is new, changed, or no longer included in z/OS 3.2.

### New

The following content is new.

#### September 2025 release

- None.

### Changed

The following content is changed.

#### September 2025 release

- [“Starting OAM” on page 104](#) is updated to include new parameter ASCBV31=YES.

### Deleted

The following content is deleted.

#### September 2025 release

- None.

## Summary of changes for z/OS 3.1

---

The following content is new, changed, or no longer included in z/OS 3.1.

### New

The following content is new.

#### September 2023 release

- None.

### Changed

The following content is changed.

#### September 2023 release

- Updates for the default TAPELIB\_PREF value of BYDEVICES in z/OS 3.1 is added. For more information, see [“Load balancing” on page 29](#), [“Scratch allocations” on page 52](#) and [“Specific allocations” on page 53](#).







---

# 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 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 8 and [“TotalStorage Automated Tape Library \(3494\) system attachment”](#) on page 10. For a discussion of the System Storage Tape Library (3584), see [“System Storage Automated Tape Library \(3584\) system attachment”](#) on page 12.

## Automated tape library dataserver (ATLDS)

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 9](#) and [Figure 2 on page 11](#) 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 (MTL)

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 109](#) 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.

The three components of OAM are:

- Object Storage and Retrieval (OSR)
- OAM Storage Management Component (OSMC)
- Library Control System (LCS)



When using OAM's object support, it is important to note that there is now a potential for a multiple OAM configuration. A multiple OAM configuration allows you to have multiple “Instances” of OAM on a single system. An instance consists of an OAM subsystem and an associated OAM address space. In a multiple OAM configuration, an OAM address space is used either for Tape Library related processing or for Object processing, and it is possible to have multiple OAM address spaces on a single z/OS system. You can also have up to two Object address spaces and one separate Tape Library address space. A classic OAM configuration supports a single OAM instance per system and can be used for both object related processing and tape library related processing. This is the original OAM configuration support prior to the introduction of the "multiple OAM configuration" support. For more information on possible OAM configurations, see [\*z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support\*](#).

The 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 dismount processing
- Operator command processing
- Tape configuration database (TCDB) management
- A set of tape library-related services that might 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 203 for more information on these installation exits.

- Unsolicited attention message processing.
- CBROAMxx PARMLIB support (SETTLIB) for tuning various aspects of the system managed tape library support (for example, cartridge entry, scratch threshold messaging and automated retry logic for mount failures).

**Recommendation:** Only a subset of the functions above actually run within the OAM address space (entry, eject, audit, and unsolicited attention message processing). Cartridge mount and dismount activity (job processing) does not require the OAM address space. However, since job processing often results in volumes that are entered and error and status messages that are 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 dataserwer 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 243](#) 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.

### **Note:**

1. For limitations on the number of device pools refer to [“Tape subsystem \(device pool\) limitation” on page 90](#).
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 (ICF) 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 Commands](#).

**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 95](#).

## 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 that need to perform actions against the VOLCAT also require READ access to STGADMIN.IGG.LIBRARY. For more information, see the table, RACF



FACILITY Class Authorization for IDCAMS Commands, in [RACF FACILITY Class Authorization for IDCAMS Commands](#) in *z/OS DFSMS Access Method Services Commands*.

READ access to STGADMIN.IGG.LIBRARY allows IDCAMS users to perform any of the listed operations.

## Allocation Considerations with the VOLCAT

During allocation processing for a specific volume, if the VOLCAT is defined and connected to the system, the expectation during job processing is that the VOLCAT is online and accessible. If the volume on which the VOLCAT resides (general or specific) is offline (or the catalog is inaccessible for another reason), the job will terminate with a CBRXVOL failure. Being able to determine if the requested volume is in the VOLCAT (general or specific) is critical to the allocation path and ensuring that the correct tape device gets allocated. Prior to catalog APAR OA43490 there was an inconsistency in this behavior depending on whether it was the general or the specific VOLCAT that was offline. Now, with this APAR, regardless of whether it is the specific or the general VOLCAT volume that is offline, the job will terminate whereas before, the job would continue down the non-system-managed path, if the general VOLCAT volume was offline or general VOLCAT was corrupted or not available but still connected to the CATALOG address space. As appropriate, also refer to [“Disaster recovery site considerations”](#) on page 96 for additional considerations during disaster recovery testing and the need to EXPORT DISCONNECT or DELETE the VOLCAT when there is no system-managed tape library.

## 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 dataserer, 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 [“SCRATCH THRESHOLD”](#) on page 247 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 or DISP=NEW (file sequence greater than 1). This will force allocation of this request to a stand-alone device.

With DISP=NEW (file sequence 1), the assignment of a storage class when the automatic class selection (ACS) routines are run determines whether the initial request is system managed (the special DUPT@SMS storage class is not used in this case).

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

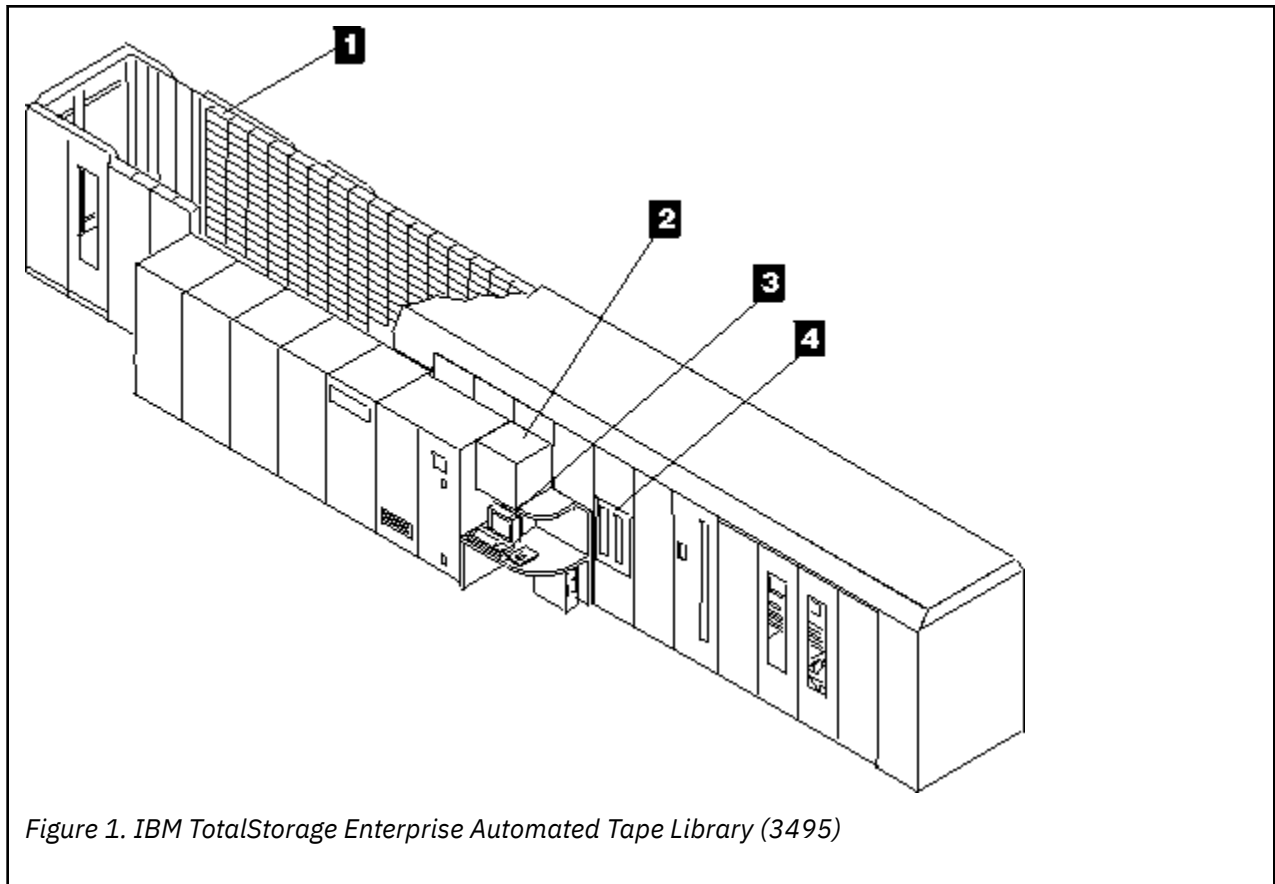
---

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 10 for more information concerning these systems.

The ATLDS (see Figure 1 on page 9) is capable of supporting multiple control units and tape drives. The details for each callout in Figure 1 on page 9 are explained in the text that follows. See Table 5 on page 44 for more information concerning configuration capabilities, and “TotalStorage Automated Tape Library (3494) system attachment” on page 10 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*.



## High capacity input and output facility

All 3495 ATLDS models can have an optional high-capacity input and output facility (Figure 1 on page 9, 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 dataserwer 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 on page 9) 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 on page 9](#), 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 9](#), 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 9](#), 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

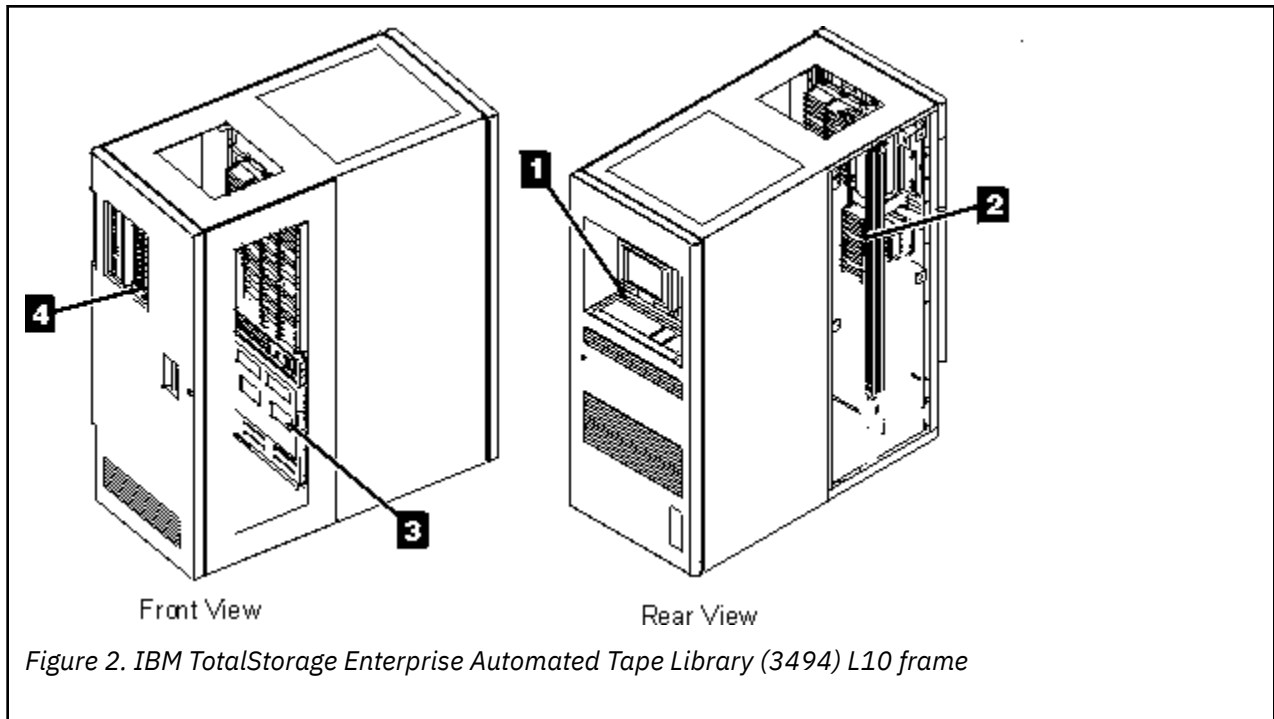
---

The IBM TotalStorage Enterprise Automated Tape Library (3494) ([Figure 2 on page 11](#)) 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 11](#) are explained in the text that follows.

This ATLDS is capable of supporting multiple control units and tape drives. See [Table 5 on page 44](#) 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*.





## Cartridge storage cells

The cartridge storage cells (Figure 2 on page 11, 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 on page 11, 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*. 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 11, 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 11, 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 IBM Z® attached hosts) and can be partitioned across multiple IBM 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 IBM 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 an IBM 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 operates 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 can still handle library requests. However, only one of the two Library Manager enabled control units actively handle library requests at any given time. The other Library Manager enabled control unit runs in standby mode ready to takeover should the primary control unit fail. Also, note that the 3592 Model C07 cannot 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 separate 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 supports attachment of the 3592 Model E05, E06, and E07 tape drives. For additional information, see [3592 Enterprise Tape System in IBM Documentation \(www.ibm.com/docs/en/3592-enterprise-tape\)](http://www.ibm.com/docs/en/3592-enterprise-tape).

## Virtual tape server (3494) system of the AT LDS

---

The virtual tape server (VTS) system (not pictured) in an AT LDS 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” on page 14](#).

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 15](#) 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 37](#) and [“Importing logical volumes into a 3494 VTS system” on page 30](#) for more information.

## 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 14](#).

## 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 [“TS7700 Virtualization Engine” on page 21](#) for information on the LIBRARY REQUEST command. For additional information on this enhancement and other cache management-related removal options, refer to [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#).

## 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. Starting with Release 2.1 of the TS7700, restricted volumes can be moved to a non-fast ready (private) category in case they were accidentally returned to scratch. 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* and [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#) 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 (BVIR) facility

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* at [IBM Techdocs: White Papers \(www.ibm.com/support/techdocs/atsmastr.nsf/Web/WhitePapers\)](http://www.ibm.com/support/techdocs/atsmastr.nsf/Web/WhitePapers).

## Peer-to-Peer Virtual Tape Server (3494)

---

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 on page 19](#) for your particular environment:

*Table 1. Environmental considerations for a peer-to-peer VTS running under GDPS*

Environment	Results	Notes
<b>Peer-to-Peer VTS runs in immediate copy mode and is fully operational.</b>	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 <i>not</i> support logical software partitioning.



Table 1. Environmental considerations for a peer-to-peer VTS running under GDPS (continued)

Environment	Results	Notes
<b>A disaster occurs and you are running in immediate copy mode.</b>	<ul style="list-style-type: none"> <li>There is no synchronization for open logical volumes.</li> <li>A rerun of the workload will inform you that you have no valid copy of the data.</li> </ul>	The Peer-to-Peer VTS library under GDPS does <i>not</i> support logical software partitioning.
<b>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.</b>	<ul style="list-style-type: none"> <li>There is no synchronization for closed and open logical volumes.</li> <li>Open logical volumes at the time of the disaster become invalid.</li> <li>Closed logical volumes at the time of the disaster are valid.</li> </ul>	<ul style="list-style-type: none"> <li>You are not able to have full control of the selection of the I/O VTS.</li> <li>The Peer-to-Peer VTS library under GDPS does <i>not</i> support logical software partitioning.</li> </ul>
<b>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.</b>	<ul style="list-style-type: none"> <li>There is no synchronization for closed and open logical volumes.</li> <li>Open logical volumes at the time of the disaster become invalid.</li> <li>Closed logical volumes on the damaged VTS at the time of the disaster become invalid.</li> </ul>	<ul style="list-style-type: none"> <li>You are not able to have full control of the selection of the I/O VTS.</li> <li>The Peer-to-Peer VTS library under GDPS does <i>not</i> support logical software partitioning.</li> </ul>

**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 IBMZ® environment and is the successor to the IBM Total Storage 3494 Virtual Tape Server (VTS) and the IBM 3494 Peer-to-Peer VTS (PtP VTS). Members of the TS7700 product family include the TS7740 Virtualization Engine (3957-V06 and 3957-V07), the TS7720 Virtualization Engine (3957-VEA and 3957-VEB), the TS7760 Virtualization Engine (3957-VEC), and the TS7770 Virtualization Engine (3957-VED or 3948-VED). Unless stated otherwise, references to the TS7700 Virtualization Engine apply to all 3957 and 3948 models. For more information, see [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](http://www.ibm.com/docs/en/ts7700-virtual-tape).

**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, as shown in [Table 2 on page 21](#).

<i>Table 2. APARs supplying additional host support for specific releases of TS7700</i>	
<b>For TS7700 Release</b>	<b>Refer to APAR</b>
<b>TS7700 Release 1.3</b>	OA20065 (z/OS V1R6 and above)
<b>TS7700 Release 1.5</b>	OA24966 (z/OS V1R8 and above)
<b>TS7700 Release 1.6</b>	OA28632 (z/OS V1R9 and above)
<b>TS7700 Release 2.0</b>	OA32957 (z/OS V1R10 and above)
<b>TS7700 Release 2.1</b>	OA37267 (z/OS V1R11 and above)
<b>TS7700 Release 3.0 and 3.1</b>	OA40572 (z/OS V1R12 and above)
<b>TS7700 Release 3.2</b>	OA44351 (z/OS V1R13 and above)
<b>TS7700 Release 3.3</b>	OA47487 (z/OS V1R13 and above)
<b>TS7700 Release 4.0</b>	OA49373 (z/OS V2R1 and above)
<b>TS7700 Release 4.1.2</b>	OA52376 (z/OS V2R2 and above)
<b>TS7700 Release 4.2.0</b>	OA55481 (z/OS V2R2 and above)
<b>TS7700 Release 5.2.1</b>	OA60929 (z/OS V2R3 and above)
<b>TS7700 Release 5.3</b>	OA62929 (z/OS V2R3 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-VEA and VEB)

The TS7720 Virtualization Engine, displayed by the host as a 3957 Model VEA or as a 3957 Model VEB, is similar in concept to the TS7740 (also defined to the host through composite and distributed library definitions). However, the TS7720 is different because it also provides support for a disk-only residency solution. Originally the TS7720 was a disk-only virtual tape solution (with a larger disk cache than the TS7740). Starting with Release 3.2 of the TS7720, the TS7720 can also attach physical tape through a tape attach feature (also referred to as a TS7720T), enabling the TS7720 to offer a combined disk and tape solution within a single cluster. In support of the tape attach feature of the TS7720, a partitioned cache is being supported. The cache-only resident partition is referred to as CP0 and cache partitions CP1-CP7 is associated with tape-related management options. The assigned storage class (on the mount) and policy settings established at the library determine which cache partition is used. The tape attach feature enables workloads to be managed differently:

- **Disk Cache Only Content** – includes data that must be in the disk cache (cache resident partition CP0) even if back store tape is available; for workloads that require a fast response time to their data.
- **Primarily Tape Only Content** - includes data where the disk cache (tape attach partitions CP1-CP7) mainly acts as a pass through allowing the data to be immediately moved out to back store tape; for workloads where the data is seldom accessed. If it is, can afford the delay in bringing the data back to the disk cache (similar to the behavior that the TS7740 provides today with cache preference group PG0).
- **Disk Cache and Tape Content** – includes data that might co-exist in the disk cache (tape attach partitions CP1-CP7) and on tape. The reason is usually because the workload is large or an extra copy is needed on tape for redundancy (similar to the behavior that the TS7740 provides today with cache preference group PG1).
- **Delayed to Tape Content** - includes data whose movement to tape is delayed based on a policy setting (such as the time since creation). It enables the data to stay in cache (tape attach partitions CP1-CP7) while it might be frequently accessed and then as it ages, is moved out to tape for “archival” purposes.

When the tape attach feature is not enabled, a single cache partition is used that maintains the data in cache. As before, regardless of whether the tape attach feature is enabled, some of the clusters in the grid might have physical tape attached, and some might not. It is referred to as a heterogeneous or a hybrid configuration. A TS7720, with or without the tape attach feature enabled, can coexist with other TS7700 clusters in the same grid.

When the TS7720 detects that available cache space falls below preset thresholds (in the cache-only resident partition), 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 messages can be used to trigger return to scratch processing, the copying of data to another library, or the movement of data to a tape attach partition. After, if the amount of available cache 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 is failed. Mount operations that are accepted before entering this state complete and volumes that are currently mounted can continue to host I/O operations. 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. In a TS7720 that has physical tape attached, the "CACHE PERCENTAGE USED" only reports on the



percentage of the cache-only resident partition (CP0). For the customer defined partitions CP1 – CP7, the TS7700 management interface can be used to track the available free space and to create, delete, and increase the partition sizes.

To assist with the cache management in a TS7720 (cache-only resident partition), having a TS7700 with a tape attach feature that is enabled in the grid provides an extra back-end tape capability. As do having tape attach partitions in the TS7720 and the ability to move data between the cache partitions in a cluster. To manage the migration of data from the TS7720 (cache-only resident partition), there is a "Volume Removal Policy" at the library. Because the TS7720 (cache-only resident partition) can have a finite amount of cache, when that cache fills, the policy allows logical volumes to be automatically removed from cache while a copy is retained elsewhere in the grid. This copy can exist on physical tape or in another TS7720 cache partition. Coupling with copy policies provides an automatic data migration function between the clusters in the grid.

## **TS7760 Virtualization Engine (3957-VEC)**

The TS7760 Virtualization Engine, displayed by the host as a 3957 Model VEC, is the follow-on to the TS7720 Virtualization Engine and is also defined to the host through composite and distributed library definitions. Like the enhanced TS7720 that introduced a tape attach feature (in Release 3.2), Release 4.0 of the TS7700 introduces a model refresh of the TS7720, referred to as the TS7760. When the tape attach feature is enabled, the TS7760 offers a combined disk and tape solution within a single cluster and is referred to as a TS7760T. Similar to the TS7720T, a partitioned cache is supported. The cache-only resident partition is referred to as CP0 and cache partitions CP1-CP7 are associated with tape-related management options. Refer to the [“TS7720 Virtualization Engine \(3957-VEA and VEB\)” on page 22](#) for more detail.

Starting with release 4.2 of the TS7700 Virtualization Engine, the ability to tier data to the cloud (an object store) now exists with the TS7760 (3957-VEC). Similar to how the TS7700 stages data to physical back store tape, the ability to tier data to an object store is also done through outboard policy management. A TS7760 with a cloud attachment capability is referred to as a TS7760C. The TS7760 is physically connected to the cloud through their grid network. The existing cache partitions (CP1-CP7) used for the management of their physical back store tape is also applicable for storing to an object store. To view additional information about this support and the TS7700, refer to the [IBM Documentation \(www.ibm.com/docs/en\)](http://www.ibm.com/docs/en).

## **TS7770 Virtualization Engine (3957-VED)**

The TS7770 Virtualization Engine, which is displayed by the host as a 3957 Model VED, is the follow-on to the TS7760 Virtualization Engine and is also defined to the host through composite and distributed library definitions. Release 5.0 of the TS7700 introduces a model refresh of the TS7760, referred to as the TS7770. When the tape attach feature is enabled, as with the TS7760, the TS7770 offers a combined disk and tape solution within a single cluster and is referred to as a TS7770T. A TS7770 with a cloud attachment capability is referred to as a TS7770C. For more information, see [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#).

## **TS7770 Virtualization Engine (3948-VED)**

The TS7770 Virtualization Engine, introduced with Release 5.0 of the TS7770 may be displayed by the host as a 3957 Model VED or as a 3948 Model VED. Starting with Release 5.3 of the TS7770, a new machine type (3948) is introduced for new manufacturing builds of the TS7770 Virtualization Engine. This change was required to support the new Expert Care Service model. Existing TS7770 clusters that are upgraded to Release 5.3 will continue to report as a 3957 Model VED. For more information, see [TS7770 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#). In general, there are no differences in host support between the 3957 and the 3948 and references to 3957 would also apply to the 3948. To detect the 3948 Machine Type change from 3957, installation of z/OS APAR OA62929 is recommended, but is not required.



## Logical WORM Considerations

Logical WORM is supported in all models of the TS7700 Virtualization Engine and was first introduced with Release 1.6 of the TS7700. 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 becomes WORM when it is first mounted and written from load point. A volume does not have the WORM attribute if user data is already written to the volume. Also, when a data set written to a WORM volume extends to another volume (EOV processing), the next volume in the chain will also be WORM. It 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 is 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) 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 (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. 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 worldwide 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.

In order to be consistent with the physical WORM and the special release actions that might be in place by the tape management system for the logical volume's VOLSER to be reused (when a logical WORM volume expires), 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. Subsequently, if the volume is reused as logical WORM, the library creates 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. Then, 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, when a previously used R/W volume expires, to be reused as logical WORM, it must also go through the logical WORM steps before 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.

## Compression enhancements

Starting with release 4.1.2 of the TS7700, enhanced (software-based) compression options are available (in data class) and selectable through the Management Interface (MI) of the TS7700. When specified, the enhanced compression support are used by the TS7700 when a volume is first written from load point. The new data class settings is supported once all of the distributed libraries in a grid are at the 4.1.2 release level or later.

When selecting enhanced compression (and also with their standard compression support), a new option is available that indicates whether the counters in read buffered log (RBL) should be allowed to overflow. The read buffered log command is used to obtain various write and read-related counters that are associated with the mounted volume and are used by various applications. By default, the TS7700 limits the number of channel (host) bytes written to 68 GB and surfaces logical end of tape (LEOT) when that threshold is reached. This is applicable to their existing as well as their enhanced compression support. For applications that rely on the various read buffered log counters for the channel (host) and the device bytes written, but do not have the proper detection in place to handle an overflow, this ensures that the counters do not overflow. When one of the read buffered log counters overflows, this causes all of the counters to be reset. This is particularly important for 25 GB logical volumes, where a compression ratio between 2:1 and 3:1 causes the channel (host) bytes written log counter to overflow. For applications that are not sensitive to the read buffered log counters overflowing or have logic in place to handle an overflow, the default can be changed at the TS7700 to allow for an overflow. DFSMSHsm already has logic in place to detect and handle an overflow of the read buffered log (RBL) counters and with



APAR OA52376, OAM's object support added the ability to detect and handle an overflow of the channel (host) bytes written. Also, refer to APAR OA52915 (for SMF 21 changes) and APAR OA52950 (for Open/Close/EOV changes) for additional changes in this area.

In general, where the host shows that the data is compacted or not, this continues to show "compacted" regardless of the algorithm. The LIBRARY REQUEST command with the LVOL keyword can be used to show which algorithm the data was compressed with. To view additional information about this support and the TS7700, refer to the [IBM Documentation \(www.ibm.com/docs/en\)](http://www.ibm.com/docs/en).

## Control Unit Initiated Recovery (CUIR) for Tape

Starting with release 4.1.2 of the TS7700 (and APAR OA52376), an automatic vary capability exists for the TS7700 to notify the host that a distributed library is going into service. Starting with release 5.2.1 of the TS7700 (and APAR OA60929), an automatic vary capability also exists for the TS7700 to notify the host that an unhealthy distributed library is being fenced. Through these notifications each supporting host system can automatically vary the devices offline and back online. By default, for each of these (service and fencing), both of the vary notifications (offline and online) are disabled. The LIBRARY REQUEST command can be used to enable each of the automatic notifications. The LIBRARY REQUEST command, as indicated below, can enable specific settings or can be used to enable both the SERVICE and FENCE ability:

Vary Offline:

```
LIBRARY REQUEST,composite-library-name,CUIR,SETTING,SERVICE,{ENABLE|DISABLE}
LIBRARY REQUEST,complib,CUIR,SETTING,FENCE,{ENABLE|DISABLE}
LIBRARY REQUEST,complib,CUIR,SETTING,ALL,{ENABLE|DISABLE}
```

Vary Online:

```
LIBRARY REQUEST,composite-library-name,CUIR,AONLINE,SERVICE,{ENABLE|DISABLE}
LIBRARY REQUEST,complib,CUIR,AONLINE,FENCE,{ENABLE|DISABLE}
LIBRARY REQUEST,complib,CUIR,AONLINE,ALL,{ENABLE|DISABLE}
```

To verify the state of the distributed library before you bring the devices online, leave the automatic online (AONLINE) notification disabled. Then, through the Management Interface (MI) of the TS7700, you can trigger the same online notification to the host.

Through this notification support, when a tape device is varied offline for service or due to fencing, it is varied offline for CUIR reasons.

- If a device is offline for CUIR reasons, the reverse notification is needed to clear the CUIR state.
- When the reverse notification occurs to clear the CUIR state, if the device was only offline because of the CUIR state, it will be brought online. It will also be brought online if the device was boxed and in the CUIR state, and not offline for path or library reasons. If the device was offline for other reasons (path, operator, or library) it can remain in the offline state due to the other states.
- If a device remains in the CUIR state, the VARY xxxx,ONLINE,RESET command can be used to manually clear the CUIR state.
- If a device is varied offline for CUIR reasons, for devices that remain in the pending offline state, the DDR SWAP command (as needed) can be used to move the job to another distributed library.
- If an IPL occurs while in a CUIR state, the CUIR state is not maintained across the IPL.
- For the unhealthy cluster vary, since a healthy cluster can also report on the state of its peer, the IOS-related CUIR messages may be issued multiple times.

You can use the existing LIBRARY DISPDV command to determine why a device is offline, including the new CUIR reason. LIBRARY REQUEST,*library-name*,LDRIVE and the LIBRARY REQUEST,*distributed-library-name*,LDRIVE,GROUP,*index* can also be used to determine the state of a CUIR notification request. For more information about the LIBRARY REQUEST command, see the IBM white paper "TS7700 Virtualization Engine in IBM Documentation ([www.ibm.com/docs/en/ts7700-virtual-tape](http://www.ibm.com/docs/en/ts7700-virtual-tape))".

Similar to disk, a new query host access (QHA) keyword is added to the DEVSERV QTAPE command (DEVSERV QTAPE,xxxx,QHA) that shows the systems that are online (grouped) to the specified tape



device. If there are systems whose devices are not going offline, this will show the systems that are still online (grouped) to the specified device. Since for a period of time, only a subset of the systems can support the new vary notification, those commands also help determine whether manual varies are still needed from some of the systems.

**Restriction:** The CUIR for tape support is only supported when running natively on MVS. It is not supported for an MVS guest that is running under VM or JES3-managed devices. JES3-managed devices are ignored and are not be placed in the CUIR state.

To view additional information about this support and the TS7700, refer to “[IBM TS7700 documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](http://www.ibm.com/docs/en/ts7700-virtual-tape)”. Also refer to the IBM white paper “[IBM TS7700 Series CUIR Users Guide V1.1 \(www.ibm.com/support/pages/node/6355675\)](http://www.ibm.com/support/pages/node/6355675)”.

## Copy mode options

Starting with Release 2.1 of the TS7700, a synchronous copy mode option was introduced for logical volume replication and starting with Release 3.1 of the TS7700, a time delayed copy mode option was also added. Prior to this, the TS7700 Virtualization Engine supported two copy mode options (deferred and immediate) the same as with the 3494 Peer-to-Peer VTS. When data is written to a logical volume in the TS7700 Virtualization Engine, a copy policy is applied through the assigned Management Class and policy settings established at the library. The outboard policy settings indicate in which distributed libraries (or clusters) a copy of the data (logical volume) should exist and how those copies should be made (through immediate, deferred or synchronous replication policies). Copy policies are established based on a customer’s high availability and disaster recovery requirements for their different workloads.

With the deferred (asynchronous) copy mode option, after the job (or application) finishes with the volume, copies of the data (logical volume) are queued for later replication, and with the time delayed copy mode option, copies of the volume occur after a user-specified delay period has passed. Then, with the immediate copy mode option, after the job (or application) finishes with the volume, copies of the volume are made during demount processing. Though the immediate copy mode option provided customers with more disaster recovery protection than the deferred copy mode option, it didn’t provide synchronous level copy granularity as the data was being written. The synchronous copy mode option provides tape copy capabilities up to synchronous level granularity across two clusters within a multi-cluster grid configuration. Copies to other clusters in the grid can also be made using the deferred or immediate mode copy options. As jobs (or applications) write data to tape, with the synchronous copy mode option, the TS7700 Virtualization Engine will fork the writes to two clusters simultaneously and guarantee dual copy consistency for all data written prior to the last implicit or explicit synchronize operation.

Before the new synchronous mode copy option was introduced, customers would often use their own tape replication methods to guarantee synchronous level granularity which often included using DFSMSHsm’s Duplex Tape Support. Now with the new synchronous mode copy option, customers can instead rely on the TS7700 Virtualization Engine to transparently make and access those copies.

For a detailed discussion of the different copy mode replication (deferred, immediate, or synchronous) options, see [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](http://www.ibm.com/docs/en/ts7700-virtual-tape).

## TS7700 library operational states

With the TS7700 Virtualization Engine there are number of different operational states that get reported to the host that result in CBR-associated messages being issued to the console for the affected distributed library as well as the associated composite library. For some of the operational states, the composite library will also reflect this state if one or more of its associated distributed libraries are in this state and for other conditions, all of its distributed libraries have to be in this state before the composite library reflects this state. [Table 3 on page 27](#) shows the different operational states, their associated CBR message, and when the composite library will report that it is in the indicated state.



<i>Table 3. Messages for TS7700 library operational states</i>		
<b>Library Operational State</b>	<b>Associated CBR Message</b>	<b>Composite Library Reporting</b>
<b>Automated</b>	CBR3756I	Set if any distributed library is in this state.
<b>Paused</b>	CBR3757E	Set if all distributed libraries which contain back end tape are in this state.
<b>Degraded Operation</b>	CBR3758E	Set if any distributed library is in this state.
<b>Safety Enclosure Interlock Open</b>	CBR3759E	Set if all distributed libraries which contain back end tape are in this state.
<b>Vision System Non-Operational</b>	CBR3760E	Set if all distributed libraries which contain back end tape are in this state.
<b>Library Manager Offline</b>	CBR3761E	Set if all distributed libraries are in this state.
<b>Intervention Required</b>	CBR3762E	Never set for the composite library. Only set for the distributed libraries that are in this state.
<b>Library Manager Check1 Condition</b>	CBR3763E	Set if all distributed libraries which contain back end tape are in this state.
<b>All Storage Cells Full</b>	CBR3764E	Set if all distributed libraries which contain back end tape are in this state.
<b>Out of Cleaner Volumes</b>	CBR3765E	Set if all distributed libraries which contain back end tape are in this state.
<b>Dual Write Disabled</b>	CBR3766E	Set if all distributed libraries which contain back end tape are in this state.
<b>Library Manager Switchover in Progress</b>	CBR3783E (enters state) and CBR3784I (switchover complete)	Set if all distributed libraries which contain back end tape are in this state.
<b>VTS is Out of Empty Stack Volumes</b>	CBR3789E	Set if all distributed libraries which contain back end tape are in this state.
<b>Insufficient Resources for Mount</b>	CBR3790E	Set if all distributed libraries which contain back end tape are in this state.
<b>Copy Operations Degraded State</b>	CBR3785E	Set if any distributed library is in the copy operations disabled state.
<b>VTS Operations Degraded State</b>	CBR3786E	Set if any distributed library is in this state.



<i>Table 3. Messages for TS7700 library operational states (continued)</i>		
<b>Library Operational State</b>	<b>Associated CBR Message</b>	<b>Composite Library Reporting</b>
<b>Immediate Mode Copy Completion's Deferred State</b>	CBR3787E and CBR3791I	Set if any distributed library is in this state.
<b>Service Preparation State</b>	CBR3788E	Set if any distributed library is in this state.
<b>Grid Link Degraded</b>	CBR3796E and CBR3797I	Set if any distributed library is in this state.
<b>Host Copy Operations Disabled</b>	CBR3799E	Set if any distributed library is in this state.
<b>Limited Cache Free Space</b>	CBR3792E and CBR3793I	Set if all distributed libraries containing a primary (deep) disk cache are in this state.
<b>Out of Cache Resources</b>	CBR3794A and CBR3795I	Set if all distributed libraries containing a primary (deep) disk cache are in this state..
<b>Synchronous Mode Copy Completion's Deferred State</b>	CBR3730E and CBR3731I	Set if any distributed library is in this state
<b>Cloud Object Storage Degraded</b>	CBR3736E and CBR3737I	Set if any distributed library is in this state.

## TS7680 tape virtualization

The IBM System Storage TS7680 ProtecTIER Deduplication Gateway is designed to deliver a high performance inline data deduplication solution on IBM 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 TS7680 also supports asynchronous replication to another TS7680. This allows another copy of the logical volume to exist at a disaster recovery (DR) location. Only unique data that does not already exist in the repository at the remote location is transmitted. Unlike the TS7700 Virtualization Engine, the TS7680 supports unilateral replication in one direction and does not support outboard (advanced) policy management. So, with system-managed tape, because scratch allocations are not controlled through volume serial number ranges, and instead uses common scratch pools, selective replication in the TS7680 is not supported and is instead controlled at the common scratch pool level. All of the volume serial ranges associated with a common scratch pool can be set up to either replicate or not replicate. So, for instance, a test system that uses a different common scratch pool can be set up to not replicate, yet the common scratch pools associated with production systems can be set up to replicate. Then, on



an exception basis, some applications or jobs could be set up to mount by specific volume serial number, thereby allowing some amount of selective replication by volume range.

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. BYDEVICES is the default randomization option with z/OS 3.1. For a discussion of the load balancing option, refer to ["Load balancing considerations"](#) on page 52.

consider using the new MVS Device Allocation TAPELIB\_PREF randomization option "BYDEVICES".

For additional information on the IBM System Storage TS7680, refer to the IBM Documentation for the TS7680 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 113](#).

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 109](#).

**Tip:** You can also use sample program CBRSPCLS 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 issued, 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 TS7700 Virtualization Engine and what mechanism is used to bring the copy exported volumes back into a TS7700, refer to [“Copy export from the TS7700 Virtualization Engine” on page 39](#).



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.

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 176](#) 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”](#) on page 32 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 32 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 35). 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 211 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-SYSZCBBR  
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-SYSZCBBR  
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 datasever 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 4 on page 36](#):

*Table 4. Methods for ejecting cartridges from a tape library*

Eject request invoked by	Action taken to cause eject	Associated procedure
<b>OAM</b>	Ejects cartridge automatically following an unsuccessful cartridge entry attempt.	N/A
<b>Operator</b>	Ejects cartridge using the LIBRARY EJECT command.	<a href="#">“Ejecting a specific Tape Volume” on page 107</a>
<b>Storage administrator</b>	Specifies an EJECT line operator next to a volume serial number on an ISMF Mountable Tape Volume List panel.	<a href="#">“Ejecting a volume from a tape library” on page 280</a>
<b>Application program</b>	Issues the CBRXLCS macro with the EJECT function.	<a href="#">“Ejecting a tape cartridge” on page 164</a>

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 219](#) 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 4 on page 36](#).

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 37](#) and [“Ejecting a logical Volume from a VTS” on page 37](#).



## 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 4 on page 36](#). 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” on page 37](#).

## 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 TS7700 Virtualization Engine, refer to [“Copy export from the TS7700 Virtualization Engine” on page 39](#).

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. 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 174](#). 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”](#) on page 38 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 38 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 TS7700 Virtualization Engine

A copy of the data within a TS7700 Virtualization Engine can be removed from the library, both in a stand-alone and in a multi-cluster grid configuration. The included references to the TS7700 refer to a TS7700 Virtualization Engine that can export a copy of the data (with physical tape attached).

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 TS7700 operating the export. Only the valid logical volumes on that TS7700 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 TS7700 is in a grid configuration, copies that are not completed to the TS7700 operating the copy export are not considered during the execution of the operation. It is expected that the copy export operation runs on a periodic basis that results in multiple groups of physical volumes that contain the copies of the logical volumes from the TS7700. However, the number of offsite volumes a TS7700 allows is limited to 2000 (by default and through the library's management interface can be set to a maximum of 10,000 with TS7700 Release 1.6). When a copy export is initiated, the TS7700 determines the total count of physical volumes that are currently offsite. It then adds that number to the number of physical volumes in the specified pool that have active data on them and might be exported. If that number exceeds the limit set, the export fails. During the copy export operation, a copy of the current TS7700's database is written to the exported physical volumes (by default and starting with TS7700 Release 2.1 a new copy export list file option LMTDBPVL can be used to limit the number of physical volumes that have a copy of the TS7700's database to the first two and the last two physical volumes in the copy export list volume set). To restore access to the data on the physical volumes that are removed, all exported physical volumes for a source TS7700 are placed into a library that is attached to an empty TS7700. A disaster recovery procedure is then performed that restores access by using the most recent copy of the database.

The physical volumes that are exported during a copy export operation continue to be managed by the source TS7700 regarding space management. Logical volumes that are resident on the exported physical volumes are expired, rewritten or otherwise invalidated. While this happens, 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 TS7700 for processing. Instead, a new secondary copy of the remaining valid logical volumes is made that uses the primary logical volume copy as a source. The next time the copy export operation runs, the physical volumes with the new copies are also exported. The physical volumes that are reclaimed (offsite) are no longer considered to have valid data and can be returned to the source TS7700 to be used as new scratch volumes.

Before you initiate a copy export operation using the existing LIBRARY EXPORT command, the export list volume must first be created on the TS7700 that is to operate the export (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 TS7700, management class can be used to direct in which TS7700 the export list volume is created. For copy export, the export list volume cannot be valid on more than one TS7700 in a grid configuration. It must be valid on the TS7700 that is to operate the copy export, otherwise the request fails. Then, when the LIBRARY EXPORT command is given, the library directs the export operation to the TS7700 that has a valid copy of the export list volume (again, only one TS7700 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) and a reserved file that the TS7700 uses to provide completion status and export operation information. As part of the execution of the copy export operation, the TS7700 creates response records in the reserved file that lists the logical volumes that are exported and the physical volume that they exist on. This information might be used by the users as a record for what data is offsite. The TS7700 also writes records in the reserved



file on the export list volume for any offsite physical volumes that are reclaimed and no longer contain any active data.

The copy export operation can also be canceled by using the existing LIBRARY EXPORT command with the CANCEL option or it can be canceled at the library. For a copy export, processing for the current physical volume completes. Status files are written for all logical and physical volumes that 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 TS7700, no notification of their change in state is created 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 exists). 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 by 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 more information 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 TS7700, 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.

## Copy export merge

With the copy export support (discussed before), when logical volumes are copy exported, those copy exported physical volumes (from the same source TS7700) are placed into an empty TS7700 Virtualization Engine. In this case, the host database information and the composite library name that is associated with the copy exported logical volumes remains the same. Starting with Release 2.1 of the TS7700 Virtualization Engine, a new copy export merge function is introduced. The function enables customers to take the copy exported physical volumes (generated in the process that is mentioned



earlier) and merge them into an existing TS7700 with data (where before the copy exported volumes (from a single source TS7700) needed to be placed into an empty TS7700). In this case, since the composite library that the logical volumes are being entered into is different, the customer needs to make the appropriate host database changes. For example, volume record in the tape configuration database and tape management system changes can show in which library the copy exported logical volumes now exist. For the recovery of the copy exported volumes, a modified disaster recovery process is used instead of an import so the host is not notified when the volumes are brought into the library. For a detailed discussion of the copy export function and copy export merge refer to [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](http://www.ibm.com/docs/en/ts7700-virtual-tape).

## 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=SYSZCBBR  
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 topic 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 topic 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 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 IBM 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 IBM Z® with control unit attached devices.

#### Note:

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 5 on page 44 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 5. 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 or 3948 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
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 <sup>2</sup>	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 <sup>2</sup>	Yes	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3590-E <sup>3</sup> (3590-1 emulation)	Yes	MEDIA3/4 MEDIA3/4	(R) (R/W)	128 256	10 GB, 20 GB 20 GB, 40 GB



Table 5. Tape storage configurations (continued)

Library model and subsystem device type	Library attachment	Media supported		Recording technology	Noncompacted data capacity
3590-H <sup>4</sup> (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 <sup>5</sup> (3590-1 emulation)	Yes	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 <sup>6</sup> (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 <sup>7</sup> (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 <sup>8</sup> (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
<b>3584 L22</b>					
3592-J <sup>5</sup> (3590-1 emulation)	Yes	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 <sup>6</sup> (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 <sup>7</sup> (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 <sup>8</sup> (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



Table 5. Tape storage configurations (continued)

Library model and subsystem device type	Library attachment	Media supported		Recording technology	Noncompacted data capacity
3592-4E <sup>9</sup> (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10 MEDIA9/10 MEDIA11/12 MEDIA13	(R) (R) (R) (R) (R) (R) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT4/EEFMT4 EFMT4/EEFMT4 EFMT4/EEFMT4	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB 1600GB 4000GB 500GB
<b>Manual Tape Library (MTL)</b>					
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 <sup>2</sup>	N/A	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3590-E <sup>3</sup> (3590-1 emulation)	N/A	MEDIA3/4 MEDIA3/4	(R) (R/W)	128 256	10 GB, 20 GB 20 GB, 40 GB
3590-H <sup>4</sup> (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 <sup>5</sup> (3590-1 emulation)	N/A	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-2 <sup>6</sup> (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 <sup>7</sup> (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 <sup>8</sup> (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



Table 5. Tape storage configurations (continued)

Library model and subsystem device type	Library attachment	Media supported		Recording technology	Noncompacted data capacity
3592-4E <sup>9</sup> (3590-1 emulation)	Yes	MEDIA5/6 MEDIA5/6 MEDIA5/6 MEDIA7/8 MEDIA7/8 MEDIA7/8 MEDIA9/10 MEDIA9/10 MEDIA9/10 MEDIA11/12 MEDIA13	(R) (R) (R) (R) (R) (R) (R) (R/W) (R/W) (R/W) (R/W)	EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT1 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT2/EEFMT2 EFMT3/EEFMT3 EFMT4/EEFMT4 EFMT4/EEFMT4 EFMT4/EEFMT4	300GB 500GB 640GB 60GB 100GB 128GB 700GB 1000GB 1600GB 4000GB 500GB
<b>Stand Alone</b>					
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 <sup>2</sup>	N/A	MEDIA3/4	(R/W)	128	10 GB, 20 GB
3590-E <sup>3</sup> (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 <sup>4</sup> (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 <sup>5</sup> (3590-1 emulation)	N/A	MEDIA5/6 MEDIA7/8	(R/W) (R/W)	EFMT1 EFMT1	300 GB 60 GB
3592-J <sup>5</sup> (3490-E emulation)	N/A	MEDIA5	(R/W)	EFMT1	300 GB
3592-2 <sup>6</sup> (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 <sup>7</sup> (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 <sup>8</sup> (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



Table 5. Tape storage configurations (continued)

Library model and subsystem device type	Library attachment	Media supported		Recording technology	Noncompacted data capacity
3592-4E9 (3590-1 emulation)	Yes	MEDIA5/6	(R)	EFMT1	300GB
		MEDIA5/6	(R)	EFMT2/EEFMT2	500GB
		MEDIA5/6	(R)	EFMT3/EEFMT3	640GB
		MEDIA7/8	(R)	EFMT1	60GB
		MEDIA7/8	(R)	EFMT2/EEFMT2	100GB
		MEDIA7/8	(R)	EFMT3/EEFMT3	128GB
		MEDIA9/10	(R)	EFMT2/EEFMT2	700GB
		MEDIA9/10	(R/W)	EFMT3/EEFMT3	1000GB
		MEDIA9/10	(R/W)	EFMT4/EEFMT4	1600GB
		MEDIA11/12	(R/W)	EFMT4/EEFMT4	4000GB
		MEDIA13	(R/W)	EFMT4/EEFMT4	500GB

**Note:**

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 24.

## 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. Starting with release 4.1.2 of the TS7700, enhanced (software



based) compression options (in data class) are also available and selectable through the Management Interface (MI) of the TS7700.

### **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 read EFMT1, EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, and EEFMT4 and write EFMT3, EEFMT3, EFMT4, and EEFMT4 formats. Write support for EFMT3 and EEFMT3 is provided only on MEDIA9 and MEDIA10 and support for EFMT4 and EEFMT4 is provided with MEDIA9, MEDIA10, MEDIA11, MEDIA12, and MEDIA13. Only read support is provided for media types MEDIA5 through MEDIA8 and EFMT2/EEFMT2 with MEDIA9 and MEDIA10.

### **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 5 on page 44](#) 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 211](#) for more information concerning this cartridge entry installation exit. See [“TDSI coexistence considerations” on page 71](#) 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**

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**

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**

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 Model E05 read-compatibility processing**

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.

### **3592 Model E06 read-compatibility processing**

Because 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, because 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.

### **3592 Model E07 read-compatibility processing**

The 3592 Model E07 is only downward read (and not write) compatible with:

- EFMT1 format on MEDIA5 through MEDIA8.
- EFMT2 and EEFMT2 formats on MEDIA5 through MEDIA10.
- EFMT3 and EEFMT3 formats on MEDIA5 through MEDIA8.

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 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 Commands*.)

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

### With the unit parameter

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. However, there might be times 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 uses the list of eligible devices that are returned by SMS and the devices that are specified on the UNIT parameter and allocates using the intersection of the two lists. Therefore, if a single device is specified, and that device is one of the eligible devices that are returned by SMS, MVS allocation allocates to the device specified. And if an esoteric is specified on the UNIT parameter (one or more devices), MVS allocation allocates from the intersection of the two lists. Devices that are not in both lists are ignored. For more information on the SMSHONOR keyword, see *z/OS MVS JCL Reference*.

### With SMS policies

With APAR OA59161 (z/OS V2R3 and above), SMSHONOR can also be specified through the tape storage group definition. The string "SMSHONOR=" is searched (as part of the storage group description) to determine if the allocation should be limited. What follows the "=" sign can be a device number (3 or 4 hexadecimal digits) or a 1-8 character esoteric (consisting of alphanumeric, \$, #, or @ characters). When specifying a 4-digit device number, a preceding slash (/) is required and is optional for a 3-digit device number. The string "SMSHONOR=" can appear anywhere within the 120-character description field. For a scratch allocation, if more than one tape storage group is assigned through the ACS routines, usage of SMSHONOR must be consistent across all of the storage groups (SMSHONOR must then be specified for all of the assigned storage groups and what is specified for the value must also be consistent across the storage groups). For a specific allocation, the storage group that is assigned to the volume is checked to see if SMSHONOR is associated with that tape storage group. This enables customers to use their ACS routines (and the assignment of tape storage groups) to then direct certain workloads to a limited set of devices, therefore, leaving the full set of devices to other workloads. As with the support above, MVS allocation then allocates using the intersection of the two lists. If an issue is detected, rather than fail the allocation request, in this case, MVS allocation returns with a warning and a new health check. However, if all of the devices in the intersected list are busy, as with any allocation request, it goes into allocation recovery. See message IEFA114I for the warning conditions that are detected, and in those cases, the allocation proceeds with the eligible device pool list returned by SMS. An SMSHONOR specification on the UNIT parameter takes precedence. Unlike the support above, specification of SMSHONOR through SMS policies is only supported if the JES subsystem is not active. If the JES3 subsystem is active, specification of SMSHONOR is ignored. Which also means that if the JES3 subsystem is active, and the devices are not JES3 managed, specification of SMSHONOR is also ignored.

## Load balancing considerations

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

### Scratch allocations

Beginning with z/OS 3.1, by default, MVS Device Allocation will use the BYDEVICES randomization algorithm, which randomizes non-specific (scratch) allocations across all eligible devices. MVS Device Allocation also supports an older EQUAL algorithm, which first randomizes across all eligible libraries and



then once a library is selected, will randomize on the eligible devices within that library. The TS7700 Virtualization Engine "library" refers to a composite library since MVS Device Allocation has no knowledge of the underlying clusters (distributed libraries).

Prior to z/OS 3.1, MVS Device Allocation will use the EQUAL algorithm, by default, but can optionally use the BYDEVICES algorithm. Even though BYDEVICES is not the default, IBM recommends the use of the BYDEVICES algorithm prior to z/OS 3.1.

The BYDEVICES algorithm will 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. 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 one-third of the scratch allocations and the library that has 256 devices will receive approximately two-thirds of the scratch allocations.

The older EQUAL algorithm 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. With this algorithm, there may 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 this imbalance occurs, it is suggested to use the BYDEVICES algorithm instead.

The algorithm can be specified through the ALLOCxx PARMLIB member by using the SYSTEM TAPELIB\_PREF(BYDEVICES) or SYSTEM TAPELIB\_PREF(EQUAL) parameter. It can be changed dynamically (after an IPL) through the SETALLOC operator command by issuing the SETALLOC SYSTEM,TAPELIB\_PREF=BYDEVICES or SETALLOC SYSTEM,TAPELIB\_PREF=EQUAL commands.

## Specific allocations

For specific allocations (JES2-only environment), an ordered list of subsystems may be returned to MVS Device 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 Device allocation attempts to allocate from the first subsystem returned in the list. If an online device is not available within that subsystem, MVS Device allocation moves to the next subsystem in the list and tries again until a device is chosen. The older EQUAL algorithm only supports an ordered list for the first seven subsystems returned in the list. If an online device is not available within that subsystem, MVS Device Allocation moves to the next subsystem in the list and tries again until a device is chosen. The older EQUAL algorithm only supports an ordered list for the first seven subsystems returned in the list. If an eligible device is not found within the first seven subsystems, all of the remaining subsystems are considered equal. The BYDEVICES algorithm does not have this ordered subsystem limitation.

## 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. Refer to information APAR II14516 and ["Load balancing considerations" on page 52](#) for additional considerations when running in balanced mode.

## Specific allocation assistance

With Release 1.5 of the TS7700 Virtualization Engine, by default, 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. This function is supported in a JES2-only environment at z/OS V1R8 and above with APAR OA24966, and in z/OS V2R1 with JES3 (refer to ["JES3 considerations"](#) on page 54 for additional detail).

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 111 for information on the LIBRARY REQUEST command. For additional information on device allocation assistance, refer to the IBM Documentation for the TS7700.

## Scratch allocation assistance

With Release 2.0 of the TS7700 Virtualization Engine, additional support is provided for scratch allocations. This function is supported in a JES2-only environment at z/OS V1R10 and above with APAR OA32957, and in z/OS V2R1 with JES3 (refer to ["JES3 considerations"](#) on page 54 for additional detail). If you have a hybrid configuration where some of the TS7700 Virtualization Engines have physical tape attached, you might want to direct specific workloads to clusters that have a disk-only cache capability (for fast access) and other (archive-type) workloads to clusters that have a physical tape capability. 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 (which is 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, the filtered lists of other eligible grid-configurations (composite libraries), or both. Refer to ["TS7700 Virtualization Engine"](#) on page 21 for information on the LIBRARY REQUEST command. For additional information on scratch allocation assistance, refer to [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#).

## JES3 considerations

Unlike the system-managed tape support in the non-JES3 (JES2) environment, the JES3 support relies on customer INISH deck setup and special tape-library-related esoteric names: complex-wide name library-specific name, library-specific device name, complex-wide device name, and a new library-specific distributed name for use with the allocation assist support. By default the allocation assist support is disabled in the JES3 environment. The following sections outline what is needed to use the device allocation assist support in a JES3 environment. The first set of steps is common for device allocation assistance (specific mounts) as well as scratch allocation assistance (scratch mounts). Device allocation assistance can be used independent of the scratch allocation assistance support and vice versa.



**complex-wide name**

Always LDGW3495. Indicates every device and device type in every library.

**library-specific name**

An eight character string composed of LDG prefixing the five digit library identification number.

Indicates every device and device type in that specific library (for example, LDG12345). In a TS7700 Virtualization Engine, the "library-specific name" refers to the composite library.

**library-specific device name**

An eight character string composed of LDx prefixing the five digit library identification number.

Indicates every device with device type "x" in that specific library (for example, LDE12345, where "E" represents all 3490E devices in library 12345). In a TS7700 Virtualization Engine, the "library-specific device name" refers to the composite library.

**complex-wide device name**

Contains a prefix of LDG and a device identifier that represents all devices of a particular machine and model type in every tape library (for example, LDG3490E for 3490E devices).

**library-specific distributed name**

An eight character string composed of LDX prefixing the five digit library identification number of the distributed library (or cluster) in a TS7700 Virtualization Engine. Only for use with the TS7700 Virtualization Engine and only if the device allocation assist functions (DAA, SAA, or both) are to be used by JES3. The "library-specific distributed name" is used in addition to the esoteric names above that are still needed. The LDXxxxxx names should be defined only for distributed libraries (or clusters) that have devices connected to the host.

***Specific allocation assistance enablement considerations***

The installation steps below must be followed to prevent job failures from occurring.

1. Ensure that all systems in the JES3plex are at z/OS V2R1 (this is needed because pre-execution and job execution can occur on different systems in the JES3plex). JES3 itself, however, can be at a lower release level.
2. Make JES3 INISH deck changes as described in ["INISH deck example"](#) on page 56. The INISH deck changes define the library-specific distributed names associated with the distributed libraries "clusters" in a TS7000 Virtualization Engine. All TS7700 Virtualization Engines being used by JES3 (with devices connected to the host) should have the new esoteric names defined, regardless of whether the TS7700 Virtualization Engine is part of a single or a multi-cluster grid.
3. Roll-out the JES3 INISH deck changes to all systems in the JES3plex (this roll-out can occur one system at a time). The new esoteric names will not be passed to JES3 until the support is enabled through DEVSUPxx.
4. By default, the device allocation assist function is enabled at the library for all specific allocations. However, starting with Release 1.7 of the TS7700 Virtualization Engine, this support can be disabled either by a tape hardware specialist (PFE) dialing into the library or starting with Release 2.0 of the TS7700, through the MVS LIBRARY REQUEST command. Verify that the DAA function is enabled at the library by using the LIBRARY REQUEST,composite-library-name,SETTING command.
5. Lastly, enable the support to the host through the DEVSUPxx PARMLIB member using the JES3\_ALLOC\_ASSIST=YES keyword (either at IPL or through the SET DEVSUP=xx operator command). The SET DEVSUP=xx operator command can be used to enable this support by routing the command to all systems in the JES3plex. Once this support is enabled, the new library-specific distributed names can be returned to JES3. Ensure that steps 2 and 3 are completed before enabling this support; otherwise, job failures can occur if JES3 does not understand the new esoteric names being passed (because they were not defined in the JES3 INISH deck).

If one of the systems in the JES3plex lags behind (in enablement of this support), all that might occur is that the device allocation assist preferred cluster list might not be honored. JES3 and MVS allocation will still see the same list of eligible devices.

***Scratch allocation assistance enablement considerations***

The installation steps below must be followed to prevent job failures from occurring.



1. Ensure that all systems in the JES3plex are at z/OS V2R1 (this is needed because pre-execution and job execution can occur on different systems in the JES3plex). JES3 itself, however, can be at a lower release level.
2. Make JES3 INISH deck changes as described in [“INISH deck example”](#) on page 56. The INISH deck changes define the library-specific distributed names associated with the distributed libraries "clusters" in a TS7000 Virtualization Engine. All TS7700 Virtualization Engines being used by JES3 (with devices connected to the host) should have the new esoteric names defined, regardless of whether the TS7700 Virtualization Engine is part of a single or a multi-cluster grid.
3. Roll-out the JES3 INISH deck changes to all systems in the JES3plex (this roll-out can occur one system at a time). The new esoteric names will not be passed to JES3 until the support is enabled through DEVSUPxx.
4. Enable the support to the host through the DEVSUPxx PARMLIB member using the JES3\_ALLOC\_ASSIST=YES keyword (either at IPL or through the SET DEVSUP=xx operator command). The SET DEVSUP=xx operator command can be used to enable this support by routing the command to all systems in the JES3plex. Once this support is enabled, the new library-specific distributed names can be returned to JES3. Ensure that steps 2 and 3 are completed before enabling this support; otherwise, job failures can occur if JES3 does not understand the new esoteric names being passed (because they were not defined in the JES3 INISH deck).
5. Then, unlike the specific allocation assistance support, the scratch allocation assistance support must be explicitly enabled at the library through the LIBRARY REQUEST,composite-library-name,SETTING,DEVALLOC,SCRATCH,ENABLE command command (disabled by default) and then policies must be set up at the library (on a management class basis) to request the support for a specific scratch allocation. Before assigning a management class policy that uses the scratch allocation assistance support (specifies candidate clusters), ensure that step 4 has been completed first to help ensure that the list of eligible devices that JES3 gets back matches the list of devices that MVS allocation got back during job execution. Even though MVS allocation has special retry logic to try to circumvent ABEND05C-309, there is no guarantee that the retry logic will succeed.

### ***INISH deck example***

Here is an example of an INISH deck for a TS7700 multi-cluster grid that has devices online in two clusters (other clusters whose devices are not connected to the host might exist for replication purposes). In this example, the composite library has library identification number X'12345' and the first distributed library in the grid has library identification number X'10001' and the second distributed library in the grid has library identification number X'10002'. In this example, each distributed library in the grid has 256 devices for a total of 512. The changes that must be made to the INISH deck to use the optional allocation assist support in JES3 are shown in ***bold italic*** text. The INISH deck changes are needed only if the allocation assist functions are to be enabled by specifying JES3\_ALLOC\_ASSIST=YES in the DEVSUPxx PARMLIB member. Before you enable the allocation assist functions, ensure that all TS7700 Virtualization Engines in the INISH deck are defined with the needed LDXxxxxx names, even if the TS7700 Virtualization is a stand-alone configuration consisting of one distributed library.

In this example, instead of the device statement representing the composite library (as a whole), the device statements are defined at the distributed (or cluster) level and LDXxxxxx names are added (as needed) for each distributed library in a TS7700 Virtualization Engine that has devices connected to the JES3 host.

#### 1. Device Statements:

Replace:

```
DEVICE,XTYPE=(CLB12345,CA),XUNIT=(1100,*ALL,,OFF),NUMDEV=512
```

With:

```
DEVICE,XTYPE=(DLB10001,CA),XUNIT=(1100,*ALL,,OFF),NUMDEV=256
DEVICE,XTYPE=(DLB10002,CA),XUNIT=(1200,*ALL,,OFF),NUMDEV=256
```



The device statements above are suggested examples that can be used; however, depending on the contiguous device ranges that are available, more than one device statement could be used to represent all of the devices in a composite library and more than one device statement could be needed to represent the devices in a distributed library (and, a given device can only occur in one device statement). For example, if there are not 256 contiguous device addresses starting with 1100, the devices could be split as follows (again, this is just an example):

```
DEVICE, XTYPE=(DLB10001, CA), XUNIT=(1000, *ALL, , OFF), NUMDEV=128
DEVICE, XTYPE=(DLB10001, CA), XUNIT=(1100, *ALL, , OFF), NUMDEV=128
```

Also, one of the factors used by JES3 in selecting devices for volume mounting is the ADDRSORT parameter on the SETPARAM initialization statement. This parameter specifies that devices are either allocated in the same order as the DEVICE statement defining them (ADDRSORT=NO) or allocated by the order of their device numbers in ascending order (ADDRSORT=YES (the default)). In a multi-cluster grid environment today, customers may have used ADDRSORT=NO to distribute their work load across multiple clusters in the grid by defining each device individually and alternating devices across the clusters. With the allocation assist support enabled, since the goal is to direct allocation requests to specific distributed libraries “clusters” in the grid, ADDRSORT=NO should no longer be needed. Within a distributed library (or cluster) it doesn’t matter which device is used and the main purpose of the allocation assist support is to direct the allocation request to appropriate distributed libraries.

## 2. SETNAME Statements:

For the 3490E devices in “composite library 12345, distributed library (10001)”

```
SETNAME, XTYPE=DLB10001, NAMES=(LDGW3495, LDG12345, LDG3490E, LDE12345, LDX10001)
```

For the 3490E devices in “composite library 12345, distributed library (10002)”

```
SETNAME, XTYPE=DLB10002, NAMES=(LDGW3495, LDG12345, LDG3490E, LDE12345, LDX10002)
```

## 3. High Watermark Statements:

```
HWSNAME, TYPE=(LDGW3495, LDG12345, LDG3490E, LDE12345, LDX10001, LDX10002)
HWSNAME, TYPE=(LDG12345, LDE12345, LDG3490E, LDX10001, LDX10002)
HWSNAME, TYPE=(LDE12345, LDG12345, LDG3490E, LDX10001, LDX10002)
HWSNAME, TYPE=(LDG3490E, LDE12345, LDG12345, LDX10001, LDX10002)
HWSNAME, TYPE=(LDX10001)
HWSNAME, TYPE=(LDX10002)
```

**Note:** The “DLB10001” and DLB10002” device statement names are used here for illustration purposes. When defining the device statement names, any name (up to 8 characters) can be used.

# 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 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 can be recorded only on 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 EEFMT2 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 EOVS 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 (TCDB) 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 6 on page 60 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 62 for a discussion of the software error category.

Table 6. 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
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
<b>Note:</b> If the tape library is partitioned, the categories used are derived from the base software categories. See <a href="#">“Partitioning tape libraries among multiple sysplexes (systems)”</a> on page 66 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 125](#) 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 62](#) 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 CONSOLxx 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:

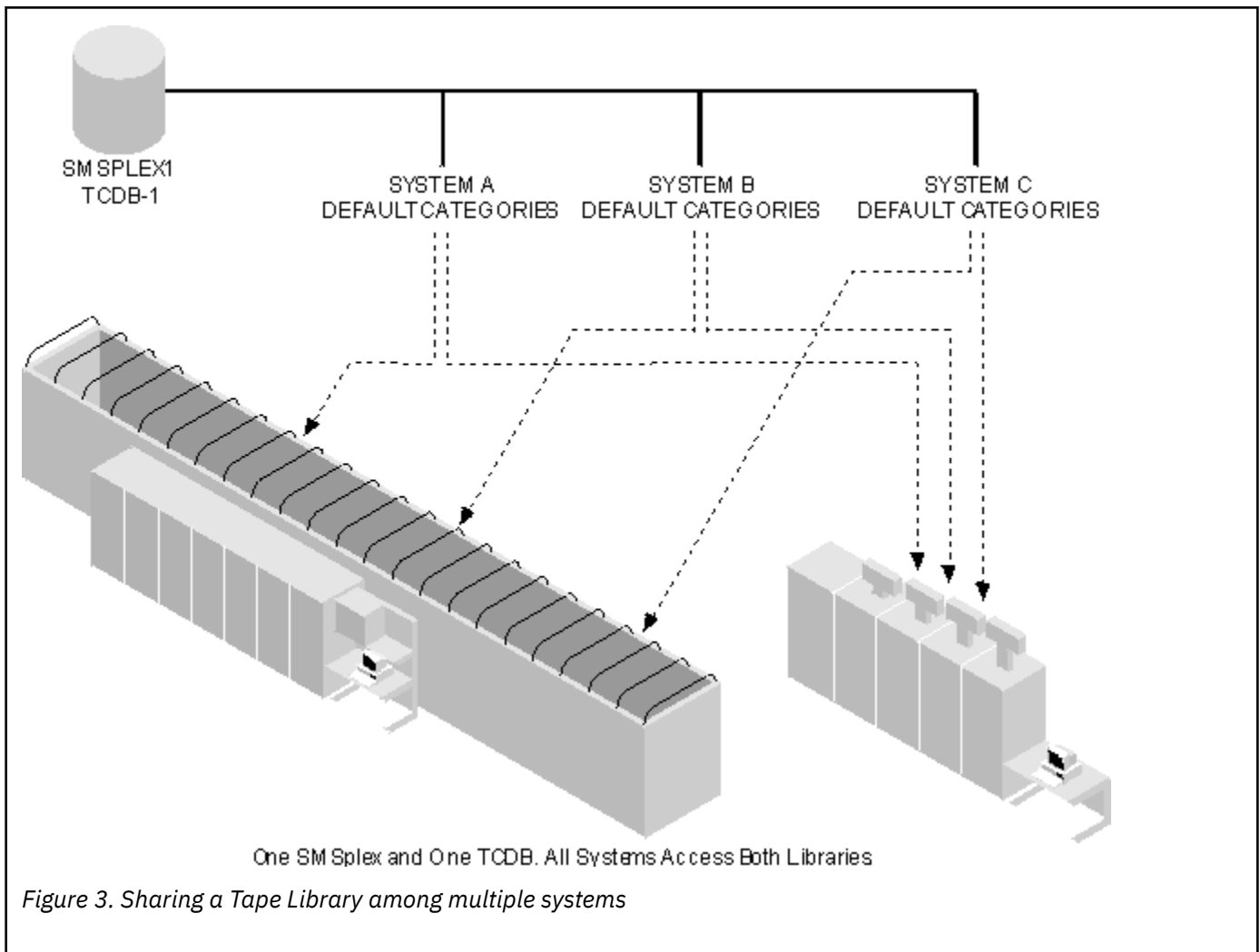
- In a JES3 environment, the console name associated with the library must be attached to the current JES3 global processor, and must be switchable to any local processor capable of becoming the global. The console should be defined in the JES3 initialization deck as an MCS console by specifying TYPE=MCS 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 on page 65](#) for an example of sharing a tape library among 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.

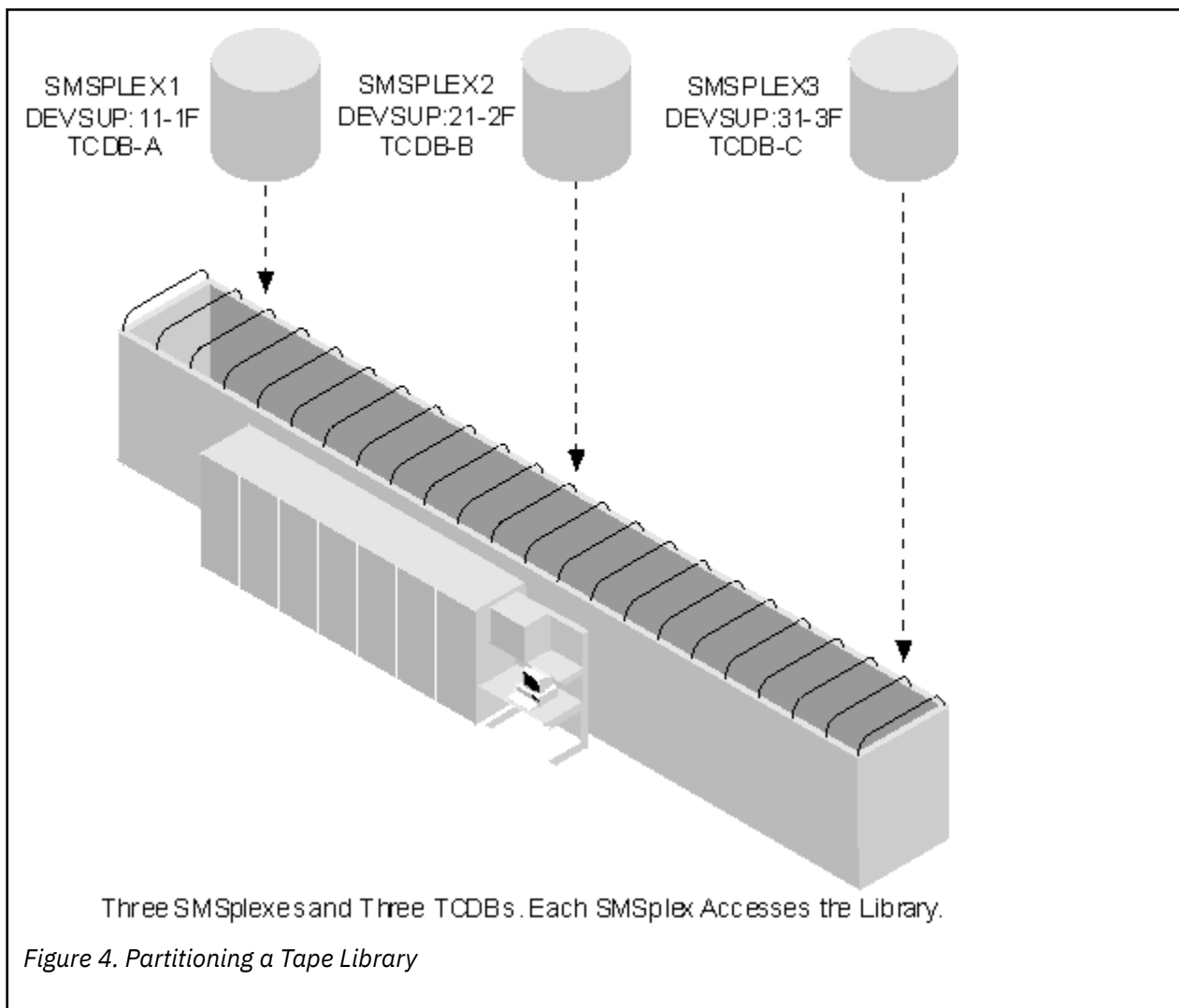
No matter which private volume management mechanism is selected, it should be noted that a permanent association between the volume and a particular SMS complex is not possible. When the volume use attribute is changed from private to scratch, the volume becomes eligible for use on any system sharing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

## Partitioning tape libraries among multiple sysplexes (systems)

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 or virtual library into multiple logical libraries, with each logical library (TCDBplex) represented by one TCDB. [Figure 4 on page 67](#) provides a pictorial description of library partitioning.

**Note:** The scratch category thresholds and counts are maintained (for each tape library) in a tape library record in the TCDB (hlq.VOLCAT.VGENERAL). In a tape library record, there is only one set of scratch values for each media type, so sharing the same tape library record with other sysplexes (or systems) that are not using the same scratch categories can cause scratch threshold and possible load balancing issues across multiple libraries. When logically partitioning a tape library there must be a separate hlq.VOLCAT.VGENERAL for each set of sharing systems, so that each set of sharing systems can be managed by its own tape library record. This ensures that the scratch counts (in a tape library record) are tied to one set of scratch categories.





## 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 6 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 DEVSUPxx parameters, see [z/OS MVS Initialization and Tuning Reference](#).

In a partitioned library, it is recommended that the installation use DEVSUPxx 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 DEVSUPxx 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 DEVSUPxx 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 DEVSUPxx 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 DEVSUPxx parameters are used, special processing is necessary to move volumes to the new categories established through DEVSUPxx:

- Modify the DEVSUPxx 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 DEVSUPxx scratch categories to be used at the library.
- IPL all systems in the TCDBplex to activate the DEVSUPxx 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 DEVSUPxx. All volumes in the default scratch categories and in the error category are changed to the new DEVSUPxx 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 69.

## 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 115](#), and [“Setting the cartridge loader scratch media type” on page 115](#) 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 115](#), and [“Setting the cartridge loader scratch media type” on page 115](#) 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 71](#).

## 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 daserver 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 topic 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 topic includes instructions for using SAMPLIB (Appendix A, “[SAMPLIB members](#),” on page 239 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](#) 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 Upgrade Workflow](#).

---

### 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 LOADxx 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.

---

### 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 dataserer support. See [“Installation procedures” on page 73](#) for more detailed information regarding each of these checklist items. Check off each item as it is completed within your installation.

- \_\_ 1. Build the library inventory.

See [“Building the library inventory” on page 73](#)

- \_\_ 2. Update PARMLIB.

See [“Changing system libraries” on page 73](#)

- \_\_ a. Update IGDSMSxx PARMLIB member.
- \_\_ b. Update IEFSSNxx PARMLIB member.
- \_\_ c. Update CONSOLxx PARMLIB member.
- \_\_ d. Update DEVSUPxx PARMLIB member.
- \_\_ e. Create or update CBROAMxx PARMLIB member (optional; used with the SETTLIB command)

- \_\_ 3. Update PROCLIB by running CBRAPROC SAMPLIB member.

- \_\_ 4. Create the global resource serialization environment. (Optional, depending on your installation.)

See [“Creating the global resource serialization environment” on page 81](#)

- \_\_ 5. Define the volume catalogs.

See [“Creating the tape configuration database” on page 82](#)

- \_\_ 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.
- \_\_ e. Authorize the storage administrator to the RACF facility class.

- \_\_ 6. Define tape drives using HCD.

See [“Creating the hardware configuration” on page 84](#)

- \_\_ 7. IPL the system.

See [“IPLing the system” on page 84](#)

- \_\_ 8. Define the base SCDS.

See [“Creating the SMS definitions” on page 85](#)

- \_\_ 9. Define tape libraries.
- \_\_ 10. Define tape storage groups.
- \_\_ 11. Define storage classes.
- \_\_ 12. Define data classes.
- \_\_ 13. Define and test ACS routines.
- \_\_ 14. Create a cartridge entry installation exit routine (optional, depending upon your installation).

See [“Creating the installation exit routines” on page 86](#)

- \_\_ 15. Create a change use attribute installation exit routine (optional, depending on your installation).
- \_\_ 16. Create a cartridge eject installation exit routine (optional, depending on your installation).
- \_\_ 17. Create a volume not in library installation exit routine (optional, depending on your installation).
- \_\_ 18. Validate the configuration.

See [“Validating the configuration” on page 86](#)

- \_\_ 19. Activate the SMS configuration.



See [“Activating the SMS configuration” on page 86](#)

\_\_ 20. Start the OAM address space.

See [“Starting the OAM address space” on page 86](#)

\_\_ 21. Vary the library online.

See [“Varying the library online” on page 87](#)

\_\_ 22. Display and set the cartridge loader media type.

See [“Displaying and setting the cartridge loader media type” on page 87](#)

\_\_ a. Display the cartridge loader media type.

\_\_ b. Set the cartridge loader media type.

\_\_ 23. Run the job stream.

See [“Running the job stream” on page 87](#)

## 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 69](#). 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 IGDSMSxx 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 - 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 - 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 that is 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 104. For more information on the START command, see [z/OS MVS System Commands](#). Also, for more details concerning these optional parameters and other keywords that are associated with the IGDSMSxx PARMLIB member, see [z/OS DFSMSdfp Storage Administration](#).

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

Add or update the OAMn entry in the IEFSSNxx PARMLIB member.

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

where:

### **TIME=xxx**

Specifies how OAM bases time values. 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 database (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.

OAMn 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 OAMn subsystem is started to ensure that the SMS entry precedes the BEGINPARALLEL keyword in the IEFSSNxx parmlib member. The OAMn subsystem entry in IEFSSNxx 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 OAMn subsystem entry. The OAMn entry defines the OAMn subsystem. To prevent a possible system abend, ensure that the subsystem name in the IEFSSNxx member is different from the name of the PROCLIB member that is used to start OAM.

### **Notes:**

1. You can add the OAM subsystem without re-IPLing the system by using the SETSSI ADD,S=OAMn,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.
2. Starting with z/OS V2R2, the SETSSI command can also be used to delete an existing subsystem. This command should not be used to delete the OAMn subsystem. Consider using RACF to ensure that the OAMn subsystem is not deleted.

## **Multiple OAM configuration**

If OAM's object support is being used, and optionally the multiple OAM configuration support, there are a few differences to note for the tape library OAM subsystem. Particularly, the addition of the D= parameter. Add or update the OAMn entry in the IEFSSNxx PARMLIB member. SUBSYS SUBNAME(OAMn) INITRTN(CBRINIT) INITPARM('D=NONE[,TIME=xxx][,MSG=xx]')



**D=**

Specifies the 4 character DB2 SSID or Group Attachment Name of the DB2 subsystem associated with this OAM subsystem in a multiple OAM configuration.

If D= is not specified on the first OAM subsystem to initialize, OAM runs in a classic OAM configuration and no other OAM subsystems can be defined.

If D= is specified on the first OAM subsystem to initialize, OAM runs in a multiple OAM configuration. Additional OAM subsystems up to the maximum allowed can be defined, but must also specify D=. For a Tape Library OAM subsystem in a multiple OAM configuration, specify “D=NONE” for the DB2 subsystem because DB2 is only used with an OAM object subsystem in a multiple OAM configuration.

**Note:** In a multiple OAM configuration, the SETSSI ADD command can also be used to bring in additional OAM subsystems without re-IPLing the system. Refer to [z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support](#).

## **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(CONSOLxx).
  - 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 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 that is recorded in higher-level recording format is mounted on a drive 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 DEVSUPxx member of PARMLIB and specify VOLNSNS=YES.

If you are partitioning an ATLDs, use the DEVSUPxx library partitioning-related parameters to change the system default category assignments. See [z/OS MVS Initialization and Tuning Reference](#) for more information regarding DEVSUPxx.

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 71 for potential usage of the MTLSHARE keyword.

## **2e Create or update CBROAMxx PARMLIB member (optional; used with the SETTLIB command)**

You must perform this step if you intend to use the SETTLIB (set tape library) command statement in the CBROAMxx PARMLIB member to tune your tape library environment. Previously this PARMLIB member had only been used with OAM's object support.

This CBROAMxx member is invoked by using the OAM=xx parameter in the OAM member of PROCLIB and is processed during OAM address space initialization. You must create or update the CBROAMxx member



to use the optional SETTLIB support. The CBROAMxx member might already be used with OAM's object support. If so, SETTLIB is an additional command statement that can be used for tape library processing. If you do not specify specific parameters, the defaults are used. You can include the CBROAMxx PARMLIB member in any data set that is specified in the concatenation list in SYS1.IPLPARM(LOADxx).

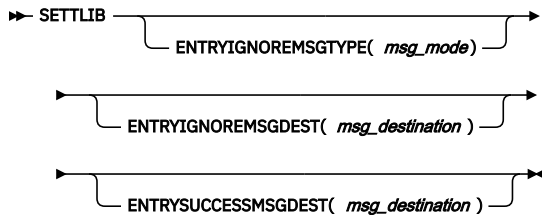
For information about using the SETTLIB command in the CBROAMxx PARMLIB member, see [“SETTLIB statement for tape library settings”](#) on page 76 and [“ONLYIF statements in a PLEX”](#) on page 78.

## SETTLIB statement for tape library settings

The SETTLIB statement and its associated keywords of the CBROAMxx PARMLIB member can be used to override the default behavior for various functions in a system managed tape library environment. The SETTLIB command statement and keywords are processed when the OAM address space is started and cannot be updated by operator command.

The syntax for the SETTLIB cartridge entry-related keywords follows.

### SETTLIB statement syntax



**SETTLIB statement keywords:** The keywords for the SETTLIB statement are:

### ENTRYIGNOREMSGTYPE(msg\_mode)

An optional parameter that specifies how OAM displays volume entry ignore messages during cartridge entry processing. If this parameter is omitted, the default behavior is “DETAIL”.

#### DETAIL

Volume ignore messages have default behavior. The following messages are displayed for each volume ignored during cartridge entry processing:

```

CBR3620I Entry of volume volser into library library-name failed.
CBR3621I Enter request ignored by the cartridge entry installation exit (CBRUXENT).
  
```

#### SUMMARY

Volume ignore messages are displayed in a summary format, up to 48 volumes at a time, 8 volumes per line (6 lines maximum):

```

CBR3670I Volume entry processing. Enter requests ignored for the following volumes in library
library-name.
volser1 volser2 volser3 volser4 volser5 volser6 volser7 volser8
  
```

#### SUPPRESS

A single status line is displayed for all volumes ignored during cartridge entry processing:

```

CBR3672I Enter requests ignored for one or more volumes in library library-name. The first volume ignored was volser.
  
```

### ENTRYIGNOREMSGDEST(msg\_destination)

An optional parameter that specifies where OAM displays volume entry ignore messages during cartridge entry processing. If this parameter is omitted, the default behavior is “ALL”.

#### ALL

Volume entry ignore messages are displayed on both the console and system log.

#### SYSLOG

Volume entry ignore messages are displayed only in the system log.

### ENTRYSUCCESSMSGDEST(msg\_destination)

An optional parameter that specifies where OAM displays successful volume entry messages (CBR3610I) during cartridge entry processing. CBR3610I is displayed in a format similar to



the CBR3670I message and contains only the SUMMARY message mode. There is no separate ENTRYSUCCESSMSGTYPE option. If this parameter is omitted, the default behavior is “ALL”.

#### **ALL**

Successful volume entry messages are displayed on both the console and system log.

#### **SYSLOG**

Successful volume entry messages are displayed only in the system log.

The syntax for the SETTLIB scratch threshold processing-related keyword follows.



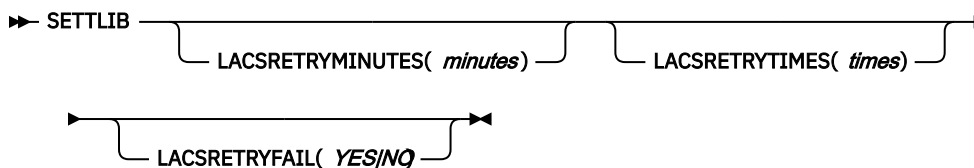
SCRATCHTHRESHOLDMSG(*percentage*)

An optional parameter that specifies when the scratch threshold message (CBR3660A) is deleted. By default, this message is deleted when the number of scratch volumes exceeds twice the threshold (or 100%). Since the OAM address space is required to parse the CBROAMxx PARMLIB member, the tuning percentages are only accepted if the OAM address space has been started, otherwise the existing default (twice the threshold or 100%) is used.

#### **percentage**

A required parameter if SCRATCHTHRESHOLDMSG is specified and indicates the percentage above scratch threshold that must be reached before the CBR3660A message is deleted. Allowed values are percentages between 25 and 100. If a value of 1 to 24 is specified, it is treated as 25% and if a value of zero is specified it is treated as 100% (the default). Based on the percentage that is specified, the CBR3660A message is deleted when the number of scratch volumes exceeds that percentage above scratch threshold. For example, if the specified percentage is 50 and the scratch threshold for MEDIA1 is 1000. The CBR3660A message is deleted when the number of scratch volumes exceeds 1500 and if the scratch threshold for MEDIA2 is 5000, the CBR3660A message is deleted when the number of scratch volumes exceeds 7500. The specified percentage applies across all libraries and media types and can be specified for an individual system by using the ONLYIF SYSNAME statement in the CBROAMxx PARMLIB member.

The syntax for the SETTLIB LACS mount-related keywords follows.



When a mount request fails and the error is considered retrievable, CBR4196D is issued asking if the mount request should be retried or failed. The LACS retry-related keywords above help automate that process.

#### **LACSRETRYMINUTES(minutes)**

An optional parameter that indicates whether the mount request should be automatically retried every (1-9) minutes. If LACSRETRYTIMES is specified and LACSRETRYMINUTES is not specified, the default minutes is two minutes. If a value of 0 is specified, the default is used.

#### **LACSRETRYTIMES(times)**

An optional parameter that indicates whether the mount request should be automatically retried for the specified (1-9) number of times. If LACSRETRYMINUTES is specified and LACSRETRYTIMES is not specified, the default times is six times. If a value of 0 is specified the default is used.

#### **LACSRETRYFAIL(YES|NO)**

An optional parameter that indicates whether the mount request should be failed or not. This can be used independent of the LACSRETRYMINUTES or the LACSRETRYTIMES keywords and indicates whether the CBR4196D message should be issued for the retrievable errors. If this keyword is used with the LACSRETRYMINUTES and the LACSRETRYTIMES parameters, then it indicates if the CBR4196D



message should be issued if the automatic retry attempts did not succeed. The default for this keyword is NO and indicates that the CBR4196D message is issued.

If LACSRRETRYMINUTES or LACSRRETRYTIMES is specified, message CBR4197D is issued letting someone know that the mount is being automatically retried. This message also allows the user to cancel out of the automatic retry logic.

## ONLYIF statements in a PLEX

The ONLYIF statement is a powerful filter mechanism that can be used to allow the same CBROAMxx PARMLIB member to be shared across different systems with the ability to have unique OAM configurations setup for each system. OAM provides various items to filter on such as the system name, the DB2ID, as well as a generic OAM variable that is used in conjunction with the system symbol service inherent within the operating system.

The scope of the ONLYIF OAMVAR statement is in effect until the next ONLYIF OAMVAR is encountered and evaluated to be true. All other ONLYIF scopes remain in effect until any next ONLYIF statement is encountered and evaluated to be true. Each filter keyword specified on a single ONLYIF statement is mutually exclusive.

Typical use cases for using the ONLYIF statements would be (but not limited to):

1. Sharing a single CBROAMxx member in a multiple OAM configuration, ONLYIF can also be used to isolate CBROAMxx PARMLIB statements for individual instances of OAM (on the same system) using the added DB2ID parameter. Note that for a tape library address space in a multiple OAM configuration, the DB2ID specified would be "NONE".
2. Sharing a single CBROAMxx member across multiple systems such as production, test, disaster recovery, and having unique statements for each OAM on each of those systems using the SYSNAME keyword. If the system name is the same across multiple systems (as it may be the case in a disaster recovery exercise), then the OAMVAR keyword can be used as it ties into the system symbol service and those definitions can be fenced off with more granularity (For example, specific OAMVAR values based on processor or LPAR names).

The syntax for the ONLYIF statement follows.

### ONLYIF statement syntax



## ONLYIF

You can use the ONLYIF statement to specify whether specific statements within the CBROAMxx PARMLIB member are to be processed on a system. The scope of the ONLYIF statement is in effect until the next ONLYIF is encountered.

**Note:** The ONLYIF statement and each of the SETTLIB statements that follow it must be on separate lines.

### SYSNAME

Specifies the system name on which the set of SETTLIB statements that follow are to be processed. Valid values are a 1-8 character system name or the reserved string \*ALL\*. If a *system\_name* is specified, then the following statements are processed only if the system OAM is initializing on has a matching system name. The system name is defined by the SYSNAME parameter in the IEASYMxx or IEASYSxx PARMLIB members. If \*ALL\* is specified, the statements are processed on all systems. If the SYSNAME keyword is not specified, the default value is \*ALL\*.

### DB2ID

Specifies the DB2 identifier (SSID or Group Attachment Name) associated with the OAM address space on the system *system\_name* for which the set of SETTLIB statements which follow are to be processed. If a *db2\_id* is specified (in this case with "NONE" for the tape library address space), then the following statements are only processed by an OAM address space that was started with a DB2 subsystem with an SSID or Group Attachment Name of *db2\_id*. If \*ALL\* is specified, the



statements are processed by all OAM address spaces. If the DB2ID keyword is not specified, the default value is \*ALL\*. For additional detail, refer to the [\*z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support\*](#).

## OAMVAR

This keyword is used in conjunction with a *system\_symbol* and a *literal\_value* separated by a blank. It performs a comparison and if the values match, the ONLYIF is enabled, otherwise the ONLYIF is ignored. Both the *system\_symbol* and *literal\_value* are required for the OAMVAR keyword to be processed.

### ***system\_symbol***

This is a system symbol variable (up to 8 bytes) that has been defined to the system symbol service inherent in the operating system. The value that is used in the comparison is the interpreted value of the system symbol. For example, you could define &OAMVAR as the system symbol (or another named system symbol of your choosing) and set it to DRTEST. In that case, the following would be specified for the ONLYIF statement: ONLYIF OAMVAR(&OAMVAR DRTEST).

### ***literal\_value***

This is a 1-8 byte literal value that is directly used in the comparison to the system symbol interpreted value.

**Note:** The OAMVAR keyword takes precedence over SYSNAME and DB2ID keywords so if an OAMVAR is encountered and that comparison fails, then ALL following OAM statements including ONLYIF SYSNAME and ONLYIF DB2ID statements will be ignored until the next ONLYIF OAMVAR statement is encountered. This allows for complete fencing of the DB2ID statement (and other statements) within an OAMVAR statement

In the following example, the ONLYIF OAMVAR statement is used to partition out OAM SETTLIB statements for an OAM configuration between a production system and a disaster recovery exercise system that both share the same SYSNAME. This may be the case with direct replication of systems.

This CBROAMxx configuration has a production system with its ENTRYIGNOREMSGTYPE set to SUMMARY and a drexercise system with its ENTRYIGNOREMSGTYPE set to SUPPRESS.

```
ONLYIF OAMVAR(&OAMVAR PROD)
    SETTLIB ENTRYIGNOREMSGTYPE(SUMMARY)

ONLYIF OAMVAR(&OAMVAR DREX)
    SETTLIB ENTRYIGNOREMSGTYPE(SUPPRESS)
```

**Note:** &OAMVAR is a system symbol that is defined with a unique value based on the system it is set in. For this example, &OAMVAR equates to “PROD” on the production system and equates to “DREX” on the drexercise system. So if we run through this example of statements for each system.

Production system processing of CBROAMxx:

- ONLYIF OAMVAR(&OAMVAR PROD) encountered, as &OAMVAR equates to PROD on this system and the literal value passed is also PROD, this ONLY IF statement is successful so any following statements are acknowledged.
- SETTLIB ENTRYIGNOREMSGTYPE statement found, set to SUMMARY.
- ONLYIF OAMVAR(&OAMVAR DREX) encountered, as &OAMVAR equates to PROD on this system and the literal value passed is DREX, the comparison fails and OAM ignores ALL statements after this ONLYIF until the next ONLYIF OAMVAR is encountered.
- There are no more ONLYIF OAMVAR statements to process, and processing ends.

Final result for Production system:

ENTRYIGNOREMSGTYPE = SUMMARY

Disaster Recovery Exercise system processing of CBROAMxx:



- ONLYIF OAMVAR(&OAMVAR PROD) encountered, as &OAMVAR equates to DREX on this system and the literal value passed is PROD, the comparison fails and OAM ignores ALL statements after this ONLYIF until the next ONLYIF OAMVAR is encountered.
- ONLYIF OAMVAR(&OAMVAR DREX) encountered, as &OAMVAR equates to DREX on this system and the literal value passed is also DREX, this ONLY IF statement is successful so any following statements are acknowledged.
- SETTLIB ENTRYIGNOREMSGTYPE statement found, set to SUPPRESS.
- There are no more ONLYIF statements to process, so processing ends.

Final result for Disaster Recovery Exercise system:

ENTRYIGNOREMSGTYPE = SUPPRESS

**Note:** The following example yields the same results as the previous one since OAM always honors the last statement found and uses the value associated with that statement to override any previous statements

```
SETTLIB ENTRYIGNOREMSGTYPE(SUMMARY)
ONLYIF OAMVAR(&OAMVAR DREX)
  SETTLIB ENTRYIGNOREMSGTYPE(SUPPRESS)
```

Final result for Production system:

ENTRYIGNOREMSGTYPE = SUMMARY

Final result for Disaster Recovery Exercise system

ENTRYIGNOREMSGTYPE = SUPPRESS

## Updating the PROCLIB

### 3 Modify, if necessary, and then run CBRAPROC SAMPLE 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.
- Review usage of the RESTART parameter and the optional OAM=XX parameter (for use with the SETTLIB command statement).

**Run SAMPLIB member CBRAPROC** (see [“SAMPLIB member CBRAPROC” on page 241](#)) to create member OAM in PROCLIB. The following member is created as the default:

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

**Note:** In general, the default can be used because most of the parameters are applicable only if OAM is used to store objects. However, if you plan to use the SETTLIB command statement in the CBROAMxx PARMLIB member, you must update this job step to include 'OAM=&OAM', and you must supply the default OAM=xx (where xx is the low order suffix of your CBROAMxx PARMLIB member) specification on the PROC statement, as shown in this example:

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

With the PARM=keyword, you can specify values for the following tape library-related parameters:



### **OAM (optional; used with the SETTLIB command)**

OAM=xx specifies the suffix of the CBROAMxx PARMLIB member that OAM should process during OAM address space initialization. The two alphanumeric characters (xx) must immediately follow the OAM=keyword in the PARM field. If the two characters immediately following the OAM= keyword are invalid or not specified, error message CBR0025I is issued. OAM only reads PARMLIB member CBROAMxx if the OAM= keyword is specified on the PARM field of the JCL EXEC statement in the OAM cataloged procedure. If no OAM= keyword is specified on the PARM field of the JCL EXEC statement, no PARMLIB member is read by OAM and the SETTLIB defaults are used until OAM is initialized with a valid OAM=xx specification, and a valid corresponding CBROAMxx PARMLIB member. OAM processes PARMLIB member CBROAMxx during OAM address space initialization. For more information on the SETTLIB command statement of the CBROAMxx PARMLIB member, refer to [“SETTLIB statement for tape library settings”](#) on page 76.

### **RESTART**

Specifies whether OAM should automatically restart when it receives notification that a new SCDS is activated. The valid parameter values on this keyword are:

#### **NO**

RESTART=NO specifies that OAM is to continue processing normally when OAM is notified that an SCDS activation has occurred. Message CBR0092I is issued to acknowledge that a new SCDS has been activated. The installation should ensure that the OAM RESTART command is issued if an OAM address space restart is necessary.

#### **YES**

RESTART=YES specifies that OAM is to automatically restart when OAM is notified that an SCDS activation has occurred. This is the default value. How soon OAM is notified of the SCDS activation depends on the time interval that is specified with the INTERVAL keyword in the IGDSMSxx PARMLIB member.

For more information concerning the RESTART parameter, see [“Restarting OAM”](#) on page 106.

### **D= (optional; required in a multiple OAM configuration with OAM's object support)**

Specifies the 1 - 4 character SSID or Group Attachment Name of the DB2 subsystem associated with the OAM address space in a multiple OAM configuration. For a Tape Library OAM address space in a multiple OAM configuration, specify “D=NONE” for the DB2 subsystem because DB2 is only used with an OAM object address space in a multiple OAM configuration.

In a classic OAM configuration, specification of D= is invalid and causes the OAM address space initialization to terminate.

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 GRSCNFxx 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=SYSZCBBR
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 41](#). For further information regarding resource names used with manual tape library processing, see [“Using global resource serialization in a manual tape library” on page 34](#).

**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.Vx), 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 Commands* 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)
```



## 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" on page 84](#). 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 OAMn subsystem. The system issues the following messages and you can use them to verify a successful IPL of the system.

CBR8001I OAMn 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 OAMn 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 243, and [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 18 on page 245](#)) to display the ISMF Tape Library Define panel shown in [Figure 19 on page 246](#) and in [Figure 21 on page 249](#). 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 211.](#)

### **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 CBRSP LCS 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 203.](#)

### **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 219.](#)

### **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 226.](#)

**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 topic 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 IGDSMSxx 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 104](#) for the syntax of the START command. Or the system programmer can update the IGDSMSxx member of PARMLIB to start OAM automatically during MVS IPL. [“Changing system libraries” on page 73](#) includes information concerning updating the IGDSMSxx 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 105](#) 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 115](#) and [“Displaying tape drive status” on page 129](#) 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 115](#) 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 are 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 separated 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 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 to 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 on a scratch allocation request. Prior to z/OS V2R2, this limit was 253 tape subsystems or 4048 devices (253 x 16 devices). With z/OS V2R2 or later (also z/OS V1R13 and V2R1 with SMS APAR OA44354), this limit can be doubled to 506 tape subsystems or 8096 devices (506 x 16 devices) for JES2 or JES3 managed devices by using the DEVSUPxx enablement indicator GREATER\_253. If GREATER\_253=YES is specified, SMS will detect and limit the number of eligible tape subsystems (device pools) to the first 506 subsystems (returned by OAM) and will ignore the tape subsystems beyond 506. By default, this enablement indicator is disabled (GREATER\_253=NO). The DEVSUP PARMLIB member can be updated outside of an IPL using the SET DEVSUP=xx operator command.



**Attention:** Before enabling the GREATER\_253 indicator, ensure that all systems in the sysplex can support the increased limit (starting with z/OS V2R2, or z/OS V1R13 and V2R1 with SMS APAR OA44354). If GREATER\_253=YES is specified and some systems in the sysplex do not have the required support installed, job abends could occur.

If an installation is using the TS7700 Virtualization Engine and assigns SGTAPE to the allocation request and SGTAPE is associated with several multi-cluster grids, the number of eligible subsystems can be quite large. As a result, having multiple grids and clusters within the grid being eligible for a scratch allocation request could grow beyond the previous subsystem limit of 253. If there are more than 506 tape subsystems that are considered eligible for the scratch request, SMS will only return the first 506 tape subsystems to MVS allocation. As you start using the TS7700 Virtualization Engine and have more and more tape subsystems being eligible, review your ACS routines and the number of tape libraries, and subsystems, being used for your scratch allocations to ensure that you fall within the 506 tape subsystem limit and that you have the GREATER\_253=YES enablement indicator specified as appropriate. It is important to note that tape subsystems that are connected and offline are still counted towards this subsystem limit. The main eligibility criteria being whether we are able to talk to the device to understand its characteristics and the characteristics of the device matching what is requested on the allocation request.

## 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” on page 91](#).

## 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 from 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 90.

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 than 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” on page 93](#)
- [“Monitoring and maintaining SMS library definitions” on page 95](#)
- [“Establishing recovery procedures” on page 95](#)
- [“TCDB procedure for retrieving data from a disabled IBM automated tape library” on page 97](#)

---

### 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 243](#) 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 243](#).

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 255](#).

**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.

#### 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 258](#).

**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 262](#).

## 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 273](#).

**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 41 on page 265](#)). For more detail regarding the ISMF alter commands, see [“Altering the volume record” on page 276](#).

## 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 280](#) and [Figure 41 on page 265](#).



## 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 Commands](#).

## 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 Commands](#).

## 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 Commands](#).

## 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 Commands](#).



## 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 (starting with Release 3.1 of the TS7700, up to 32 categories can be excluded). 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 DEVSUPxx PARMLIB member on the DR host. In addition, the DEVSUPxx 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 IBM Documentation for the TS7700.

## FlashCopy for disaster recovery (DR) test

As an extension to the Selective Write Protect function that is discussed in “[Selective write protect for disaster recovery \(DR\) test](#)” on page 97, starting with release 3.1 of the TS7700 Virtualization Engine, a FlashCopy for disaster recovery (DR) test is also available so that a snapshot of the file system (logical volumes) can be captured. The snapshot (point in time copy at time zero) can be initiated with the LIBRARY REQUEST command. FlashCopy for disaster recovery (DR) test is supported in the TS7700 Virtualization Engine and supports a read-only copy of the flashed logical volumes. While the DR test is accessing the FlashCopy of a logical volume, the production environment can continue to mount and modify the original copy of the volume and can also return the volume to scratch. The DR test environment continues to see the data as it existed (when the snapshot was taken) before any updates. For specifics on setting up and using the FlashCopy for disaster recovery (DR) test, refer to [TS7700 Virtualization Engine in IBM Documentation \(www.ibm.com/docs/en/ts7700-virtual-tape\)](#).

## 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 CBROAMxx 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.

**Note:** In a multiple OAM configuration (used with OAM's object support), the DISPLAY SMS commands are directed to the tape library address space (if it exists). To direct the command to one of the OAM object address spaces, the equivalent MODIFY OAM command is used where "OAM" is replaced by the particular object address space. For further discussion and command syntax, refer to the [\*z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support\*](#).

---

### 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 OAM topology with the DISPLAY OAM,CONFIG command
- Remove an OAM subsystem from the current OAM configuration with the MODIFY OTIS command
- Display the status of:
  - OAM
  - Tape library
  - Tape drive
  - Tape storage group
  - Tape volume
  - SETTLIB parameters
  - 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.

## Message format conventions

The following conventions are used to show message format:

**CBRnnnnX 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 CBRxxxxx 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.

## RACF support for the LIBRARY command

The LIBRARY command is used for many different tape-library-related functions, some of which are display-related and some of which cause an action to occur. When the LIBRARY command is issued, it can be protected by RACF (or an equivalent security product) by using a security product profile for MVS.LIBRARY. If a security product profile is established for the LIBRARY command, UPDATE authority is required to issue the command regardless of its function.

Command/Keyword	Authority	Resource-Name
LIBRARY	UPDATE	MVS.LIBRARY

Starting with (OA49373 – z/OS V2R1 and above) additional support is provided to protect the different LIBRARY command functions that can be issued. This added support provides resource-names for each of the LIBRARY command functions listed later. The added resource-names are an extension of what exists with MVS.LIBRARY and are based on the first keyword that is specified with the command: MVS.LIBRARY.*keyword*



<b>Keyword</b>	<b>Function</b>	<b>Authority</b>	<b>Resource-Name</b>
DISPDRV	Display tape drive status	READ	MVS.LIBRARY.DISPDRV
DISABLE	Used to disable the installation exits and the category count call during return to scratch processing	UPDATE	MVS.LIBRARY.DISABLE
DISPCL	Display the cartridge loader status of a tape drive	READ	MVS.LIBRARY.DISPCL
EJECT	Eject a volume from a tape library	UPDATE	MVS.LIBRARY.EJECT
ENTER	Enter a volume into a manual tape library	UPDATE	MVS.LIBRARY.ENTER
EXPORT	Export volumes from a virtual tape library	UPDATE	MVS.LIBRARY.EXPORT
IMPORT	Import volumes into a virtual tape library	UPDATE	MVS.LIBRARY.IMPORT
LMPOLICY	Update policy settings for volumes in a virtual tape library	UPDATE	MVS.LIBRARY.LMPOLICY
REQUEST	Multi-use virtual tape library command that can cause status information to be returned and actions to be taken at the library that depend on the keywords specified	UPDATE	MVS.LIBRARY.REQUEST
RESET	Used to reset the installation exits and the category count call during return to scratch processing	UPDATE	MVS.LIBRARY.RESET
SETCL	Set the cartridge loader scratch media type	UPDATE	MVS.LIBRARY.SETCL

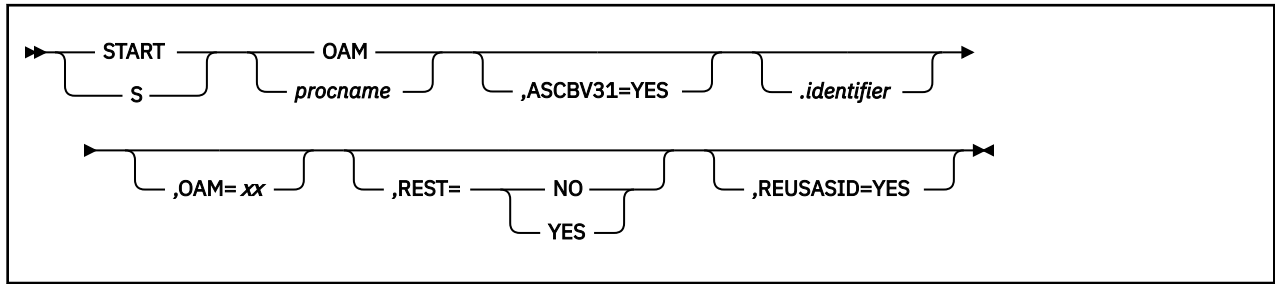
It is the OPERCMDS resource class that is used to protect the issuance of an operator command and is also where the LIBRARY command profiles are defined. Each LIBRARY command function can be protected by its own security product profile. The installation's security administrator gives each user ID appropriate authority to the resource that represents the command that is being used. If the security product profile that is associated with the command that is issued is not active, the command is accepted.

In summary, the MVS LIBRARY command can be protected with a security product profile using the MVS.LIBRARY resource-name and UPDATE authority. And if more granular protection is needed, security product profiles (MVS.LIBRARY.keyword) can be established for the individual command functions (or groups of functions) based on whether UPDATE or READ access is needed. For example, if USER1 is to have access to all of the LIBRARY commands, the security product profile could be established as MVS.LIBRARY.\* (with an "\*"") and USER1 would be given UPDATE access to this security product profile. Then, if USER2 is only allowed access to the display-type functions, USER2 could be given READ access to MVS.LIBRARY.\* (with an "\*""). If more control is needed, individual profiles can be established for some of the commands and their associated resource-names. The more specific profile is matched first.



## 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.

### ASCBV31=YES

Specifies whether the ASCB is in 31-bit addressable storage.

#### NO

The ASCB is in 24-bit addressable storage.

#### YES

The ASCB is in 31-bit addressable storage.

**Default:** NO

### 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.

### OAM=xx

OAM=xx specifies the suffix of the CBROAMxx PARMLIB member that OAM should process during OAM address space initialization. The two alphanumeric characters (xx) must immediately follow the OAM= keyword in the PARM field. OAM reads PARMLIB member CBROAMxx only if the OAM= keyword is specified on the PARM field of the JCL EXEC statement in the OAM cataloged procedure. OAM processes PARMLIB member CBROAMxx during OAM address space initialization and for tape library processing is used for the optional SETTLIB support.

### REST

Determines whether OAM should automatically restart when it receives notification that a new SCDS is activated. The valid values for this parameter are:

#### NO

OAM does not automatically restart when a new SCDS is activated.

#### YES

OAM automatically restarts when a new SCDS is activated.

### REUSASID=YES

REUSASID=YES can be specified to allow OAM address space to be reused should OAM be stopped. This parameter should only be used with OAM's tape library support and should not be specified if OAM is also being used for object support.

## Multiple OAM Configuration

In a multiple OAM configuration (used with OAM's object support), it is recommended that you use multiple members of PROCLIB each with a different name (OAMA, OAMB, and so on) and containing the parameters specific to each instance of OAM. A single member of PROCLIB can be used and started with a unique task identifier for each address space (S OAM.OAMA, S OAM.OAMB, and so on), but because unique values for the D= keyword are required for each address space, this approach requires specifying



the D= value on the START command. For the tape library address space, "D=NONE" would be specified. OAMA and OAMB might be used for the object address spaces and OAMC or OAMT might be used for the tape library address space.

Commands can be directed to a specific OAM address space:

```
F OAMA, ...
F OAMB, ...
F OAMT, ...
```

Commands can also be directed to all OAM address spaces using wildcarding:

```
F OAM*, ...
```

**Recommendation:** You can include any parameter that was defined in the OAM procedure JCL (PROCLIB member OAM, OAMA, and so on) in this command to initialize or override the parameter upon activation of the OAM address space.

#### Notes about starting OAM:

1. In z/OS V2R3 and higher, a classic OAM instance does not issue CBR0006D within a tape only configuration (no OBJECT storage groups, optical libraries, or optical drives that are defined within SMS) when OAM=xx is specified within the OAM proc and DB2SSID is not specified within the IGDSMSxx parmlib member.
2. In z/OS V2R3 and higher, if OAM detects a tape defined address space, with D=NONE specified within the OAM proc, then OAM does not issue CBR0006D.

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

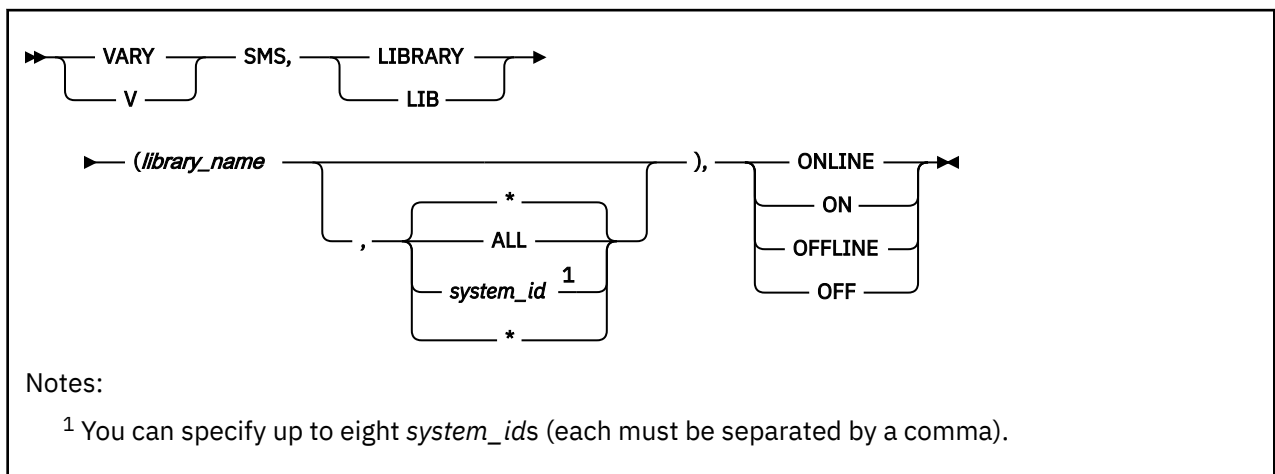
When OAM is initialized, the system issues the following messages:

```
CBR0001I OAMx initialization starting.
CBR0002I OAMx initialization completed.
```

If other CBRxxxxx 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:



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 “Updating the PROCLIB” on page 80 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.

**Note:** It is also possible to create a multiple OAM configuration (for use with OAM's object support). In a multiple OAM configuration, the Tape Library address space is separate from OAM address space(s) that provide object support. A multiple OAM configuration should be considered as it is not necessary to restart the Tape Library OAM address space when a SCDS is being activated due to changes that only pertain to object processing.

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 IGDSMSxx 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.

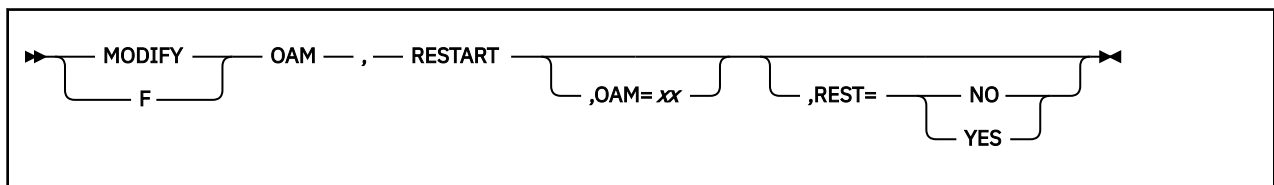
```
CBR0092I  New SMS Source Control Data Set activated.  OAM address space
          restart may be required.
```

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:



#### **OAM=xx**

OAM=xx specifies the suffix of the CBROAMxx PARMLIB member that OAM should process during OAM address space initialization. The two alphanumeric characters (xx) must immediately follow the OAM= keyword in the PARM field. OAM reads PARMLIB member CBROAMxx only if the OAM= keyword is specified on the PARM field of the JCL EXEC statement in the OAM cataloged procedure. OAM processes PARMLIB member CBROAMxx during OAM address space initialization and for tape library processing is used for the optional SETTLIB support.

#### **REST**

Determines whether OAM should automatically restart when it receives notification that a new SCDS is activated. The valid values for this parameter are:

##### **NO**

OAM does not automatically restart when a new SCDS is activated.

##### **YES**

OAM automatically restarts when a new SCDS is activated.

## **Varying tape drives online or offline**

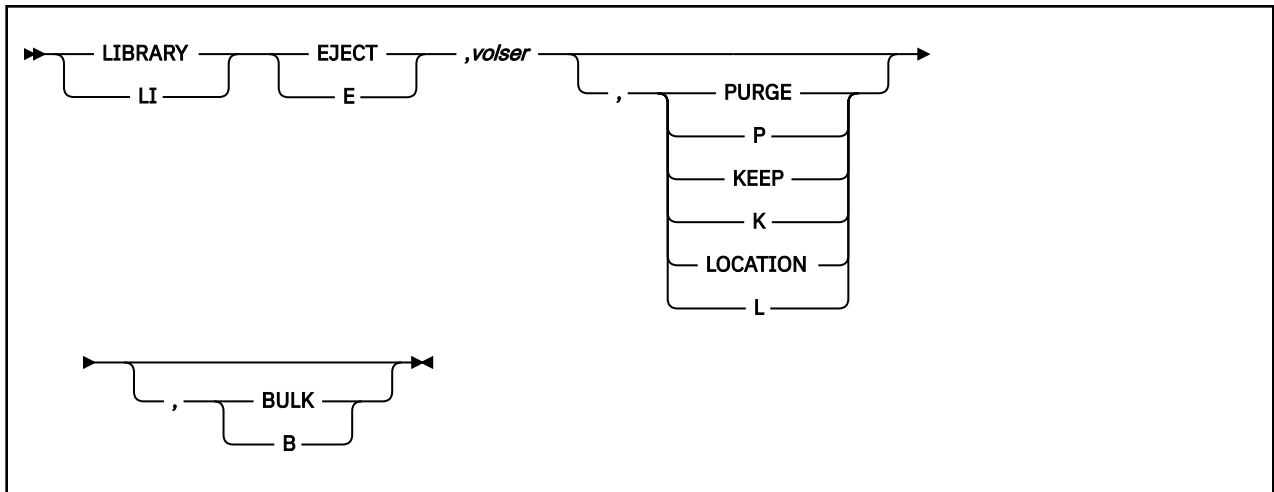
Use the MVS VARY command to vary tape drives online or offline. See [z/OS MVS System Commands](#) for additional information on the MVS VARY command.

## **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

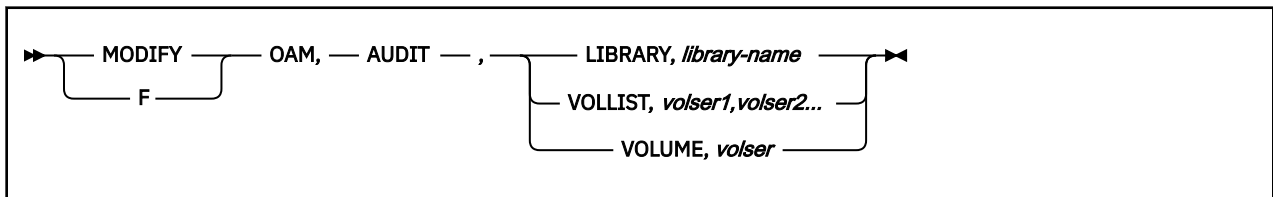
**Note:** ????? is displayed in the eject completion messages if you have not provided a shelf location.

## 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.

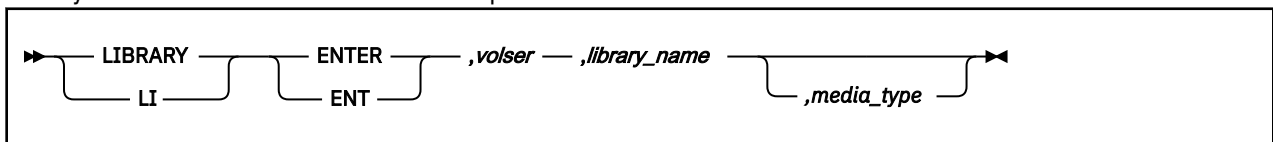
### library-name

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.

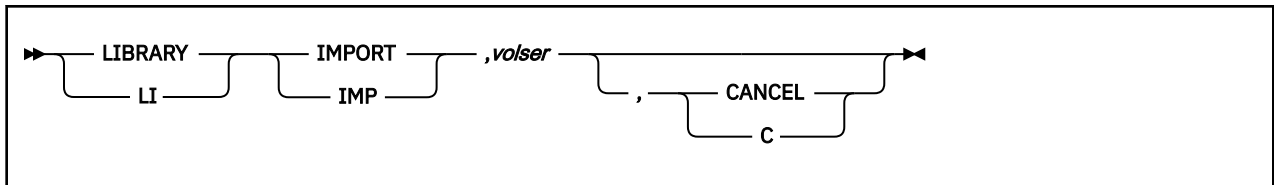
## Importing tape volumes into a VTS

---

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 TS7700 Virtualization Engine and what mechanism is used to bring the copy exported volumes back into a TS7700, refer to [“Copy export from the TS7700 Virtualization Engine”](#) on page 39.

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.

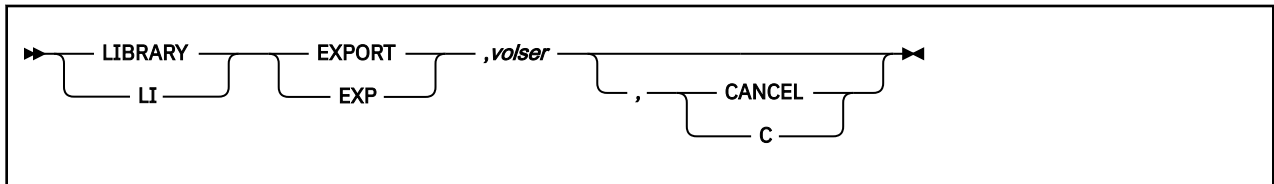
### CANCEL | C

Requests that the currently running import operation for the specified volume serial number should be canceled. It 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 37, and for information on the copy export support in the TS7700 Virtualization Engine, refer to [“Copy export from the TS7700 Virtualization Engine”](#) on page 39.

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

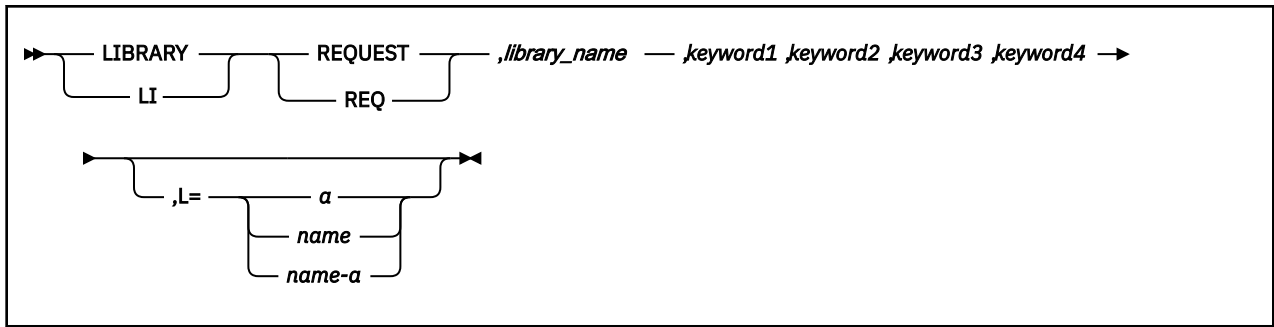
Requests that the currently executing export operation for the specified volume serial number be canceled. This is an optional parameter.

## 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.

### 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 LIBRARY,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
```

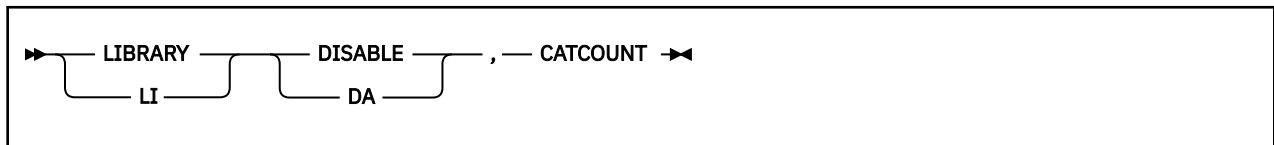
#### LOGICAL VOLUME INFORMATION V1

```
LOGICAL VOLUME: Y03469
VOLUME NOT IN LIBRARY SPECIFIED
```

## Disabling category count scratch transition processing

Use the LIBRARY DISABLE command to disable category count scratch transition processing for a particular system.

The following syntax is of the command to disable the installation exit processing:



### DISABLE | DA,CATCOUNT

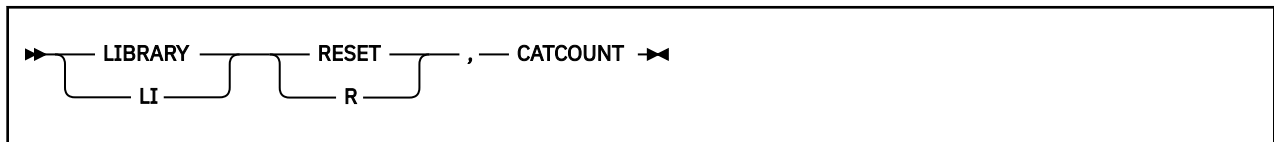
Specifies a request to disable category count I/O calls to the library for transitions from private to scratch. The elimination of this extra I/O might improve performance during bulk return to scratch processing.

Other transitions from scratch to private (during job processing) continue to issue the category count call to the library. A monitoring task continues to update the scratch count every 10 minutes.

## Re-enabling category count scratch transition processing

Use the LIBRARY RESET command to re-enable category count scratch transition processing for a particular system.

The following syntax is of the command to disable the installation exit processing:



### RESET | R,CATCOUNT

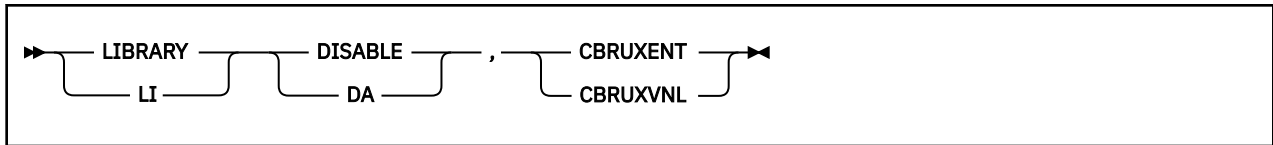
Specifies a request to re-enable category count I/O calls to the library for transitions from private to scratch.

## 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:

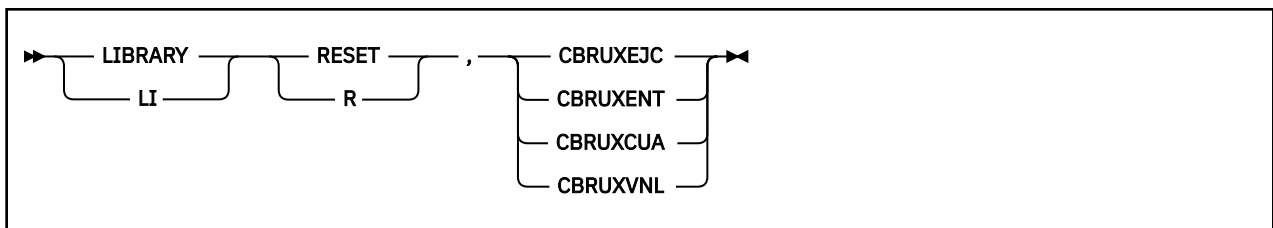
```
CBR1951I  Installation exit installation-exit-name has been disabled by operator command.
```

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 reenale 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.

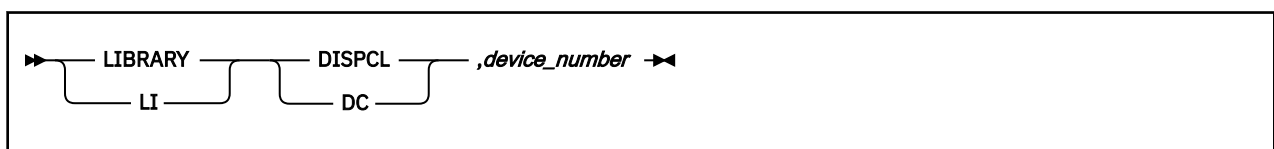
### CBRUXVNL

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.

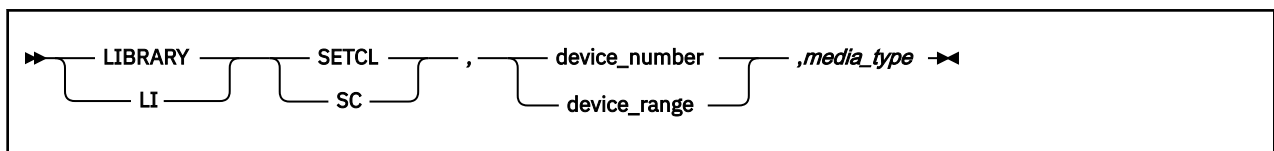
### device\_number

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 129](#) 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

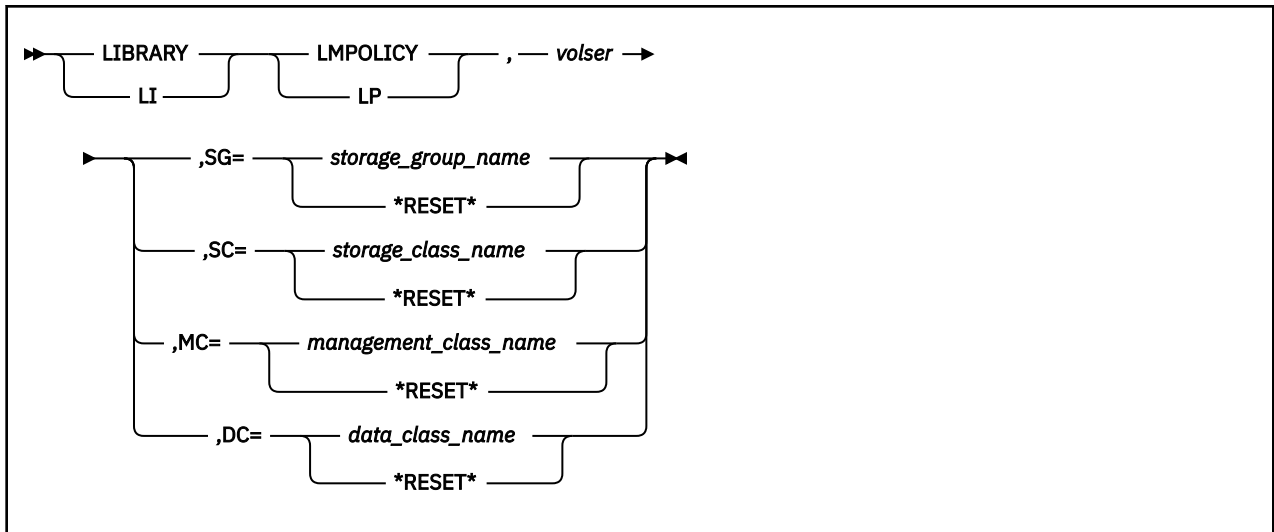
---

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 157 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:



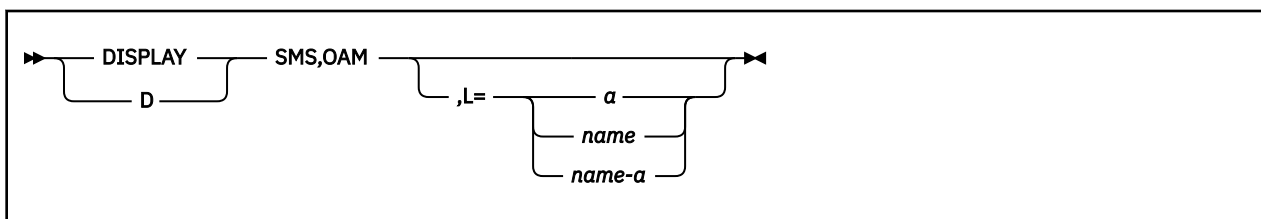
- Alphanumeric and national characters only
- Name must begin with an alphabetic or national character (\$\*@#%)
- No leading or embedded blanks
- Eight characters or less

## 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

In some cases, the DISPLAY SMS command can be used to obtain status about various aspects of OAM as shown in the table below.



### OAM

Displays OAM status.

When displaying the status for “OAM” in a multiple OAM configuration (for use with OAM's object support), an Object OAM address space will only display values applicable to object processing and a Tape Library OAM address space will only display values applicable to tape library processing. For more information, see CBR1100I in [z/OS MVS System Messages, Vol 4 \(CBD-DMO\)](#).

### ,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.

DB2 ID: NONE. If a DB2 ID is specified with NONE for the tape library address space, then the following statements are only processed by an OAM address space that was started with a Db2 subsystem with an SSID or Group Attachment Name of DB2 ID.

**Note:** 'CBROAM: xx' is only displayed when a SETTLIB statement is parsed.

To display OAM status, enter the following command:

```
D 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  DRV  SCRATCH
nnn  ooo  ppp  qqg  rrr  sss  ttttt  uuuuu  vvvvv  wwwwwww
exit-name PROCESSING (ENABLED | DISABLED | BYPASSED | OPERATOR DISABLED).
CBROAM: parm-lib-suffix

```

A display of the OAM address space status is generated. If you define 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 that are 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 that are known to the current system and exist in the connected tape libraries. Includes tape drives in both automated tape library dataservers, Virtual Tape Servers and manual tape libraries.

**uuuuuu**

Total number of tape drives that are known to the current system and exist in the connected tape libraries that are online.

**vvvvvv**

Total number of tape drives that are known to the current system and exist in the connected tape libraries that are online and not allocated.

**wwwwwwwww**

Total number of scratch volumes of all media types in the connected tape libraries. It includes scratch volumes in the automated, manual, and virtual tape libraries.

**CBROAM: parmlib-suffix**

This field displays the suffix of the CBROAMxx PARMLIB member that was in effect during OAM initialization.

When Peer-to-Peer VTS subsystems are defined to the system, the following status line is displayed reflecting the number of distributed libraries that are associated with the preceding composite libraries:

**There are also numvdl-lib VTS distributed libraries defined.**

For the OAM category count scratch transition setting, the following is displayed in the status message:

**Category count scratch transition {ENABLED|OPERATOR DISABLED}.**

**ENABLED**

Category count I/O calls to the library for transitions from private to scratch are enabled.

**DISABLED**

Category count I/O calls to the library for transitions from private to scratch have been disabled by the operator. Other transitions from scratch to private (during job processing) continue to issue the category count call to the library.

A monitoring task will continue to update the scratch count every 10 minutes.

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. It can be CBRUXENT, CBRUXEJC, CBRUXCUA, or CBRUXVNL. This line is repeated for each installation exit.

**ENABLED**

The exit is enabled and runs 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 does not start.

**OPERATOR DISABLED**

For CBRUXENT, you request to disable the cartridge entry processing by issuing the LIBRARY DISABLE, CBRUXENT command.

For CBRUXVNL, you request to disable the volume not in library installation exit by issuing the LIBRARY DISABLE, CBRUXVNL command. The CBRUXVNL installation exit is not started during job processing.

You can enable an installation exit that is OPERATOR DISABLED by using the LIBRARY RESET command or a system IPL.

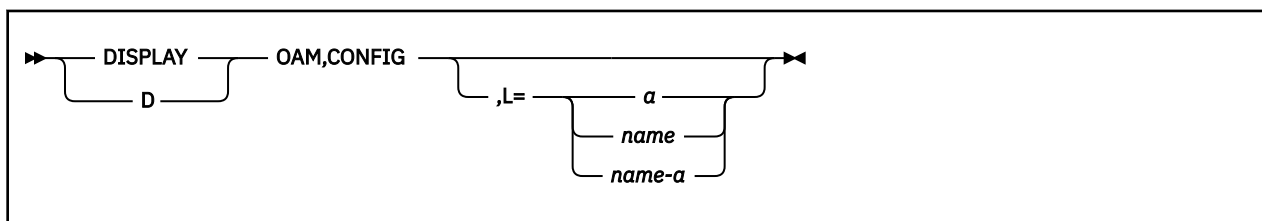
The following is a sample of DISPLAY SMS,OAM status:

```
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.
Category count scratch transition ENABLED.
CBRUXCUA PROCESSING ENABLED.
CBRUXEJC PROCESSING ENABLED.
CBRUXENT PROCESSING ENABLED.
CBRUXVNL PROCESSING ENABLED.
CBROAM: 19
```

**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 OAM configuration information

Use the DISPLAY OAM,CONFIG command to display OAM configuration information. The OAM subsystem and address space information will be displayed.

**L=a, name, or name-a**

Specifies the display area (*a*), console name (*name*), or both (*name-a*) where the display is to appear.

If you omit this operand, the display is presented in the first available display area or the message area of the console through which you enter the command.

The following is example output for a classic OAM configuration that is also using OAM's object support.

```
CBR1960I OAM configuration data:
OAM  OAM  OAM  OAM  OAM  OAMPLEX DB2 DB2
```



SUB	PROC	TASKID	STC#	TYPE	GROUP	ID	GATT
OAM1	OAM	OAM	STC00317	CLAS		DB2A	

The following is example output for a multiple OAM configuration.

```

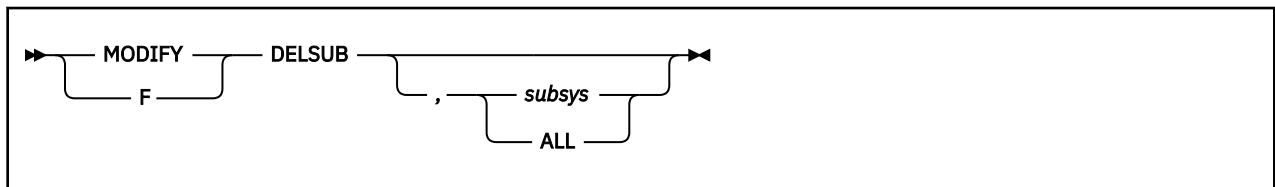
CBR1960I OAM configuration data:
OAM OAM OAM OAM OAM OAMPLEX DB2 DB2 DB2
SUB PROC TASKID STC# TYPE GROUP ID SSID GATT
OAM0 OAMT OAMT STC07053 TLIB NONE
OAM1 OAMA OAMA STC07051 OBJ PRODPLX2 DB2A DB2A DBG1
OAM2 OAMB OAMB STC07052 OBJ PRODPLX2 DBG2 DB2B DBG2

```

**Note:** For a detailed description of the output of the DISPLAY OAM,CONFIG command, see the description of message CBR1960I in [z/OS MVS System Messages, Vol 4 \(CBD-DMO\)](#).

## OTIS Operator Command

The MODIFY OTIS command (primarily used with OAM's object support) can also be used to remove an OAM subsystem from the current OAM configuration. This is intended to provide support for changing between both a classic OAM configuration and a multiple OAM configuration or removing an incorrectly defined OAM subsystem without requiring an IPL. Use the MODIFY OTIS,DELSUB,subsys command to remove the specified subsystem (previously defined in the IEFSSNxx PARMLIB member or by a SETSSI ADD command) from the OAM configuration. Use the MODIFY OTIS,DELSUB,ALL command to remove all subsystems that are currently in the OAM configuration leaving an OAM configuration with no subsystems.



### subsys

Specifies the subsystem name of the OAM subsystem to be removed from the OAM configuration. Any OAM address space associated with the subsystem must be stopped prior to issuing this command. It fails if an OAM address space is active for the subsystem.

### ALL

Specifies that all OAM subsystems that are in the OAM configuration should be removed from it. All OAM address spaces associated with any OAM subsystem in the configuration must be stopped prior to issuing this command. If any OAM address spaces are active, the command fails and no subsystems are removed. This command can be used to remove one or all OAM subsystems from the OAM configuration. The subsystem(s) remain defined to z/OS but will no longer be a part of the OAM configuration and are no longer used.

This command can be used to remove from the OAM configuration OAM subsystems that were defined in the IEFSSNxx member of PARMLIB or with a SETSSI ADD command but are no longer needed. Once removed the subsystem(s) cannot be reconnected to the OAM configuration without an IPL. A new OAM subsystem (or multiple OAM subsystems in a multiple OAM configuration) can be defined and added to the OAM configuration using the SETSSI ADD command, but because the removed subsystem remains defined to z/OS, any newly added subsystem must use a different subsystem name.

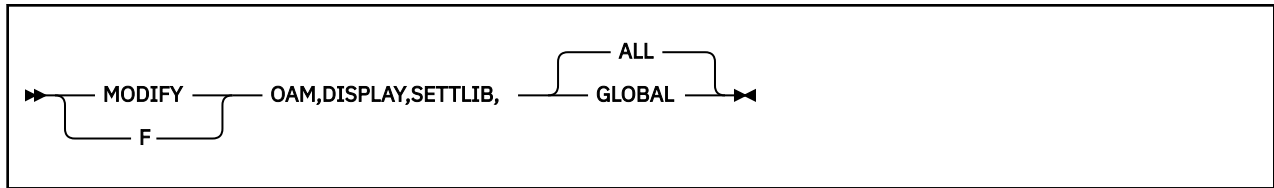
**Note:** The OAM address space, if any, and all other activity (OSREQ applications using OAM's object support) associated with the OAM subsystem to be deleted must be stopped prior to issuing this command. If any activity is detected for any OAM subsystem to be removed from the configuration, the command fails and no changes to the configuration are made.

## Displaying SETTLIB parameters

Display SETTLIB command is not valid on a Multiple Object OAM Address Space. Use the F OAM,DISPLAY command to display the current settings of the SETTLIB statement for the OAM address space.



The following text is the command syntax:



The following keywords are followed by their descriptions used in this command:

#### SETTLIB

Specifies that the SETTLIB statement settings are to be displayed.

#### ALL | GLOBAL

Specifies the kind of information that OAM is to display. For the SETTLIB parameter, ALL and GLOBAL are the only valid values and display the same. There are no Storage Group level settings.

The following code block is a sample of the output of the F OAM,DISPLAY,SETTLIB,GLOBAL command:

```

CBR1075I GLOBAL value for EIMTYPE is SUMMARY
CBR1075I GLOBAL value for EIMDEST is SYSLOG
CBR1075I GLOBAL value for ESMDEST is SYSLOG
CBR1075I GLOBAL value for STHRESHM is 50
CBR1075I GLOBAL value for LACSRMIN is 2.
CBR1075I GLOBAL value for LACSRTIM is 6.
CBR1075I GLOBAL value for LACSRFAL is NO.
  
```

These abbreviations are used:

#### EIMTYPE

ENTRYIGNOREMSGTYPE

#### EIMDEST

ENTRYIGNOREMSGDEST

#### ESMDEST

ENTYRSUCCESSMSGDEST

#### STHRESHM

SCRATCHTHRESHOLDMSG

#### LACSRMIN

LACSRETRYMINUTES

#### LACSRTIM

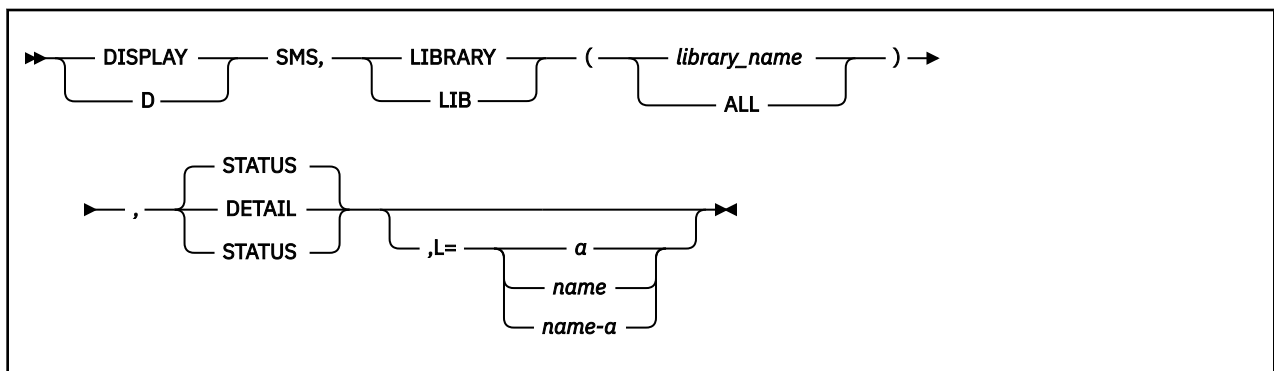
LACSRETRYTIMES

#### LACSRFAL

LACSRETRYFAIL

## 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 125](#) 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															
LIBRARY name	CLASS type	SYSTEM =	1	2	3	4	5	6	7	8	9	0	1	2	3
			s	s	s	s	s	s	s	s	s	s	s	s	s
LIBRARY name	CLASS type	SYSTEM =	1	2	3	4	5	6	7	8	9	0	1	2	3
			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 125](#) 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

LIBRARY  CLASS  SYSTEM=  1 2 3 4 5 6 7 8 9  1 1 1 1 1 1
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

LIBRARY  CLASS  SYSTEM=  1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3
OPTLIB1  OPTICAL  7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
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 ooooooo ppppppp 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 workstation and model types. "GRID" might be displayed for the composite library's device type. For a manual tape library, "MANUAL" is displayed.

***llll***

Total number of tape drives, which are known to the current system, existing in the tape library.

***mmmm***

Total number of tape drives, which are known to the current system and existing in the tape library, that is online.

***nnnn***

Total number of tape drives, which are known to the current system and existing in the tape library, that is online and not allocated.

***ooooooo***

Total number of storage slots in the tape library Dataserver. For a library that exists 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 TS7700, when the TS7700 (with physical tape attached) 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. For a TS7680, this count displays the maximum number of logical volumes that can be defined to the library.

***ppppppp***

Total number of empty slots in the tape library Dataserver. For a TS7680, this count displays the number of logical volumes that can still be defined to the library.

***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 later.

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 that are displayed do not include volumes that are 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 might 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. It is meant to be an approximation. Without having an external source to derive the count, the scratch count from that point forward might 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 is 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 that is displayed indicates the percentage of cache space that is used by the tape virtualization product. Depending on the library being displayed, this data might not be available. For a TS7700, the cache percentage displayed reflects the usage in just CPO.

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 has no physical back store cartridges (is a disk-only VTS).

The private stacked volume count is only 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 that is displayed has no physical back store cartridges (is a disk-only VTS).

For a VTS library with outboard policy management support, the scratch stacked volume count and the private stacked volume count reflects the cumulative count from all physical volume storage pools. See [“Physical volume pooling” on page 17](#) for more information on physical volume pooling.

The corrupted token volume count is only 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 shows 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 is configured.

In an ATLDS, the following status lines might 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 | degraded}
- VTS operations degraded
- Immediate mode copy operations deferred
- Synchronous 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 physical tape
- Cloud object store configured
- Cloud object store degraded

**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 Y Y
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:

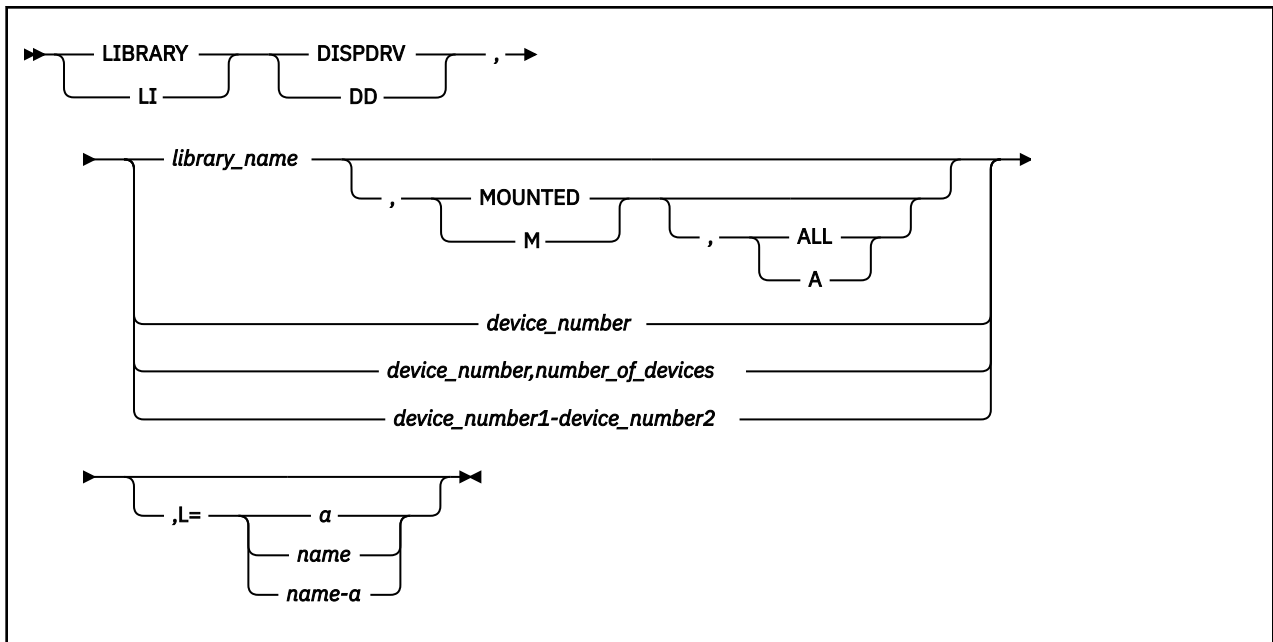
- All tape drives in a tape library
- A single tape drive
- A number of tape drives



- 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 4096.

#### MOUNTED

Specifies that status information is displayed for volumes that are mounted in the TS7700 Virtualization Engine for the specified composite or distributed library. When this keyword is specified, CBR1230I is displayed, rather than CBR1220I. Information pertaining to the distributed library that owns the device for the mount as well as distributed library information associated with the primary and the secondary tape volume cache (TVC) is displayed. This keyword can be specified only with the library-name option of the command and only with a composite or a distributed library associated with a TS7700 Virtualization Engine. This is an optional keyword. MOUNTED can be abbreviated as M.

#### ALL

Specifies that, for a distributed library in a TS7700 Virtualization Engine, additional drives may be displayed that are not owned by the specified distributed library. The additional drives are displayed if the distributed library specified is the primary or secondary TVC for the mounted volume. This option can be useful when a distributed library is going into service and can be used to determine if the specified distributed library is associated with a mount request from another distributed library. This is an optional keyword and is applicable only if the MOUNTED keyword is also specified. If MOUNTED,ALL is specified for a composite library, the ALL keyword is ignored and the results for the composite library are displayed. ALL can be abbreviated as A.

#### 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 4096.



**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 4096.

**,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 tape drive status

**Note:** The information in this section applies only when the MOUNTED keyword is omitted from the DISPDRV command. For information on the output of the DISPDRV command with the MOUNTED keyword, see [“Displaying mounted tape drive status” on page 135](#).

To display tape drive status, enter the following command:

```
LIBRARY DISPDRV,parameters
```

where *parameters* are any of the valid parameters for the DISPRV command, except MOUNTED and ALL.

The following information is displayed:

```
CBR1220I Tape drive status:
DRIVE  DEVICE  LIBRARY  ON  OFFREASON  LM  ICL  ICL  MOUNT
NUM    TYPE   NAME      b   LI  OP  PT  CU  AV  CATEGRY  LOAD  VOLUME
devnum devtyp libname  b    c   d   e   i   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-E1x 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-H1x 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 and media types MEDIA5 through MEDIA8 (EFMT1, EFMT2, EEFMT2, EFMT3, and EEFMT3). 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.

**ggggggg**

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 AT LDS, 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 applicable only 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.

***i***

Tape drive is offline for CUIR reasons:

**N**

The tape drive is not offline for CUIR reasons.

**Y**

The tape drive is offline for CUIR reasons (host was notified through the TS7700).



### **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 4096; 4096 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  OFFREASON  M  ICL  ICL  MOUNT
NUM   TYPE    NAME      LI  OP  PT  CU  AV  CATEGORY  LOAD  VOLUME
0FC0  3490    ATLF4017 Y    N  N  N  N  A  NONE      N    TST211
0FC1  3490    ATLF4017 N    Y  N  N  A  NONE      N
0FD0  3590-E   ATLF4017 Y    N  N  N  N  A  NONE      N    TST256
0FD1  3590-E   ATLF4017 Y    N  N  N  N  A  NONE      N
0FD2  3590-E   ATLF4017 Y    N  N  N  N  A  NONE      N
0FD3  3590-E   ATLF4017 Y    N  N  N  N  A  NONE      N
0FF0  3590-H   ATLF4017 Y    N  N  N  N  A  NONE      N    TST384
0FF1  3590-H   ATLF4017 Y    N  N  N  N  A  NONE      N
0FF2  3590-H   ATLF4017 Y    N  N  N  N  A  NONE      N
0FF3  3590-H   ATLF4017 Y    N  N  N  N  A  NONE      N
0FE0  3590-1   ATLF4017 Y    N  N  N  N  A  NONE      N    TST500
0FE1  3590-1   ATLF4017 Y    N  N  N  N  A  NONE      N
0FE2  3590-1   ATLF4017 Y    N  N  N  N  A  NONE      N
0FE3  3590-1   ATLF4017 Y    N  N  N  N  A  NONE      N
```

## **Displaying mounted tape drive status**

**Note:** The information in this section applies only when the MOUNTED keyword is specified on the DISPDRV command. For information on the output of the DISPDRV command without the MOUNTED keyword, see [“Displaying tape drive status” on page 131](#).

To display mounted tape drive status, enter the following command:

```
LIBRARY DISPDRV,library_name,MOUNTED
```

If the MOUNTED keyword is specified with a library name (a composite or a distributed library in a TS7700 Virtualization Engine), the following information is displayed in message CBR1230I. The data line is displayed only if the drive is currently mounted.

```
CBR1230I Mounted status:
DRIVE  COMPLIB  ON  MOUNT  DISTLIB  PRI-TVC  SEC-TVC
NUM    NAME     VOLUME Name    DISTLIB  DISTLIB
devnum complib  a  mntvol  distlib  pdistlib  sdistlib
```

The fields in the data line are defined as follows:

### **devnum**

The device number of the tape drive.

### **complib**

Name of the library in which the tape drive resides. All volumes and drives in a TS7700 configuration are primarily associated with the composite library.

### **a**

Tape drive status:

#### **Y**

Online

#### **N**

Offline



**P**

Pending Offline

**mntvol**

Volume serial number of the volume that is currently mounted on the tape drive.

**distlib**

Name of the distributed library where the tape drive actually resides (also referred to as the owning distributed library). This information will be provided only if the distributed library that owns the drive is at TS7700 R3.3 (or higher), otherwise this field contains '-----'.

**pdistlib**

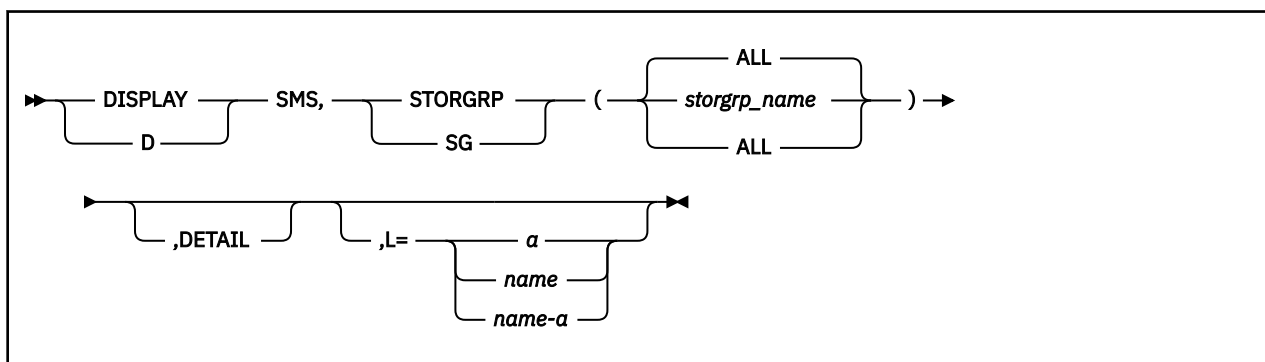
Name of the distributed library that is the primary tape volume cache (TVC) for the mounted volume. This could be the same distributed library as the owner of the drive or it could be a different distributed library if this distributed library is acting as the primary TVC. This information will be provided only if the distributed library that owns the drive is at TS7700 R3.3 (or higher), otherwise this field contains '-----'. If a distributed library is returned that OAM does not know about, but is known to device services then the distributed library displayed is the 5-CHAR library sequence number associated with the distributed library. If a distributed library is returned that neither device services nor OAM knows about then the distributed library ID will be displayed as CLO, CL1, CL2, and so on.

**sdistlib**

Name of the distributed library that is the secondary tape volume cache (TVC) for the mounted volume. The secondary TVC is applicable only if the mounted volume is being replicated using synchronous mode copy. This information will be provided only if the distributed library that owns the drive is at TS7700 R3.3 (or higher), otherwise this field contains '-----'. If this field is not applicable for the mounted volume, this field contains blanks. If a distributed library is returned that OAM does not know about, but is known to device services then the distributed library displayed is the 5-CHAR library sequence number associated with the distributed library. If a distributed library is returned that neither device services nor OAM knows about then the distributed library will be displayed as CLO, CL1, CL2, and so on.

## Displaying storage group status

Use the DISPLAY command to display storage group status.

**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.

When displaying the status for "STORGRP" in a multiple OAM configuration (for use with OAM's object support), an Object OAM address space displays values applicable to object processing and a Tape Library OAM address space displays values applicable to tape library processing. For more information, see CBR1130I in *z/OS MVS System Messages, Vol 4 (CBD-DMO)*.

**,DETAIL**

Displays the tape libraries that are 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
SMSHONOR   xxxxxxxx
```

The fields that are 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.

**SMSHONOR xxxxxxxx**

Device number or esoteric optionally that is specified in the description field of the tape storage group definition. If SSMHONOR is not specified in the description field, the additional line is not displayed. Use of SSMHONOR limits the devices that are used on the allocation request.

**Note:** SSMHONOR information is only displayed, if a storage group is specified, with DETAIL. This information is not displayed if ALL is specified with DETAIL.

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

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      + + + + + - - + . . . . .

STORGRP     TYPE      SYSTEM= 1 1 1 2 2 2 2 2 2 2 2 2 2 3 3 3
BACKUP01    OBJECTB   . . . . . . . . . . . . . . .
OBJSG01     OBJECT    . . . . . . . . . . . . . . .
OBJSG02     OBJECT    . . . . . . . . . . . . . . .
OBJSG03     OBJECT    . . . . . . . . . . . . . . .
```



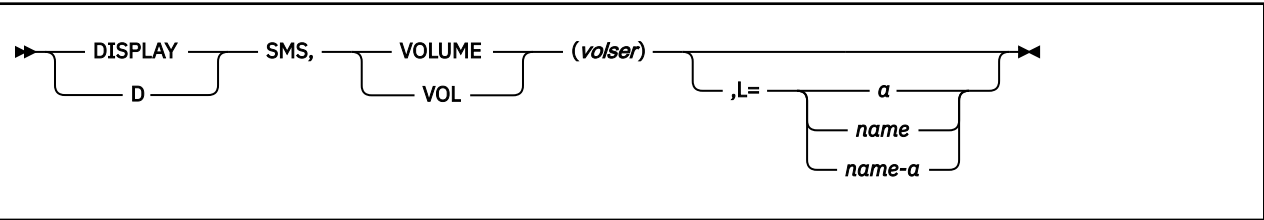
```

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.

When displaying the status for “VOLUME” in a multiple OAM configuration (for use with OAM's object support), an Object OAM address space command F OAM\*,D,VOL,*volser* will only display values applicable to object processing, and a Tape Library OAM address space command D SMS,VOL(*volser*) will only display values applicable to tape library processing.

## ,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
        medtype sgname  libname  u   x  y   errstat  category
-----
RECORDING TECH:  aaaaaaaaaa  COMPACTION:      bbbbbbbbbb
SPECIAL ATTRIBUTE: cccccccccc  ENTER/EJECT DATE: hhhhhhhhhh
CREATION DATE:   dddddddddd  EXPIRATION DATE:  eeeeeeeeee
LAST MOUNTED DATE: ffffffff  LAST WRITTEN DATE: gggggggggg
SHELF LOCATION:  shelfloc
OWNER: owner information
LM SG: iiiiinii  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 (the longer names are displayed through the ISMF Mountable Volume Application):

**ANSILAB (ANSI LABEL VOLUME)**

ANSI label not supported.

**CHECKPT (CHKPOINT CONFLICT)**

Attempt to access secure checkpoint volume.

**DAMAGED (CARTRIDGE DAMAGED)**

Cartridge is physically damaged and leader block may be missing.

**DUPMOUNT (DUPLICATE VOLSER)**

Volume with same *volser* already mounted.

**EXTLABEL (EXTERNAL LABEL ERR)**

External label missing or unreadable.

**INACCESS (INACCESSIBLE)**

Volume inaccessible in library.

**INTLABEL (I/O ERROR)**

Volume label cannot be read.

**LABTYPE (INVALID LABEL TYPE)**

Invalid volume label type, neither standard nor ANSI.

**LNGTHERR (TAPE TOO LONG)**

Cartridge length exceeds IBM supported maximum.

**MEDIAMNT (MEDIA TYP MISMATCH)**

Mounted media does not match the type specified for a scratch volume mount request.

**MED2MNT (MEDIA2 ON 3480X)**

MEDIA2 cartridge mounted on a non-MEDIA2 capable device.

**MISSING (VOLUME MISPLACED)**

Volume not in assigned location in library.

**NOERROR (NO ERROR)**

No errors detected.

**NOMATCH (VOLSER MISMATCH)**

Internal and external labels do not match.

**NOTINLIB (NOT IN LIBRARY)**

Volume not in library manager inventory.

**PASSPROT (PASSWORD CONFLICT)**

Attempt to access password-protected volume.

**RACFPROT (SECURITY CONFLICT)**

Attempt to access SAF/RACF-protected volume.



**REJTMS (REJ BY TAP MGT SYS)**

Volume rejected by the tape management system.

**REJUSER (REJECTED BY USER)**

Volume rejected by the user's DCB exit or label editing routine.

**TRKMPAT (INCMPTAT\_TRK\_MOUNT)**

Media was mounted whose recording technology is incompatible with the device.

**UNEXPIR (UNEXPIRED SCRATCH)**

Attempt to write over unexpired data.

**UNFORMAT (UNFORMATTED MEDIA)**

Volume has not been formatted with servo tracks and should be returned to the media manufacturer.

**UNKNOWN (????????????????)**

Volume error status unknown.

**WRITPROT (WRITE CONFLICT)**

Attempt to write on write-protected volume.

**WRONGVOL (WRONG VOLUME)**

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.

**EXPEND**

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

***cccccccccc***

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.

***dddddddddd***

Date the volume record in the TCDB catalog was initially created, in ISO date format YYYY-MM-DD.

***eeeeeeeeee***

Expiration date of the tape volume, in ISO date format YYYY-MM-DD.

***ffffffffff***

Date the volume was last mounted, in ISO date format YYYY-MM-DD.

***gggggggggg***

Date a data set was last opened for output on the volume, in ISO date format YYYY-MM-DD.

***hhhhhhhhhh***

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
- Cloud object store instance of volume exists

### **Note:**

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
```



LOG001	TYPE	GROUP	NAME	ATR	P	P	ERR	STAT	CATEGORY
	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:

```

>> DISPLAY R,L, — KEY=OAM <<
  D

```

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:

```

>> MODIFY OAM , STOP ,OAM <<
  F      procname .identifier      P

```

The syntax of the STOP OAM command to stop OAM is:

```

>> STOP OAM <<
  P      procname .identifier

```

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.

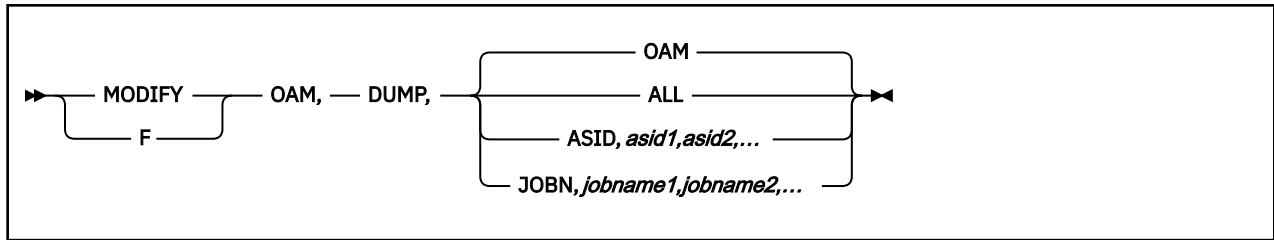
```

## 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 \(CBD-DMO\)](#).



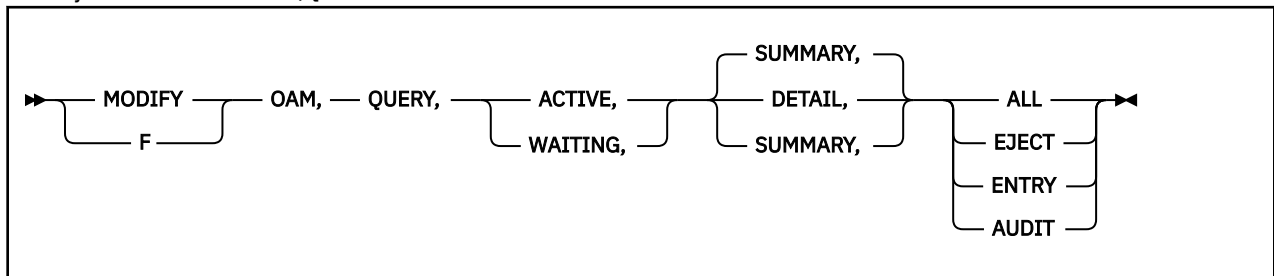
## Querying active and waiting OAM tape library requests

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.

### **ccccc**

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 command in *z/OS MVS System Commands* for syntax and additional information as well as information on the DEVSERV QTAPE command.



---

## Chapter 6. Library control system (LCS) external services

Library control system (LCS) external services provide 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 203.

### 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 211.

### Cartridge eject (EJECT)

The cartridge eject (EJECT) function of the LCS External Services provides two major functions for tape cartridge ejections:

- 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 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 219 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 164 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 167.

## 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 172.

## 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 174.

## 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 176.

## 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 177.

## 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 180.



## 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 182](#).

## 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 CBR LCSPL macro, retrieves the entry point for LCS External Services, and branches to perform the requested function. See [“CBRXLCS macro interface” on page 185](#) 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 on page 153](#) 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 “Tape device selection information (CBRTDSI macro)” on page 200), 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 203 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 the use attribute of a WORM tape volume**

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 203.

## **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 7 on page 158 provides the reason codes associated with each of the return codes returned by change use attribute processing. See [“CBRXLCS return codes”](#) on page 186 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 7. 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)
		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.



Table 7. Change use attribute return and reason codes (continued)

Return code	Error type	Reason code	Meaning
		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. <sup>1</sup>
		80	LCS External Services unable to establish an ESTAE.
		81	LCS External Services unable to obtain storage for installation exit parameter list.

<sup>1</sup>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 IEFSSNxx PARMLIB member. Then verify whether the OAM address space has been started.

## Entering cartridges into a manual tape library

Figure 6 on page 159 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 CBR LCSPL. 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 alphabetic 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 dataset server (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 8 on page 162](#).

<i>Table 8. TDSI processing for MCE—Volume exists</i>				
<b>TDSI attribute</b>	<b>TDSI input</b>	<b>Default entry data class</b>	<b>Installation exit</b>	<b>Volume record</b>
<b>Recording technology</b>	Ignored	Ignored	May override existing volume record	Updated only if installation exit makes change
<b>Media type</b>	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
<b>Compaction</b>	Ignored	Not applicable	May override existing volume record	Updated only if installation exit makes change
<b>Special attribute</b>	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 9 on page 162](#).

<i>Table 9. TDSI processing for MCE—No volume record exists for volume</i>				
<b>TDSI attribute</b>	<b>TDSI input</b>	<b>Default entry data class</b>	<b>Installation exit</b>	<b>Volume record</b>
<b>Recording technology</b>	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.
<b>Media type</b>	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.
<b>Compaction</b>	Ignored	Not applicable	Can specify value.	Created with value specified by installation exit. If no value specified, set to UNKNOWN.
<b>Special attribute</b>	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 10 on page 163 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 186. Also, for more information concerning other return and reason codes not specific to manual cartridge entry processing, see *z/OS DFSMSdfp Diagnosis*.

Table 10. 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.



Table 10. Manual cartridge entry return and reason codes (continued)			
Return code	Error type	Reason code	Meaning
		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. <sup>1</sup>
		80	LCS External Services unable to establish an ESTAE.
		90	Cartridge entry disabled due to an error in the installation exit.
		91	Cartridge entry temporarily suspended.
<sup>1</sup> 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 IEFSSNxx PARMLIB member. Then verify whether the OAM address space has been started.			

## Ejecting a tape cartridge

Figure 7 on page 164 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}]
         [,BULKEJECT={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 221.



## 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 11 on page 166 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 167](#). For more comprehensive information on the CBRXLCS return codes, see [“CBRXLCS return codes” on page 186](#).

Also, for more information concerning other return and reason codes not specific to cartridge eject processing, see [z/OS DFSMSdfp Diagnosis](#).

Table 11. 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.
		310	Media type or recording technology not supported at this software level.



Table 11. Cartridge eject return and reason codes (continued)

Return code	Error type	Reason code	Meaning
16	Environment	2	OAM control block structure not available. <sup>1</sup>
		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.

<sup>1</sup>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 IEFSSNxx 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 12 on page 167 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 12. 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 196 for more information on this macro.

Figure 8 on page 167 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 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 ([“LCS external services parameter list \(CBRLCSPL macro\)”](#) on page 187) 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 LCSCONS. Otherwise, LCSCONS 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 [“Tape volume information \(CBRTVI macro\)”](#) on page 196 for more information on this macro. 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.

## TS7700 Virtualization Engine programming considerations

Through the CBRXLCS FUNC=QVR programming interface, TVIVCOPY can be used to determine if there is at least two valid copies of the logical volume in a multi-cluster grid configuration. However, this single bit indicator cannot be used to determine in which distributed libraries (or clusters) a copy exists. So for multi-cluster grids (beyond two), this single bit does not return enough detailed information. Starting with Release 2.1 of the TS7700 Virtualization Engine, TVICCMAP can be used (1-byte copy cluster bit mapping) that will indicate in which clusters, a valid copy of the logical volume exists. The cluster bit mapping is ordered left to right with the first bit representing cluster 0, the second bit representing cluster 1, etc. If a particular cluster is missing from the configuration (skipped) that bit position will remain OFF. The bit positions match how the clusters are defined in the configuration (by cluster number starting with cluster 0) and are positional. The validity of TVIVCOPY and also TVICCMAP is based on the availability of each cluster in a TS7700 multi-cluster grid so if one or more of the clusters are not available (and cannot be queried), the bit indicators may not be appropriately reflected. The new copy cluster bit mapping (TVICCMAP) is returned at TS7700 Release 2.1 (or later). Before using the new copy cluster bit mapping (TVICCMAP), status flag TVICCMOK should be checked to ensure that the new bit mapping is valid to use.

## 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 13 on page 170 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 186. Also, for more information concerning other return and reason codes not specific to the query volume residence function, see *z/OS DFSMSdfp Diagnosis*.

Table 13. Query Volume residence return and reason codes			
Return code	Error type	Reason code	Meaning
0	Successful	0	Successful execution. <ul style="list-style-type: none"> <li>• If volume resides in an MTL, <ul style="list-style-type: none"> <li>– if VOLINFO=YES was specified, TVI contains the volume TCDB record information.</li> <li>– if LIBNAME was specified, the library name specified matches the volume record library name.</li> </ul> </li> <li>• If the volume resides in an ATL, <ul style="list-style-type: none"> <li>– if VOLINFO=YES was specified, TVI contains TCDB and library manager information.</li> <li>– 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.</li> <li>– if LIBNAME,TCDBCHK=NO and VOLINFO=YES was specified, the TVI contains library manager information only.</li> <li>– 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.</li> </ul> </li> </ul>
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.
		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.



Table 13. Query Volume residence return and reason codes (continued)

Return code	Error type	Reason code	Meaning
		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.
		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.



Table 13. Query Volume residence return and reason codes (continued)

Return code	Error type	Reason code	Meaning
		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 on page 172 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 14 on page 173 represents the reason codes associated with each of the return codes returned by the test volume eligibility function. See [“CBRXLCS return codes” on page 186](#) for more information.

Table 14. 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.
		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.



Table 14. Test Volume eligibility 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	80	LCS External Services unable to establish ESTAE.

## Exporting logical volumes from a VTS

Figure 10 on page 174 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 15 on page 175 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 186](#) for more information.



Table 15. 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).
		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. <sup>1</sup>
		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.

<sup>1</sup>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 IEFSSNxx PARMLIB member. Then verify whether the OAM address space has been started.



# Importing logical volumes into a VTS

Figure 11 on page 176 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 16 on page 176 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 186 for more information.

Table 16. 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.



Table 16. IMPORT return and reason codes (continued)

Return code	Error type	Reason code	Meaning
		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.
		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. <sup>1</sup>
		80	LCS External Services unable to establish ESTAE.
		93	Library is offline, pending offline or not operational.
		404	OAM address space not available.

<sup>1</sup>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 IEFSSNxx 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 19 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 20 for further information on the selective peer-to-peer copy mode.

Figure 12 on page 178 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 primary 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 primary; 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 is ignored .

**Return codes for CBRXLCS PTPMC**

Table 17 on page 180 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 17. 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 185.](#)

## 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 19](#) for more information on GDPS.)

Figure 13 on page 180 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 CBR LCSPL 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 CBR LCSPL 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.

#### **Note:**

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 18 on page 181 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 18. 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.



Table 18. PTPDATA return and reason codes (continued)

Return code	Error type	Reason code	Meaning
		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 on page 182 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 19 on page 184 shows the fields that contain the information returned by the OLN function.

Table 19. OLN function fields	
Field	Information
LCSLIBNM	Library name
LCSLBID	Library ID
LCSCONS	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
<b>Note:</b> <ol style="list-style-type: none"><li>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.</li><li>2. A 3494 VTS tape library has both the LCSATL and the LCSVTS library type indicators set on.</li><li>3. A 3494 Peer-to-Peer VTS library has the LCSATL, LCSVTS, and either the LCSVDL or the LCSVCL library type indicators set on.</li><li>4. A TS7700 Virtualization Engine has the LCSATL, LCSVTS, LCSVE and either the LCSVDL or the LCSVCL library type indicators set on.</li><li>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.</li></ol>	



## Return and reason codes for CBRXLCS OLN

Table 20 on page 185 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 20. 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:

1. Include mapping macro CBRLCSPL to provide a DSECT for the LCS External Services parameter list, as follows:

```
CBRLCSPL
```



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.

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.

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.

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.

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 “LCS external services parameter list (CBRLCSPL macro)” on page 187 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 CBRXLCSPL, 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.

Here is 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                       *
*                                     *
*-----*
LCSPL      SPACE 1                      LCS PARAMETER LIST
           DSECT ,
           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
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)      *
*      *      *
*-----*
*
LCSUCCESS 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
LCS_BULKEJECT 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_DEFTHRESH 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
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
*                               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
LCSSBELOW EQU    1        BELOW THE 16 MEGABYTE LINE
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 UCBSAN
LCSUSRS  DS    F          REASON CODE FROM UCBSAN
LCXXLIBR DS    F          RETURN CODE FROM TCDB LIBRARY
*          RECORD INQUIRY
LCXXVOLR 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)
LCSTOST  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
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@)
LCVBUF   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
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,
*			REWITABLE 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
LCSIRTD	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
LCSGNGDS 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
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



LC	CSXINVD	EQU	83	(CBRUXCUA) EXECUTION INVALID RETURN CODE OR DATA RETURNED FROM CHANGE USE ATTRIBUTE INSTALLATION EXIT (CBRUXCUA)
LC	SEABND	EQU	84	ABNORMAL TERMINATION OCCURRED DURING EXECUTION
LC	SENDIS	EQU	90	CARTRIDGE ENTRY PROCESSING HAS BEEN DISABLED
LC	SENSUS	EQU	91	CARTRIDGE ENTRY PROCESSING HAS BEEN SUSPENDED FOLLOWING ERROR INVOKING INSTALLATION EXIT
LC	SNOTMT	EQU	92	LIBRARY FOR MCE NOT MANUAL TAPE LIBRARY
LC	SLBOFF	EQU	93	LIBRARY OFFLINE, PENDING OFFLINE, OR NOT OPERATIONAL
LC	SINLIB	EQU	94	SPECIFIED VOLUME ALREADY RESIDES IN ANOTHER LIBRARY
LC	SVETO	EQU	95	INSTALLATION EXIT VETOED ENTRY OF VOLUME INTO LIBRARY
LC	SIGNR	EQU	96	VOLUME NOT ENTERED INTO MTL BECAUSE INSTALLATION EXIT SAID TO IGNORE THE VOLUME
LC	SASDV	EQU	97	VOLUME OF SAME VOLSER IS KNOWN DASD VOLUME
ADDITIONAL REASON CODES ASSOCIATED WITH RETURN CODE LCSWARN(4)				
LC	SNTMNT	EQU	120	VOLUME IS INELIGIBLE BECAUSE THE TYPE OF MEDIA DEFINED IN THE VOLUME RECORD MAY NOT BE MOUNTED ON SPECIFIED DEVICE
LC	SMMISM	EQU	121	VOLUME IS INELIGIBLE BECAUSE THE TYPE OF MEDIA DEFINED IN THE TDSI DOES NOT MATCH MEDIA DEFINED ON THE VOLUME RECORD
LC	SVERST	EQU	122	VOLUME IS INELIGIBLE BECAUSE THE VOLUME RECORD REFLECTS AN ERROR STATUS
LC	SRTNMT	EQU	123	VOLUME IS INELIGIBLE BECAUSE THE SPECIFIED RECORDING TECHNOLOGY IS INCOMPATIBLE WITH THE VOLUME MEDIA TYPE OR THE SPECIFIED DRIVE TYPE
LC	SSAMEL	EQU	130	SPECIFIED VOLUME ALREADY RESIDES IN THIS TAPE LIBRARY
LC	SWLNOP	EQU	131	SCRATCH VOLUME THRESHOLD PROCESS- ING NOT PERFORMED BECAUSE LIBRARY WAS NOT OPERATIONAL
LC	SWNSCT	EQU	132	DELETED WITH 3590 SUPPORT
LC	SWNULR	EQU	133	DELETED WITH 3590 SUPPORT
LC	SWLMIO	EQU	134	NO TCDB RECORD BUT VOLUME RESIDES IN SPECIFIED LIBRARY
LC	SWMSLM	EQU	135	LIBRARY MISMATCH, VOLUME RESIDES IN SPECIFIED LIBRARY
LC	SWMSNF	EQU	136	LIBRARY MISMATCH, VOLUME NOT FOUND IN SPECIFIED LIBRARY
LC	SWMSLF	EQU	137	LIBRARY MISMATCH, UNABLE TO ACCESS SPECIFIED LIBRARY
LC	WSCNU	EQU	138	LIBRARY SCRATCH COUNT NOT UPDATED IN TCDB
LC	WMSLN	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)				
LC	SEJCTD	EQU	201	VOLUME ALREADY EJECTED
LC	SEJEJO	EQU	202	INVALID VALUE FOR EJECT OPTION
LC	SEJBLK	EQU	203	INVALID VALUE FOR BULK EJECT
LC	SIUSER	EQU	204	INVALID TSO USERID SPECIFIED
LC	SBADRT	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
*	LCSFNML 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
*	LCSFNRRNF EQU 319	NO TCDB RECORD AND VOLUME NOT
*		FOUND IN SPECIFIED LIBRARY
*	LCSFNRLF EQU 320	NO TCDB RECORD AND UNABLE TO
*		ACCESS SPECIFIED LIBRARY

*	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
*	LCSN00AM EQU 404	OAM ADDRESS SPACE NOT



*		AVAILABLE
.END	MEND	*/

## 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. Here is 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.)
*
*          LENGTH OF ONE MODE CONTROL DATA ENTRY
TDIMSDLN DS      F
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
*****
*
*          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
TDIWTPTT EQU B'00100000' WRITE PROTECT ACCESS MODE
TDIDMPTV DS      XL1    DEFERRED MODE PRIORITY THRESHOLD
TDIVDLID DS      XL1    PRIMARY/PREFERRED IO DISTRIBUTED LIBRARY
*          ID
*          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
TDIMLEN DS    F          DATA MSG LENGTH (LENGTH OF THIS DSECT
*                      PLUS LENGTH OF DEVICE DATA ENTRIES)
TDINVTD DS    F          NUMBER OF DEVICE DATA ENTRIES
TDIDLEN DS    F          LENGTH OF ONE DEVICE DATA ENTRY
TDIDADR 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
TDIDVID DS    XL2        VIRTUAL DEVICE IDENTIFIER
*                      AX0 IDENTIFIER/DEVICE NUMBER COMBINATION
TDIIOD DS    XL1         I/O VTS IDENTIFIER
TDIVOLSR DS    CL6        MOUNTED VOLUME
TDIVFLAG DS    BL1        VOLUME FLAGS
TDIWRTM 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

```

## 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 that is specified on a CBRXLCS query volume residence request.

The following is 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 LCSCONS
*
* IF THE LIBRARY NAME IS SPECIFIED ON THE QVR INVOCATION, LCSLIBNM
* CONTAINS THE SPECIFIED LIBRARY AND LCSCONS 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 LCSLIBNM AND
* TVILIBNM FIELDS CONTAIN THE LIBRARY NAME FOUND IN THE VOLUME
* RECORD. LCSCONS CONTAINS THE CONSOLE NAME OF TVILIBNM.
*
* INCLUDE MAPPING MACRO CBRVERR TO DEFINE CONSTANTS
* FOR THE VALUES ASSIGNED TO TVIERROR.
*
*****
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
* (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
TVIDMNTIP EQU B'00000100' VOLUME IN PROCESS OF BEING DEMOUNTED
TVIEJCQ EQU B'00000010' VOLUME IS QUEUED FOR EJECT/EXPORT
TVIEJCIPI 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 AT LEAST TWO DISTRIBUTED
* LIBRARIES
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 VOLUME1
TVICLOUD EQU B'00000010' CLOUD OBJECT STORE INSTANCE
OF VOLUME EXISTS

TVIEXFLG DS BL1 EXPANDED VOLUME STATUS FLAGS
TVICCMOK EQU X'80' COPY CLUSTER BIT MAPPING TVICCMAP
VALID TO LOOK AT (UNAVAILABLE CLUSTERS
MAY STILL BE EXCLUDED FROM MAPPING)
TVICCMAP DS BL1 COPY CLUSTER BIT MAPPING (LEFT TO RIGHT
STARTING WITH CLUSTER 0)
TVICCCLO EQU X'80' CL0 HAS VALIDATED CONSISTENT COPY
TVICCCCL1 EQU X'40' CL1 HAS VALIDATED CONSISTENT COPY
TVICCCCL2 EQU X'20' CL2 HAS VALIDATED CONSISTENT COPY
TVICCCCL3 EQU X'10' CL3 HAS VALIDATED CONSISTENT COPY
TVICCCCL4 EQU X'08' CL4 HAS VALIDATED CONSISTENT COPY
TVICCCCL5 EQU X'04' CL5 HAS VALIDATED CONSISTENT COPY
TVICCCCL6 EQU X'02' CL6 HAS VALIDATED CONSISTENT COPY
TVICCCCL7 EQU X'01' CL7 HAS VALIDATED CONSISTENT COPY
DS CL23 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

*****
*
* 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

```

```

*          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
*
*****
*

```

<sup>1</sup> Because a logical volume retains 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.



```

* 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

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
TVIEXPND 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 */

```

## 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. Here is 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
TDSPEC 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
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.) *
*-----*
TDSMPNS 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

\*-----\*



---

## Chapter 7. Installation exits

This topic 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 239](#).

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 LNKST 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.

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
- 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 Table 21 on page 204. 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 Table 21 on page 204, 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. 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.

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 21 on page 204 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 21. 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)



Table 21. Parameters passed to the installation exit—CBRUXCUA (continued)

Parameter	SCR->PRIV	PRIV->SCR
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 blank. 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](#) 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](#) 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 UXCVLOPM 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. Here is 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
*
UXCLDEV     DS    CL8     LIBRARY DEVICE TYPE
*
UXCLCON     DS    CL8     LIBRARY CONSOLE NAME
*
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
*
*                      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)
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
UXCPLEN           EQU    *-UXCPL
                SPACE 1
*****
*
*          RETURN CODES
*
*****
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
*                RESERVED
UXCDONT           EQU    12          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
*****
*          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 ,

```



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:

<b>Code</b>	<b>Meaning</b>
<b>0</b>	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.
<b>4</b>	Change the use attribute of the volume specified and note that one or more fields in the parameter list (CBRUXCPL) have changed.
<b>8</b>	Do not change the use attribute of the volume specified.  <b>Note:</b> 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.
<b>12</b>	Reserved.
<b>16</b>	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.  <b>Note:</b> 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 LNKLIST 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.

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 22 on page 211 lists the volume-related parameters that are passed to the exit.

Table 22. 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
UXELMSG	Library manager storage group	Input only
UXELMSC	Library manager storage class	Output/Verified



Table 22. Fields passed to the installation exit—CBRUXENT (continued)

Parameter	Parameter description	Input/Output
<b>UXELMMC</b>	Library manager management class	Output/Verified
<b>UXELMDC</b>	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=*vol/ser* 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 is passed to the installation exit as an input-only value. Otherwise, UXEXITI 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 dataserer, 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](#) 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 215](#) 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.

### UXEVD CSP

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. Here is 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)
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
*
*****
UXENOCHEG 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
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
UXESCRPT 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

UXEEEFMT4 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

```

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 dataserer, OAM schedules the cartridge to be ejected.
- 12** Ignore the cartridge entry request. For an automated tape library dataserer, 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 LNKST 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 reentrant.

**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.



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 23 on page 220 lists the volume-related parameters that are passed to the exit.

Table 23. Fields passed to the installation exit—CBRUXEJC		
Parameter	Parameter description	Input/Output
<b>UXJVDISP</b>	Volume record disposition	Output/Verified
<b>UXJNCALL</b>	Notification call indicator	Input only
<b>UXJSTKVS</b>	Stacked “container” volume	Input only/with export call
<b>UXJVOLSR</b>	Volume serial number	Input only
<b>UXJFLAGS/UXJCBACK</b>	Failed eject notification call indicator	Output
<b>UXJUSEA</b>	Volume use attribute	Output/Verified
<b>UXJWPROT</b>	Write protection status	Output/Verified
<b>UXJCHKPT</b>	Checkpoint volume indicator	Output/Verified
<b>UXJLOC</b>	Volume location code	Input only
<b>UXJTDSI</b>	Tape device selection information	Input only
<b>UXJGROUP</b>	Storage group name	Output/Verified
<b>UXJSHLOC</b>	Shelf location	Output
<b>UXJOWNER</b>	Volume owner information	Output
<b>UXJCREAT</b>	Volume record creation date	Input only
<b>UXJENTEJ</b>	Last entry or eject date	Input only
<b>UXJMOUNT</b>	Last mounted date	Output/Verified
<b>UXJWRITE</b>	Last written date	Output/Verified
<b>UXJEXPIR</b>	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 \*SCRATCH\*. 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 37](#).

When a logical volume is successfully exported from the library, the cartridge eject installation exit is notified and a notification call indicator (UXJEXPT) 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. Here is the format of CBRUXJPL.

UXJPL	DSECT , SPACE 1	CBRUXEJC PARAMETER LIST
*****		
*		*
*	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)
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
UXJPLEN     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
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
UXJEXPT      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
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
UXJEFORMAT1  EQU  6      READ/WRITE ON ENTERPRISE FORMAT 1
*      (EFMT1) DEVICE
UXJEFORMAT2  EQU  7      READ/WRITE ON ENTERPRISE FORMAT 2
*      (EFMT2) DEVICE
UXJEEFORMAT2 EQU  8      READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*      (EEFMT2) DEVICE
UXJEFORMAT3  EQU  9      READ/WRITE ON ENTERPRISE
*      FORMAT 3 (EFMT3) DEVICE
UXJEEFORMAT3 EQU 10      READ/WRITE ON ENTERPRISE
*      ENCRYPTED FORMAT 3 (EEFMT3) DEVICE
UXJEFORMAT4  EQU 11      READ/WRITE ON ENTERPRISE FORMAT 4
*      (EFMT4) DEVICE
UXJEEFORMAT4 EQU 12      READ/WRITE ON ENTERPRISE ENCRYPTED
*      FORMAT 4 (EEFMT4) DEVICE
*****
*      CONSTANTS TO DEFINE MEDIA TYPE      *
*****
UXJNOMED     EQU  0      MEDIA TYPE UNKNOWN OR
*      UNSPECIFIED
UXJMEDI1     EQU  1      MEDIA1 - CARTRIDGE SYSTEM TAPE
UXJMEDI2     EQU  2      MEDIA2 - ENHANCED CAPACITY
*      CARTRIDGE SYSTEM TAPE
UXJMEDI3     EQU  3      MEDIA3 - HIGH PERFORMANCE
*      CARTRIDGE TAPE
UXJMEDI4     EQU  4      MEDIA4 - EXTENDED HIGH PERFORMANCE
*      CARTRIDGE TAPE
UXJMEDI5     EQU  5      MEDIA5 - ENTERPRISE TAPE CARTRIDGE
UXJMEDI6     EQU  6      MEDIA6 - ENTERPRISE WORM TAPE CARTRIDGE
UXJMEDI7     EQU  7      MEDIA7 - ENTERPRISE ECONOMY TAPE CARTRIDGE
UXJMEDI8     EQU  8      MEDIA8 - ENTERPRISE ECONOMY WORM TAPE
*      CARTRIDGE
UXJMEDI9     EQU  9      MEDIA9 - ENTERPRISE EXTENDED TAPE
*      CARTRIDGE
UXJMEDI10    EQU 10      MEDIA10 - ENTERPRISE EXTENDED WORM TAPE
*      CARTRIDGE
UXJMEDI11    EQU 11      MEDIA11 - ENTERPRISE ADVANCED
*      TAPE CARTRIDGE
UXJMEDI12    EQU 12      MEDIA12 - ENTERPRISE ADVANCED
*      WORM TAPE CARTRIDGE

```



```

UXJMEDI3      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)                                *
*****
UXJCMPSN      EQU 0                      COMPACTION UNKNOWN OR NOT SET
UXJNOCMP      EQU 1                      NO COMPACTION
UXJCOMPT      EQU 2                      COMPACTION
UXJIDRC       EQU 2                      COMPACTION
*****
*          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 ,

```

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 LNKLIST 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 linked 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.

**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 dataset server 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 dataset server 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 24 on page 229 lists the contents of the exit input when a volume record does not exist in the TCDB.

<i>Table 24. CBRUXVNL input during job step setup—No TCDB volume record</i>	
<b>Variable</b>	<b>Meaning</b>
<b>UXNVOLSR</b>	Volume serial number
<b>UXNWHERE</b>	1 indicates job step setup processing
<b>UXNERROR</b>	1 indicates no TCDB record

Table 25 on page 229 lists the contents of the exit input when a shelf-resident tape volume record exists in the TCDB.

<i>Table 25. CBRUXVNL input during job step setup—Existing TCDB volume record</i>	
<b>Parameter</b>	<b>Meaning</b>
<b>UXNVOLSR</b>	Volume serial number
<b>UXNWHERE</b>	1 indicates job step setup processing
<b>UXNERROR</b>	2 indicates volume is shelf-resident
<b>UXNGROUP</b>	Storage group name
<b>UXNUSEA</b>	Volume use attribute
<b>UXNWPROT</b>	Write protection status
<b>UXNCHKPT</b>	Checkpoint volume indicator
<b>UXNLOC</b>	Volume location code
<b>UXNSHLOC</b>	Shelf location
<b>UXNOWNER</b>	Volume owner information
<b>UXNCREAT</b>	Volume record creation date
<b>UXNENTEJ</b>	Last entry or ejection date
<b>UXNMOUNT</b>	Last mounted date
<b>UXNWRITE</b>	Last written date
<b>UXNEXPIR</b>	Volume expiration date
<b>UXNTDSI</b>	Tape device selection information

Table 26 on page 230 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.



<i>Table 26. CBRUXVNL input during job step setup—Job information fields</i>	
<b>Parameter</b>	<b>Meaning</b>
<b>UXNJINFO</b>	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.
<b>UXNJOBNM</b>	Job Name - contains zeros if not available
<b>UXNSTPNM</b>	Step Name - contains zeros if not available
<b>UXNPRGNM</b>	Program Name - contains zeros if not available
<b>UXNDDNM</b>	DD Name - contains zeros if not available. May contain blanks if not the first data set in a concatenated data set DD statement
<b>UXNDSN</b>	Data Set Name - contains zeros if not available
<b>UXNUNIT</b>	Unit Name - contains zeros if not available
<b>UXNDISP</b>	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
<b>UXNCATLG and UXNDEVTP</b>	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 27 on page 230 lists the contents of the exit input when a volume record does not exist in the TCDB.

<i>Table 27. CBRUXVNL input during device allocation—No TCDB volume record</i>	
<b>Parameter</b>	<b>Meaning</b>
<b>UXNVOLSR</b>	Volume serial number
<b>UXNWHERE</b>	2 indicates device allocation processing
<b>UXNERROR</b>	1 indicates no TCDB record

Table 28 on page 231 lists the contents of the exit input when a shelf-resident tape volume record exists in the TCDB.



*Table 28. 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
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 29 on page 231 lists the contents of the exit input when the volume record does not exist in the TCDB.

*Table 29. 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 30 on page 232 lists the contents of the exit input when the volume record still exists in the TCDB.

<i>Table 30. CBRUXVNL input library mount processing—Existing TCDB volume record</i>	
<b>Parameter</b>	<b>Meaning</b>
<b>UXNVOLSR</b>	Volume serial number
<b>UXNWHERE</b>	3 indicates library mount processing
<b>UXNERROR</b>	4 indicates volume is being ejected 3 indicates volume is in a different library 2 indicates volume is shelf-resident
<b>UXNLIB</b>	Library in which the volume must be re-entered (target)
<b>UXNLDEV</b>	Library device type of the target library
<b>UXNLCON</b>	Library console name of the target library
<b>UXNLTYP</b>	Library logical type of the target library
<b>UXNLDESC</b>	Library description of the target library
<b>UXNLIBRS</b>	Library in which the volume currently resides (might not be the same library as the target resident library)
<b>UXNGROUP</b>	Storage group name
<b>UXNUSEA</b>	Volume use attribute
<b>UXNWPROT</b>	Write protection status
<b>UXNCHKPT</b>	Checkpoint volume indicator
<b>UXNLOC</b>	Volume location code
<b>UXNSHLOC</b>	Shelf location
<b>UXNOWNER</b>	Volume owner information
<b>UXNCREAT</b>	Volume record creation date
<b>UXNENTEJ</b>	Last entry or ejection date
<b>UXNMOUNT</b>	Last mounted date
<b>UXNWRITE</b>	Last written date
<b>UXNEXPIR</b>	Volume expiration date
<b>UXNTDSI</b>	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. Here is 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
UXNLTY	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
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
UXNPLEN EQU * - UXNPL LENGTH OF THE PARAMETER LIST
*****
* 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 (UXNLTP) *
*
*****
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 *
*
*****
* 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) *
*****
UXNCOMPNS EQU 0 COMPACTION UNKNOWN OR NOT SET
UXNOCMP EQU 1 NO COMPACTION
UXNIDRC EQU 2 COMPACTION
UXNCOMPT EQU 2 COMPACTION

*****
* 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

```

Storage is obtained below the line, from subpool 230, user key, for the installation exit parameter list.



## Volume not in library installation exit (CBRUXVNL) 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 (CBRUXVNL) 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 (CBRUXVNL) 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 LNKLIST 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 information on sample library members that you can modify to suit your own business requirements:

- CBRSP LCS, 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 203.
- CBRAPROC, which is used to create member OAM in SYS1.PROCLIB.
- CBRSPSIM, CBRSPPIIM, CBRSPPIP, CBRSPSXP, CBRSPXP, and CBRSPX03 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 six 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).
- CBRSPPIIM for import list volume (private request).
- CBRSPPIP for import list volume (private request). Illustrates IMPORT LIST 02 format for outboard policy management specifications.
- CBRSPSXP for export list volume (scratch request).
- CBRSPXP for export list volume (private request).
- CBRSPX03 for copy export list volume (private request - TS7700 Virtualization Engine).

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 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 CBRSP LCS sample program.

The following provides a summary of the samples referenced earlier in this section. For detailed information on each of the samples, and for the source, refer to SYS1.SAMPLIB. For reference, and discussion in this manual, the source for CBRAPROC is also included at the end of this section.



<b>Sample</b>	<b>Purpose</b>
CBRSPLCS	Sample program that invokes the CBRXLCS programming interface using a transactional dataset on input.
CBRSPUXC	Sample change use attribute installation exit for CBRUXCUA.
CBRSPUXE	Sample cartridge entry installation exit for CBRUXENT.
CBRSPUXJ	Sample cartridge eject installation exit for CBRUXEJC.
CBRSPUXV	Sample volume not in library installation exit for CBRUXVNL.
CBRAPROC	Sample JCL that creates the OAM started procedure in PROCLIB.
CBRSPSIM	SAMPLIB JCL that writes the two required files on the import list volume using a scratch volume and import list format 01.
CBRSPPIIM	SAMPLIB JCL that writes the two required files on the import list volume using a private volume and import list format 01.
CBRSPPIP	SAMPLIB JCL that writes the two required files on the import list volume using a private volume and import list format 02.
CBRSPSXP	SAMPLIB JCL that writes the three required files on the export list volume using a private volume and export list format 01.
CBRSPXPX	SAMPLIB JCL that writes the three required files on the export list volume using a private volume and export list format 01.
CBRSPX03	SAMPLIB JCL that 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.



## 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 will create a procedure in PROCLIB that can be used
//* to start OAM.
//*
//* NOTE: If the DB2 load module library containing DSNALI is
//* not in the LNKLIST concatenation, either include
//* the DB2 load module library in the SYS1.LINKLIB
//* concatenation (LNKLISTxx) or add a STEPLIB DD to
//* this PROCEDURE.
//*
//* If a STEPLIB is used, then that concatenation must be
//* APF-authorized.
//*
//* Note:
//* If you want to have access to SETOAM, SETOPT, SETOSMC,
//* SETDISK, SETTLIB, and OAMXCF statements in the
//* PARMLIB member (required for many functions, such as
//* writing to tape volumes, using an OAMplex, multiple
//* backups, etc), you must update this job step to
//* include 'OAM=&OAM', and you must supply the default
//* OAM=xx (where xx is the low order suffix of your CBROAMxx
//* PARMLIB member) specification on the PROC statement.
//*
//* If you are using a multiple OAM configuration, you must update this
//* job step to include 'D=&DB2ID' in the PARM= string and you must
//* supply the default DB2ID=xxxx specification on the PROC statement.
//* D= is required in a multiple OAM configuration. It specifies the
//* SSID or Group Attachment Name of the DB2 subsystem associated with
//* the OAM address space being started with this procedure if it is
//* for Object processing or NONE if the OAM address space is for Tape
//* Library processing.
//*
//* Refer to OAM Planning, Installation, and Storage
//* Administration Guide for Object Support for more info.
//*
//* CHANGE ACTIVITY:
//* $L0=JDP3227 320 890601 TUCJRL: Initial Release
//* $P1=KBI0238 331 900904 TUCKHB: Added the UNLOAD keyword and
//* made OSMC, MAXS, and UNLOAD
//* procedure variables.
//* $L1=HDZ11C0 130 940818 TUCGRD: Added the EJECT keyword
//* $O1=OW22202 1C0 960809 TUCLJT: Added the RESTART keyword
//* $P2=K190347 R19 060921 TUCBLC: RESTART is reserved word so
//* change to REST
//*
//*****
// EXEC PGM=IEBUPDTE,PARM=NEW
//SYSPRINT DD SYSOUT=A
//SYSUT2 DD DSN=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,REST=YES
//IEFPROC EXEC PGM=CBROAM,REGION=0M,
// PARM=('OSMC=&OSMC,APLAN=CBROAM,MAXS=&MAXS,UNLOAD=&UNLOAD',
// 'EJECT=&EJECT','RESTART=&REST')
//SYSABEND DD SYSOUT=A
./ ENDUP
/*
```

Figure 15. Sample CBRAPROC program that creates the OAM member in PROCLIB







---

## 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 243.](#)
- [“Displaying tape library attributes” on page 252.](#)
- [“Redefining a tape library” on page 255.](#)
- [“Altering a tape library” on page 258.](#)
- [“Copying tape library definitions” on page 260.](#)
- [“Deleting a tape library definition” on page 261.](#)
- [“Creating a list of tape libraries” on page 269.](#)
- [“Auditing volumes in an automated tape library” on page 273.](#)
- [“Altering the volume record” on page 276.](#)
- [“Ejecting a volume from a tape library” on page 280.](#)

---

### 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 16 on page 244](#)) to start the library management dialog.

**Note:** When you define the libraries that are 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 when 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 16. ISMF Primary Option Menu Panel

When you select option 10, Library Management, the Library Management Selection Menu is displayed, as shown in [Figure 17 on page 244](#).

**Note:** Since only OAM's relationship with tape libraries is discussed, just 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 17. Library Management Selection Menu Panel

Selecting option 3, Tape Library, and pressing ENTER displays the Tape Library Application Selection panel (see [Figure 18 on page 245](#)).

**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 18. 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.

**Note:**

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 might not use the letter "V" as the first character of a tape library name. Additionally, tape library names might not begin with numeric characters. You might use alphabetic and the special characters "\$", "@", and "#" for the first character of a tape library name. You might 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 19 on page 246](#) and [Figure 20 on page 246](#).



```

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 19. 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 20. 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.



**Restriction:** The library ID must not point to more than one library name.

### CONSOLE NAME

Specifies the name of the MVS console associated with the tape library that is defined. The console name provides precise routing of console messages that pertain 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 that is defined on this panel must also be defined in the CONSOLxx member of the PARMLIB (see the discussion in topic [“#unique\\_190/unique\\_190\\_Connect\\_42\\_step2d”](#) on page 75 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 that are entered into the library that is 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 that is 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 20 on page 246](#)). 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. By default, when the number of scratch volumes exceeds twice the scratch volume threshold for that media type, the message is deleted. Starting with OA49373, the SETTLIB in the CBROAMxx PARMLIB member (SCRATCHTHRESHOLDMSG) can be used to optionally tune when the CBR3660A message is deleted. Refer to [“SETTLIB statement for tape library settings”](#) on page 76.



**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 60.

When the second define panel is complete, use the DOWN command to display the third part of the Tape Library Define panel (Figure 21 on page 249). Continue with the definition for library LIB1 by completing part three of the Tape Library Define panel. You might also need to use part four of the Tape Library Define panel (Figure 22 on page 249).



```

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 21. 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 22. 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 that is defined is 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 that are 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 that defines 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 they are created. However, both the SCDS and the TCDB for the SMS complex that is defined must be available to the system administrator during the library definition process.

The definition for the tape library does not take effect until the SCDS to which it is defined is activated. When the library is defined within the SCDS and the record for the library is updated in the TCDB, the attributes that are 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 18 on page 245](#)) 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 that is 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 want to change the SCDS NAME, you might do so here; otherwise, the library (LIB2) that is being defined exists in the same SCDS as LIB1.

The Tape Library Define panels ([Figure 23 on page 250](#), [Figure 24 on page 251](#), [Figure 25 on page 251](#), and [Figure 26 on page 252](#)) 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 23. 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 24. 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 25. 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 26. Tape Library Define Panel (Page 4 of 4)

After you complete these library definitions, you have two libraries—one ATLD library, LIB1, along with an MTL library, LIB2—defined in the SMS configuration. Defining a tape library by 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 dataserer by:

1. Select option 2, DISPLAY, on the Tape Library Application Selection panel ([Figure 18 on page 245](#)).
2. Press ENTER.

[Figure 27 on page 252](#) 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 27. 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.

**Restriction:** The library ID must not point to more than one library name.

**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 28 on page 255](#) 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 28. 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 29 on page 256, Figure 30 on page 256, Figure 31 on page 257, and Figure 32 on page 257) 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 29. 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 30. 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 31. 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 32. 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 46 on page 270](#) through [Figure 52 on page 273](#)).

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 18 on page 245](#):

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 33 on page 258](#), [Figure 34 on page 259](#), [Figure 35 on page 259](#), and [Figure 36 on page 260](#).

```
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 33. 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 34. 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		
Device Type . . :3495-L50		
Library ID . . . :0001C		
Number of Slots :16260		
Empty Slots . . :2050		
Initial Online Status (Yes, No, or Blank):		
*SYSPLX01 ==>	*SYSPLX02 ==>	*SYSPLX03 ==>
*SYSPLX04 ==>	*SYSPLX05 ==>	*SYSPLX06 ==>
SYSSTM01 ==> YES	SYSSTM04 ==> YES	SYSSTM07 ==>
SYSSTM02 ==>	SYSSTM05 ==>	SYSSTM08 ==>
SYSSTM03 ==>	SYSSTM06 ==>	SYSSTM09 ==>
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 35. 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 36. 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 46 on page 270](#) through [Figure 52 on page 273](#)). 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 37 on page 261](#)).



```
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 37. 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 46 on page 270](#) through [Figure 52 on page 273](#)):

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 38 on page 262](#), 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 38. 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 280](#)).

**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 16 on page 244](#)). ISMF displays the Library Management Selection menu (see [Figure 17 on page 244](#)).
2. Select option 3, TAPE LIBRARY. This in turn, displays the Tape Library Application Selection panel ([Figure 18 on page 245](#)).

**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 16 on page 244](#)). ISMF displays the Volume List Selection Menu (see [Figure 39 on page 263](#)).

```

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 39. Volume List Selection Menu Panel*

2. Select option 3, MOUNTABLE TAPE, which prompts the display of Mountable Tape Volume Selection Entry Panel ([Figure 40 on page 264](#)).



```

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 40. 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			
Enter Line Operators Below:			Entries 1-11 of 11			
			Data Columns 3-7 of 20			
LINE OPERATOR	VOLUME SERIAL	USE ATTR	VOLUME ERROR STATUS	CHECKPT VOLUME	LIBRARY NAME	STORAGE GRP NAME
---(1)---	-(2)--	--(3)--	----- (4) -----	--(5)--	--(6)---	--(7)---
	VOL01	PRIVATE	I/O ERROR	NO	SHELF	TAPE1
	VOL02	SCRATCH	UNEXPIRED SCRATCH	---	SHELF	*SCRATCH*
	VOL101	SCRATCH	NO ERROR	NO	SHELF	*SCRATCH*
	VOL102	SCRATCH	PASSWORD CONFLICT	NO	LIB1	*SCRATCH*
	VOL103	SCRATCH	SECURITY CONFLICT	NO	LIB1	*SCRATCH*
	VOL104	PRIVATE	SCRATCH IN USE	---	LIB2	TAPE1
	VOL105	PRIVATE	VOLSER MISMATCH	NO	LIB1	TAPE1
	VOL106	SCRATCH	CHECKPOINT CONFLICT	YES	LIB2	*SCRATCH*
	VOL107	SCRATCH	WRITE CONFLICT	YES	LIB1	*SCRATCH*
	VOL108	PRIVATE	NOT IN SLOT	NO	LIB1	TAPE1
	VOL109	PRIVATE	NO ERROR	NO	LIB1	TAPE1
-----	-----	-----	BOTTOM OF DATA	-----	----	-----

Figure 41. 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. See the description of the *errstat* field in [“Displaying tape volume status” on page 138](#) for a list of the volume error status codes.

### 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, \*SCRATCH\*, or ----- (when blank).



Panel List Utilities Scroll Help						
MOUNTABLE TAPE VOLUME LIST						
Command ==>			SCROLL ==> PAGE			
Enter Line Operators Below:			Entries 1-14 of 14			
			Data Columns 8-12 of 20			
LINE OPERATOR	VOLUME SERIAL	MEDIA TYPE	RECORDING TECHNOLOGY	COMPACTION	SPECIAL ATTRIBUTE	LAST 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 42. 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 43. 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 44. 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
  --- (1) ---  (2) --
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.....COLUMN
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 45. 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 265 to generate the library list.



Once you have generated the library list, the tape library list panels are displayed (Figure 46 on page 270 through Figure 52 on page 273). See [“Displaying tape library attributes” on page 252](#) 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 OPERATOR	LIBRARY NAME	DEVICE TYPE	LIBRARY TYPE	LIBRARY ID	CONSOLE NAME	ENTRY DEF 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 46. 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 OPERATOR	LIBRARY NAME	ENTRY DEF USE ATTR	EJECT DEFAULT	NUM SLOTS	EMPTY SLOTS	MEDIA1 SCR NUM	MEDIA1 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 47. 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 26-31 of 34

CDS Name . :SCDS.TEMP.PRIMARY

Enter Line Operators Below:
```

LINE OPERATOR	LIBRARY NAME	MEDIA8 SCR NUM	MEDIA8 SCR THR	MEDIA9 SCR NUM	MEDIA9 SCR THR	MEDIA10 SCR NUM	MEDIA10 SCR THR
---(1)---	--(2)---	-(26)--	-(27)--	-(28)--	-(29)--	-(30)--	-(31)--
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	-----	-----	-----	-----	-----
-----	-----	-----	BOTTOM OF DATA	-----	-----	-----	-----

[illegible]



Figure 52. Tape Library List Panel (part 7 of 7).

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.

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.

- 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)

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).

**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.

- 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 53 on page 275](#) for the Confirm Audit Request panel.



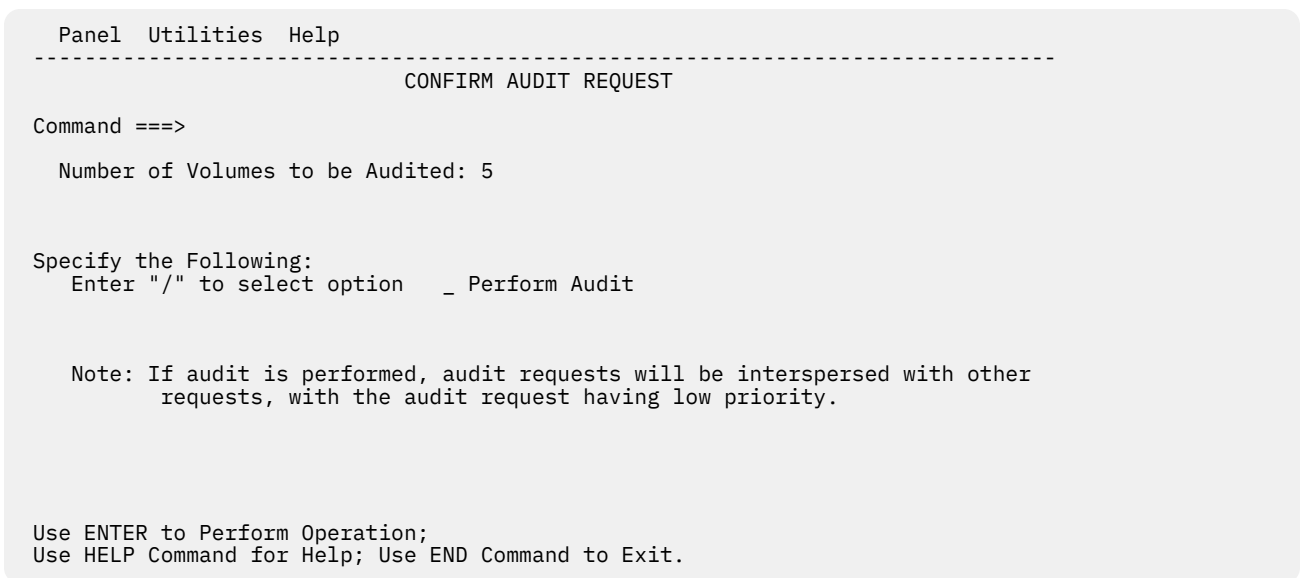


Figure 53. Confirm Audit Request Panel

**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 41 on page 265](#)).

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 54 on page 276](#)) 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 54. 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 55 on page 277) 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 55. 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 56 on page 277).

```

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 56. 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 is displayed. See [Figure 57 on page 278](#).

```
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 57. 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 58 on page 278](#)).

```
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 58. 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 59 on page 279) 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 59. 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 60 on page 280) 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 60. 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 203](#) 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 41 on page 265](#)). 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 219](#) 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

Accessible publications for this product are offered through [IBM Documentation for z/OS \(www.ibm.com/docs/en/zos\)](http://www.ibm.com/docs/en/zos).

If you experience difficulty with the accessibility of any z/OS documentation see [How to Send Feedback to IBM](#) to leave documentation feedback.







## Notices

---

This information was developed for products and services that are offered in the USA or elsewhere.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

IBM may have patents or pending patent applications covering subject matter described in this document. The furnishing of this document does not grant you any license to these patents. You can send license inquiries, in writing, to:

*IBM Director of Licensing  
IBM Corporation  
North Castle Drive, MD-NC119  
Armonk, NY 10504-1785  
United States of America*

For license inquiries regarding double-byte character set (DBCS) information, contact the IBM Intellectual Property Department in your country or send inquiries, in writing, to:

*Intellectual Property Licensing  
Legal and Intellectual Property Law  
IBM Japan Ltd.  
19-21, Nihonbashi-Hakozakicho, Chuo-ku  
Tokyo 103-8510, Japan*

**The following paragraph does not apply to the United Kingdom or any other country where such provisions are inconsistent with local law:** INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. Some states do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or the program(s) described in this publication at any time without notice.

This information could include missing, incorrect, or broken hyperlinks. Hyperlinks are maintained in only the HTML plug-in output for IBM Documentation. Use of hyperlinks in other output formats of this information is at your own risk.

Any references in this information to non-IBM websites are provided for convenience only and do not in any manner serve as an endorsement of those websites. The materials at those websites are not part of the materials for this IBM product and use of those websites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Licensees of this program who wish to have information about it for the purpose of enabling: (i) the exchange of information between independently created programs and other programs (including this one) and (ii) the mutual use of the information which has been exchanged, should contact:

*IBM Corporation  
Site Counsel  
2455 South Road*



Poughkeepsie, NY 12601-5400  
USA

Such information may be available, subject to appropriate terms and conditions, including in some cases, payment of a fee.

The licensed program described in this document and all licensed material available for it are provided by IBM under terms of the IBM Customer Agreement, IBM International Program License Agreement or any equivalent agreement between us.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on generally available systems. Furthermore, some measurements may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

All statements regarding IBM's future direction or intent are subject to change or withdrawal without notice, and represent goals and objectives only.

This information contains examples of data and reports used in daily business operations. To illustrate them as completely as possible, the examples include the names of individuals, companies, brands, and products. All of these names are fictitious and any similarity to the names and addresses used by an actual business enterprise is entirely coincidental.

#### COPYRIGHT LICENSE:

This information contains sample application programs in source language, which illustrate programming techniques on various operating platforms. You may copy, modify, and distribute these sample programs in any form without payment to IBM, for the purposes of developing, using, marketing or distributing application programs conforming to the application programming interface for the operating platform for which the sample programs are written. These examples have not been thoroughly tested under all conditions. IBM, therefore, cannot guarantee or imply reliability, serviceability, or function of these programs. The sample programs are provided "AS IS", without warranty of any kind. IBM shall not be liable for any damages arising out of your use of the sample programs.

## Terms and conditions for product documentation

---

Permissions for the use of these publications are granted subject to the following terms and conditions.

### **Applicability**

These terms and conditions are in addition to any terms of use for the IBM website.

### **Personal use**

You may reproduce these publications for your personal, noncommercial use provided that all proprietary notices are preserved. You may not distribute, display or make derivative work of these publications, or any portion thereof, without the express consent of IBM.

### **Commercial use**

You may reproduce, distribute and display these publications solely within your enterprise provided that all proprietary notices are preserved. You may not make derivative works of these publications, or



reproduce, distribute or display these publications or any portion thereof outside your enterprise, without the express consent of IBM.

## Rights

Except as expressly granted in this permission, no other permissions, licenses or rights are granted, either express or implied, to the publications or any information, data, software or other intellectual property contained therein.

IBM reserves the right to withdraw the permissions granted herein whenever, in its discretion, the use of the publications is detrimental to its interest or, as determined by IBM, the above instructions are not being properly followed.

You may not download, export or re-export this information except in full compliance with all applicable laws and regulations, including all United States export laws and regulations.

IBM MAKES NO GUARANTEE ABOUT THE CONTENT OF THESE PUBLICATIONS. THE PUBLICATIONS ARE PROVIDED "AS-IS" AND WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT, AND FITNESS FOR A PARTICULAR PURPOSE.

## IBM Online Privacy Statement

---

IBM Software products, including software as a service solutions, ("Software Offerings") may use cookies or other technologies to collect product usage information, to help improve the end user experience, to tailor interactions with the end user, or for other purposes. In many cases no personally identifiable information is collected by the Software Offerings. Some of our Software Offerings can help enable you to collect personally identifiable information. If this Software Offering uses cookies to collect personally identifiable information, specific information about this offering's use of cookies is set forth below.

Depending upon the configurations deployed, this Software Offering may use session cookies that collect each user's name, email address, phone number, or other personally identifiable information for purposes of enhanced user usability and single sign-on configuration. These cookies can be disabled, but disabling them will also eliminate the functionality they enable.

If the configurations deployed for this Software Offering provide you as customer the ability to collect personally identifiable information from end users via cookies and other technologies, you should seek your own legal advice about any laws applicable to such data collection, including any requirements for notice and consent.

For more information about the use of various technologies, including cookies, for these purposes, see IBM's Privacy Policy at [ibm.com/privacy](http://ibm.com/privacy) and IBM's Online Privacy Statement at [ibm.com/privacy/details](http://ibm.com/privacy/details) in the section entitled "Cookies, Web Beacons and Other Technologies," and the "IBM Software Products and Software-as-a-Service Privacy Statement" at [ibm.com/software/info/product-privacy](http://ibm.com/software/info/product-privacy).

## Policy for unsupported hardware

---

Various z/OS elements, such as DFSMSdfp, JES2, and MVS, contain code that supports specific hardware servers or devices. In some cases, this device-related element support remains in the product even after the hardware devices pass their announced End of Service date. z/OS may continue to service element code; however, it will not provide service related to unsupported hardware devices. Software problems related to these devices will not be accepted for service, and current service activity will cease if a problem is determined to be associated with out-of-support devices. In such cases, fixes will not be issued.

## Minimum supported hardware

---

The minimum supported hardware for z/OS releases identified in z/OS announcements can subsequently change when service for particular servers or devices is withdrawn. Likewise, the levels of other software products supported on a particular release of z/OS are subject to the service support lifecycle of those



products. Therefore, z/OS and its product publications (for example, panels, samples, messages, and product documentation) can include references to hardware and software that is no longer supported.

- For information about software support lifecycle, see: [IBM Lifecycle Support for z/OS \(www.ibm.com/software/support/systemsz/lifecycle\)](http://www.ibm.com/software/support/systemsz/lifecycle)
- For information about currently-supported IBM hardware, contact your IBM representative.

## Programming interface information

---

This publication documents information that is **not** intended to be used as programming interfaces of DFSMSdfp OAM.

## Trademarks

---

IBM, the IBM logo, and ibm.com are trademarks or registered trademarks of International Business Machines Corporation in the United States, other countries, or both. If these and other IBM trademarked terms are marked on their first occurrence in this information with a trademark symbol (® or ™), these symbols indicate U.S. registered or common law trademarks owned by IBM at the time this information was published. Such trademarks may also be registered or common law trademarks in other countries. A current list of IBM trademarks is available on the Web at [Copyright and Trademark information \(www.ibm.com/legal/copytrade.shtml\)](http://www.ibm.com/legal/copytrade.shtml).



# Glossary

---

The terms in this glossary are defined as they pertain to the Object Access Method.

This glossary might include terms and definitions from:

- The *American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies might be purchased from the American National Standards Institute, 11 West 42nd Street, New York 10036.
- 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.

## **3480**

IBM 3480 Magnetic Tape Subsystem. A group of magnetic tape controllers and drives supporting cartridge system tape (as opposed to reel tape). There are two controller models, A11 and A22, and two drive models, B11 and B22.

## **3490**

IBM 3490 Magnetic Tape Subsystem. A group of magnetic tape controllers and drives supporting cartridge system tape (as opposed to reel tape).

## **3490E**

IBM 3490E Magnetic Tape Subsystem. A group of enhanced capability tape controllers and drives supporting cartridge system tape (as opposed to reel tape).

## **3590**

IBM TotalStorage Enterprise Tape System 3590.

## **3590B1x**

IBM TotalStorage Enterprise Tape Drive 3590 Model B1x .

## **3590E1x**

IBM TotalStorage Enterprise Tape Drive 3590 Model E1xx.

## **3590H1x**

IBM TotalStorage Enterprise Tape Drive 3590 Model H1xx.

## **3592J1A**

IBM TotalStorage Enterprise Tape Drive 3592.

## **3592E05**

IBM Enterprise Tape Drive 3592 Model E05.

## **3592E06**

IBM Enterprise Tape Drive 3592 Model E06.

## **3592E07**

IBM Enterprise Tape Drive 3592 Model E07.

## **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 data server.

**Attribute**

A named property of an entity.

**Automated mode**

The mode of operation of an ATLDS in which host requests for mounts and dismounts with no operator action.

**automated tape library dataserver (ATLDS)**

A device consisting of robotic components, cartridge storage areas, tape subsystems, and controlling hardware and software, together with the set of tape volumes that reside in the library and can be mounted on the library tape drives. Contrast with *manual tape library*. See *tape library*.

**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.

**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 many tape cartridges to the ATLDS.

**Bulk output**

The process of removing many tape cartridges from the ATLDS.

**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 that are 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 might 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.

**Classic OAM Configuration**

An OAM configuration that supports a single OAM instance per system and can be used for both object related processing and tape library related processing. This OAM instance (when used with object support) can also be used with other OAM instances on other systems in an OAMplex. This is the original OAM configuration support prior to the introduction of the "Multiple OAM Configuration" support.



**Cluster**

The physical elements of a TS7700 Virtualization Engine (3957 or 3948) that consists of the virtualization component, the cache controller, the cache drawer and, the underlying physical library, media, and drives. The term cluster is used synonymously with the term "distributed library".

**COMMDS**

Communication data set.

**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 usage statistics for each system-managed volume.

**Compaction**

See *improved data recording capability*.

**Compatibility mode**

The mode of running SMS in which no more than eight names—representing systems, system groups, or both—are supported in the SMS configuration.

**Composite library**

The virtual view of a 3494 Peer-to-Peer VTS (3494) or of a TS7700 Virtualization Engine(s) to the host. In general, host communications with the library are at the composite level with the virtual volumes and drives that are 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 that is defined. The console name provides precise routing of console messages that pertain to a specific library.

**Container**

A receptacle in which one or more exported logical volumes can be stored. A stacked volume that contains one or more logical volumes and existing outside a virtual tape server library is considered to be the container for those volumes.

**Control data set (CDS)**

Regarding 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 few cartridges to the ATLDS without interrupting automated operations.

**Convenience output**

The process of removing a few 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 TS7700 Virtualization Engines that has a physical tape capability. At the end of this operation, the primary copy of the data still exists in the library.

**Copy export merge**

The operation to merge a copy exported stacked volume set (that uses the copy export process) into an existing TS7700 Virtualization Engine that already contains data. The TS7700 Virtualization Engine that the exported stacked volumes are going into must support physical tape.

**CUIR**

Control Unit Initiated Recovery. The state that a tape drive is in when notified by the TS7700 to take the device offline for service. Optional support that is enabled through the LIBRARY REQUEST CUIR command options.

**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 that has a disk-only cache resident partition capability.

**Distributed library**

The underlying physical library that is associated with a Peer-to-Peer VTS (3494) and with a TS7700 Virtualization Engine (3957 or 3948), the term distributed library is used synonymously with the term "cluster".

**DOM**

Delete operator message. When a situation that is indicated by a message changes or is satisfied, the message to the operator is deleted from the console.

**Eject**

The process that is 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 that 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 exists on a stacked volume outside a virtual tape server library.

**Export list volume**

A logical volume that contains export operation instructions for the library. It might include a list of the logical volumes to export or other pertinent information.

**External label**

The computer and human-readable label attached to the outside of a tape cartridge. The label contains the volume serial number of the tape volume.

**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 that provides an access control mechanism that is 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.

**Hardware configuration dialog (HCD)**

A dialog for interacting with MVS for device configuration.

**HCD**

Hardware configuration dialog.

**Hybrid configuration**

A TS7700 multi-cluster grid configuration where some of the clusters have physical tape attached and some of the clusters do not.

**Image copy**

An exact reproduction of all or part of an image.

**Installation exit**

The means described in an IBM software product's documentation by which an IBM software product might 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 that are written to replace one or more existing modules of an IBM software product. Or, they might be modified to add one or more modules or subroutines to an IBM software product for 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 that exist 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 that contains 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.

**Improved data recording capability (IDRC)**

A form of compression used when storing data on tape. This can increase the effective cartridge data capacity and the effective data transfer rate.

**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 dialog manager. Used for writing application programs, it provides a means of generating standard screen panels and interactive dialogs 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.

**KB**

Kilobyte.

**kilobyte (KB)**

A unit of measure for storage capacity. One kilobyte equals 1 024 bytes.

**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 that 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 that is related to the library such as library name and logical type. The library record exists 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 using 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 exist in a virtual tape server or on exported stacked volumes. Applications can access the data on these volumes only when the volumes exist in a virtual tape server that makes the data available by using its tape volume cache. Or, they can access the data after it is copied to a physical volume by using 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.

**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 that is 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.



**Multiple OAM Configuration**

An OAM configuration that supports multiple OAM Object instances and a separate Tape Library instance per system. One or more of the OAM instances (when used with object support) can also be used with other OAM instances on other systems in an OAMplex. Refer to "Classic OAM Configuration" for the original OAM configuration support.

**OAM**

Object Access Method.

**OAM instance**

An OAM subsystem and an associated OAM address space. When the multiple OAM configuration support is used, multiple OAM instances can exist on the same system. Otherwise, only one instance of OAM is supported with the classic OAM configuration support.

**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 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.

**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.

**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 might 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 VTSSs. This dual-volume copy functionality improves data availability and data recovery, while it is observable 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 that are 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 that is 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 that consists of one or more virtual tape server libraries with each virtual tape server that is identified to the host as a separate library. Restrictions by the library manager might 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 is used directly by MVS applications. It might exist in an automated tape library dataserer 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 might be grouped because of common characteristics.

**Policy action**

Actions that are 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.

**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.

**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 exists outside of a tape library.

**Stacked volume**

A volume that has a one-to-one association with physical tape media and 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 might 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).

**Tape cartridge**

A case that contains 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 might 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 exists 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 might also share access to the set of private volumes in each tape library.

**TDSI**

Tape device selection information.

**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 might 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 or 3948). The TS7700 replaces the IBM 3494 Virtual Tape Server. The existing virtual tape server (VTS) concepts also apply to the virtualization engine.

**Virtual volume**

A tape volume that exists in a tape volume cache of a virtual tape server. Whether the volume exists in the tape volume cache as a virtual volume or on a stacked volume as a logical volume is observable 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 that contains 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 that contains information related to a volume, such as volume serial number, library name, and storage group. The volume record exists 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*.







# Index

## Numerics

- 3495
  - external high-capacity input and output station feature [9](#)
- 3592
  - integrated library manager [12](#)

## A

- accessibility
  - contact IBM [283](#)
- ACS routines, pre-ACS routines [5](#)
- address space identifier (ASID)
  - description [146](#)
- aggregate group
  - description [4](#)
- alter
  - altering volume records [94](#)
  - mountable tape volume alter entry panel [276](#)
  - private to scratch confirmation panel [279](#)
  - the use attribute of scratch volumes [98](#)
  - updating the library record in the SCDS/TCDB [93](#)
- alter request
  - confirming [279](#)
- altering
  - volume record [276](#)
- altering a tape library [258](#)
- alternate z/OS MCS
  - console
    - defining [63](#)
- APARs
  - OA43490 [7](#)
- assigning policy names outboard [117](#)
- assistive technologies [283](#)
- ATLDS cartridge loaders
  - assigning categories to [116](#)
- AUDIT
  - audit command [109](#)
  - detecting software errors [276](#)
  - full library [94](#), [273](#)
  - identifying audit discrepancies [275](#)
  - single volume [94](#), [273](#)
  - tape libraries [273](#)
  - verifying volume location [94](#), [273](#)
  - verifying VTS logical volume entries [274](#)
  - volume list [94](#), [273](#)
- audit discrepancies
  - identifying [275](#)
- Automated Tape Library Dataserver
  - 3495 description
    - convenience input and output facility [10](#)
    - external high-capacity input and output facility [9](#)
    - high-capacity input and output facility [9](#)
    - library manager [10](#)
    - manual mode terminal [10](#)
    - virtual volume characteristics [13](#)
  - automated tape storage description [1](#)

- Automated Tape Library Dataserver (*continued*)
  - coexistence support for outboard policy management [71](#)
  - description [1](#)
  - ejecting a tape cartridge [36](#)
  - entering a tape cartridge into a tape library [29](#)
  - ISMFS's role [3](#)
  - library sharing among multiple systems [64](#)
  - retrieving data from a disabled ATLDS [97](#)
  - sharing with DFSMSrmm [69](#)
  - storage configurations [44](#)
  - subsystem attachment, 3494
    - 3490E magnetic tape subsystem [11](#)
    - 3590 Model E [11](#)
    - cartridge storage cells [11](#)
    - convenience input output station [12](#)
    - description [10](#)
    - high-capacity output facility [12](#)
    - library manager [12](#)
  - virtual tape server
    - description [11](#)
    - logical library partitioning [17](#)
    - outboard policy management [8](#)
    - stacked volumes [14](#), [17](#)
    - tape volume cache [17](#)
    - utilization of the 3590 storage capacity [17](#)
    - virtual device characteristics [13](#)
    - virtual volume characteristics [13](#)
  - volume requirements [34](#)
  - volume restrictions [35](#)
- automatic class selection (ACS)
  - changing routines [95](#)
  - overview [5](#)
  - writing and testing the routines [85](#)

## B

- balanced mode
  - in TS7700 [53](#)
- base configuration
  - description [4](#)
- building the library inventory [73](#)
- Bulk Volume Information Retrieval (BVIR) facility [18](#)
- BVIR [39](#)

## C

- cache management [15](#)
- cartridge eject installation exit
  - creating the exit [86](#)
  - description [219](#)
  - parameter description [164](#), [166](#)
  - parameter list (CBRUXJPL) [222](#), [225](#)
  - return codes [225](#)
  - usage requirements [225](#)
  - used with EJECT function [151](#)
- cartridge entry installation exit



- cartridge entry installation exit (*continued*)
  - creating the exit [86](#)
  - description [211](#)
  - entering a cartridge (automated tape library dataserver) [29](#)
  - parameter list (CBRUXEPL) [215](#)
  - return and reason codes [218](#), [219](#)
  - usage requirements [219](#)
  - used with MCE function [151](#)
- cartridge entry processing
  - without an online device [30](#)
- cartridge loader
  - displaying the scratch media type [115](#)
  - setting the scratch media type [115](#)
- catalog
  - defining [82](#)
  - general catalog description [6](#)
  - recovering volume catalogs [96](#)
  - recreating library entries [96](#)
  - recreating volume entries [96](#)
  - specific catalog description [6](#)
  - volume catalog description [6](#)
- categories
  - displaying volume categories
    - CBRTVI macro [196](#)
    - scratch, library display [123](#)
    - volume display [138](#)
  - error [63](#)
  - library manager [67](#)
  - volume [62](#)
- CBROAMxx PARMLIB member
  - creating or updating SETTLIB statements [76](#)
- CBRTDI macro [195](#)
- CBRTVI macro [196](#)
- CBRUXCUA
  - creating the exit [86](#)
  - description [203](#)
  - parameter list (CBRUXCPL) [207](#), [210](#)
  - return and reason codes [210](#)
  - syntax rules for outboard policy constructs [205](#)
  - usage requirements [210](#)
  - WORM volume use attribute [157](#)
- CBRUXEJC
  - creating the exit [86](#)
  - description [219](#)
  - parameter list (CBRUXJPL) [222](#), [225](#)
  - return codes [225](#)
  - usage requirements [225](#)
- CBRUXENT
  - creating the exit [86](#)
  - description [211](#)
  - parameter list (CBRUXEPL) [215](#)
  - return codes [218](#)
  - syntax rules for outboard policy constructs [214](#)
  - usage requirements [219](#)
- CBRUXVNL
  - creating the exit [86](#)
  - description [226](#)
  - entering tape volumes in library with [227](#)
  - input during device allocation [230](#)
  - parameter list (CBRUXNPL) [232](#), [235](#)
  - return codes
    - device allocation [236](#), [237](#)
    - job step processing [236](#)
- CBRUXVNL (*continued*)
  - return codes (*continued*)
    - library mount [237](#)
  - return codes for device allocation [236](#)
  - usage requirements [237](#)
- CBRXLCS macro
  - changing VTS library operating modes (PTPMC) [177](#)
  - CUA function [151](#)
  - EJECT function [151](#)
  - execution environment [187](#)
  - EXPORT function
    - canceling operation [174](#)
    - initiating operation [174](#)
  - IMPORT function
    - canceling operation [176](#)
    - initiating operation [176](#)
  - interface [185](#)
  - macro syntax
    - change use attribute [153](#)
    - export [174](#)
    - import [176](#)
    - manual cartridge entry [159](#)
    - obtain library name information [182](#)
    - peer-to-peer data [180](#)
    - peer-to-peer operating modes [180](#)
    - query volume residence [167](#), [172](#)
    - test volume eligibility [172](#)
  - MCE function [151](#)
  - obtaining library name information (OLN) [182](#)
  - obtaining VTS library operational mode settings (PTPDATA) [180](#)
  - overview [151](#)
  - parameter list (LCSPPL)
    - canceling operation [174](#)
    - initiating operation [174](#)
  - QVR function [152](#), [167](#)
  - return and reason codes
    - CBRXLCS [186](#)
    - change use attribute (CUA) [157](#)
    - Change Use Attribute Installation Exit (CBRUXCUA) [210](#)
    - manual cartridge entry (MCE) [163](#), [164](#)
    - Peer-to-Peer Mode Control (PTPMC) [179](#)
    - Peer-to-Peer VTS Data (PTPDATA) [181](#)
    - query volume residence (QVR) [169](#), [170](#)
    - tape cartridge eject (EJECT) [166](#)
    - tape cartridge eject query [166](#)
    - test volume eligibility (TVE) [173](#)
    - Volume not in Library Installation Exit (CBRUXVNL) [99](#), [236](#)
    - tape data information (CBRTDI macro) [195](#)
    - TVE function [152](#), [172](#)
- CBRXLCS PTPMC
  - return and reason codes for [181](#)
- CBRXLCS query volume
  - return and reason codes [169](#)
- change use attribute
  - successful processing [156](#)
- change use attribute installation exit
  - CBRXLCS macro syntax [153](#)
  - changing from private to scratch [156](#)
  - changing from scratch to private [98](#), [156](#)
  - changing to the same use attribute [157](#)
  - creating the exit [86](#)



- change use attribute installation exit (*continued*)
  - CUA function [151](#)
  - CUA macro parameter description [153](#)
  - description [203](#)
  - exit parameter list [207](#), [210](#)
  - LIBRARY LMPOLICY command [117](#)
  - return and reason codes for CBRXLCS (CUA) [157](#)
  - usage requirements [210](#)
- changing use attribute
  - for tape volumes [280](#)
- changing VTS library operating modes [177](#)
- checklist, tape library installation [72](#)
- class
  - description
    - aggregate group [4](#)
    - data class [4](#)
    - management class [4](#)
    - storage class [4](#)
    - storage group [4](#)
  - using ACS routines to change [95](#)
- coexistence support
  - for down-level systems [71](#)
- command
  - ALTER [94](#), [276](#)
  - AUDIT [94](#), [273](#)
  - DISPLAY commands
    - SETTLIB statement [122](#)
  - DISPLAY SMS,LIBRARY [123–125](#)
  - DISPLAY SMS,OAM [119](#)
  - DISPLAY SMS,STORGRP [136](#)
  - DISPLAY SMS,VOLUME [138](#)
  - EJECT [36](#), [94](#), [280](#)
  - LIBRARY DISABLE [110](#), [113](#)
  - LIBRARY DISPCL [115](#), [116](#)
  - LIBRARY DISDRV [129](#)
  - LIBRARY EJECT [107](#)
  - LIBRARY ENTER [109](#)
  - LIBRARY EXPORT [111](#)
  - LIBRARY LMPOLICY [117](#)
  - LIBRARY REQUEST [111](#)
  - LIBRARY RESET [113](#), [114](#)
  - LIBRARY SETCL [115](#), [116](#)
  - MODIFY OAM [145](#)
  - OAM AUDIT [109](#)
  - OAM DUMP [145](#)
  - OAM RESTART [106](#)
  - START OAM [104](#)
  - STOP OAM [145](#)
  - VARY MVS (tape drive) [107](#)
  - VARY SMS (tape library) [105](#)
- composite library
  - defining libraries [85](#)
  - defining tape storage groups [85](#)
  - library ID [84](#)
  - online/offline [106](#)
  - peer-to-peer VTS system [18](#)
  - stacked volume [128](#)
  - VCL [126](#)
  - VDL [126](#)
- Compression enhancements [24](#)
- configuration
  - creating the TCDB [82](#)
  - defining and monitoring overview [93](#)
  - defining with ISMF [243](#)

- configuration (*continued*)
  - ICF support for the TCDB [6](#)
  - using HCD for drive definition [7](#)
  - validating [86](#)
- Confirm Alter Request panel [279](#)
- console names
  - associating with tape libraries [63](#)
- constructs
  - adding [93](#)
  - altering the library definitions [93](#)
  - changing SMS constructs definitions [95](#), [117](#)
  - SMS overview [4](#)
  - using outboard policy management [8](#)
  - validity checking [119](#)
- contact
  - z/OS [283](#)
- Control Unit Initiated Recovery (CUIR) for Tape [25](#)
- copy export [39](#)
- copy export merge [40](#)
- copy mode options
  - for TS7700 [26](#)
- copying tape library definitions [260](#)

## D

- DALSMSHR
  - SMSHONOR keyword [52](#)
- data class
  - CBRUXCUA exit [203](#)
  - description [4](#)
  - entry (CBRUXENT exit) [211](#)
  - entry default data class [243](#)
  - import [214](#)
  - using outboard policy management
    - display volume [138](#)
    - FUNC=CUA [153](#)
    - LIBRARY LMPOLICY [117](#)
    - QVR [167](#)
    - syntax [117](#)
- data retrieval from disabled ATLDS
  - altering private TCDB records [97](#)
  - changing from SMS-managed to non-SMS-managed [98](#)
  - changing the use attribute [98](#)
  - library manager database volume list [99](#)
  - overview [97](#)
  - return ATLDS operational status [99](#)
  - sample JCL [98](#)
  - volume not in library exit [99](#)
- data, Peer-to-Peer VTS (PTPDATA)
  - definition [180](#)
  - obtaining VTS library operational mode settings [180](#)
- databases
  - defining and monitoring configurations [93](#)
  - defining tape drives with HCD [84](#)
  - ISMF functions [243](#)
  - library manager database volume list [99](#)
  - TCDB description [6](#)
- deleting expired VTS volume data [16](#)
- demand allocation
  - with system-managed tape [52](#)
- device pools
  - limitation on scratch allocations [90](#)
- device services



device services (*continued*)

    querying [150](#)

DEVSUPxx [67](#)

diagnostic data

    capturing [145](#)

DISABLE

    MVS LIBRARY DISABLE command [113](#)

    MVS LIBRARY RESET command [113](#)

disabled ATLDs, retrieving data

    altering private TCDB records [97](#)

    changing from SMS-managed to non-SMS-managed [98](#)

    changing the use attribute [98](#)

    library manager database volume list [99](#)

    overview [97](#)

    return ATLDs operational status [99](#)

    sample JCL [98](#)

    volume not in library exit [99](#)

disaster recovery (DR) test

    FlashCopy [97](#)

    selective write protect [97](#)

disaster recovery site considerations [96](#)

DISPCL command [115](#)

DISPDRV command [129](#)

display

    cartridge loader scratch media type [115](#)

    drive status [129](#)

    library connectivity [124](#)

    library detail [125](#)

    library status [99](#), [123](#)

    OAM outstanding messages [145](#)

    OAM status [119](#)

    storage group status [136](#)

    tape volume status [138](#)

    volume's outboard policies [138](#)

distributed library

    defining libraries [85](#)

    defining tape storage groups [85](#)

    online/offline [106](#)

    peer-to-peer VTS system [18](#)

    stacked volume [128](#)

drive

    displaying status [129](#)

    varying online/offline [107](#)

duplicate volume management [8](#)

## E

eject

    cartridge eject function (EJECT) [151](#)

    Cartridge Eject Installation Exit description [219](#)

    failed notification [221](#)

    line operator command [94](#)

    MVS LIBRARY EJECT command [107](#)

    overview [36](#)

    return and reason codes [166](#)

    specifying shelf location [108](#)

    volume from a tape library [94](#), [280](#)

EJECT

    successful processing [165](#)

EJECT line operator parameters

    specifying [281](#)

enter

enter (*continued*)

    CBRUXENT reference [211](#)

    disabling entry processing [114](#)

    import reference [30](#)

    LIBRARY ENTER command [109](#)

    MCE [159](#)

    tape cartridge entry [29](#)

entry default use attribute [247](#)

error category [62](#)

error count [63](#)

exits (installation)

    CBRUXCUA [203](#)

    CBRUXEJC [37](#), [219](#)

    CBRUXENT [211](#)

    CBRUXVNL [226](#)

    LIBRARY RESET [114](#)

    pre-ACS routine [5](#)

exporting

    canceling an operation [38](#)

    completion processing [221](#)

    EXPORT return and reason codes [174](#)

    FUNC=EXPORT [38](#), [152](#), [174](#)

    global resource serialization [41](#), [81](#)

    LIBRARY EXPORT command [111](#)

    logical volumes from a VTS [37](#)

    overview [15](#)

    status messages [38](#)

## F

F OAM,DISPLAY,SETTLIB command

    syntax [122](#)

FlashCopy for disaster recovery (DR) test [97](#)

## G

geographically dispersed parallel sysplex

    considerations for running PTP VTS [19](#)

    description [19](#)

    topology [19](#)

    use with disaster recovery [20](#)

global resource serialization

    in manual tape library [34](#)

global resource serialization (GRS)

    creating the ring [81](#)

    using with cartridge entry processing [34](#)

    using with export processing [41](#), [81](#)

## H

hardware

    3494 ATLDs

        3490E magnetic tape subsystem [11](#)

        3590H magnetic tape subsystem [11](#)

        cartridge storage cells [11](#)

        IBM TotalStorage Enterprise High Performance Tape System [11](#)

        library manager [12](#)

        subsystem attachment [10](#)

    3495 ATLDs

        convenience input and output facility [10](#)

        external high-capacity input and output facility [9](#)

        high-capacity input and output facility [9](#)



- hardware (*continued*)
  - 3495 ATLDS (*continued*)
    - library manager (ATLDS) [10](#)
    - manual mode terminal [10](#)
    - subsystem attachment [8](#)
  - 3584 ATLDS [12](#)
  - configuration database
    - defining the tape drives [84](#)
  - library models [43](#)
  - tape subsystems [43](#)
  - virtual tape server
    - description [11](#)
    - logical library partitioning [17](#)
    - stacked volumes [14](#), [17](#)
    - tape volume cache [17](#)
    - utilization of the 3590 storage capacity [17](#)
    - virtual device characteristics [13](#)
    - virtual volume characteristics [13](#)
- hardware configuration definition (HCD)
  - creating [84](#)
  - deleting subsystems [92](#)
  - description [7](#)
  - moving subsystems [91](#)

**I**

- IART [15](#)
- IBM TotalStorage Enterprise Tape System 3590
  - coexistence support [71](#)
  - description [11](#)
  - storage configurations [44](#)
- identifying
  - audit discrepancies [275](#)
- import
  - canceling an operation [32](#)
  - FUNC=IMPORT [32](#), [152](#), [176](#)
  - IMPORT return and reason codes [176](#)
  - LIBRARY IMPORT command [110](#)
  - multiple logical volumes at the host [30](#)
  - overview [15](#)
  - single logical volume at the library manager [33](#)
  - status messages [32](#)
- improved cache management [15](#)
- initial access response time [15](#)
- initial online status
  - description [249](#)
- installation
  - activating the configuration [86](#)
  - building the library inventory [73](#)
  - changing system libraries [73](#)
  - checklist [72](#)
  - creating the exit routines [86](#)
  - creating the GRS [81](#)
  - creating the hardware configuration [84](#)
  - creating the SMS definitions [85](#)
  - creating the TCDB [82](#)
  - defining tape storage groups [85](#)
  - display and set the cartridge loader media type [87](#), [115](#)
  - IPLing the system [84](#)
  - outboard policy management installation
    - recommendations [87](#)
    - planning [43](#)
    - running the job stream [87](#)
    - starting the OAM address space [86](#)

- installation (*continued*)
  - validating the configuration [86](#)
  - varying the library online [87](#), [105](#)
- installation exit
  - entering tape volumes in library with [227](#)
- installation exits
  - creating the exit
    - cartridge eject [86](#), [219](#)
    - cartridge entry [86](#), [211](#)
    - change use attribute [86](#), [203](#)
    - sample library members [239](#)
    - volume not in library [86](#), [226](#)
  - description
    - CBRUXCUA [203](#)
    - CBRUXEJC [219](#)
    - CBRUXENT [211](#)
    - CBRUXVNL [226](#)
  - disabling entry processing (DISABLE) [113](#)
  - outboard policy management [206](#)
  - re-enabling entry processing (LIBRARY RESET) [113](#)
  - reenabling processing (RESET) [114](#)
  - return codes
    - CBRUXCUA [210](#)
    - CBRUXEJC [225](#)
    - CBRUXENT [218](#)
    - CBRUXVNL [236](#), [237](#)
  - sample program
    - CBRAPROC, creates OAM member in PROCLIB [241](#)
    - CBRSPUXV, Volume Not in Library Exit [99](#)
- installation storage management policy
  - overview [4](#)
  - planning for [43](#)
  - scratch tape management [7](#)
  - tape library management overview [1](#)
  - terminology [1](#)
  - types of tape volumes [7](#)
- integrated catalog facility (ICF)
  - tape configuration database [6](#)
  - volume catalogs
    - general [6](#)
    - specific [6](#)
  - volume record [6](#)
- ISMF (Interactive Storage Management Facility)
  - AUDIT command [273](#)
  - checklist, tape library define [85](#)
  - description [3](#)
  - panels
    - application selection [244](#)
    - confirm audit request [274](#)
    - defining a manual library [250](#)
    - management selection menu [244](#)
    - mountable tape volume alter entry panel [276](#)
    - mountable tape volume application [262](#), [269](#)
    - mountable tape volume list [265](#), [269](#)
    - mountable tape volume selection entry panel [263](#)
    - primary option menu [243](#)
    - private to scratch confirmation panel [279](#)
    - tape library define [245](#)
    - tape library list [270](#)
    - volume list selection menu [263](#)
  - role with tape library dataservers [3](#)
  - typical procedures
    - altering a tape library definition [93](#)
    - altering the volume record [94](#), [276](#)



## ISMF (Interactive Storage Management Facility) (*continued*)

### typical procedures (*continued*)

- auditing volumes in a library [94](#), [273](#)
- confirming audit request [274](#)
- creating tape library lists [269](#), [273](#)
- defining a tape library [85](#), [93](#), [243](#)
- defining SMS constructs [85](#)
- ejecting a volume [94](#), [280](#)
- generating a volume list [263](#)
- management functions [93](#)
- monitoring and maintaining SMS library definitions [95](#)
- verifying volumes in a library [273](#)
- viewing and sorting lists [273](#)

## J

### JCL keyword

- SMSHONOR [52](#)

job processing for outboard policy management [206](#)

## K

### keyboard

- navigation [283](#)
- PF keys [283](#)
- shortcut keys [283](#)

## L

### LCS (library control system)

- external services
- CBRXLCS description [151](#)

### LCS (Library Control System)

- description [2](#)
- external services
- cartridge eject (EJECT) [151](#)
- CBRXLCS return and reason codes [186](#)
- change use attribute (CUA) [151](#), [153](#)
- execution environment [187](#)
- EXPORT [152](#)
- IMPORT [152](#)
- LCSPL parameter list [187](#)
- macro interface [153](#)
- manual cartridge entry (MCE) [151](#), [159](#)
- obtain library name (OLN) [153](#)
- PTPDATA [152](#)
- PTPMC [152](#)
- query volume residence (QVR) [152](#), [167](#)
- testing volume eligibility (TVE) [152](#), [172](#)
- tape data information
- CBRTDI mapping macro [195](#)
- description [180](#)
- tape volume information
- CBRTVI mapping macro [196](#)
- description [196](#)

### library

- 3953 library manager [12](#)
- adding subsystems to [90](#)
- auditing a full library [273](#)
- auditing volumes in a library [273](#)
- changing system libraries [73](#)
- defining the tape library with ISMF [85](#)

## library (*continued*)

- display library status [123](#)
- displaying OAM status [119](#)
- displaying the cartridge loader scratch media type [115](#)
- drive status [129](#)
- ejecting a specific tape volume [107](#)
- ejecting a volume from a library [280](#)
- entering tape volumes in [227](#)
- identifying audit discrepancies [275](#)
- ISMF screens
- application selection panel [244](#)
- confirm audit request [274](#)
- defining a manual library [250](#)
- management selection menu [244](#)
- mountable tape volume alter entry panel [276](#)
- tape library define panel [245](#)
- tape library list [270](#)
- library manager [10](#)
- outboard policy management [8](#)
- partitioning [66](#)
- recreating library entries [96](#)
- SCDS definition [93](#)
- setting the cartridge loader scratch media type [115](#)
- subsystem modifications [90](#)
- tape management overview [1](#)
- TCDBplex [66](#)
- using ISMF to define [93](#), [243](#)
- vary drive online/offline [107](#)
- vary library online/offline [105](#)
- verifying volumes in a library [262](#)

### LIBRARY IMPORT [110](#)

### library inventory

- building [73](#)

### library operational states

- TS7700 [26](#)

### library vision system of AT LDS [274](#)

### load balancing

- tape control units [29](#)

### logical library partitioning [17](#)

### logical volume

- building library inventory [73](#)
- canceling an export [38](#)
- considerations [227](#)
- ejecting [37](#)
- export [152](#), [174](#), [227](#)
- export pending category [141](#)
- exported category [141](#)
- exporting [37](#)
- exporting from a VTS [8](#)
- import [152](#), [176](#)
- import/export [15](#)
- importing
- single volume [33](#)
- initiate/cancel export [111](#)
- initiate/cancel import [111](#)
- inventory [17](#)
- outboard policy management [8](#)
- remove [221](#)
- stacked volume [30](#)

## M

### macros

- CBRLCSPL [187](#)



- macros (*continued*)
  - CBRTDI [195](#)
  - CBRTDSI [196](#)
  - CBRUXCPL [207](#)
  - CBRUXEPL [215](#)
  - CBRUXJPL [222](#)
  - CBRUXNPL [231](#)
- management
  - introduction to tape library [1](#)
  - ISMF functions [3](#), [93](#)
  - multiple media formats [49](#)
  - scratch tape [7](#)
  - storage policy [4](#)
- management class
  - description [4](#)
  - maintaining [93](#)
  - selective dual copy [18](#)
  - selective peer-to-peer copy mode [177](#)
- manual cartridge entry (MCE)
  - CBRXLCS macro [159](#)
  - overview [151](#)
  - parameter description [160](#)
  - return and reason codes [163](#), [164](#)
- manual tape library
  - considerations [71](#)
  - ejecting a tape cartridge [36](#)
  - global resource serialization [34](#), [41](#)
  - hardware considerations [49](#)
  - LIBRARY ENTER [109](#)
  - library sharing among multiple systems [64](#)
  - manual tape storage [2](#)
  - partitioned
    - handling tape drives [69](#)
  - role of ISMF [3](#)
  - scratch tape management [8](#)
  - sharing with DFSMSrmm [69](#)
  - stand-alone [69](#)
  - storage configurations [44](#)
  - volume requirements [34](#)
  - volume restrictions [35](#)
- manual tape library (MTL) [2](#)
- MCS console
  - defining alternate console [63](#)
- media
  - displaying cartridge loader scratch media type [115](#)
  - IBM Cartridge System Tape (MEDIA1) [212](#)
  - IBM E [212](#)
  - IBM Enhanced Capacity Cartridge System Tape (MEDIA2) [212](#)
  - IBM Enterprise Economy Tape Cartridge (MEDIA7) [212](#)
  - IBM Enterprise Economy WORM Tape Cartridge (MEDIA8) [212](#)
  - IBM Enterprise Extended Tape Cartridge (MEDIA9) [212](#)
  - IBM Enterprise Tape Cartridge (MEDIA5) [212](#)
  - IBM Enterprise WORM Tape Cartridge (MEDIA6) [212](#)
  - IBM Extended High Performance Cartridge Tape (MEDIA4) [34](#), [212](#)
  - IBM High Performance Cartridge Tape (MEDIA3) [34](#), [212](#)
  - managing multiple media formats [49](#)
  - media selection
    - in ATLDs [117](#)
    - in MTL [117](#)
  - setting cartridge loader scratch media type [115](#)
- MEDIA1 (Cartridge System Tape) [44](#), [60](#), [133](#), [247](#)
- MEDIA10 (Enterprise Extended WORM Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA11 (Enterprise Advanced Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA12 (Enterprise Advanced WORM Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA13 (Enterprise Advanced Economy Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA2 (Enhanced Capacity Cartridge System Tape) [44](#), [60](#), [133](#), [247](#)
- MEDIA3 (High Performance Cartridge Tape) [44](#), [60](#), [134](#), [247](#)
- MEDIA4 (Extended High Performance Cartridge Tape) [44](#), [60](#), [134](#), [248](#)
- MEDIA5 (Enterprise Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA6 (Enterprise WORM Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA7 (Enterprise Economy Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA8 (Enterprise Economy WORM Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- MEDIA9 (Enterprise Extended Tape Cartridge) [44](#), [60](#), [134](#), [248](#)
- messages
  - format conventions [102](#)
  - routing to console [63](#)
- mode control, Peer-to-Peer VTS (PTPMC)
  - CBRTDI macro [195](#)
  - changing VTS library operating modes [177](#)
  - definition [177](#)
  - obtaining VTS using device information [180](#)
  - parameters [178](#)
  - return and reason codes [179](#)
  - selective peer-to-peer copy mode [20](#)
  - syntax [178](#)
- mountable tape volume application
  - generating a volume list [263](#)
  - list panel, ALTER [94](#), [276](#)
  - list panel, AUDIT [273](#)
  - list panel, EJECT [280](#)
  - selection entry panel [262](#)
- mountable tape volume list
  - generating [265](#)
- MVS
  - commands
    - DISPLAY SMS,LIBRARY [123](#)
    - DISPLAY SMS,OAM [119](#)
    - DISPLAY SMS,STORGRP [136](#)
    - DISPLAY SMS,VOLUME [138](#)
    - LIBRARY DISABLE [113](#)
    - LIBRARY DISPDRV [129](#)
    - LIBRARY EJECT [36](#), [107](#)
    - LIBRARY EXPORT [111](#)
    - LIBRARY IMPORT [110](#)
    - LIBRARY RESET [113](#), [114](#)
    - MODIFY OAM [145](#)
    - MVS LIBRARY DISPCL [115](#)
    - MVS LIBRARY SETCL [115](#)
    - OAM DUMP [145](#)
    - OAM QUERY [147](#)
    - OAM RESTART [106](#)
    - START OAM [104](#)
    - STOP OAM [145](#)
  - hardware configuration definition [7](#)
  - LIBRARY ENTER [109](#)
  - LIBRARY REQUEST [111](#)



MVS (*continued*)  
OAM AUDIT [109](#)  
partitioning [66](#)

## N

name restrictions, tape library [243](#), [245](#)  
navigation  
keyboard [283](#)

## O

OAM (Object Access Method)  
defining elements [85](#)  
installation checklist [73](#)  
installation procedures  
activating the configuration [86](#)  
building the library inventory [73](#)  
changing system libraries [73](#)  
creating the exit routines [86](#)  
creating the GRS [81](#)  
creating the hardware configuration [84](#)  
creating the SMS definitions [85](#)  
creating the TCDB [82](#)  
defining tape storage groups [85](#)  
display and set the cartridge loader media type [87](#),  
[115](#)  
IPLing the system [84](#)  
running the job stream [87](#)  
starting the OAM address space [86](#)  
validating the configuration [86](#)  
varying the library online [87](#), [105](#)  
keywords, OAMPROC, OAMTASK [73](#)  
operating the OAM Address Space [101](#)  
planning for [43](#)  
role of ISMF [3](#)  
SETTLIB statements  
CBROAMxx PARMLIB member [76](#)  
storage management policy [4](#), [43](#)  
support for tape libraries overview [2](#)  
using ISMF to define the configuration [243](#)  
OAM AUDIT command [109](#)  
OAM DUMP command  
description and syntax [145](#)  
OAM QUERY command  
command description [147](#)  
keyword descriptions [147](#)  
syntax [147](#)  
obtaining library name information  
FUNC=OLN [182](#)  
return and reason codes [185](#)  
Successful processing [184](#)  
VTS library device information [180](#)  
VTS library operational mode settings [180](#)  
online/offline  
displaying library status [123](#)  
library connectivity [124](#)  
varying a tape drive [107](#)  
varying a tape library [105](#)  
ONLYIF statement  
in an OAMplex [78](#)  
syntax [78](#)  
operator commands

operator commands (*continued*)  
F OAM,DISPLAY [122](#)  
operator tasks  
DISPLAY OAM messages [145](#)  
DISPLAY SMS,LIBRARY [123](#)  
DISPLAY SMS,OAM [119](#)  
DISPLAY SMS,STORGRP [136](#)  
DISPLAY SMS,VOLUME [138](#)  
LIBRARY DISABLE [113](#)  
LIBRARY DISPCL [115](#)  
LIBRARY DISPDRV [129](#)  
LIBRARY EJECT [107](#)  
LIBRARY ENTER [109](#)  
LIBRARY EXPORT [111](#)  
LIBRARY IMPORT [110](#)  
LIBRARY LMPOLICY [117](#)  
LIBRARY RESET [113](#), [114](#)  
LIBRARY SETCL [115](#)  
MODIFY OAM [145](#)  
OAM AUDIT [109](#)  
OAM DUMP [145](#)  
OAM QUERY [147](#)  
OAM RESTART [106](#)  
overview of [101](#)  
START OAM [104](#)  
STOP OAM [145](#)  
VARY MVS (tape drive) [107](#)  
VARY SMS (tape library) [105](#)  
outboard policy management  
assigning policy names [117](#)  
cache management [15](#)  
calling the entry exit [214](#)  
displaying policy names  
CBRTVI macro [196](#)  
QVR function [167](#)  
volume display [138](#)  
for VTS volumes [8](#)  
installation recommendations [87](#)  
migration and expected actions [89](#)  
physical volume pooling [17](#)  
returning from the entry exit [215](#)  
scenarios, installation [88](#)  
selective dual copy [18](#)  
selective peer-to-peer copy mode [20](#)  
test environments [89](#)  
outstanding requests, OAM query [147](#)

## P

parameter  
CBRUXCUA parameter list (CBRUXCPL) [207](#), [210](#)  
CBRUXEJC parameter list (CBRUXJPL) [222](#), [225](#)  
CBRUXENT parameter list (CBRUXEPL) [215](#)  
CBRUXVNL parameter list (CBRUXNPL) [232](#), [235](#)  
changing the use attribute [153](#)  
EXPORT [174](#)  
IMPORT [176](#)  
LCS external services (LCSPL) [187](#)  
manual cartridge entry [160](#)  
OLN [182](#)  
PTPDATA [180](#)  
PTPMC [177](#)  
query volume residence [168](#)  
tape cartridge eject [164](#)



- parameter (*continued*)
  - test volume eligibility [172](#), [174](#), [176](#)
- partitioned ATLDS
  - tape drives in [68](#)
- partitioned MTL
  - tape drives in [69](#)
- partitioning
  - tape libraries among multiple sysplexes [66](#)
- peer-to-peer data (PTPDATA)
  - overview [152](#)
- Peer-to-Peer VTS data (PTPDATA)
  - definition [180](#)
  - obtaining VTS library operational mode settings [180](#)
  - parameters [181](#)
  - return and reason codes [181](#)
  - syntax [180](#)
- Peer-to-Peer VTS mode control (PTPMC)
  - CBRTDI macro [195](#)
  - changing VTS library operating modes [177](#)
  - definition [177](#)
  - obtaining VTS using device information [180](#)
  - parameters [178](#)
  - return and reason codes [179](#)
  - selective peer-to-peer copy mode [20](#)
  - syntax [178](#)
- peer-to-peer VTS subsystem
  - using with GDPS [19](#)
- Peer-to-Peer VTS Subsystem
  - defining [85](#)
  - description [18](#)
  - library ID [84](#)
- performance scaling [59](#)
- performance segmentation [59](#)
- physical volume
  - eject [221](#)
  - vision system [274](#)
- physical volume pooling [17](#)
- planning
  - analyzing the processing environment [43](#)
  - hardware recommendations [43](#)
  - managing multiple media formats [49](#)
  - OAM installation [43](#)
  - tape cartridge capacities [50](#)
  - TDSI considerations [49](#)
- policy names
  - setting outboard using keywords [157](#)
- policy names outboard [117](#)
- pre-ACS routine installation exit [5](#)
- preferred mode
  - in TS7700 [53](#)
- private volume
  - altering in the TCDB [97](#)
  - Change Use Attribute Installation Exit (CBRUXCUA)
    - description [203](#)
  - changing from private to scratch [156](#)
  - changing from scratch to private [98](#), [156](#)
  - changing to the same use attribute [157](#)
  - CUA function [151](#)
  - defining eject default attribute [247](#)
  - defining entry default attribute [247](#)
  - description [7](#)
  - detecting software errors [62](#)
  - managing in a library sharing environment [65](#)
  - private to scratch confirmation panel [279](#)

- private volume (*continued*)
  - restrictions [35](#)
- PROCLIB
  - SAMPLIB member CBRAPROC [80](#), [241](#)
  - updating [80](#)
- programming interface information [288](#)
- PTPDATA (peer-to-peer data)
  - overview [152](#)

## Q

- query device services [150](#)
- query volume residence (QVR)
  - CBRTVI macro [196](#)
  - CBRXLCS macro [167](#)
  - description [147](#), [152](#)
  - macro parameter description [168](#)
  - return and reason codes [169](#), [170](#)
  - successful processing [169](#)

## R

- RACF
  - facility class profile [83](#)
  - VOLCAT considerations [6](#)
- read compatibility [50](#)
- recovery
  - disaster recovery site considerations [96](#)
  - library entries [96](#)
  - volume catalogs [96](#)
  - volume entries [96](#)
- requirements
  - media [49](#)
  - tape volume [34](#)
  - volser uniqueness [33](#), [34](#)
- RESET
  - MVS LIBRARY RESET command [114](#)
- RESTART command [106](#)
- restrictions
  - tape library name [245](#)
  - volume serial number [35](#)
- retrieving data from a disabled ATLDS
  - altering private TCDB records [97](#)
  - changing from SMS-managed to non-SMS-managed [98](#)
  - changing the use attribute [98](#)
  - library manager database volume list [99](#)
  - overview [97](#)
  - return ATLDS operational status [99](#)
  - sample JCL [98](#)
  - volume not in library exit [99](#)
- return and reason codes
  - for CBRXLCS PTPMC [181](#)
  - for CBRXLCS query volume [169](#)
- return codes
  - CBRUXCUA [210](#)
  - CBRUXEJC [225](#)
  - CBRUXENT [218](#)
  - CBRUXVNL
    - device allocation [236](#), [237](#)
    - job step processing [236](#)
    - library mount [237](#)
  - CBRXLCS



- return codes (*continued*)
  - CBRXLCS (*continued*)
    - CBRXLCS [186](#)
    - change use attribute [157](#)
    - eject [166](#)
    - export [174](#)
    - import [176](#)
    - Manual Cartridge Entry [163](#), [164](#)
    - OLN [185](#)
    - PTPDATA [181](#)
    - PTPMC [179](#)
    - Query Volume Residence [169](#), [170](#)
    - Tape Cartridge Eject [166](#)
    - Test Volume Eligibility [173](#)
- routing console messages [63](#)

## S

- sample programs
  - CBRAPROC, creates OAM member in PROCLIB [241](#)
- SAMPLIB members
  - CBRAPROC [241](#)
- SCDS (source control data set)
  - activating [86](#)
  - defining a tape library [93](#)
  - updating the library record [93](#)
  - validating [86](#)
- scratch threshold settings and allocation [60](#)
- scratch volume
  - Change Use Attribute Installation Exit (CBRUXCUA)
    - description [203](#)
  - changing to private from scratch [98](#), [156](#)
  - changing to scratch from private [156](#)
  - changing to the same use attribute [157](#)
  - changing use attribute with CBRSPUXC [98](#)
  - CUA function [151](#)
  - defining the default entry use attribute [247](#)
  - description [7](#)
  - displaying the cartridge loader scratch media type [115](#)
  - error count [63](#)
  - MTL tape management [8](#)
  - private to scratch confirmation panel [279](#)
  - restrictions [35](#)
  - scratch count [125](#)
  - setting cartridge loader scratch media type [115](#)
  - tape management [7](#)
- scratch volume counts
  - displaying [63](#)
- selective dual copy [18](#)
- selective peer-to-peer copy [20](#)
- selective peer-to-peer dual copy [20](#)
- selective write protect [97](#)
- SETOSMC
  - F OAM,DISPLAY,SETOSMC command
    - keyword parameters [123](#)
- SETTLIB
  - using [76](#)
- SETTLIB statement
  - syntax [76](#)
- shortcut keys [283](#)
- SMS (Storage Management Subsystem)
  - aggregate group [4](#)
  - automated tape storage [1](#)
  - cartridge entry processing [34](#)

- SMS (Storage Management Subsystem) (*continued*)
  - configuration elements [4](#)
  - constructs [4](#)
  - creating definitions with ISMF [85](#)
  - creating the SMS definitions [82](#)
  - data class construct [4](#)
  - DFSMSrmm support for sharing TLDS [69](#)
  - display commands for:
    - cartridge loader scratch media type [115](#)
    - drive status [129](#)
    - library status [123](#)
    - OAM status [119](#)
    - storage group status [136](#)
    - volume status [138](#)
  - management class [4](#)
  - manual tape storage overview [2](#)
  - outboard policy management [153](#)
  - partitioning [66](#)
  - setting the cartridge loader scratch media type [115](#)
  - sharing tape volumes [69](#)
  - sharing, multiple SMS complexes [64](#)
  - stopping OAM [145](#)
  - storage class construct [4](#)
  - storage group construct [4](#)
  - storage management policy overview [4](#)
  - support for libraries [2](#)
  - system group description [4](#)
- SMSHONOR
  - JCL keyword [52](#)
- software volume categories
  - description [60](#)
  - TCDB volume error status field and the MTL [63](#)
  - updating the TCDB volume error status field in an ATLDS [62](#)
- stacked volume
  - composite library [128](#)
  - description [14](#)
  - distributed library [128](#)
  - export [37](#)
  - exported category [141](#)
  - identification of [30](#)
  - import [30](#)
  - importing
    - status message [32](#)
  - logical volume [30](#)
  - reuse [32](#)
- START OAM command syntax [104](#)
- status
  - drive [129](#)
  - library [123](#)
  - OAM [119](#)
  - returning the library manager to operational status [99](#)
  - storage group [136](#)
  - volume [138](#)
- storage class
  - description [4](#)
  - maintaining [93](#)
- storage group
  - blank storage group [5](#)
  - defining [5](#)
  - description [4](#)
  - displaying status [136](#)
  - maintaining [95](#)
  - mountable tape volume selection panel [85](#), [93](#), [264](#)



- storage management
  - tape volume cache [15](#)
- storage management policy
  - overview [4](#)
- subsystems
  - adding to a library [90](#)
- summary of changes [xix](#)
- syntax
  - CBRXLCS macro
    - FUNC=CUA [153](#)
    - FUNC=EXPORT [174](#)
    - FUNC=IMPORT [176](#)
    - FUNC=MCE [159](#)
    - FUNC=OLN [182](#)
    - FUNC=PTPDATA [180](#)
    - FUNC=PTPMC [177](#)
    - FUNC=QVR [167](#)
    - FUNC=TVE [172](#)
  - DISPLAY SMS,LIBRARY [123](#)
  - DISPLAY SMS,OAM [119](#)
  - DISPLAY SMS,STORGRP [136](#)
  - DISPLAY SMS,VOLUME [138](#)
  - LIBRARY DISABLE [113](#)
  - LIBRARY DISPCL [115](#)
  - LIBRARY DISDRV [129](#)
  - LIBRARY EJECT [107](#)
  - LIBRARY ENTER [109](#)
  - LIBRARY EXPORT [111](#)
  - LIBRARY LMPOLICY [117](#)
  - LIBRARY REQUEST [111](#)
  - LIBRARY RESET [113](#), [114](#)
  - LIBRARY SETCL [115](#)
  - MODIFY OAM [145](#)
  - OAM AUDIT [109](#)
  - OAM DUMP [145](#)
  - OAM QUERY [147](#)
  - OAM RESTART [106](#)
  - PTPDATA function [180](#)
  - PTPMC function [178](#)
  - START OAM [104](#)
  - STOP OAM [145](#)
  - VARY SMS [105](#), [107](#)
- syntax diagrams
  - how to read [xv](#)
- system
  - cartridge entry processing [34](#)
  - connectivity, displaying [129](#)
  - libraries, changing [73](#)
  - library sharing among multiple systems [64](#)
  - system group definition [4](#)
  - TCDBplex [66](#)
- system group overview [4](#)
- system-managed tape
  - demand allocation with [52](#)

**T**

tape

- application selection [244](#)
- automated tape storage [1](#)
- bulk entry and eject [9](#)
- Cartridge Eject Installation Exit (CBRUXEJC) [219](#)
- Cartridge Entry Installation Exit (CBRUXENT) [211](#)
- Change Use Attribute Installation Exit (CBRUXCUA) [203](#)

tape (*continued*)

- defining a manual library [250](#)
- displaying tape drive status [129](#)
- displaying the cartridge loader scratch media type [115](#)
- EJECT line operator [280](#)
- ejecting from an automated tape library dataserver [36](#)
- entering a cartridge into an automated tape library dataserver [29](#)
- entering a cartridge into an manual tape library [151](#)
- management selection menu [244](#)
- media requirements [49](#)
- media types
  - cartridge system tape (MEDIA1) [212](#)
  - enhanced capacity cartridge system tape (MEDIA2) [212](#)
  - extended high performance cartridge tape (MEDIA4) [34](#), [212](#)
  - high performance cartridge tape [34](#), [212](#)
  - MEDIA1 (Cartridge System Tape) [44](#), [60](#), [133](#), [247](#)
  - MEDIA10 (Enterprise Extended WORM Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA11 (Enterprise Advanced Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA12 (Enterprise Advanced WORM Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA13 (Enterprise Advanced Economy Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA2 (Enhanced Capacity Cartridge System Tape) [44](#), [60](#), [133](#), [247](#)
  - MEDIA3 (High Performance Cartridge Tape) [44](#), [60](#), [134](#), [247](#)
  - MEDIA4 (Extended High Performance Cartridge Tape) [44](#), [60](#), [134](#), [247](#)
  - MEDIA5 (Enterprise Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA6 (Enterprise WORM Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA7 (Enterprise Economy Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA8 (Enterprise Economy WORM Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
  - MEDIA9 (Enterprise Extended Tape Cartridge) [44](#), [60](#), [134](#), [247](#)
- mountable tape volume application [262](#)
- mountable tape volume selection entry panel [263](#)
- primary option menu [243](#)
- private volume description [7](#)
- scratch tape description [7](#)
- setting outboard policy names [117](#), [154](#)
- setting the cartridge loader scratch media type [115](#)
- tape library define [245](#)
- tape library list panel [270](#)
- terminology [1](#)
- volume list selection menu [263](#)
- Volume not in Library Installation Exit [226](#)
- volume requirements [34](#)
- volume restrictions [35](#)
- volume types [7](#)

tape configuration database (TCDB)

- altering records [97](#)
- changing the use attribute [98](#)
- changing to non-SMS-managed [98](#)
- coexistence support [71](#)
- defining the eject default attribute [247](#)



tape configuration database (TCDB) (*continued*)

- description [59](#)
- ICF support [6](#)
- library manager volume list [99](#)
- maintaining [93](#)
- monitoring [93](#)
- operational status [99](#)
- partitioning [66](#)
- querying volume residency [152](#)
- retrieving data from [97](#)
- TCDBplex [66](#)
- using the sample exit (CBRUXVNL) [99](#)
- volume expiration date [63](#)

tape control units

- load balancing [29](#)

tape device selection information (TDSI)

- as used by CBRXLCS [200](#)
- attributes [50](#)
- coexistence considerations [71](#)
- coexistence support [71](#)
- definition [49](#)
- parameter list [200](#)
- processing for volumes [160](#)

tape drives

- in partitioned ATLDS [68](#)
- in partitioned MTL [69](#)

Tape Encryption Support [57](#)

tape libraries

- associating console names with [63](#)

tape library

- altering [258](#)
- copying definitions [260](#)
- customizing [71](#)
- defining [243](#)
- deleting definition [261](#)
- displaying attributes of [252](#)
- installing support for [71](#)
- redefining [255](#)

Tape Library Dataserver

- 3494 subsystem attachment
  - 3490E magnetic tape subsystem [11](#)
  - cartridge storage cells [11](#)
  - convenience input output station [12](#)
  - description [10](#)
  - high-capacity output facility [12](#)
  - library manager [12](#)
  - storage configurations [44](#)
- 3495 ATLDS
  - convenience input and output facility [10](#)
  - description [13](#)
  - external high-capacity input and output facility [9](#)
  - high-capacity input and output facility [9](#)
  - library manager (ATLDS) [10](#)
  - manual mode terminal [10](#)
  - storage configurations [44](#)
  - subsystem attachment 3495 ATLDS [13](#)
- 3584 subsystem attachment [12](#)
- 3590 tape systems [11](#)
- automated tape storage overview [1](#)
- defining a tape library
  - defining a composite library [243](#)
  - field parameters [246](#)
  - name restrictions [245](#)
- ejecting a tape cartridge [36](#)

Tape Library Dataserver (*continued*)

- entering a tape cartridge (automated tape library dataserver) [29](#)
- installation checklist [72](#)
- library sharing among multiple systems [64](#)
- manual tape storage overview [2](#)
- retrieving data from a disabled ATLDS [97](#)
- sharing with DFSMSrmm [69](#)
- virtual tape server
  - description [11](#)
  - logical library partitioning [17](#)
  - stacked volumes [14](#), [17](#)
  - tape volume cache [17](#)
  - utilization of the 3590 Storage Capacity [17](#)
  - virtual device characteristics [13](#)
  - virtual volume characteristics [13](#)
- volume requirements [34](#)
- volume restrictions [35](#)

tape subsystems

- limitation on scratch allocations [90](#)

tape virtualization

- TS7680 [28](#)

tape volume

- changing values for [278](#)

tape volume cache

- storage management of [15](#)

tape volume information

- adding values to [277](#)

tape volume information (TVI)

- description [196](#)
- mapping macro [196](#)

tape volumes

- accessing [35](#)
- altering volume records [94](#)
- changing default scratch categories [68](#)
- changing use attribute [280](#)
- ejecting a volume [94](#)
- entering in library [227](#)
- entering into MTL [109](#)
- exporting from a VTS [111](#)
- importing into a VTS [110](#)
- managing [94](#)
- processing default categories [68](#)
- sharing between SMSplex and non-MVS platform [69](#)
- tape volume cache [15](#)

TCDBplex

- assigning volumes to [68](#)

test volume eligibility (TVE)

- CBRXLCS macro syntax [172](#)
- description [152](#)
- return and reason codes [173](#), [186](#)
- successful processing [173](#)
- test volume eligibility [172](#), [174](#), [176](#)

threshold, scratch [60](#)

trademarks [288](#)

TS7680 tape virtualization [28](#)

TS7700 Virtualization Engine

- affinity list support [53](#)
- balanced mode in [53](#)
- copy mode options [26](#)
- device allocation assistance (DAA) [53](#)
- grid [21](#)
- INISH deck example [56](#)
- JES3 considerations [53](#), [54](#)



- TS7700 Virtualization Engine (*continued*)
  - library operational states [26](#)
  - preferred mode in [53](#)
  - programming considerations [169](#)
  - scratch allocation assistance [54](#)
  - specific allocation assistance [53](#)
- TS7720 Virtualization Engine (3957-VEx) [22](#)
- TS7760 Virtualization Engine (3957-VEC) [23](#)
- TS7770 Virtualization Engine (3948-VED) [23](#)
- TS7770 Virtualization Engine (3957-VED) [23](#)

## U

- UNIT parameter
  - SMSHONOR keyword [52](#)
- usage requirements
  - CBRUXCUA [210](#)
  - CBRUXEJC [225](#)
  - CBRUXENT [219](#)
  - CBRUXVNL [237](#)
- user interface
  - ISPF [283](#)
  - TSO/E [283](#)

## V

- validity checking, constructs [119](#)
- VARY SMS command
  - tape drive [107](#)
  - tape library [105](#)
- verify
  - external volume label [274](#)
  - prerequisites [71](#)
  - testing volume eligibility (TVE) [152](#)
  - volume location [94](#), [273](#)
  - VTs logical volume entries [274](#)
- virtual tape server
  - cache management [17](#)
  - description [11](#)
  - exporting logical volumes [37](#)
  - importing logical volumes [30](#), [33](#)
  - logical library partitioning [17](#)
  - outboard policy management [8](#)
  - peer-to-peer data (PTPDATA) [180](#)
  - peer-to-peer mode control (PTPMC) [177](#)
  - physical volume pooling [15](#)
  - selective dual copy [18](#)
  - stacked volumes [14](#), [17](#)
  - tape volume cache [17](#)
  - using with GDPS [19](#)
  - utilization of the 3590 storage capacity [17](#)
  - virtual device characteristics [13](#)
  - virtual volume characteristics [13](#)
- virtual tape server (VTS) [13](#)
- virtual tape server logical volume
  - deleting expired data [16](#)
- virtualization engine [39](#), [111](#)
- VOLCAT
  - allocation considerations with [7](#)
  - RACF considerations [6](#)
- volume
  - altering the volume record [97](#), [276](#)
  - auditing a tape library [273](#)

- volume (*continued*)
  - cartridge entry
    - CBRUXEPL policy fields [215](#)
  - changing from private to scratch [156](#)
  - changing from scratch to private [156](#)
  - changing to non-SMS-managed [98](#)
  - checking volser for uniqueness [33](#)
  - confirm audit request [274](#)
  - confirming private to scratch alteration [279](#)
  - CUA
    - CBRUXCPL policy fields [207](#)
    - parameters for policy names [157](#)
  - defining scratch threshold limits [247](#)
  - defining the eject default attribute [247](#)
  - displaying the cartridge loader scratch media type [115](#)
  - displaying volume status [138](#)
  - duplicate volume management [8](#)
  - ejecting a specific volume [107](#)
  - ejecting from a library [280](#)
  - entering a tape cartridge (automated tape library dataser) [29](#)
  - error status, audit results [275](#)
  - importing logical volumes [110](#), [117](#)
  - ISMF mountable tape volume application
    - alter entry panel [276](#)
    - selection entry panel [263](#)
    - volume list selection menu [263](#)
  - LIBRARY LMPOLICY command [117](#)
  - policy names outboard [117](#)
  - private volume description [7](#)
  - query volume residence (QVR) [152](#)
  - record [6](#)
  - recovering volume catalogs [96](#)
  - recovering volume entries [96](#)
  - requirements [34](#)
  - restrictions [35](#)
  - retrieving from a disabled ATLDS [97](#)
  - scratch tape description [7](#)
  - serial number criteria [264](#)
  - setting outboard policy names [153](#)
  - setting the cartridge loader scratch media type [115](#)
  - sharing [69](#)
  - software volume categories [60](#)
  - specifying volume location [108](#)
  - tape types [7](#)
  - tape volume information description [196](#)
  - testing volume eligibility (TVE) [152](#)
  - verify external volume label [274](#)
  - volume not in library installation exit [99](#), [226](#)
- volume allocation
  - VOLCAT considerations [7](#)
- volume error status field
  - resetting [62](#)
- volume expiration date [109](#)
- volume not in library installation exit
  - creating the exit [86](#), [99](#)
  - description [99](#), [226](#)
  - parameter list [99](#), [232](#), [235](#)
  - return codes
    - device allocation [99](#), [236](#), [237](#)
    - job step processing [99](#), [236](#)
    - library mount [99](#), [237](#)
  - return codes for device allocation [236](#)
  - usage requirements [99](#), [237](#)



- volumes
  - using in different TCDBplexes [68](#)
- VTs
  - larger logical volume sizes [14](#)

## W

- WORM
  - changing the use attribute [48](#), [157](#)
  - considerations [48](#)
- write once, read many [48](#)

## Z

- z/OS
  - running as guest under z/VM [71](#)
- z/OS MCS console
  - defining alternate console [63](#)
- z/VMS
  - running z/OS as guest
- [71](#)









Product Number: 5655-ZOS

SC23-6867-70

