Note
Before using this information and the product it supports, read the information in “Notices” on page 285.
Figures................................................................................................................. ix

Tables................................................................................................................ xiii

About this book....................................................................................................xv
  Required product knowledge................................................................................ xv
  z/OS information.................................................................................................. xv
  How to read syntax diagrams............................................................................. xv

How to send your comments to IBM................................................................. xix
  If you have a technical problem.......................................................................... xix

Summary of changes...........................................................................................xxi
  Summary of changes for z/OS Version 2 Release 3............................................xxi
  Summary of changes for z/OS Version 2 Release 2............................................xxii
  Summary of changes for z/OS Version 2 Release 1............................................xxiii
    z/OS Version 2 Release 1 summary of changes.................................................xxiii

Chapter 1. Introduction to tape library management.......................................... 1
  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.......................................................... 6
  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
Chapter 2. Planning for the tape library support................................................... 41

Analyzing your hardware environment......................................................................................................41

Hardware................................................................................................................................................... 41
Chapter 3. Installing your tape library support .......................................................... 69

Verifying prerequisites .................................................................................................. 69
Manual tape library considerations ............................................................................ 69
TDSI coexistence considerations .................................................................................. 69
Considerations when running z/OS as a guest under z/VM ........................................ 69
Tape library installation checklist ................................................................................ 70
Installation procedures ..................................................................................................71
Building the library inventory .........................................................................................71
Changing system libraries ..............................................................................................71
Updating the PROCLIB ......................................................................................................77
Creating the global resource serialization environment ............................................. 78
Creating the tape configuration database ..................................................................... 79
Creating the hardware configuration ............................................................................ 80
IPLing the system ..............................................................................................................81
Creating the SMS definitions .........................................................................................81
Creating the installation exit routines .......................................................................... 82
Validating the configuration ............................................................................................ 83
Activating the SMS configuration .................................................................................. 83
Starting the OAM address space .................................................................................... 83
Varying the library online ............................................................................................... 83
Displaying and setting the cartridge loader media type ............................................... 84
Running the job stream .................................................................................................... 84
Outboard policy management installation recommendations .................................... 84
Outboard policy management test environments ....................................................... 86
Outboard policy management migration and expected actions .................................. 86
Tape subsystem (device pool) limitation ....................................................................... 87
Library subsystem modifications ..................................................................................... 87
Adding subsystems to a library ....................................................................................... 87
Moving subsystems within a library ................................................................................. 88
Deleting subsystems from a library ................................................................................ 88

Chapter 4. Defining and monitoring your configuration .............................................. 91
Monitoring and maintaining the tape configuration .................................................... 91
Typical library management functions ......................................................................... 91
Monitoring and maintaining SMS library definitions ................................................. 92
Establishing recovery procedures............................................................................................................. 93
Re-enabling category count scratch transition processing....................................................................111
Ejecting a specific Tape Volume. ................................................................................................................115
Specifying the shelf location. .................................................................................................................. 116
Auditing a volume.................................................................................................................................... 107
Entering a tape volume into an MTL........................................................................................................107
Importing tape volumes into a VTS.........................................................................................................108
Exporting tape volumes from a VTS........................................................................................................ 109
Requesting information from the TS7700 Virtualization Engine............................................................109
Required parameters..............................................................................................................................110
Optional parameters..............................................................................................................................110
Disabling category count scratch transition processing........................................................................111
Re-enabling category count scratch transition processing..................................................................111
Disabling installation exit processing....................................................................................................112
Reenabling installation exit processing..................................................................................................112
Displaying the cartridge loader scratch media type............................................................................... 113
Setting the cartridge loader scratch media type.................................................................................... 113
Assigning categories to ATLDS cartridge loaders. ............................................................................... 114
Assigning media types to MTL cartridge loaders. ............................................................................... 115
Media selection in an ATLDS................................................................................................................115
Media selection in an MTL.....................................................................................................................94
Assigning policy names outboard...........................................................................................................115
Required parameters..............................................................................................................................116
Optional parameters..............................................................................................................................116
Construct validity checking....................................................................................................................117
Displaying OAM status............................................................................................................................117
Displaying OAM configuration information..........................................................................................119
OTIS Operator Command......................................................................................................................120
Displaying SETTLIB parameters..........................................................................................................120
Displaying library status.......................................................................................................................... 121
Displaying library connectivity..............................................................................................................122
Displaying library detail status..............................................................................................................123
Displaying tape drive status..................................................................................................................128

Chapter 5. Operating the OAM address space................................................................. 99
Overview of operator tasks.........................................................................................................................99
Message format conventions......................................................................................................................100
RACF support for the LIBRARY command.............................................................................................100
Starting OAM..........................................................................................................................................102
Varying a tape library online or offline .....................................................................................................103
Restarting OAM......................................................................................................................................104
Varying tape drives online or offline.........................................................................................................105
Ejecting a specific Tape Volume. ................................................................................................................105
Specifying the shelf location. .................................................................................................................. 106
Auditing a volume.................................................................................................................................... 107
Entering a tape volume into an MTL........................................................................................................107
Importing tape volumes into a VTS.........................................................................................................108
Exporting tape volumes from a VTS........................................................................................................ 109
Requesting information from the TS7700 Virtualization Engine............................................................109
Required parameters..............................................................................................................................110
Optional parameters..............................................................................................................................110
Disabling category count scratch transition processing........................................................................111
Re-enabling category count scratch transition processing..................................................................111
Disabling installation exit processing....................................................................................................112
Reenabling installation exit processing..................................................................................................112
Displaying the cartridge loader scratch media type............................................................................... 113
Setting the cartridge loader scratch media type.................................................................................... 113
Assigning categories to ATLDS cartridge loaders. ............................................................................... 114
Assigning media types to MTL cartridge loaders. ............................................................................... 115
Media selection in an ATLDS................................................................................................................115
Media selection in an MTL.....................................................................................................................94
Assigning policy names outboard...........................................................................................................115
Required parameters..............................................................................................................................116
Optional parameters..............................................................................................................................116
Construct validity checking....................................................................................................................117
Displaying OAM status............................................................................................................................117
Displaying OAM configuration information..........................................................................................119
OTIS Operator Command......................................................................................................................120
Displaying SETTLIB parameters..........................................................................................................120
Displaying library status.......................................................................................................................... 121
Displaying library connectivity..............................................................................................................122
Displaying library detail status..............................................................................................................123
Displaying tape drive status..................................................................................................................128
Chapter 6. Library control system (LCS) external services .......................................................... 149

LCS external services overview.................................................................................................. 149
Change use attribute (CUA)........................................................................................................ 149
Manual cartridge entry (MCE).................................................................................................... 149
Cartridge eject (EJECT)................................................................................................................ 149
Query volume residence (QVR).................................................................................................. 150
Test volume eligibility (TVE)....................................................................................................... 150
Export logical volumes (EXPORT).............................................................................................. 150
Import logical volumes (IMPORT)............................................................................................... 150
Peer-to-Peer mode control (PTPMC)........................................................................................... 150
Peer-to-Peer data (PTPDATA)..................................................................................................... 150
Obtain library name information (OLN)..................................................................................... 151
LCS external services functions.................................................................................................. 151
Changing the use attribute of a volume...................................................................................... 151
Entering cartridges into a manual tape library.......................................................................... 157
Ejecting a tape cartridge............................................................................................................. 162
Querying the residence of a volume............................................................................................ 165
Testing the eligibility of a volume............................................................................................... 170
Exporting logical volumes from a VTS....................................................................................... 172
Importing logical volumes into a VTS....................................................................................... 174
Changing library operating modes (peer-to-peer VTS mode control)....................................... 176
Obtaining operational mode settings (peer-to-peer VTS data).................................................... 178
Obtaining library name information (OLN)................................................................................ 180
CBRXLCS macro interface.......................................................................................................... 183
Using the CB XLCS macro in an assembler environment......................................................... 183
CBRXLCS return codes.............................................................................................................. 184
CBRXLCS execution environment.............................................................................................. 185
LCS external services parameter list (CBRLCSPL macro)........................................................ 185
Tape data information (CBRTDI macro).................................................................................... 193
Tape volume information (CBRTVI macro)................................................................................ 194
Tape device selection information (CBRTDSI macro)............................................................... 198

Chapter 7. Installation exits........................................................................................................ 201
Change use attribute installation exit (CBRUXCUA)................................................................. 201
Outboard policy management considerations............................................................................ 204
Job processing considerations................................................................................................. 204
Change use attribute installation exit parameter list (CBRUXCPL)........................................... 205
Change use attribute installation exit (CBRUXCUA) return codes......................................... 208
Change use attribute installation exit (CBRUXCUA) usage requirements............................... 208
Cartridge entry installation exit (CBRUXENT).......................................................................... 209
Outboard policy management processing when calling the entry exit..................................... 212
Outboard policy management processing when returning from the entry exit........................ 213
Cartridge entry installation exit parameter list (CBRUXEPL).................................................... 213
Cartridge entry installation exit (CBRUXENT) return codes..................................................... 216
Cartridge entry installation exit (CBRUXENT) usage requirements.......................................... 217
Cartridge eject installation exit (CBRUXEJC)............................................................................ 217
Failed eject notification processing............................................................................................. 219
Export completion processing.................................................................................................... 219
Cartridge eject installation exit parameter list (CBRUXJPL)...................................................... 220
Appendix A. SAMPLIB members ........................................................................ 237
SAMPLIB member CBRAPROC .................................................................... 239

Appendix B. Using ISMF panels to define and monitor your configuration .......... 241
ISMF for the storage administrator ................................................................ 241
Defining a tape library .................................................................................. 241
Displaying tape library attributes ................................................................. 250
Redefining a tape library .............................................................................. 253
Altering a tape library .................................................................................. 256
Copying tape library definitions ................................................................... 258
Deleting a tape library definition ................................................................. 259
Monitoring and maintaining tape volumes .................................................... 260
ISMF mountable tape volume application .................................................... 260
Creating a list of tape libraries ...................................................................... 268
Auditing volumes in an automated tape library ............................................ 271
Altering the volume record .......................................................................... 274
Ejecting a volume from a tape library .......................................................... 278

Appendix C. Accessibility ............................................................................ 281
Accessibility features .................................................................................... 281
Consult assistive technologies ....................................................................... 281
Keyboard navigation of the user interface .................................................... 281
Dotted decimal syntax diagrams ................................................................... 281

Notices ........................................................................................................... 285
Terms and conditions for product documentation ....................................... 286
IBM Online Privacy Statement .................................................................... 287
Policy for unsupported hardware ................................................................. 287
Minimum supported hardware ..................................................................... 288
Programming interface information ............................................................. 288
Trademarks ..................................................................................................... 288

Glossary ......................................................................................................... 289

Index .............................................................................................................. 301
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......................................................................................... 62
4. Partitioning a Tape Library.......................................................................................................................... 64
7. CBRXLCS CUA assembler macro syntax........................................................................................................ 151
8. CBRXLCS MCE assembler macro syntax......................................................................................................... 157
9. CBRXLCS EJECT assembler macro syntax.................................................................................................... 162
10. CBRXLCS QVR assembler macro syntax....................................................................................................... 166
11. CBRXLCS TVE assembler macro syntax......................................................................................................... 170
12. CBRXLCS EXPORT assembler macro syntax................................................................................................ 172
13. CBRXLCS IMPORT assembler macro syntax.................................................................................................. 174
14. Peer-to-Peer VTS mode control (PTPMC) assembler macro syntax.............................................................. 176
15. Peer-to-Peer VTS data (PTPDATA) assembler macro syntax.......................................................................... 179
16. Obtain Library name information (OLN) assembler macro syntax.............................................................. 180
17. Sample CBRAPROC program that creates the OAM member in PROCLIB............................................... 240
18. ISMF Primary Option Menu Panel.................................................................................................................. 242
19. Library Management Selection Menu Panel.................................................................................................. 242
20. Tape Library Application Selection Panel..................................................................................................... 243
21. Tape Library Define Panel (Page 1 of 4)........................................................................................................... 244
22. Tape Library Define Panel (Page 2 of 4)........................................................................................................... 244
23. Tape Library Define Panel (Page 3 of 4)........................................................................................................... 247
24. Tape Library Define Panel (Page 4 of 4)........................................................................................................... 247
25. Tape Library Define Panel (Page 1 of 4)........................................................................................................... 248

ix
26. Tape Library Define Panel (Page 2 of 4)................................................................................................. 249
27. Tape Library Define Panel (Page 3 of 4)................................................................................................. 249
28. Tape Library Define Panel (Page 4 of 4)................................................................................................. 250
29. Tape Library Display Panel (Page 1 of 2)........................................................................................... 250
30. Tape Library Display Panel (Page 2 of 2)........................................................................................... 253
31. Tape Library Redefine Panel (Page 1 of 4).......................................................................................... 254
32. Tape Library Redefine Panel (Page 2 of 4).......................................................................................... 254
33. Tape Library Redefine Panel (Page 3 of 4).......................................................................................... 255
34. Tape Library Redefine Panel (Page 4 of 4).......................................................................................... 255
35. Tape Library Alter Panel (Page 1 of 4)............................................................................................... 256
36. Tape Library Alter Panel (Page 2 of 4)............................................................................................... 257
37. Tape Library Alter Panel (Page 3 of 4)............................................................................................... 257
38. Tape Library Alter Panel (Page 4 of 4)............................................................................................... 258
39. Copy Entry Panel.................................................................................................................................259
40. Confirm Delete Request Panel.............................................................................................................260
41. Volume List Selection Menu Panel..................................................................................................... 261
42. Mountable Tape Volume Selection Entry Panel................................................................................... 262
43. Mountable Tape Volume List Panel (part 1 of 5).................................................................................. 263
44. Mountable Tape Volume List Panel (part 2 of 5).................................................................................. 264
45. Mountable Tape Volume List Panel (part 3 of 5).................................................................................. 266
46. Mountable Tape Volume List Panel (part 4 of 5).................................................................................. 267
47. Mountable Tape Volume List Panel (part 5 of 5).................................................................................. 267
48. Tape Library List Panel (part 1 of 7)...................................................................................................... 268
49. Tape Library List Panel (part 2 of 7)...................................................................................................... 268
50. Tape Library List Panel (part 3 of 7)...................................................................................................... 269
51. Tape Library List Panel (part 4 of 7)....................................................................................................... 269
52. Tape Library List Panel (part 5 of 6)....................................................................................................... 270
53. Tape Library List Panel (part 6 of 7)....................................................................................................... 270
54. Tape Library List Panel (part 7 of 7)....................................................................................................... 271
55. Confirm Audit Request Panel..................................................................................................................273
56. Alter from the Mountable Tape Volume Alter Entry Panel.....................................................................274
57. Mountable Tape Volume Alter Entry Panel displayed (ALTER request)................................................275
58. Both OLD VALUE and NEW VALUE reflect the values assigned to the Volume.....................................275
59. NEW VALUE blanked out for storage group............................................................................................276
60. New storage group assigned after storage group was altered to blank................................................276
61. Confirm Alter Request Confirmation Panel............................................................................................277
62. Private to Scratch Confirmation Panel..................................................................................................278
<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Environmental considerations for a peer-to-peer VTS running under GDPS</td>
</tr>
<tr>
<td>2.</td>
<td>APARs supplying additional host support for specific releases of TS7700</td>
</tr>
<tr>
<td>3.</td>
<td>Messages for TS7700 library operational states</td>
</tr>
<tr>
<td>4.</td>
<td>Methods for ejecting cartridges from a tape library</td>
</tr>
<tr>
<td>5.</td>
<td>Tape storage configurations</td>
</tr>
<tr>
<td>6.</td>
<td>Software volume categories</td>
</tr>
<tr>
<td>7.</td>
<td>Change use attribute return and reason codes</td>
</tr>
<tr>
<td>8.</td>
<td>TDSI processing for MCE—Volume exists</td>
</tr>
<tr>
<td>9.</td>
<td>TDSI processing for MCE—No volume record exists for volume</td>
</tr>
<tr>
<td>10.</td>
<td>Manual cartridge entry return and reason codes</td>
</tr>
<tr>
<td>11.</td>
<td>Cartridge eject return and reason codes</td>
</tr>
<tr>
<td>12.</td>
<td>Return and reason code meanings for the EJECTOPT=QUERY keyword</td>
</tr>
<tr>
<td>13.</td>
<td>Query Volume residence return and reason codes</td>
</tr>
<tr>
<td>14.</td>
<td>Test Volume eligibility return and reason codes</td>
</tr>
<tr>
<td>15.</td>
<td>EXPORT return and reason codes</td>
</tr>
<tr>
<td>16.</td>
<td>IMPORT return and reason codes</td>
</tr>
<tr>
<td>17.</td>
<td>PTPMC return and reason codes</td>
</tr>
<tr>
<td>18.</td>
<td>PTPDATA return and reason codes</td>
</tr>
<tr>
<td>19.</td>
<td>OLN function fields</td>
</tr>
<tr>
<td>20.</td>
<td>OLN return and reason codes</td>
</tr>
<tr>
<td>21.</td>
<td>Parameters passed to the installation exit—CBRUXCUA</td>
</tr>
<tr>
<td>22.</td>
<td>Fields passed to the installation exit—CBRUXENT</td>
</tr>
<tr>
<td>23.</td>
<td>Fields passed to the installation exit—CBRUXEJC</td>
</tr>
</tbody>
</table>
24. CBRUXVNL input during job step setup—No TCDB volume record....................................................... 227

25. CBRUXVNL input during job step setup—Existing TCDB volume record.................................................. 227

26. CBRUXVNL input during job step setup—Job information fields................................................................228

27. CBRUXVNL input during device allocation—No TCDB volume record.......................................................... 228

28. CBRUXVNL input during device allocation—Existing TCDB volume record.................................................. 229

29. CBRUXVNL input library mount processing—No TCDB volume record.......................................................... 229

30. CBRUXVNL input library mount processing—Existing TCDB volume record.................................................. 230
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.

To find the complete z/OS® library, go to IBM Knowledge Center (www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

How to read syntax diagrams

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

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

• Read the syntax diagrams from left to right and from top to bottom.
• Each syntax diagram begins with a double arrowhead (►►) and ends with opposing arrows (►◄).
• An arrow (←) at the end of a line indicates that the syntax continues on the next line. A continuation line begins with an arrow (←→).
• Commands and keywords are shown in uppercase letters.
• Some commands and keywords have alternative abbreviations; these appear as part of the stack for that command or keyword. For example, the alternative abbreviation for DISPLAY is D.
• Where you can choose from two or more keywords, the choices are stacked one above the other. If one choice within the stack lies on the main path, a keyword is required, and you must choose one. In the following example you must choose either DETAIL or STATUS.

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

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

• Words or names in italicized, lowercase letters represent information that you supply. The values of these variables may change depending on the items to which they refer. For example, volser refers to the serial number of a volume, while storgrp_name refers to the name of a storage group.

• You must provide all items enclosed in parentheses ( ). You must include the parentheses. In the following example, you must supply the volume serial number (volser) and it must be enclosed in parentheses.

You would code this as follows:

```
D SMS, VOL(volser)
```

The variable volser is the serial number of the volume you wish to display.

• The repeat symbol shown below indicates that you can specify keywords and variables more than once. The repeat symbol appears above the keywords and variables that can be repeated. For example, when a comma appears in the repeat symbol, you must separate repeated keywords or variables with a comma.

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

(library_name, system_id, system_id, system_id)

The variable library_name is the name of the library you are working with, and system_id names three different instances of system identification numbers.
How to send your comments to IBM

We invite you to submit comments about the z/OS product documentation. Your valuable feedback helps to ensure accurate and high-quality information.

Important: If your comment regards a technical question or problem, see instead “If you have a technical problem” on page xix.

Submit your feedback by using the appropriate method for your type of comment or question:

Feedback on z/OS function
If your comment or question is about z/OS itself, submit a request through the IBM RFE Community (www.ibm.com/developerworks/rfe/).

Feedback on IBM® Knowledge Center function
If your comment or question is about the IBM Knowledge Center functionality, for example search capabilities or how to arrange the browser view, send a detailed email to IBM Knowledge Center Support at ibmkc@us.ibm.com.

Feedback on the z/OS product documentation and content
If your comment is about the information that is provided in the z/OS product documentation library, send a detailed email to mhvrdfs@us.ibm.com. We welcome any feedback that you have, including comments on the clarity, accuracy, or completeness of the information.

To help us better process your submission, include the following information:
• Your name, company/university/institution name, and email address
• The following deliverable title and order number: z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Tape Libraries, SC23-6867-30
• The section title of the specific information to which your comment relates
• The text of your comment.

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute the comments in any way appropriate without incurring any obligation to you.

IBM or any other organizations use the personal information that you supply to contact you only about the issues that you submit.

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If you have a technical problem or question, do not use the feedback methods that are provided for sending documentation comments. Instead, take one or more of the following actions:
• Go to the IBM Support Portal (support.ibm.com).
• Contact your IBM service representative.
• Call IBM technical support.
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.

Summary of changes for z/OS Version 2 Release 3

This edition contains updates for Version 2 Release 3 (V2R3).

New information

This edition includes the following new information:

- Added updates for the new MOUNTED and ALL keywords for the MVS LIBRARY DISPDRV command. See “Displaying tape drive status” on page 128 for more information.
- Added definitions for classic and multiple OAM configurations as well as OAM instance. See “Glossary” on page 289 for more information.
- Added new sections for disabling and re-enabling category count scratch transition processing. See “Disabling category count scratch transition processing” on page 111 and “Re-enabling category count scratch transition processing” on page 111 for more information.
- Added as follow-on to TS7720 Virtualization Engine. See “TS7760 Virtualization Engine (3957-VEC)” on page 23 for more information.
- Added to include new RACF support. See “RACF support for the LIBRARY command” on page 100 for more information.
- Added paragraph to include cloud as a tier support. See “TS7760 Virtualization Engine (3957-VEC)” on page 23 for more information.
- Added new section for compression enhancements. See “Compression Enhancements” on page 24 for more information.
- Added new section for Control Unit Initiated Recovery (CUIR) for Tape. See “Control Unit Initiated Recovery (CUIR) for Tape” on page 24 for more information.
- Added new messages for TS7700 library operational states. See #unique_20 for more information.
- Added new SETTLIB command keywords. See “SETTLIB statement for tape library settings” on page 74 for more information.
- Added new CBR1075I examples and their abbreviations. See “Displaying SETTLIB parameters” on page 120 for more information.
- Added CUIR updates to the LIBRARY DISPDRV command. See “Displaying tape drive status” on page 128 for more information.

Changed information

This edition includes the following topics that contain changed information:

- Changed by adding description of new D= keyword that is required in a multiple OAM configuration. See “Updating the PROCLIB” on page 77 for more information.
- Changed by adding information about copy export for disaster recovery purposes. See “Copy export from the TS7700 Virtualization Engine” on page 38 for more information.
- Changed by adding note regarding address spaces in a multiple OAM configuration. See “Displaying tape volume status” on page 136 for more information.
• Changed by adding note about displaying OAM status in a multiple OAM configuration and added paragraph describing the category count status line. See “Displaying OAM status” on page 117 for more information.

• Changed by generalizing instances of OAM1 to OAMn. See “IPLing the system” on page 81 for more information.

• Changed by generalizing instances of OAM1 to OAMn, adding description of D= keyword, and updating syntax for ONLYIF. See “Changing system libraries” on page 71 for more information.

• Changed by adding note regarding storage group status in a multiple OAM configuration. See “Displaying storage group status” on page 134 for more information.

• Changed by updating syntax for ONLYIF in a multiple OAM configuration. See “ONLYIF statements in a PLEX” on page 76 for more information.

• Changed by adding naming conventions for OAM procedure. See “Starting OAM” on page 102 for more information.

• Changed by adding note about creating a multiple OAM configuration. See “Restarting OAM” on page 104 for more information.

• Changed by replacing contents with updated CBRAPROC member of SAMPLIB. See “SAMPLIB member CBRAPROC” on page 239 for more information.

• Changed by updating multiple OAM support for tape libraries. See “Object access method support for tape libraries” on page 2 for more information.

• Changed by updating content for TS7700 Release 4.0. See “TS7700 Virtualization Engine” on page 21 for more information.

• Changed by updating content for TS7720 Virtualization Engine. See “TS7720 Virtualization Engine (3957-VEA and VEB)” on page 22 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Logical WORM Considerations” on page 23 for more information.

• Changed by updating content for TS7700 Release 4.0. See “SETTLIB statement for tape library settings” on page 74 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Copy export from the TS7700 Virtualization Engine” on page 38 for more information.

• Changed by updating content for TS7700 Release 4.0. See “FlashCopy for disaster recovery (DR) test” on page 95 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Importing tape volumes into a VTS” on page 108 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Displaying library detail status” on page 123 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Glossary” on page 289 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Displaying OAM status” on page 117 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Displaying SETTLIB parameters” on page 120 for more information.

• Changed by updating content for TS7700 Release 4.0. See “Defining a tape library” on page 241 for more information.

Summary of changes for z/OS Version 2 Release 2

This edition contains updates for Version 2 Release 2 (V2R2).
New information
This edition includes the following new information:
• “Allocation Considerations with the VOLCAT” on page 7
• “TS7700 library operational states” on page 25
• “FlashCopy for disaster recovery (DR) test” on page 95

Changed information
This edition includes the following topics that contain changed information:
• “Duplicate volume management” on page 8
• “TS7700 Virtualization Engine” on page 21
• “TS7720 Virtualization Engine (3957-VEA and VEB)” on page 22
• “Copy mode options” on page 25
• “Selective write protect for disaster recovery (DR) test” on page 94
• “Displaying library detail status” on page 123

Summary of changes for z/OS Version 2 Release 1
These topics have been updated for TS7700 Release 2.1 support:
• “Deleting expired virtual tape server logical volume data” on page 16.
• “TS7700 Virtualization Engine” on page 21.
• “Copy mode options” on page 25.
• “Copy export from the TS7700 Virtualization Engine” on page 38.
• “Copy export merge” on page 39.
• “Displaying library detail status” on page 123.
• “TS7700 Virtualization Engine programming considerations” on page 167.
• “Tape volume information (CBRTVI macro)” on page 194.
• SAMPLIB member CBRSPX03.
• “Glossary” on page 289

These topics have been updated for JES3 device allocation assistance support:
• “JES3 considerations” on page 52
• “Balanced mode in the TS7700 Virtualization Engine” on page 51.
• “Specific allocation assistance” on page 51.
• “Scratch allocation assistance” on page 51

These topics have been updated to reflect 3592 Model E07 read-compatibility processing:
• Table 5 on page 42
• “Managing multiple media formats” on page 47
• “Tape device selection information” on page 48

z/OS Version 2 Release 1 summary of changes
See the Version 2 Release 1 (V2R1) versions of the following publications for all enhancements related to z/OS V2R1:
• z/OS Migration
• z/OS Planning for Installation
• z/OS Summary of Message and Interface Changes
• z/OS Introduction and Release Guide
Chapter 1. Introduction to tape library management

The Object Access Method (OAM) is a component of DFSMSdftp, 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 107 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 149)
• 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 201 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 that are earlier 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 dataserver or a manual tape library must be defined using the hardware configuration definition (HCD). For more information on HCD requirements, see “Creating the hardware configuration” on page 80 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 241 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 87.
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 79 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 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 93.

**RACF considerations for the VOLCAT**

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

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 94 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 80 and z/OS HCD User’s Guide.

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

Types of tape volumes

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

Private tape management

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

Scratch tape management

All scratch tapes within a library are contained within common scratch pools—one for each type of media in the library—and cannot be explicitly mounted by specifying a volume serial number. See “SCRATCH THRESHOLD” on page 245 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 42 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.

![Figure 1. IBM TotalStorage Enterprise Automated Tape Library (3495)](image)

**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 dataserver using the high-capacity input station is known as *bulk entry*.

**External high-capacity input and output facility**

The optional external high-capacity input and output station feature (not shown in Figure 1 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 136 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 42 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 will operate in a client/server model with the ability for two of the tape control units (for redundancy) to be able to run as servers providing the...
equivalent 3593 Library Management functionality. The two Library Manager enabled control units form a highly available pair. One tape control unit can fail or be brought down for a code upgrade, and the other control unit will still be able to handle library requests. However, only one of the two Library Manager enabled control units will actively handle library requests at any given time. The other Library Manager enabled control unit will run in standby mode ready to takeover should the primary control unit fail. Also note that the 3592 Model C07 will not be able to coexist in the same 3584 logical library partition with a 3953 Library Manager or with any of the older tape control units (3592 Model C06 or 3592 Model J70). From a host perspective, each 3584 logical library partition in a 3584 tape library appears as a separate library to the host. With the addition of a 3592 Model C07, into an existing 3584 library, an additional 3584 logical library partition will need to be created to segregate any 3592 Model C07 control units from the older tape control units (J70 and C06) and partitions that have a 3953 Library Manager. The 3592 Model C07 control unit will support attachment of the 3592 Model E05, E06 and E07 tape drives. For additional information, see 3592 Enterprise Tape System in IBM Knowledge Center (www.ibm.com/support/knowledgecenter/STCTNLZ).

Virtual tape server (3494) system of the ATLDS

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

The key concepts of this system are as follows:

- Emulating 3490-type tape devices (virtual devices)
- Emulating 3490-type tape volumes (virtual volumes)
- Import and export functions
- Tape volume cache
- Storage management of the tape volume cache
- Improved cache management
- Deleting expired virtual tape server logical volume data
- Maintaining data fragments from migrated volumes
- Fast response for nonspecific mount requests
- Use of the IBM Enterprise Tape System 3590 and 3592
- Automatic 3590 and 3592 storage capacity utilization
- Logical library partitioning
- Operator interface with the library manager
- Logical volume inventory
- Physical volume pooling
- Selective dual copy

Emulating 3490-type virtual tape devices

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

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

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

Data is written and read as if it is stored on a real Standard or Enhanced Cartridge System Tape; however, within the system it is really stored on DASD. All tape read and write commands are translated to read and write data records to or from DASD. Volumes residing on the DASD are called virtual volumes. For more information concerning virtual volumes, see “Emulating 3490-type virtual volumes” 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 *z/OS: DFSMS Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*. 
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 36 and “Importing logical volumes into a 3494 VTS system” on page 29 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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69) 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*.

**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>
<thead>
<tr>
<th>Environment</th>
<th>Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peer-to-Peer VTS runs in immediate copy mode and is fully operational.</td>
<td>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.</td>
<td>The Peer-to-Peer VTS library under GDPS does not support logical software partitioning.</td>
</tr>
</tbody>
</table>
### 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 redefine 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.

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

<table>
<thead>
<tr>
<th>Environment</th>
<th>Results</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A disaster occurs and you are running in immediate copy mode.</td>
<td>• There is no synchronization for open logical volumes.</td>
<td>The Peer-to-Peer VTS library under GDPS does not support logical software partitioning.</td>
</tr>
<tr>
<td></td>
<td>• A rerun of the workload will inform you that you have no valid copy of the data.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>• There is no synchronization for closed and open logical volumes.</td>
<td>• You are not able to have full control of the selection of the I/O VTS.</td>
</tr>
<tr>
<td></td>
<td>• Open logical volumes at the time of the disaster become invalid.</td>
<td>• The Peer-to-Peer VTS library under GDPS does not support logical software partitioning.</td>
</tr>
<tr>
<td></td>
<td>• Closed logical volumes at the time of the disaster are valid.</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>• There is no synchronization for closed and open logical volumes.</td>
<td>• You are not able to have full control of the selection of the I/O VTS.</td>
</tr>
<tr>
<td></td>
<td>• Open logical volumes at the time of the disaster become invalid.</td>
<td>• The Peer-to-Peer VTS library under GDPS does not support logical software partitioning.</td>
</tr>
<tr>
<td></td>
<td>• Closed logical volumes on the damaged VTS at the time of the disaster become invalid.</td>
<td></td>
</tr>
</tbody>
</table>
The IBM System Storage Virtualization Engine TS7700 provides tape virtualization capabilities for the IBM Z environment and is the successor to the IBM Total Storage 3494 Virtual Tape Server (VTS) and the IBM TotalStorage 3494 Peer-to-Peer VTS (PtP VTS). Members of the TS7700 product family include the TS7740 Virtualization Engine (3957-V06 and 3957-V07), the TS7720 Virtualization Engine (3957-VEA and 3957-VEB), and the TS7760 Virtualization Engine (3957-VEC). Unless stated otherwise, references to the TS7700 Virtualization Engine apply to all 3957 models. Starting with Release 3.2 of the TS7720 Virtualization Engine, a new tape attach feature can be enabled on the TS7720 (traditionally a disk-only VTS) combining attributes of the TS7740 with the TS7720. Starting with Release 4.0 of the TS7700 Virtualization Engine, the TS7760 (follow-on to the TS7720) also supports a tape attach feature. For more information, see TS7700 Virtualization Engine in IBM Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

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.

<table>
<thead>
<tr>
<th>For TS7700 Release</th>
<th>Refer to APAR</th>
</tr>
</thead>
<tbody>
<tr>
<td>TS7700 Release 1.3</td>
<td>OA20065 (z/OS V1R6 and above)</td>
</tr>
<tr>
<td>TS7700 Release 1.5</td>
<td>OA24966 (z/OS V1R8 and above)</td>
</tr>
<tr>
<td>TS7700 Release 1.6</td>
<td>OA28632 (z/OS V1R9 and above)</td>
</tr>
<tr>
<td>TS7700 Release 2.0</td>
<td>OA32957 (z/OS V1R10 and above)</td>
</tr>
<tr>
<td>TS7700 Release 2.1</td>
<td>OA37267 (z/OS V1R11 and above)</td>
</tr>
<tr>
<td>TS7700 Release 3.0 and 3.1</td>
<td>OA40572 (z/OS V1R12 and above)</td>
</tr>
<tr>
<td>TS7700 Release 3.2</td>
<td>OA44351 (z/OS V1R13 and above)</td>
</tr>
<tr>
<td>TS7700 Release 3.3</td>
<td>OA47487 (z/OS V1R13 and above)</td>
</tr>
<tr>
<td>TS7700 Release 4.0</td>
<td>OA49373 (z/OS V2R1 and above)</td>
</tr>
<tr>
<td>TS7700 Release 4.1.2</td>
<td>OAxxxxx (z/OS V2R2 and above)</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>TS7720 Virtualization Engine (3957-VEA and VEB)</th>
</tr>
</thead>
</table>
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 Knowledge Center (www.ibm.com/support/knowledgecenter).

**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 higher).

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 associated with the mounted volume and are used by various applications. By default, the TS7700 limits the number of channel (host) bytes written to 68GB 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 25GB 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 Knowledge Center (www.ibm.com/support/knowledgecenter).

**Control Unit Initiated Recovery (CUIR) for Tape**

Starting with release 4.1.2 of the TS7700 (and APAR OA52376), an automatic vary capability now exists for the TS7700 to notify the host that a distributed library is going into service. This enables each of the supporting host systems to automatically vary the devices offline and back online. By default both of the vary notifications (offline and online) are disabled. The LIBRARY REQUEST command can be used to enable each of the automatic notifications:

- Vary Offline: LIBRARY REQUEST,composite-library-name,CUIR,SETTING,SERVICE,{ENABLE|DISABLE}
- Vary Online: LIBRARY REQUEST,composite-library-name,CUIR,AONLINE,SERVICE,{ENABLE|DISABLE}

For customers that prefer to verify the state of the distributed library before bringing the devices online, they can leave the automatic online notification disabled and then through the Management Interface (MI) of the TS7700, trigger the same online notification to the host.

Through this new notification support, when a tape device is varied offline for service, 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. If the device is subsequently offline for other reasons (path, operator, or library) it can remain...
in the offline state due to the other states. The existing LIBRARY DISPDRV command can be used to determine the reason that a device is offline, including the new CUIR reason. The 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 detailed information on the LIBRARY REQUEST command, refer to IBM Whitepaper, “IBM Virtualization Engine TS7700 Series z/OS Host Command Line Request User’s Guide”. Similar to disk, a new query host access (QHA) keyword is added to the DEVSERV QTAE command (DEVSERV QTAE,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, the commands noted above also help determine if manual varies are still needed from some of the systems. Also, to note is that the CUIR for tape support is only supported when running natively on MVS, it is not supported for an MVS guest running under VM nor is it supported for 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 the IBM Knowledge Center (www.ibm.com/support/knowledgecenter).

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 polices 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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

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 26 shows the different operational states, their associated CBR message, and when the composite library will report that it is in the indicated state.

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

<table>
<thead>
<tr>
<th>Library Operational State</th>
<th>Associated CBR Message</th>
<th>Composite Library Reporting</th>
</tr>
</thead>
<tbody>
<tr>
<td>VTS Operations Degraded State</td>
<td>CBR3786E</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Immediate Mode Copy Completion's Deferred State</td>
<td>CBR3787E and CBR3791I</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Service Preparation State</td>
<td>CBR3788E</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Grid Link Degraded</td>
<td>CBR3796E and CBR3797I</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Host Copy Operations Disabled</td>
<td>CBR3799E</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Limited Cache Free Space</td>
<td>CBR3792E and CBR3793I</td>
<td>Set if all distributed libraries containing a primary (deep) disk cache are in this state.</td>
</tr>
<tr>
<td>Out of Cache Resources</td>
<td>CBR3794A and CBR3795I</td>
<td>Set if all distributed libraries containing a primary (deep) disk cache are in this state.</td>
</tr>
<tr>
<td>Synchronous Mode Copy Completion's Deferred State</td>
<td>CBR3730E and CBR3731I</td>
<td>Set if any distributed library is in this state.</td>
</tr>
<tr>
<td>Cloud Object Storage Degraded</td>
<td>CBR3736E and CBR3737I</td>
<td>Set if any distributed library is in this state.</td>
</tr>
</tbody>
</table>

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 volser range.

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

**Cache management**

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

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

**Load balancing**

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

If an imbalance across the two enterprise tape controllers is observed with one enterprise tape controller (and its tape subsystems) getting the majority of the mounts, consider using the new MVS Device Allocation TAPELIB_PREF randomization option "BYDEVICES". For a discussion of the load balancing option, refer to “Load balancing considerations” on page 50.

For additional information on the IBM System Storage TS7680, refer to the IBM Knowledge Center 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 112.

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 29.

**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 149. For more information on the LIBRARY ENTER command, see “Entering a tape volume into an MTL” on page 107.

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

### Cartridge entry processing without an online device

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

### Importing logical volumes into a 3494 VTS system

**Note:** This section discusses the import support that is available in the 3494 VTS. For a discussion of the copy export support that is available in the 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 38.
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 32.

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, CREATEINDEX, 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 150 and “Importing logical volumes into a VTS” on page 174 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 31 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 31 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 temporally 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 29.

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, CBRSRXV, 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 34). 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 (CBRXENT) is called to set or verify values for many of the record fields. See “Cartridge entry installation exit (CBRXENT)” on page 209 for a list of fields.

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

QNAME-SYSZCBR
RNAME-CARTRIDGE_ENTRY_libname

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

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

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

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

**Recommendation:** Use global resource serialization.

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

### Using global resource serialization in a manual tape library

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

The resource names are as follows:

QNAME-SYSZCBR
RNAME-MTL_VOLSER_volservename

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

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

### Tape volume requirements

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

- All physical volumes residing in an ATLDS must have a supported external barcode label readable by the automated tape library dataserver vision system unless the unlabeled tape facility at the library manager is being used.
- All volumes residing in a MTL should also have a supported machine readable external label to be compatible with the ATLDS.
• All private volumes must have either an internal IBM standard tape label or an International Organization for Standardization American National Standards Institute (ISO/ANSI) label, unless bypass label processing (BLP) or nonlabeled tape (NL) is specified.

• All private volumes must have identical internal and external volume serial numbers, unless BLP or NL is specified. The internal volume serial number is recorded in the tape volume label (VOL1 label).

• BLP or NL may be requested for input processing on specific volume serial references. It may also be requested for output processing on specific or nonspecific references.

• All volume serial numbers in the same SMS complex must be unique across tape, DASD, and optical environments.

• A scratch volume cannot be requested using a specific volume serial number.

• All volumes of a multivolume data set should reside in the same library, or all should reside outside a library; however, if they do not, the installation will be given the chance to enter the volumes through the volume not in library installation exit (CBRUXVNL).

• All volumes of a multivolume data set must belong to the same tape storage group.

• All volumes of a multivolume data set must be recorded using the same tape recording technology.

• Volumes of a multivolume data set may be an intermix of media types supporting the same recording technology.

• Volumes of a multivolume data set must be recorded either on all rewritable media or on all WORM media and cannot be intermixed.

**Accessing the tape volumes**

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

• When a library-resident volume is requested, the system mounts it on a tape drive in the tape library containing the volume.

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

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

**Volume serial number restrictions**

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

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

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

**Ejecting a tape cartridge from a tape library**

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

In the automated tape library environment, there is currently a limit on the number of eject requests that device services can have queued across all libraries from a single system. This queue limit is currently set at 1600. For this limit to be as transparent as possible, OAM will not send more than 100 eject requests to a single library from a single system. If OAM receives more than 100 eject requests for a given library, it will wait until an eject request completes before sending another request to that library. However, if the OAM address space is stopped or restarted with an SCDS activation, rather than purging the remaining eject requests, OAM will try and send down as many of the remaining eject requests as it can before reaching the device services queue limit of 1600. Additionally, there is a Peer-to-Peer VTS system limitation. This library will only accept up to 1000 eject requests across all connected systems.

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

Cartridges can be ejected from a tape library in several ways, as shown in Table 4 on page 35:

<table>
<thead>
<tr>
<th>Eject request invoked by</th>
<th>Action taken to cause eject</th>
<th>Associated procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAM</td>
<td>Ejects cartridge automatically following an unsuccessful cartridge entry attempt.</td>
<td>N/A</td>
</tr>
<tr>
<td>Operator</td>
<td>Ejects cartridge using the LIBRARY EJECT command.</td>
<td>“Ejecting a specific Tape Volume” on page 105</td>
</tr>
<tr>
<td>Storage administrator</td>
<td>Specifies an EJECT line operator next to a volume serial number on an ISMF Mountable Tape Volume List panel.</td>
<td>“Ejecting a volume from a tape library” on page 278</td>
</tr>
<tr>
<td>Application program</td>
<td>Issues the CBRXLCS macro with the EJECT function.</td>
<td>“Ejecting a tape cartridge” on page 162</td>
</tr>
</tbody>
</table>

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 217 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 35.

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 36 and “Ejecting a logical Volume from a VTS” on page 36.
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 35. 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 36.

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 38.

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 150 and “Exporting logical volumes from a VTS” on page 172. 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 (CBRXUEJC) 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 UXJIGNORE, Return Code 12, to allow another tape management system who “owns” the exported volume to process. If UXJIGNORE is returned from the CBRXUEJC 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 TCDU 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 37 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 TCDU, 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 37 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
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.


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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

**Using global resource serialization with export processing**

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

- **QNAME**=SYSZCBR
- **RNAME**=EXPORTED_CATEGORY_libname

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

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

**Recommendation:** Use global resource serialization.
Chapter 2. Planning for the tape library support

In many ways, planning is the most important phase of a product’s implementation and administration cycle. Time spent in planning is fully repaid in time, effort, and money saved by a well-implemented installation and a smooth transition to full system integration. This 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).
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, 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 42 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>
<thead>
<tr>
<th>Library model and subsystem device type</th>
<th>Library attachment</th>
<th>Media supported</th>
<th>Recording technology</th>
<th>Noncompacted data capacity</th>
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<td>MEDIA1/2</td>
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Table 5. Tape storage configurations

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Table 5. Tape storage configurations (continued)

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<th>Library model and subsystem device type</th>
<th>Library attachment</th>
<th>Media supported</th>
<th>Recording technology</th>
<th>Noncompacted data capacity</th>
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<td>Library attachment</td>
<td>Media supported</td>
<td>Recording technology</td>
<td>Noncompacted data capacity</td>
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<td>MEDIA13</td>
<td>(R/W) EFMT4/EEFMT4</td>
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</table>

Note:

1. MB = 1 048 576 bytes
2. GB = 1 073 741 824 bytes
3. (R) = Read only
4. (R/W) = Read and write
5. MEDIA1 = IBM Cartridge System Tape
6. MEDIA2 = IBM Enhanced Capacity Cartridge System Tape
7. MEDIA3 = IBM High Performance Cartridge Tape
8. MEDIA4 = IBM Extended High Performance Cartridge Tape
9. MEDIA5 = IBM Enterprise Tape Cartridge
10. MEDIA6 = IBM Enterprise WORM Tape Cartridge
11. MEDIA7 = IBM Enterprise Economy Tape Cartridge
12. MEDIA8 = IBM Enterprise Economy WORM Tape Cartridge
13. MEDIA9 = IBM Enterprise Extended Tape Cartridge
14. MEDIA10 = IBM Enterprise Extended WORM Tape Cartridge
15. MEDIA11 = IBM Enterprise Advanced Tape Cartridge
16. MEDIA12 = IBM Enterprise Advanced WORM Tape Cartridge
17. 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. 3592-3 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. 3592-4 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 DEV$UPxx 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 23.

**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 42 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 209 for more information concerning this cartridge entry installation exit. See “TDSI coexistence considerations” on page 69 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 (CBRXENT).
- 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=\(\text{IN}\) on the DD statement of your JCL.

Demand allocation with system-managed tape

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

Load balancing considerations

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

Scratch allocations

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

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

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

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

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

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

### Specific allocations

For specific allocations (JES2-only environment), an ordered list of subsystems may be returned to MVS allocation. The environments that support an ordered list include the 3494 tape library and the TS7700 Virtualization Engine (Release 1.5 and higher). With the TS7700 Virtualization Engine, the list of subsystems returned is in cluster preference order. When an ordered list is returned, MVS allocation attempts to allocate from the first subsystem returned in the list. If an online device is not available within that subsystem, MVS allocation moves to the next subsystem in the list and tries again until a device is chosen. The default algorithm "EQUAL", supports an ordered list for the first seven subsystems returned in the list. After that, if an eligible device is not found, all of the remaining subsystems are considered equal. The alternate algorithm "BYDEVICES" removes the ordered subsystem limitation. With the TS7700 Virtualization Engine (Release 1.5 or higher), additional APAR OA30718 should also be installed prior to enabling the new "BYDEVICES" algorithm. Without this APAR, the ordered subsystem list may not be honored properly, causing specific allocations to appear randomized.

### Balanced mode in the TS7700 Virtualization Engine

A multi-cluster grid can be run in "Preferred" or "Balanced Mode". "Preferred Mode" is where a host has virtual devices online to only one cluster in the grid. All allocations are then directed to the devices in that one cluster. "Balanced Mode", on the other hand, is where a host has virtual devices online to two or more clusters in the grid. Allocations from the host could then select virtual devices from multiple clusters. Refer to information APAR II14516 and “Load balancing considerations” on page 50 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 52 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 109 for information on the LIBRARY REQUEST command. For additional information on device allocation assistance, refer to the IBM Knowledge Center 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 52 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 | 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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

**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 54. The INISH deck changes define the library-specific distributed names associated with the distributed libraries “clusters” in a TS7000 Virtualization Engine. All TS7000 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 DEV$UPxx PARMLIB member using the JES3_ALLOC_ASSIST=YES keyword (either at IPL or through the SET DEV$UP=xx operator command). The SET DEV$UP=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 54. The INISH deck changes define the library-specific distributed names associated with the distributed libraries “clusters” in a TS7000 Virtualization Engine. All TS7000 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 DEV$UPxx PARMLIB member using the JES3_ALLOC_ASSIST=YES keyword (either at IPL or through the SET DEV$UP=xx operator command). The SET DEV$UP=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 JES3ALLOCASSIST=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 LDxxxxxxx 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 LDxxxxxxx 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, 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 EFMT2 or EEFMT2, a MEDIA5 cartridge written on a 3592 Model E05 has a capacity of 500 GB. If the cartridge is performance segmented, the MEDIA5 cartridge is segmented into a 100 GB fast access segment and a 333 GB slower access segment (for a total capacity of 433 GB). By default, the MEDIA5, MEDIA9, or MEDIA11 cartridge is used to its full capacity. When written from loadpoint, the segmented tape cartridge is reformatted according to the assigned data class.

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

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

Using the tape configuration database (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 57 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 59 for a discussion of the software error category.

<table>
<thead>
<tr>
<th>Category (in hex)</th>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0001</td>
<td>MEDIA1</td>
<td>Cartridge system tape common scratch pool</td>
</tr>
<tr>
<td>0002</td>
<td>MEDIA2</td>
<td>Enhanced capacity cartridge system tape common scratch pool</td>
</tr>
<tr>
<td>0003</td>
<td>MEDIA3</td>
<td>High performance cartridge tape common scratch pool</td>
</tr>
<tr>
<td>0004</td>
<td>MEDIA4</td>
<td>Extended high performance cartridge tape common scratch pool</td>
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<tr>
<td>0005</td>
<td>MEDIA5</td>
<td>Enterprise Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>0006</td>
<td>MEDIA6</td>
<td>Enterprise WORM Tape Cartridge common scratch pool</td>
</tr>
</tbody>
</table>
### Table 6. Software volume categories (continued)

<table>
<thead>
<tr>
<th>Category (in hex)</th>
<th>Name</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0007</td>
<td>MEDIA7</td>
<td>Enterprise Economy Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>0008</td>
<td>MEDIA8</td>
<td>Enterprise Economy WORM Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>0009</td>
<td>MEDIA9</td>
<td>Enterprise Extended Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>000A</td>
<td>MEDIA10</td>
<td>Enterprise Extended WORM Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>000B</td>
<td>MEDIA11</td>
<td>Enterprise Advanced Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>000C</td>
<td>MEDIA12</td>
<td>Enterprise Advanced WORM Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>000D</td>
<td>MEDIA13</td>
<td>Enterprise Advanced Economy Tape Cartridge common scratch pool</td>
</tr>
<tr>
<td>000E</td>
<td>ERROR CATEGORY</td>
<td>Scratch volumes for which the software detected an error during processing</td>
</tr>
<tr>
<td>000F</td>
<td>PRIVATE CATEGORY</td>
<td>Specific volume category</td>
</tr>
</tbody>
</table>

**Note:** If the tape library is partitioned, the categories used are derived from the base software categories. See “Partitioning tape libraries among multiple sysplexes (systems)” on page 63 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 136.

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 149 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 123 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 60 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 62 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 64 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.
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 57.

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 66.

Handling tape drives in a partitioned ATLD

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.
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 113, and “Setting the cartridge loader scratch media type” on page 113 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 69.

Sharing tape volumes between an SMSplex and a non-MVS platform

All library-resident tape volumes used by an SMSplex must be defined in the tape configuration database. This means that cartridge entry must occur on an SMS system. Therefore, all volumes to be used exclusively by SMS, and all volumes to be shared by SMS and a non-MVS platform must be entered on an SMS system. Either the Cartridge Entry Installation Exit or DFSMSrmm may be used to control which cartridges are accepted. Other considerations include:

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

DFSMSrmm support for sharing a tape library dataserver

DFSMSrmm provides support for easier installation control over sharing a tape library dataserver. DFSMSrmm provides a cartridge entry installation exit that can be used to help partition volumes in a tape library dataserver across multiple sysplexes. This can include both VM and MVS platforms, as well as multiple SMSplexes. Support for partitioning with VM is provided based on volume naming convention, and at the individual volume level for volumes defined to DFSMSrmm on MVS. With a single tape configuration database (TCDB) across multiple MVS systems and complexes, a single DFSMSrmm control data set is typically used. With a single DFSMSrmm control data set, all volumes can be used on any or all systems with no partitioning possible. Then with carefully selected PRTITION and OPENRULE parameters.
for DFSMSrmm, you can also partition the tape library dataserver across multiple MVS systems. In doing so, there is typically one-to-one correspondence of tape configuration database TCDB to DFSMSrmm control data sets. You must use the DFSMSrmm facilities to ensure that a single volume is defined in only a single tape configuration database and a single DFSMSrmm control data set. See *z/OS DFSMSrmm Implementation and Customization Guide* for implementation details for these and any additional scenarios. Also refer to the IBM Redbook *Guide to Sharing and Partitioning IBM Tape Library Dataservers.*
Chapter 3. Installing your tape library support

This 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 237 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 Migration.

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 dataserver support. See
“Installation procedures” on page 71 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 71

2. Update PARMLIB.
   See “Changing system libraries” on page 71
   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 upon your installation.)
   See “Creating the global resource serialization environment” on page 78

5. Define the volume catalogs.
   See “Creating the tape configuration database” on page 79
   a. Define general volume catalog.
   b. Define specific volume catalogs (optional, depending upon your installation).
   c. Connect the volume catalogs to the SMS complex.
   d. Define the RACF® facility class profile. RACF is a component of the Security Server for z/OS.
   e. Authorize the storage administrator to the RACF facility class.

6. Define tape drives using HCD.
   See “Creating the hardware configuration” on page 80

7. IPL the system.
   See “IPLing the system” on page 81

8. Define the base SCDS.
   See “Creating the SMS definitions” on page 81

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 82

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

16. Create a cartridge eject installation exit routine (optional, depending upon your installation).
17. Create a volume not in library installation exit routine (optional, depending upon your installation).
18. Validate the configuration.
   See “Validating the configuration” on page 83
19. Activate the SMS configuration.
   See “Activating the SMS configuration” on page 83
20. Start the OAM address space.
   See “Starting the OAM address space” on page 83
21. Vary the library online.
   See “Varying the library online” on page 83
22. Display and set the cartridge loader media type.
   See “Displaying and setting the cartridge loader media type” on page 84
   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 84

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 66. 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 102. 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*.

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

```plaintext
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( CBINIT) 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 69 for potential usage of the MTLSHARE keyword.

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

Installing your tape library support 73
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 74 and “ONLYIF statements in a PLEX” on page 76.

**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
  ENTRYIGNOREMSGTYPE(msg_mode)
  ENTRYIGNOREMSGDEST(msg_destination)
  ENTRYSUCCESSMSGDEST(msg_destination)
```

**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.

```
SETTLIB
  SCRATCHTHRESHOLDMSG( percentage )
```

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.

```
SETTLIB
  LACRETRYMINUTES( minutes )
  LACRETRYTIMES( times )
  LACRETRYFAIL( YES|NO )
```

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

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

LACRETRYTIMES(times)
An optional parameter that indicates whether the mount request should be automatically retried for the specified (1-9) number of times. If LACRETRYMINUTES is specified and LACRETRYTIMES 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 independently of the LACSRETRYMINUTES or the LACSRETRYTIMES keywords and indicates whether the CBR4196D message should be issued for the retriable 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 LACRSRETRYMINUTES or LACRSRETRYTIMES 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 can be used to specify whether specific statements within the CBROAMxx PARMLIB member are to be processed on a system, and further, whether statements are to be processed by an OAM address space. The scope of the ONLYIF statement is in effect until the next ONLYIF is encountered.

In a multiple OAM configuration (used with OAM's object support), 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".

The syntax for the ONLYIF statement follows.

ONLYIF statement syntax

```
ONLYIF
SYSTYPE( *ALL* system_name )
DB2ID( *ALL* db2_id )
```

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.
In this example, SETTLIB ENTRYIGNOREMSGTYPE(SUMMARY) is processed only if the system is SYS1 and all of the statements after ONLYIF SYSNAME(*ALL*) are processed on all systems.

<table>
<thead>
<tr>
<th>ONLYIF SYSNAME(SYS1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SETTLIB ENTRYIGNOREMSGTYPE(SUMMARY)</td>
</tr>
<tr>
<td>ONLYIF SYSNAME(<em>ALL</em>)</td>
</tr>
<tr>
<td>SETTLIB ENTRYIGNOREMSGDEST(SYSLOG)</td>
</tr>
</tbody>
</table>

**Note:** The value of an ONLYIF statement cannot be displayed with the F OAM,DISPLAY command or updated with the F OAM,UPDATE command.

### Updating the PROCLIB

**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 239) to create member OAM in PROCLIB. The following member is created as the default:

`://OAM PROCUREMENT 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=&RESTART')`  
`://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 PROCUREMENT 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,'  
`:// 'OAM=OAM,EJECT=&EJECT,RESTART=&RESTART')`  
`://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 74.

**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 104.

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

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:

<table>
<thead>
<tr>
<th>QNAME</th>
<th>RNAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSZCBR</td>
<td>CARTRIDGE_ENTRY_libname</td>
</tr>
</tbody>
</table>

For export processing, the following resource names are used:

<table>
<thead>
<tr>
<th>QNAME</th>
<th>RNAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSZCBR</td>
<td>EXPORTED_CATEGORY_libname</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>QNAME</th>
<th>RNAME</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYSZCBR</td>
<td>MTL_VOLSER_volsername</td>
</tr>
</tbody>
</table>

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 32. For further information regarding resource names used by OAM during VTS export processing, see “Using global resource serialization with export processing” on page 40. For further information regarding resource names used with manual tape library processing, see “Using global resource serialization in a manual tape library” on page 33.

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

5a 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 -
```

Installing your tape library support 79
The catalog parameters are:

**NAME**
- Specifies the volume catalog, hlq.VOLCAT.VT.

**VOLCATALOG**
- Specifies that the user catalog is a volume catalog.

**VOLUME**
- Specifies that the user catalog resides on volume 338001.

**CYLINDERS**
- Specifies that one cylinder is allocated to the catalog and that when the catalog is extended, it extends in increments of one cylinder.

All other parameters are allowed to default.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

### Creating the hardware configuration

6  **Define tape drives using HCD.**

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

**Note:** When defining the drives using HCD, device number 0000 is not supported in an automated (which includes virtual) or manual tape library environment.
The devices in an ATLDS are recognized as tape library devices as they are initialized during IPL and during IODF activation. The devices in an MTL are recognized as MTL devices only through the IODF definition.

When you define the tape drives in an ATLDS, you can optionally specify the LIBRARY-ID and LIBPORT-ID parameters. If a tape drive is then busy or unavailable at system IPL, the drive is configured based on the information provided in the optional parameters and a subsequent IODF activate should not be required. Without specification of the optional parameters, tape drives that are busy or unavailable at system IPL are not included in the library control blocks built by the system and are not eligible for allocation until the tape drives become available and an IODF ACTIVATE is issued. When you define the tape drives in an MTL, since the devices are not self-defining during IPL or IODF activation, the LIBRARY-ID and LIBPORT-ID parameters must be specified. As with an ATLDS, the LIBRARY-ID specified must match the LIBRARY-ID specified on the ISMF define panel and can be any unique five-digit hexadecimal number. The LIBPORT-ID identifies all devices attached to a specified control unit and should start with subsystem “01”. Also, note that in the MTL environment, the maximum number of subsystems supported is 32. For further information, see “IPLing the system” on page 81. 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**

**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.
- CBR8002I OAMn subsystem initialization completed.

**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.

**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 241, and z/OS DFSMSdfp Storage Administration. This book, along with the online ISMF functional and help panels, explains the items you specify using ISMF.

1. 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.

2. 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 243) to display the ISMF Tape Library Define panel shown in Figure 19 on page 244 and in Figure 21 on page 247. When defining the Peer-to-Peer VTS Subsystem, remember to define not only the composite library but also the underlying distributed libraries.

3. 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.

4. 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.

5. 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.

6. 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 209.
Create a change use attribute installation exit routine—CBRUXCUA.

If you need to influence the process of changing a volume’s use attribute (for example, by preventing the return of a private volume to scratch), you need to create an installation exit routine of your own. You may use SYS1.SAMPLIB member CBRSPLCS as a model. Otherwise, the system uses the installation exit provided with DFSMSrmm. For detailed information on the installation exit, see “Change use attribute installation exit (CBRUXCUA)” on page 201.

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 CBRSPLXJ 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 217.

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 CBRSPLU 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 224.

Note: Customer written installation exits are optional.

Validating the configuration

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

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

Start the OAM address space.

Start the OAM address space using the MVS START command. See “Starting OAM” on page 102 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 71 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

Vary the library online.
Vary the library online using the SMS VARY command. See “Varying a tape library online or offline” on page 103 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

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

**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 113 and “Displaying tape drive status” on page 128 for the command syntax.

**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 113 for the command syntax.

### Running the job stream

**Run the job stream.**

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

### Outboard policy management installation recommendations

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

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

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

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

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

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

**Scenario 1: System with Full Outboard Policy Management Support**

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

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

**Scenario 2: System with Coexistence Support**

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

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

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

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

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

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

1. 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.

2. 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 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 88.

### 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 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 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 87.

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

If the steps documented in the sections above are not followed, you may have the same device being configured in multiple device pools or the appearance of more drives then are actually in the library, or both, resulting in subsequent failures during library processing.
Chapter 4. Defining and monitoring your configuration

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

- “Monitoring and maintaining the tape configuration” on page 91
- “Monitoring and maintaining SMS library definitions” on page 92
- “Establishing recovery procedures” on page 93
- “TCDB procedure for retrieving data from a disabled IBM automated tape library” on page 95

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 241 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 241.

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 Define 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 253.

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 256.

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 260.

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 271.

**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 263). For more detail regarding the ISMF alter commands, see “Altering the volume record” on page 274.

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 278 and Figure 41 on page 263.

---

**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 PARTITION and OPENRULE commands. For additional information refer to the IBM Knowledge Center 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 94, 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 TS7720 and the TS7760 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 Knowledge Center (www.ibm.com/support/knowledgecenter/STFS69).

**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:

```cl
//ALTERVOL JOB 'NAME', MSGCLASS=H, MSGLEVEL=(1,1), CLASS=A
ITERAL VOLUMEENTRY- LOCATION(SHELF)
```

---

Defining and monitoring your configuration 95
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:

<table>
<thead>
<tr>
<th>CBRnnn</th>
<th>Message_text</th>
</tr>
</thead>
</table>

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.

<table>
<thead>
<tr>
<th>Command/Keyword</th>
<th>Authority</th>
<th>Resource-Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIBRARY</td>
<td>UPDATE</td>
<td>MVS.LIBRARY</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Keyword</th>
<th>Function</th>
<th>Authority</th>
<th>Resource-Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>DISPDRV</td>
<td>Display tape drive status</td>
<td>READ</td>
<td>MVS.LIBRARY.DISPDRV</td>
</tr>
<tr>
<td>DISABLE</td>
<td>Used to disable the installation exits and the category count call during return to scratch processing</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.DISABLE</td>
</tr>
<tr>
<td>DISPCL</td>
<td>Display the cartridge loader status of a tape drive</td>
<td>READ</td>
<td>MVS.LIBRARY.DISPCL</td>
</tr>
<tr>
<td>EJECT</td>
<td>Eject a volume from a tape library</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.EJECT</td>
</tr>
<tr>
<td>ENTER</td>
<td>Enter a volume into a manual tape library</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.ENTER</td>
</tr>
<tr>
<td>EXPORT</td>
<td>Export volumes from a virtual tape library</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.EXPORT</td>
</tr>
<tr>
<td>IMPORT</td>
<td>Import volumes into a virtual tape library</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.IMPORT</td>
</tr>
<tr>
<td>LMPOLICY</td>
<td>Update policy settings for volumes in a virtual tape library</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.LMPOLICY</td>
</tr>
<tr>
<td>REQUEST</td>
<td>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 on the keywords specified</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.REQUEST</td>
</tr>
<tr>
<td>RESET</td>
<td>Used to reset the installation exits and the category count call during return to scratch processing</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.RESET</td>
</tr>
<tr>
<td>SETCL</td>
<td>Set the cartridge loader scratch media type</td>
<td>UPDATE</td>
<td>MVS.LIBRARY.SETCL</td>
</tr>
</tbody>
</table>

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:

```
START
   S
   OAM
      procname
      .identifier
      ,OAM=xx
   ,REST=NO
      YES
   ,REUSASID=YES
```

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

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

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

- **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, etc.) 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, etc.), 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=NULL” would be specified. OAMA and OAMB could be used for the object address spaces and OAMC or OAMT could 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, etc.) in this command to initialize or override the parameter upon activation of the OAM address space.

**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 CBRxxxxxx 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:

```
VARY SMS, LIBRARY LIB(library_name) ON OFFLINE, ONLINE
```

Notes:

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

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

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

**LIBRARY | LIB(library_name)**

Specifies the name of the library to be varied online or offline. If the name is not specified or the specified library is not defined in the SMS configuration, an error message is displayed.
ALL
Varies the state of the tape library on all systems in the SMS complex to which the library is connected.

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

system_id
Varies the state of the tape library only on the systems or system groups that are specified. If a specified system is not connected to the named tape library, an error message is displayed.

Note: To specify a system or system group that is named ALL, surround it with parentheses; for example, VARY SMS,LIBRARY(library_name,(ALL)),ONLINE.

ONLINE | ON
Specifies that the library be varied online.

OFFLINE | OFF
Specifies that the library be varied offline.

An example of the command to vary a tape library online:

VARY SMS,LIBRARY(ATL01),ONLINE

An example of the command to vary a tape library offline:

VARY SMS,LIBRARY(ATL01),OFFLINE

Restarting OAM

OAM provides the ability for you to specify a RESTART option on the OAM started procedure statement (see the example in "Updating the PROCLIB" on page 77 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:

| MODIFY F OAM , RESTART ,OAM=xx ,REST= |
|---|---|---|
| MOD | Y | F | O | A | M | , | R | E | S | T | A | R | T | , | O | A | M | = | x | x | , | R | E | S | T | = | N | O | |

**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:

```
MODIFY F OAM, AUDIT, LIBRARY, library-name, VOLLIST, volser1,volser2...
```

**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 29. 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 38.

The syntax of the command to import volumes into a VTS follows:

```
LIBRARY IMPORT volser CANCEL 
IMPORT | IMP
```

**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 36, and for information on the copy export support in the TS7700 Virtualization Engine, refer to “Copy export from the TS7700 Virtualization Engine” on page 38.

The syntax of the command to export volumes from a VTS follows:

```
LIBRARY EXPORT volser CANCEL 
EXPORT | EXP
```

**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*. 

Operating the OAM address space  109
The syntax of the command for the REQUEST function:

![Diagram of the syntax]

**Required parameters**

**REQUEST | REQ**  
Specifies a request to obtain information from the library or to perform an outboard operation at the library. This command is supported only by the TS7700 Virtualization Engine (3957-V0x or 3957-VEx).

**library_name**  
Specifies the library in which the request should be directed. The library specified may be a composite or a distributed library and which library is applicable depends on the keywords specified.

**keyword1**  
Specifies which operation is to be performed at the library.

**Optional parameters**

The optional parameters are dependent on the first keyword specified. Based on the first keyword specified, zero or more of the additional keywords may be appropriate.

**keyword2**  
Specifies additional information in support of the operation specified with the first keyword.

**keyword3**  
Specifies additional information in support of the operation specified with the first keyword.

**keyword4**  
Specifies additional information in support of the operation specified with the first keyword.

**,L={a | name | name-a}**  
Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=name), or both the console name and the display area (L=name-a). The name parameter can be an alphanumeric character string.

**Rules:** The keywords specified must be from one to eight characters in length and can consist of alphanumeric (A-Z and 0-9), the national character set ($@#), and mask and wildcard-type characters (*%). The only checking done by the host is to verify that the specified keywords conform to the supported character set. The validity of the keywords themselves and the keywords in combination with each other is verified when the command is received at the library. Any errors that the library encounters are reported back to the host and displayed as part of the command output for CBR1280I.

The following information is displayed:

```
CBR1280I Library library-name request.
Keywords: keyword1[keyword2[keyword3[keyword4]
---------------------------------------------------------------
  data from the library (1 to 50 lines; up to 70 characters per line)
```

The following are examples of the LIBRARY,REQUEST command output:

If you issue the following command:

```
LIBRARY REQUEST,ATLDIST1,POOLCNT
```

The following information is displayed:
If you issue the following command (for a volume that does not reside in the library):

```
LIBRARY REQUEST, ATL0MP1, LVOL, Y03469
```

The following information is displayed:

```
CBR1286I Library ATL0MP1 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:

```
LIBRARY LI DISABLE DA, CATCOUNT
```

**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:

```
LIBRARY LI RESET R, CATCOUNT
```

**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:

```
LIBRARY LI DISABLE DA CBRUXENT,
```

**DISABLE | DA**

Specifies a request to disable the installation exit.

**CBRUXENT**

Specifies a request to disable cartridge entry installation exit processing. Cartridge entry processing does not occur on this system while the exit is disabled.

*Note:* Disabling the cartridge entry installation exit on a system allows cartridge entry to be processed by another system, which is connected to the library and has the cartridge entry exit enabled. In effect, this directs cartridge entry processing to a particular system.

With APAR OA24966 (z/OS V1R8 and above), the cartridge entry installation exit can be disabled prior to the start of the OAM address space to ensure that when the OAM address space is started, entry processing is not attempted on the disabled system.

**CBRUXVNL**

Specifies a request to disable volume not in library installation exit processing.

*Note:* This does not disable job processing but does result in the volume not in library installation exit being bypassed or not called. In the absence of the CBRUXVNL installation exit's intervention, Job Step Setup processing attempts to allocate an applicable stand-alone tape drive for a volume that has been inadvertently ejected from a tape library. If there is no stand-alone drive capable of handling the tape volume request, the job or dynamic allocation fails. During Device Allocation or during Library Mount Processing, normal job processing for a volume not in the library with no CBRUXVNL installation exit intervention causes the failure of the job step or dynamic allocation.

The following message displays upon successful completion of the disable request:

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

The installation exit processing on this system is disabled until a LIBRARY RESET command is issued or the system is IPLed. Restarting the OAM address space does not re-enable installation exit processing if it has been disabled by an operator command. You can use the DISPLAY SMS,OAM command to display the current status of the installation exits.

Reenabling installation exit processing

When OAM detects an error during installation exit processing, the function that is being performed when the exit is invoked is disabled. For example, cartridge entry, cartridge eject, private-to-scratch change use attribute, or volume-not-in-library processing is not performed. An installation exit might also request, by way of a return code, that the exit not be invoked again, and function processing continues without the exit. Also an operator, through the use of the MVS LIBRARY DISABLE command, might request that cartridge entry processing on a particular system be disabled, or request that the volume not in library exit be disabled. Use the MVS LIBRARY RESET command to reenable installation exit processing.

The syntax of the command to reestablish installation exit processing follows:
RESET | R
Specifies a request to reactivate an installation exit.

CBRUXEJC | CBRUXENT | CBRUXCUA | CBRUXVNL
Specifies which exit to reactivate.

CBRUXEJC
Specifies that the cartridge eject installation exit (CBRUXEJC) be reactivated.

CBRUXENT
Specifies that the cartridge entry installation exit (CBRUXENT) be reactivated.

CBRUXCUA
Specifies that the change use attribute installation exit (CBRUXCUA) be reactivated.

CBRUXVNL
Specifies that the volume not in library installation exit (CBRUXVNL) be reactivated.

Note: Resetting the CBRUXENT installation exit invokes cartridge entry processing for volumes in the insert category.

Displaying the cartridge loader scratch media type

Use the MVS LIBRARY DISPCL command to display the media type of scratch volumes that you want loaded into the cartridge loader of a library-resident tape drive. The syntax of the LIBRARY DISPCL command follows:

```
LIBRARY
  LI
  DISPCL
    DC
      ,device_number
```

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 128 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:

```
LIBRARY
  LI
  SETCL
    SC
      ,device_number
        ,media_type
      ,device_range
```

Operating the OAM address space
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 EFMT2, 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 155 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 136.

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 136.

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.

![Diagram of DISPLAY SMS,OAM command]

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  ONL  AVL  TOTAL
LIB  LIB  AL  VL  VCL  ML  DRV  DRV  DRV  SCRATCH
nnn  ooo  ppp  qqq  rrr  sss  ttttt  uuuuu  vvvvv  wwww
exit-name PROCESSING (ENABLED | DISABLED | BYPASSED | OPERATOR DISABLED).
CBROAM: parmlib-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.

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

**vvvvv**
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.

**wwwwww**
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 ONL AVL TOTAL
LIB LIB AL VL VCL ML DRV DRV DRV SCRATCH
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.

```
DISPLAY OAM,CONFIG
L=a, name, or name-a
```

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
```
The following is example output for a multiple OAM configuration.

<table>
<thead>
<tr>
<th>SUB</th>
<th>PROC</th>
<th>TASKID</th>
<th>STC#</th>
<th>TYPE</th>
<th>GROUP</th>
<th>ID</th>
<th>GATT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAM</td>
<td>OAM</td>
<td>OAM</td>
<td>STC00317</td>
<td>CLAS</td>
<td></td>
<td></td>
<td>DB2A</td>
</tr>
</tbody>
</table>

CBR1960I OAM configuration data:

<table>
<thead>
<tr>
<th>SUB</th>
<th>PROC</th>
<th>TASKID</th>
<th>STC#</th>
<th>TYPE</th>
<th>GROUP</th>
<th>ID</th>
<th>SSID</th>
<th>GATT</th>
</tr>
</thead>
<tbody>
<tr>
<td>OAM0</td>
<td>OAMT</td>
<td>OAMT</td>
<td>STC07053</td>
<td>TLIB</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OAM1</td>
<td>OAMA</td>
<td>OAMA</td>
<td>STC07051</td>
<td>OBJ</td>
<td>PRODPLX2</td>
<td>DB2A</td>
<td>DBG1</td>
<td></td>
</tr>
<tr>
<td>OAM2</td>
<td>OAMB</td>
<td>OAMB</td>
<td>STC07052</td>
<td>OBJ</td>
<td>PRODPLX2</td>
<td>DB2B</td>
<td>DBG2</td>
<td></td>
</tr>
</tbody>
</table>

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.

```
MODIFY F DELSUB
```

**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:

![Command Syntax Diagram]

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**
- LACSETRYMINUTES

**LACSRTIM**
- LACSETRYTIMES

**LACSRFAL**
- LACSETRYFAIL

### 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 123 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:

<table>
<thead>
<tr>
<th>LIBRARY name</th>
<th>CLASS type</th>
<th>SYSTEM 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6</th>
<th>s s s s s s s s s s s s s s s s</th>
</tr>
</thead>
<tbody>
<tr>
<td>name</td>
<td></td>
<td>1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1</td>
<td>s s s s s s s s s s s s s s s s</td>
</tr>
<tr>
<td>LIBRARY name</td>
<td>CLASS type</td>
<td>SYSTEM 1 1 1 2 2 2 2 2 2 2 2 2 2 2 3 3</td>
<td>s s s s s s s s s s s s s s s s</td>
</tr>
<tr>
<td>name</td>
<td></td>
<td>1 1 1 2 2 2 2 2 2 2 2 2 2 2 3 3 3</td>
<td>s s s s s s s s s s s s s s s s</td>
</tr>
</tbody>
</table>

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:
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 123 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 0 1 2 3 4 5 6
OPTLIB1 OPTICAL + . . . . . . . . . . . . . . . . .
OPTLIB2 OPTICAL + . . . . . . . . . . . . . . . . .
OPTLIB3 OPTICAL + . . . . . . . . . . . . . . . . .
ATLLIB1 TAPE + + + . . . . . . . . . . . . . . . . .
MTLA0001 TAPE + - P . . . . . . . . . . . . . . . . .
MTLA0002 TAPE + - P . . . . . . . . . . . . . . . . .
PCTREUSE OPTICAL LIBRARY IS NOT A REAL LIBRARY
STDALONE OPTICAL LIBRARY IS NOT A REAL LIBRARY
1 1 1 2 2 2 2 2 2 2 2 3 3 3
LIBRARY CLASS SYSTEM= 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2
OPTLIB1 OPTICAL . . . . . . . . . . . . . . . . . .
OPTLIB2 OPTICAL . . . . . . . . . . . . . . . . . .
OPTLIB3 OPTICAL . . . . . . . . . . . . . . . . . .
ATLLIB1 TAPE + + . . . . . . . . . . . . . . . . .
MTLA0001 TAPE + - P . . . . . . . . . . . . . . . . .
MTLA0002 TAPE + - P . . . . . . . . . . . . . . . . .
PCTREUSE OPTICAL LIBRARY IS NOT A REAL LIBRARY
STDALONE OPTICAL LIBRARY IS NOT A REAL LIBRARY
***********************************************************************
. 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 TYE  TYE  DRV  DRV  DRV  SLOTS  SLOTS  VOLS
 tlibname  tdevtype  llll  mmmm  nnnn  oooooo  ppppppp  qqqqqqq  r  s
Operating the OAM address space 123
```
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 a 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.
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 SCRATCH 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   Y  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 used is displayed for a TS7720 (3957-VEA or VEB) or a TS7760 (3957-VEC) distributed library or for a TS7680 (3958-DE2); it indicates what percentage of cache the library has used.

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
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
```

Operating the OAM address space
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:

```plaintext
LIBRARY LI DISPDRV DD ,
library_name , MOUNTED M , ALL A ,
device_number ,
device_number,number_of_devices ,
device_number1-device_number2 ,
 ,L= a ,
name , name-a

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 133.

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:

<table>
<thead>
<tr>
<th>devnum</th>
<th>devtyp</th>
<th>libname</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
<th>ggggggg</th>
<th>h</th>
<th>mntvol</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVE</td>
<td>DEVICE</td>
<td>LIBRARY</td>
<td>ON</td>
<td>OFFREASON</td>
<td>LM</td>
<td>ICL</td>
<td>ICL</td>
<td>MOUNT</td>
<td>NUM</td>
<td>TYPE</td>
</tr>
</tbody>
</table>

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 80 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.
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.

Cartridge loader scratch media category:

**MEDIA1**
The cartridge loader of the tape drive is set to load with MEDIA1 scratch tapes if available.

**MEDIA2**
The cartridge loader of the tape drive is set to load with MEDIA2 scratch tapes if available.

**MEDIA3**
The cartridge loader of the tape drive is set to load with MEDIA3 scratch tapes if available.

**MEDIA4**
The cartridge loader of the tape drive is set to load with MEDIA4 scratch tapes if available.

**MEDIA5**
The cartridge loader of the tape drive is set to load with MEDIA5 scratch tapes if available.

**MEDIA6**
The cartridge loader of the tape drive is set to load with MEDIA6 scratch tapes if available.

**MEDIA7**
The cartridge loader of the tape drive is set to load with MEDIA7 scratch tapes if available.

**MEDIA8**
The cartridge loader of the tape drive is set to load with MEDIA8 scratch tapes if available.

**MEDIA9**
The cartridge loader of the tape drive is set to load with MEDIA9 scratch tapes if available.

**MEDIA10**
The cartridge loader of the tape drive is set to load with MEDIA10 scratch tapes if available.

**MEDIA11**
The cartridge loader of the tape drive is set to load with MEDIA11 scratch tapes if available.

**MEDIA12**
The cartridge loader of the tape drive is set to load with MEDIA12 scratch tapes if available.

**MEDIA13**
The cartridge loader of the tape drive is set to load with MEDIA13 scratch tapes if available.

**X'xxxx'**
The hexadecimal value of the assigned category is not recognized by this system.

**NONE**
For devices in an ATLDS, no category is assigned to the cartridge loader, and the cartridge loader is emptied. For devices in an MTL, indexing does not occur on this system; however, indexing may occur on other systems that own the volumes in the cartridge loader.

**ANY**
The cartridge loader may be loaded with any valid media type. This is 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.
Volume loaded in the cartridge loader.

At least one volume has been loaded in the cartridge loader.

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.

Tape drive is offline for CUIR reasons:

The tape drive is not offline for CUIR reasons.

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

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:

<table>
<thead>
<tr>
<th>NUM</th>
<th>TYPE</th>
<th>NAME</th>
<th>LI</th>
<th>OP</th>
<th>PT</th>
<th>AV</th>
<th>CATEGORY</th>
<th>LOAD</th>
<th>VOLUME</th>
</tr>
</thead>
<tbody>
<tr>
<td>0FC0</td>
<td>3490</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>A</td>
<td>NONE</td>
<td>N</td>
<td>TST211</td>
</tr>
<tr>
<td>0FC1</td>
<td>3490</td>
<td>ATLF4017</td>
<td>N</td>
<td>N</td>
<td>Y</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FD0</td>
<td>3590-E</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td>TST256</td>
</tr>
<tr>
<td>0FD1</td>
<td>3590-E</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>A</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FD2</td>
<td>3590-E</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FD3</td>
<td>3590-E</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FF0</td>
<td>3590-H</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td>TST384</td>
</tr>
<tr>
<td>0FF1</td>
<td>3590-H</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FF2</td>
<td>3590-H</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FF3</td>
<td>3590-H</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FE0</td>
<td>3590-1</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td>TST500</td>
</tr>
<tr>
<td>0FE1</td>
<td>3590-1</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FE2</td>
<td>3590-1</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>0FE3</td>
<td>3590-1</td>
<td>ATLF4017</td>
<td>Y</td>
<td>N</td>
<td>N</td>
<td>N</td>
<td>NONE</td>
<td>N</td>
<td></td>
</tr>
</tbody>
</table>

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 129.

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.

<table>
<thead>
<tr>
<th>CBR1230I Mounted status:</th>
</tr>
</thead>
<tbody>
<tr>
<td>DRIVE</td>
</tr>
<tr>
<td>devnum</td>
</tr>
</tbody>
</table>

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 devices 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 CL0, 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 devices 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 CL0, 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 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 CBR1130I in *z/OS MVS System Messages, Vol 4 (CBD-DMO)*.

**,DETAIL**

Displays the tape libraries associated with the tape storage groups.

**,L={a|name | name-a}**

Specifies where to display the results of the inquiry: the display area (L=a), the console name (L=name), or both the console name and the display area (L=name-a). The name parameter can be an alphanumeric character string.

To display status for an individual storage group, enter the following command:

```
DISPLAY SMS,STORGRP(storgrp_name),DETAIL
```

The following information is displayed:

```
CBR1130I OAM storage group status:
TAPE LIBRARY
STORGRP NAMES
sgname libname1 libname2 libname3 libname4
libname5 libname6 libname7 libname8
```

The fields displayed in each data line are as follows:

**sgname**

Name of the tape storage group

**libname1**

Names of the one to eight tape libraries associated with the storage group

The following is sample output of the `DISPLAY SMS,STORGRP(ALL),DETAIL` command:

```
CBR1130I OAM storage group status:
TAPE LIBRARY
STORGRP NAMES
TAPESG1 TAPELIB1
TAPESG2 TAPELIB1 TAPELIB2
TAPESG3 TAPELIB1 TAPELIB2 TAPELIB3
```

If ALL and DETAIL are specified with the STORGRP keyword and both object storage groups and tape storage groups are defined in the SMS configuration, object storage group information is displayed first followed by the tape storage group information similar to that shown in the sample above.

If ALL is specified but DETAIL is *not* specified with the STORGRP keyword and both object storage groups and tape storage groups are defined in the SMS configuration, then the status is combined in one display similar to that shown below.
The following is sample output from the DISPLAY SMS,STORGRP(ALL) command:

<table>
<thead>
<tr>
<th>STORGRP</th>
<th>TYPE</th>
<th>SYSTEM</th>
<th>BACKUP01</th>
<th>OBJECTB</th>
<th>STORGRP</th>
<th>TYPE</th>
<th>SYSTEM</th>
<th>TAPESG1</th>
<th>TAPE</th>
<th>TAPESG2</th>
<th>TAPE</th>
<th>TAPESG3</th>
<th>TAPE</th>
<th>T50DAS0</th>
<th>POOL</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 1 1 1 1 1</td>
<td></td>
<td></td>
<td>1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IGD002I</td>
<td>11.19.56</td>
<td>DISPLAY SMS</td>
<td></td>
<td></td>
<td></td>
<td>REVERSED 2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>STORGRP</td>
<td>TYPE</td>
<td>SYSTEM</td>
<td>BACKUP01</td>
<td>OBJECTB</td>
<td>STORGRP</td>
<td>TYPE</td>
<td>SYSTEM</td>
<td>TAPESG1</td>
<td>TAPE</td>
<td>TAPESG2</td>
<td>TAPE</td>
<td>TAPESG3</td>
<td>TAPE</td>
<td>T50DAS0</td>
<td>POOL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 1 1 1 1 1</td>
<td></td>
<td></td>
<td>1 1 1 1 1 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BACKUP01</td>
<td>OBJECTB</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBJSG01</td>
<td>OBJECT</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBJSG02</td>
<td>OBJECT</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>OBJSG03</td>
<td>OBJECT</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAPESG1</td>
<td>TAPE</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAPESG2</td>
<td>TAPE</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TAPESG3</td>
<td>TAPE</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T50DAS0</td>
<td>POOL</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*******************************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:

```
DISPLAY
D
SMS,
VOLUME
VOL
(volser)
,L={a | name | name-a}
```

**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:

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>volser</td>
<td>Volume serial number of the requested tape volume.</td>
</tr>
<tr>
<td>medtype</td>
<td>Media type of the tape volume, as follows:</td>
</tr>
<tr>
<td>MEDIA1</td>
<td>IBM Cartridge System Tape</td>
</tr>
<tr>
<td>MEDIA2</td>
<td>IBM Enhanced Capacity Cartridge System Tape</td>
</tr>
<tr>
<td>MEDIA3</td>
<td>IBM High Performance Cartridge Tape</td>
</tr>
<tr>
<td>MEDIA4</td>
<td>IBM Extended High Performance Cartridge Tape</td>
</tr>
<tr>
<td>MEDIA5</td>
<td>IBM Enterprise Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA6</td>
<td>IBM Enterprise WORM Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA7</td>
<td>IBM Enterprise Economy Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA8</td>
<td>IBM Enterprise Economy WORM Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA9</td>
<td>IBM Enterprise Extended Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA10</td>
<td>IBM Enterprise Extended WORM Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA11</td>
<td>IBM Enterprise Advanced Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA12</td>
<td>IBM Enterprise Advanced WORM Tape Cartridge</td>
</tr>
<tr>
<td>MEDIA13</td>
<td>IBM Enterprise Advanced Economy Tape Cartridge</td>
</tr>
<tr>
<td>UNKNOWN</td>
<td>No media type specified</td>
</tr>
<tr>
<td>INVALID</td>
<td>Media type specified is not valid</td>
</tr>
</tbody>
</table>
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 (CHECKPOINT 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.

TRKCMPAT (INCMPAT_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.

EXPPEND
The export of the logical volume is pending in the library.

INSERT
Volume has been put into the library, but has not yet been processed by software cartridge entry.
**MANEJECT**
Volume has been manually removed from the library. Volumes in this category are not processed by the host and remain in this category.

**NONE**
The volume does not reside in an automated tape library.

**NOTAVAIL**
OAM display processor was unable to obtain the volume data record from the tape library.

**PRIVATE**
Volume contains useful data and may be requested only by specific volser reference.

**SCRMED1**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library category for scratch volumes of media type MEDIA1.

**SCRMED2**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library category for scratch volumes of media type MEDIA2.

**SCRMED3**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA3.

**SCRMED4**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA4.

**SCRMED5**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA5.

**SCRMED6**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA6.

**SCRMED7**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA7.

**SCRMED8**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA8.

**SCRMED9**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA9.

**SCRMED10**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA10.

**SCRMED11**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA11.

**SCRMED12**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA12.

**SCRMED13**
Volume contains no useful data and may be requested only by nonspecific volser reference. The volume resides in the library manager category for scratch volumes of media type MEDIA13.

**UNKNOWN**
Hardware category is not recognized by software.
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

Compaction mode set during recording:

**YES**
Compaction

**NO**
No compaction

**UNKNOWN**
Compaction not specified

**INVALID**
Compaction specified is invalid

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

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

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

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

Date the volume was last entered into or ejected from a tape library, in ISO date format YYYY-MM-DD.

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.

Library manager storage group name.

Library manager storage class name.

Library manager management class name.

Library manager data class name.

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:

<table>
<thead>
<tr>
<th>VOLUME</th>
<th>MEDIA</th>
<th>STORAGE</th>
<th>LIBRARY</th>
<th>USE</th>
<th>W</th>
<th>C</th>
<th>SOFTWARE</th>
<th>LIBRARY TYPE</th>
<th>GROUP</th>
<th>NAME</th>
<th>ATR</th>
<th>P</th>
<th>P</th>
<th>ERR</th>
<th>STAT</th>
<th>CATEGORY</th>
</tr>
</thead>
<tbody>
<tr>
<td>LOG001</td>
<td>MEDIA2</td>
<td>TAPESG2</td>
<td>LIBVTS1</td>
<td>P</td>
<td>N</td>
<td>N</td>
<td>NOERROR</td>
<td>PRIVATE</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

-----------------------------------------------------------------------
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
-----------------------------------------------------------------------

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 D R,L, KEY=OAM
```

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 F OAM procname .identifier , STOP OAM
```

The syntax of the STOP OAM command to stop OAM is:
To stop OAM, enter the following command:

```
F OAM,STOP,OAM
```

The system displays the following messages indicating OAM termination status.

```
CBR0098I  OAM termination starting.
CBR1000I  OAM STOP command execution scheduled.
CBR0099I  OAM termination completed.
```

### Capturing OAM diagnostic data

OAM uses SVC dumps as a diagnostic tool for system hangs or performance problems. To capture this data, issue the DUMP command after the problem has been recreated or at the time of failure. OAM provides a streamlined version of the previous DUMP command. The `F OAM,DUMP,(operands)` command automatically collects all the pertinent data needed for diagnostic purposes without you having to key in all the correct parameters.

The syntax of the `F OAM,DUMP` command follows:

```
MODIFY F OAM, DUMP, (operands)
```

**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 up to 14 other address spaces that currently have work queued in the OAM address space.
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:

```
MODIFY F OAM, QUERY, ACTIVE, WAITING, SUMMARY, DETAIL, ALL
```

**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 proname, 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 | bbbbbbb | ccccccc |

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.

bbbbbbb
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.

ccccccc
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
```

Operating the OAM address space 147
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.

**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.
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 201.

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 209.

Cartridge eject (EJECT)

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

• Can eject a tape volume from a tape library. The tape volume record in the TCDB may be kept or purged. The cartridge eject installation exit is also called 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 217 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 162 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 165.

**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 170.

**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 172.

**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 174.

**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 176.

**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 178.
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 180.

LCS external services functions

An executable macro called CBRXLCS is used to invoke the functions provided by LCS External Services. The macro expansion sets parameter values in the LCS External Services parameter list (LCSPL), which is mapped by the CBRLCSPL macro, retrieves the entry point for LCS External Services, and branches to perform the requested function. See “CBRXLCS macro interface” on page 183 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 151 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= tapes-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 198), 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, EEFMT4, 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 (CBRXCUA) 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 (CBRXCUA)” on page
201 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 201.

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 156 provides the reason codes associated with each of the return codes returned by change use attribute processing. See “CBRXLCS return codes” on page 184 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>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful execution.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>4</td>
<td>Requested change to SCRATCH but volume was already SCRATCH.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5</td>
<td>Requested change to PRIVATE but volume was already PRIVATE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>8</td>
<td>Scratch volume threshold processing did not successfully complete. Check the console log for further diagnostic information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>131</td>
<td>Scratch volume threshold processing not performed because library was not operational.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>138</td>
<td>Library scratch count not updated in TCDB.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>14</td>
<td>Required use parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>15</td>
<td>Invalid value specified for use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td>Invalid expiration date specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>26</td>
<td>Library in which volume resides not defined to specified storage group.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>28</td>
<td>Invalid write protect value specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid parameter address for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>34</td>
<td>Invalid storage group name specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>38</td>
<td>Invalid compaction type specified in TDSI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>39</td>
<td>Invalid special attribute specified in TDSI.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40</td>
<td>Invalid combination of TDSI values specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>41</td>
<td>Ambiguous TDSI combination specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>43</td>
<td>Invalid pointer to TDSI specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>54</td>
<td>Storage group not of type tape.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>219</td>
<td>Invalid outboard policy management construct. (SC, MC, and DC)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>220</td>
<td>Mutually exclusive optional keywords specified. This reason code is returned if GETPOLICY is specified with GRPNAME, SCNNAME, MCNAME, or DCNAME.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>6</td>
<td>Request failed because CUA processing disabled for private to scratch requests.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>7</td>
<td>Installation exit vetoed the requested change.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>53</td>
<td>Library not defined to active configuration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58</td>
<td>Failure accessing volume record in TCDB.</td>
</tr>
</tbody>
</table>
Table 7. Change use attribute return and reason codes (continued)

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>59</td>
<td></td>
<td>60</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>60</td>
<td>Failure accessing SMS storage group constructs.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>63</td>
<td>Volume record not found in TCDB.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>64</td>
<td>Library record for specified volume not found in TCDB.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>65</td>
<td>No library attached at last IPL.</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td>66</td>
<td>Volume not found in library manager inventory.</td>
</tr>
<tr>
<td>82</td>
<td></td>
<td>67</td>
<td>Installation exit abended.</td>
</tr>
<tr>
<td>83</td>
<td></td>
<td>68</td>
<td>Installation exit returned bad data.</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td>69</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td>310</td>
<td></td>
<td>70</td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td>312</td>
<td></td>
<td>71</td>
<td>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).</td>
</tr>
<tr>
<td>313</td>
<td></td>
<td>72</td>
<td>Volume is currently in use.</td>
</tr>
<tr>
<td>322</td>
<td></td>
<td>73</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td>323</td>
<td></td>
<td>74</td>
<td>Unable to retrieve library policy constructs from a library that supports outboard policy management.</td>
</tr>
<tr>
<td>324</td>
<td></td>
<td>75</td>
<td>Volume expire time has not elapsed at the library.</td>
</tr>
<tr>
<td>325</td>
<td></td>
<td>76</td>
<td>I/O terminated due to timeout detection.</td>
</tr>
<tr>
<td>326</td>
<td></td>
<td>77</td>
<td>Selective device access control group denied request.</td>
</tr>
<tr>
<td>327</td>
<td></td>
<td>78</td>
<td>Selective device access control group is not valid.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>2</td>
<td>OAM control blocks not available.</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td>79</td>
<td>LCS External Services unable to establish an ESTAE.</td>
</tr>
<tr>
<td>81</td>
<td></td>
<td>80</td>
<td>LCS External Services unable to obtain storage for installation exit parameter list.</td>
</tr>
</tbody>
</table>

1Depending 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 157 provides the CBRXLCS Assembler macro syntax that is used to perform the manual cartridge entry function.

```assembler
CBRXLCS  TYPE=TAPE,LIBNAME=library-name,LIBLIST=volume-list-pointer [,EXITINFO=installation-exit-information]
```

**Figure 6. CBRXLCS MCE assembler macro syntax**

When a value or address is requested, the keyword operand may be:
• The name of the field that contains the requested value or address
• The number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field

**Parameter descriptions**

**TYPE=TAPE**
Specifies a request related to the TCDB.

**FUNC=MCE**
Specifies a request to enter a list of one or more volumes into a manual tape library.

**LIBNAME=library-name**
Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks.

**VOLLIST=volume-list-pointer**
Specifies a variable that contains the address of the list of volumes to be entered into the manual tape library.

The volume list mapping, LCSV and LCSMLIST, is declared in mapping macro CBRLCSPL. LCSV is the header for the volume list, and LCSMLIST maps the array of volumes and the associated information for each. Volume-list-pointer contains the address of the list header.

Each member of the volume list array contains the volume serial number, left-justified in a six-character field and padded on the right with blanks; a six-byte reserved area; a four-byte field for tape device selection information (TDSI); and two full words into which LCS External Services stores the return code and reason code for this volume.

**Processing the tape device selection information (TDSI)**
The tape device selection information for each volume is processed as follows:

• If a volume record exists for the volume to be entered into the manual tape library, all TDSI values are ignored and the values from the existing volume record are passed to the cartridge entry installation exit (CBRUXENT).

• If no volume record exists for the volume to be entered into the manual tape library, TDSI values are processed as follows:
  - Recording technology specified in TDSI is ignored. A volume's recording technology may be determined by using the library's default entry data class, if applicable, by a default recording technology based on the media type, or explicitly set by the CBRUXENT installation exit. If the volume is a SCRATCH volume, UNKNOWN is also a possible recording technology value.
    - If the volume is MEDIA1 and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, 36-track is passed to the exit. UNKNOWN can be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may set an applicable value (18-track, 36-track).
    - If the volume is MEDIA2, 36-track is passed to the exit because this is the only applicable recording technology.
    - If the volume is MEDIA3 or MEDIA4, and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, 128-track is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (128-track, 256-track, 384-track).
    - If the volume is MEDIA5, MEDIA6, MEDIA7, or MEDIA8 and the entry default data class is not defined for the library or is not applicable for the volume's media type, by default, EFMT1 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (EFMT1, EFMT2, EEFMT2, EFMT3, or EEFMT3).
- If the volume is MEDIA9 or MEDIA10 and the entry default data class is not defined for the library or not applicable for the volume’s media type, by default, EFMT2 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined. The installation exit may specify an applicable recording technology (EFMT2, EEFMT2, EFMT3, EEFMT3, EFMT4, or EEFMT4).

- If the volume is MEDIA11, MEDIA12 or MEDIA13 and the entry default data class is not defined for the library or not applicable for the volume’s media type, by default, EFMT4 is passed to the exit. UNKNOWN may be passed to the exit for a SCRATCH volume if the default data class is not defined.

- 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 alphabets or numerics. The volume serial may not contain any imbedded blanks.

The volume serial for each volume entered into a manual tape library may not be a duplicate of a known DASD volume, or a tape volume which resides in another tape library dataserver (according to the tape volume record in the TCDB).

If a volume record exists for a private volume and it contains a nonblank storage group name, the storage group name is validated. If the storage group is not "tape", is not defined to the active SMS configuration, or does not contain the library specified for the MCE request, the request fails and the volume is not entered into the library.
If a volume record exists in the TCDB for an MCE volume and the volume record indicates that the volume already resides in the specified library the entry for this volume fails (duplicate assumed).

If an error is encountered while processing one of the volumes, the return and reason codes for that volume are stored in the fields LCSMRET and LCSMREAS in the volume list array, and processing continues for the rest of the volumes. If an error occurs which causes cartridge entry to be disabled or suspended, no more volumes are processed and error return and reason codes are set for the remaining volumes in the list.

If a volume record exists for the volume entered into the manual tape library, tape device selection information is processed as shown in Table 8 on page 160.

<table>
<thead>
<tr>
<th>TDSI attribute</th>
<th>TDSI input</th>
<th>Default entry data class</th>
<th>Installation exit</th>
<th>Volume record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording technology</td>
<td>Ignored</td>
<td>Ignored</td>
<td>May override existing volume record</td>
<td>Updated only if installation exit makes change</td>
</tr>
<tr>
<td>Media type</td>
<td>Ignored</td>
<td>Ignored</td>
<td>Cannot override existing volume record</td>
<td>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</td>
</tr>
<tr>
<td>Compaction</td>
<td>Ignored</td>
<td>Not applicable</td>
<td>May override existing volume record</td>
<td>Updated only if installation exit makes change</td>
</tr>
<tr>
<td>Special attribute</td>
<td>Ignored</td>
<td>Not applicable</td>
<td>May override existing volume record</td>
<td>Updated only if installation exit makes change</td>
</tr>
</tbody>
</table>

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 160.

<table>
<thead>
<tr>
<th>TDSI attribute</th>
<th>TDSI input</th>
<th>Default entry data class</th>
<th>Installation exit</th>
<th>Volume record</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recording technology</td>
<td>Ignored</td>
<td>Can specify value</td>
<td>Can specify an applicable value, overriding the default value or library default entry data class value passed to the exit.</td>
<td>Created with value passed to installation exit or applicable value specified by installation exit.</td>
</tr>
<tr>
<td>Media type</td>
<td>May be specified</td>
<td>Used if no TDSI value specified</td>
<td>Can specify value if not provided in TDSI or default entry data class, or may override value from either source.</td>
<td>Created with value specified in TDSI or default entry data class or installation exit.</td>
</tr>
<tr>
<td>Compaction</td>
<td>Ignored</td>
<td>Not applicable</td>
<td>Can specify value.</td>
<td>Created with value specified by installation exit. If no value specified, set to UNKNOWN.</td>
</tr>
<tr>
<td>Special attribute</td>
<td>Ignored</td>
<td>Not applicable</td>
<td>Can specify value.</td>
<td>Created with value specified by installation exit. If no value specified, set to NONE.</td>
</tr>
</tbody>
</table>
**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 161 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 184. Also, for more information concerning other return and reason codes not specific to manual cartridge entry processing, see z/OS DFSMSdfp Diagnosis.

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful execution.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>8</td>
<td>Scratch volume threshold message processing did not successfully complete. Check the console log for further diagnostic information.</td>
</tr>
<tr>
<td>138</td>
<td></td>
<td></td>
<td>The library scratch volume count is not updated in TCDB.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td>9</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td>13</td>
<td></td>
<td>9</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td>17</td>
<td></td>
<td>11</td>
<td>Invalid volume serial number specified.</td>
</tr>
<tr>
<td>20</td>
<td></td>
<td>12</td>
<td>Required volume list not specified.</td>
</tr>
<tr>
<td>21</td>
<td></td>
<td>12</td>
<td>Required volume list not specified.</td>
</tr>
<tr>
<td>23</td>
<td></td>
<td>12</td>
<td>Required library name parameter not specified.</td>
</tr>
<tr>
<td>26</td>
<td></td>
<td>12</td>
<td>MCE library is not defined to storage group on tape volume record.</td>
</tr>
<tr>
<td>27</td>
<td></td>
<td>12</td>
<td>Invalid library name specified.</td>
</tr>
<tr>
<td>29</td>
<td></td>
<td>12</td>
<td>Invalid parameter address specified for LCSPL or VOLLIST.</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td>12</td>
<td>LCSPL or VOLLIST not aligned on fullword boundary.</td>
</tr>
<tr>
<td>34</td>
<td></td>
<td>12</td>
<td>Invalid storage group name.</td>
</tr>
<tr>
<td>35</td>
<td></td>
<td>12</td>
<td>Required media type not specified from any source.</td>
</tr>
<tr>
<td>53</td>
<td></td>
<td>12</td>
<td>Library not defined to active configuration.</td>
</tr>
<tr>
<td>54</td>
<td></td>
<td>12</td>
<td>Storage group specified on volume record is type tape.</td>
</tr>
<tr>
<td>92</td>
<td></td>
<td>12</td>
<td>Library specified is not an MTL.</td>
</tr>
<tr>
<td>94</td>
<td></td>
<td>12</td>
<td>Specified volume already resides in another tape library.</td>
</tr>
<tr>
<td>97</td>
<td></td>
<td>12</td>
<td>Volume of same name is known DASD volume.</td>
</tr>
<tr>
<td>130</td>
<td></td>
<td>12</td>
<td>Specified volume already resides in this tape library</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>60</td>
<td>Failure accessing SMS storage group constructs.</td>
</tr>
<tr>
<td>75</td>
<td></td>
<td>60</td>
<td>UCB scan failure when attempting to determine volume serial uniqueness.</td>
</tr>
<tr>
<td>78</td>
<td></td>
<td>60</td>
<td>Catalog failure when attempting to retrieve the volume record.</td>
</tr>
</tbody>
</table>
### Table 10. Manual cartridge entry return and reason codes (continued)

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>79</td>
<td></td>
<td></td>
<td>Catalog failure when attempting to update the volume record.</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td></td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td>95</td>
<td></td>
<td></td>
<td>Installation exit vetoed the entry of the volume into the library.</td>
</tr>
<tr>
<td>96</td>
<td></td>
<td></td>
<td>Installation exit said to ignore the volume.</td>
</tr>
<tr>
<td>310</td>
<td></td>
<td></td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td>321</td>
<td></td>
<td></td>
<td>The media type returned from the Installation Exit does not match the</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>existing media type defined for the volume record in TCDB.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>2</td>
<td>OAM control block structure not available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1 Depending on the CBRXLCS function being performed, one or more OAM</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>initialization-related control blocks might be required. First, verify</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>whether the OAM1 subsystem entry was specified in the IEFSSNx PARMLIB</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>member. Then verify whether the OAM address space has been started.</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td>LCS External Services unable to establish an ESTAE.</td>
</tr>
<tr>
<td>90</td>
<td></td>
<td></td>
<td>Cartridge entry disabled due to an error in the installation exit.</td>
</tr>
<tr>
<td>91</td>
<td></td>
<td></td>
<td>Cartridge entry temporarily suspended.</td>
</tr>
</tbody>
</table>

#### Ejecting a tape cartridge

Figure 7 on page 162 provides the CBRXLCS Assembler macro syntax that is used to perform the cartridge eject function.

```assembler
CBRXLCS TYPE=TAPE,FUNC=EJECT,VOLUME=volume-serial-number [,EJECTOPT={KEEP | PURGE | QUERY}] [,BULKJECT={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.

**BULKJEKCT=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.

**BULKJEKCT=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, BULKJEKCT 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 219.
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 164 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 165. For more comprehensive information on the CBRXLCS return codes, see “CBRXLCS return codes” on page 184.

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

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successfully scheduled.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid parameter address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>201</td>
<td>Volume already ejected (not in library).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>202</td>
<td>Invalid value specified for eject option.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>203</td>
<td>Invalid value specified for bulk eject.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>204</td>
<td>The userid specified contains all binary zeroes or blanks.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>45</td>
<td>Library name as defined in volume record is unknown in SMS configuration.</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td></td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td>300</td>
<td></td>
<td></td>
<td>OAM abend during eject request processing.</td>
</tr>
<tr>
<td>302</td>
<td></td>
<td></td>
<td>Eject request already pending for volume.</td>
</tr>
<tr>
<td>303</td>
<td></td>
<td></td>
<td>Unable to make user address space nonswappable.</td>
</tr>
<tr>
<td>304</td>
<td></td>
<td></td>
<td>TCDB access error in OAM.</td>
</tr>
<tr>
<td>305</td>
<td></td>
<td></td>
<td>TCDB authorization error in OAM.</td>
</tr>
<tr>
<td>306</td>
<td></td>
<td></td>
<td>OAM internal error.</td>
</tr>
<tr>
<td>307</td>
<td></td>
<td></td>
<td>Volser not in TCDB.</td>
</tr>
</tbody>
</table>
Table 11. Cartridge eject return and reason codes (continued)

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>310</td>
<td></td>
<td></td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>2</td>
<td>OAM control block structure not available.¹</td>
</tr>
<tr>
<td>80</td>
<td></td>
<td></td>
<td>LCS External Services unable to establish an ESTAE.</td>
</tr>
<tr>
<td>400</td>
<td></td>
<td></td>
<td>OAM initialized with null configuration (no libraries).</td>
</tr>
<tr>
<td>401</td>
<td></td>
<td></td>
<td>Library not accessible: offline, pending offline, or not operational.</td>
</tr>
<tr>
<td>402</td>
<td></td>
<td></td>
<td>Vision system inoperative.</td>
</tr>
<tr>
<td>403</td>
<td></td>
<td></td>
<td>Eject processing has been disabled because an error in the eject installation exit has been detected.</td>
</tr>
<tr>
<td>404</td>
<td></td>
<td></td>
<td>OAM address space not available.</td>
</tr>
</tbody>
</table>

¹Depending 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 165 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

<table>
<thead>
<tr>
<th>If the return code is...</th>
<th>And the reason code is...</th>
<th>It means...</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>The volume is library-resident. For the library in which the volume resides, an eject request was not found on the OAM eject queues.</td>
</tr>
<tr>
<td>12</td>
<td>302</td>
<td>The eject request is still pending.</td>
</tr>
<tr>
<td>8</td>
<td>201</td>
<td>The pending eject has completed.</td>
</tr>
<tr>
<td>12</td>
<td>307</td>
<td>The pending eject has completed.</td>
</tr>
</tbody>
</table>

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 194 for more information on this macro.
Figure 8 on page 166 provides the CBRXLCS Assembler macro syntax that is used to perform the query volume residence function:

```
CBRXLCS TYPE=TAPE
  ,FUNC=QVR
  ,VOLUME=volume-serial-number
  [,LIBNAME={library-name}]
  [,TCDBCHK={YES | NO}]
  [,VOLINFO={YES | NO}]
  [,SUBPOOL={spno}]
  [,LOC={ANY | BELOW}]
  [,STORADDR={TVI-storage-address}]
```

Figure 8. CBRXLCS QVR assembler macro syntax

When a value is requested, the keyword operand may be:

- The name of the field that contains the requested value
- The number, in parentheses, of a general register in the range of 2 through 12 that contains the address of the field

Parameter descriptions

**TYPE=TAPE**
- Specifies a request related to the TCDB.

**FUNC=QVR**
- Specifies a request to return the name and type of library in which the given volume is resident.

**VOLUME=volume-serial-number**
- Specifies the name of a character variable (six-byte length) that contains the volume serial number of the volume whose residence is to be determined. The volume serial number must be left justified in the field and padded on the right with blanks.

**LIBNAME=library-name**
- Specifies the name of a character variable (eight-byte length), that contains the name of the library where the volume is expected to reside. The library name must be left justified in the field and padded on the right with blanks.

If the volume has no volume record in the TCDB, QVR checks for the volume in the specified library. If the volume has a record in the TCDB, QVR validates that the specified library and the library indicated on the volume record match. It also checks to see the whether the volume physically resides in the library specified by this parameter.

**Note:** A library name of SHELF is considered invalid. The SHELF library name is reserved for shelf-resident volumes.

**TCDBCHK=YES | NO**
- If this optional parameter is omitted or YES is specified, the QVR function attempts to retrieve the specified volume's TCDB record. TCDBCHK=YES is the default.
- If this optional parameter is specified and NO is specified, the QVR function does not retrieve the specified volume's TCDB record from the catalog and only makes the call to the library manager of the specified library. With VOLINFO=YES specified, the TVI will contain only information from the library manager inventory of the library specified.
- If the 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 185) are updated:

- The name of library in which the volume resides is returned in field LCSLIBNM. This may be the library name found in the volume record or the library name specified in the QVR invocation. TVILIBNM contains the library name stored in the TCDB for comparison.
- If the library is an ATLDS, the flag LCSATL is turned on.
- If the library is an MTL, the flag LCSMTL is turned on.
- If a console name has been specified for the library, it is returned in LCSCONSN. Otherwise, LCSCONSN is set to blanks.
- If VOLINFO=YES was specified, LCSTVI@ contains the address of the requested volume information. The information is mapped by macro CBRTVI. See “Tape volume information (CBRTVI macro)” on page 194 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 TVICCOPY 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 168** 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 184. Also, for more information concerning other return and reason codes not specific to the query volume residence function, see z/OS DFSMSdfp Diagnosis.

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful execution.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• If volume resides in an MTL,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ if VOLINFO=YES was specified, TVI contains the volume TCDB record information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ if LIBNAME was specified, the library name specified matches the volume record library name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• If the volume resides in an ATL,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ if VOLINFO=YES was specified, TVI contains TCDB and library manager information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ 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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ if LIBNAME.TCDBCHK=NO and VOLINFO=YES was specified, the TVI contains library manager information only.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>‒ 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.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>52</td>
<td>Volume is shelf-resident. If VOLINFO=YES was specified, TVI contains only TCDB information. LIBNAME was not specified.</td>
</tr>
<tr>
<td>61</td>
<td></td>
<td></td>
<td>Unable to access library manager. If VOLINFO=YES, TVI contains only TCDB information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If LIBNAME was specified, the library name specified and the volume record library name matched.</td>
</tr>
<tr>
<td>63</td>
<td></td>
<td></td>
<td>Volume record for specified volume not found in TCDB. If VOLINFO=YES was specified, no volume information is returned.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If LIBNAME was specified and the library specified was an MTL, no further validation is performed.</td>
</tr>
<tr>
<td>70</td>
<td></td>
<td></td>
<td>Volume not found in library manager inventory. If VOLINFO=YES was specified, TVI contains only TCDB information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>If LIBNAME was specified, the library name specified and the volume record library name matched.</td>
</tr>
<tr>
<td>Return code</td>
<td>Error type</td>
<td>Reason code</td>
<td>Meaning</td>
</tr>
<tr>
<td>-------------</td>
<td>-----------------</td>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>134</td>
<td></td>
<td>134</td>
<td>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.</td>
</tr>
<tr>
<td>135</td>
<td></td>
<td>135</td>
<td>Volume record was found in the TCDB. LIBNAME was specified and the volume was found in the specified library. 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.</td>
</tr>
<tr>
<td>136</td>
<td></td>
<td>136</td>
<td>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.</td>
</tr>
<tr>
<td>137</td>
<td></td>
<td>137</td>
<td>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.</td>
</tr>
<tr>
<td>139</td>
<td></td>
<td>139</td>
<td>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.</td>
</tr>
<tr>
<td>323</td>
<td></td>
<td>323</td>
<td>Unable to retrieve policy names from the library.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27</td>
<td>Invalid library name specified. SHELF is a reserved name and not allowed for library name specification.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid address specified for LCSPL or mapping macro.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL or TVI not aligned on fullword boundary.</td>
</tr>
<tr>
<td>216</td>
<td></td>
<td>216</td>
<td>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.</td>
</tr>
<tr>
<td>221</td>
<td></td>
<td>221</td>
<td>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.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>45</td>
<td>Library name as defined in volume record is unknown in the SMS configuration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58</td>
<td>Failure accessing volume record in TCDB.</td>
</tr>
<tr>
<td>Return code</td>
<td>Error type</td>
<td>Reason code</td>
<td>Meaning</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
<td>---------</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td>59</td>
<td>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.</td>
</tr>
<tr>
<td>64</td>
<td></td>
<td>64</td>
<td>Library record not found for specified library.</td>
</tr>
<tr>
<td>65</td>
<td></td>
<td>65</td>
<td>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.</td>
</tr>
<tr>
<td>81</td>
<td></td>
<td>81</td>
<td>GETMAIN failed for TVI storage.</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td>310</td>
<td></td>
<td>310</td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td>319</td>
<td></td>
<td>319</td>
<td>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.</td>
</tr>
<tr>
<td>320</td>
<td></td>
<td>320</td>
<td>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.</td>
</tr>
<tr>
<td>322</td>
<td></td>
<td>322</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>80</td>
<td>LCS External Services unable to establish an ESTAE.</td>
</tr>
</tbody>
</table>

**Testing the eligibility of a volume**

Figure 9 on page 170 provides the CBRXLCS Assembler macro syntax that is used to perform the test volume eligibility function.

```assembler
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 171 represents the reason codes associated with each of the return codes returned by the test volume eligibility function. See “CBRXLCS return codes” on page 184 for more information.

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>The volume is eligible to be mounted on the device.</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>51</td>
<td>Volume is ineligible because its use attribute is SCRATCH; for example, this is a specific request for a scratch volume.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52</td>
<td>Volume is ineligible because it is not library resident but the device is defined to a tape library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>55</td>
<td>Volume is ineligible because it is library resident but the device is not defined to the same tape library.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>18</td>
<td>Required UCB address not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>19</td>
<td>Invalid address specified for UCB.</td>
</tr>
</tbody>
</table>
Table 14. Test Volume eligibility return and reason codes (continued)

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>29</td>
<td></td>
<td></td>
<td>Invalid parameter address specified for LCSPL.</td>
</tr>
<tr>
<td>30</td>
<td></td>
<td></td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>58</td>
<td>Failure accessing the volume record in TCDB.</td>
</tr>
<tr>
<td>59</td>
<td></td>
<td></td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td>64</td>
<td></td>
<td></td>
<td>Unable to determine in which library the volume resides.</td>
</tr>
<tr>
<td>84</td>
<td></td>
<td></td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td>310</td>
<td>Environment</td>
<td>80</td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
</tbody>
</table>

Exporting logical volumes from a VTS

Figure 10 on page 172 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 173 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 184 for more information.

Table 15. EXPORT return and reason codes

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successfully scheduled.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>45</td>
<td>Library name as defined in volume record not found in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52</td>
<td>Volume is not library resident.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58</td>
<td>Failure accessing volume record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>59</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>63</td>
<td>Volume record not found in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70</td>
<td>Volume does not exist in library manager inventory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>310</td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>312</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>313</td>
<td>Volume is currently in use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>314</td>
<td>Import/Export already in progress or host processing not complete.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>315</td>
<td>Not enough physical drives available in VTS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>316</td>
<td>Export operation not in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>317</td>
<td>No scratch stacked volume available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>322</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>326</td>
<td>Selective device access control group denied request.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>327</td>
<td>Selective device access control group is not valid.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>2</td>
<td>OAM control block structure not available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>LCS External Services unable to establish ESTAE.</td>
</tr>
</tbody>
</table>
Table 15. EXPORT return and reason codes (continued)

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>93</td>
<td></td>
<td></td>
<td>Library is offline, pending offline, or not operational.</td>
</tr>
<tr>
<td>403</td>
<td></td>
<td></td>
<td>Eject processing has been disabled because an error in the eject installation exit has been detected.</td>
</tr>
<tr>
<td>404</td>
<td></td>
<td></td>
<td>OAM address space not available.</td>
</tr>
</tbody>
</table>

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 IEFSSNx member. Then verify whether the OAM address space has been started.

Importing logical volumes into a VTS

Figure 11 on page 174 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 (CBRXENT) 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 175 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 184 for more information.

<table>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successfully scheduled.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
<td>Required volume parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
<td>Invalid volume serial specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>45</td>
<td>Library name as defined in volume record not found in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52</td>
<td>Volume is not library resident.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>58</td>
<td>Failure accessing volume record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>59</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>63</td>
<td>Volume record not found in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>70</td>
<td>Volume does not exist in library manager inventory.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>310</td>
<td>Media type or recording technology not supported at this software level.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>312</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>313</td>
<td>Volume is currently in use.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>314</td>
<td>Import/Export already in progress or host processing not complete.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>315</td>
<td>Not enough physical drives available in VTS.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>316</td>
<td>Import operation not in progress.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>317</td>
<td>No volumes in the import category or no scratch stacked volumes available.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>318</td>
<td>Maximum number of logical volumes defined to library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>322</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>2</td>
<td>OAM control block structure not available.¹</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80</td>
<td>LCS External Services unable to establish ESTAE.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93</td>
<td>Library is offline, pending offline or not operational.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>404</td>
<td>OAM address space not available.</td>
</tr>
</tbody>
</table>

¹Depending 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 176 provides the CBRXLCS Assembler macro syntax that is used to perform the PTPMC function.

```
CBRXLCS TYPE=TAPE
   ,FUNC=PTPMC
   ,LIBNAME=library-name
   [,IOLIB={PRIMARY | PREFERRED | BALANCED | DEFAULT}]
   [,COPYMODE={IMMEDIATE | DEFERRED | DEFAULT}]
   [,DEFVALUE=deferred-priority-threshold]
   [,COPYOPER={ENABLE | DISABLE}]
   [,ACCESS=RWDISCON]
```

Figure 12. Peer-to-Peer VTS mode control (PTPMC) assembler macro syntax

When a value is requested, the keyword operand may be one of the following:

- The name of the field that contains the requested value
- The number, in parentheses, of a general register in the range of 2–12 that contains the address of the field

Required parameters

**TYPE=TAPE**
   Specifies a request related to the TCDB.

**FUNC=PTPMC**
   Specifies a request to change current mode settings of the Peer-to-Peer VTS library.

**LIBNAME=library-name**
   Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks. Unless explicitly specified with the parameter, the library name specified can be either a distributed library or a composite library.

Optional parameters

At least one of the following optional keywords must be specified with the function PTPMC:

- **ACCESS**
- **COPYMODE**
- **COPYOPER**
- **IOLIB**

If an optional keyword is not specified, the current setting for that option is retained. The operational modes specified are applied to all IBM TotalStorage™ Virtual Tape Controllers (AX0).

**IOLIB=PRIMARY**
   Specifies a request to set the distributed library that is to be selected for all host I/O operations; this makes the selected library the master library. During mount processing, if the primary VTS is not available, the mount request is failed. If the VTS does not have a valid version of the volume, and a
valid version is available on another VTS, a copy operation is performed as part of the mount process. If a valid version cannot be copied, the mount is failed. If the specified VTS does not have the needed volume in cache, and it is in cache in another VTS, a copy operation is also performed. If the needed volume is not in cache in any available VTS, a recall is performed on the specified VTS. The library specified for LIBNAME must be a distributed library.

**Note:** If you are setting IOLIB=PRIMARY and the specified distributed library is not currently the master library, the completion of this request can take up to 20 minutes.

**IOLIB=PREFERRED**
Specifies a request to set the preferred distributed library for host I/O operations. The preferencing is honored as long as the VTS library specified is available and has a valid version of the volume in its cache, and as long as another available VTS does not have the volume in its cache. The library specified for LIBNAME must be a distributed library.

**IOLIB=BALANCED**
Specifies a request to let the library balance the workload across all the VTS libraries in the Peer-to-Peer VTS configuration. The balance of the workload is the primary criterion for selection of the VTS to perform host I/O operations.

**IOLIB=DEFAULT**
Specifies a request to use the customer engineer's default I/O selection setting on the AX0s for host I/O operations.

**COPYMODE=IMMEDIATE**
Specifies a request to set the copy mode to IMMEDIATE. With this setting, a copy of the data is made upon receiving the host rewind/unload (RUN) command. The completion of the rewind/unload (RUN) command is held until the copy has been made.

**COPYMODE=DEFERRED**
Specifies a request to set the copy mode to DEFERRED. With this setting, upon receiving the host rewind/unload (RUN) command, the copying of the data is queued.

**COPYMODE=DEFAULT**
Specifies a request to use the customer engineer's copy mode setting and the customer engineer's deferred mode priority threshold value on the AX0s.

**DEFVALUE=deferred-priority-threshold**
Specifies the name of a bit variable (1-byte length) that contains the number of hours between 0 and 255 for the deferred copy mode priority threshold value. If a copy operation has been queued longer than the number of hours specified by the deferred copy mode priority threshold value, when it is selected for processing, it is given a higher I/O priority than host I/O operations. This specified parameter value affects copy operations that are initiated after the successful completion of this command.

This parameter is only applicable with the COPYMODE=DEFERRED specification and is ignored with any other FUNC=PTPMC specification. If COPYMODE=DEFERRED is specified without this parameter, the current deferred mode priority threshold value is retained.

**COPYOPER=ENABLE**
Specifies a request to enable copy operations that have been previously disabled.

**COPYOPER=DISABLE**
Specifies a request to disable copy operations. Copies currently in progress are completed. Subsequent copies are queued to be performed later when copy operations are enabled again.

**ACCESS=RWDISCON**
Specifies a request to enable the access mode of Read/Write Disconnected, a special mode that allows controlled access to data when one or more elements of a PTP VTS become unavailable and prevent normal operations. The Read/Write Disconnected mode allows logical volumes to be read, modified, or rewritten, unless the volumes are known to be invalid. This mode forces the available VTS to become the master; it should only be set for one VTS. This mode is no longer in effect when communication with both VTSs has been established and token updates have been completed.
The library specified for LIBNAME must be a distributed library. IOLIB, COPYMODE, and COPYOPER specifications are ignored at the library when the ACCESS keyword is specified.

**Note:** Check with your hardware support center for the availability of the Read/Write Disconnected option through this interface. If the installed microcode does not support this option, it will be ignored.

**Return codes for CBRXLCS PTPMC**

Table 17 on page 178 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>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>9</td>
<td>No warnings returned by PTPMC.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23</td>
<td>Required library name parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27</td>
<td>Invalid library name.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid parameter address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>217</td>
<td>At least one optional keyword must be specified with function.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>59</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64</td>
<td>Library record not found in TCDB for requested library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>312</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>322</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>80</td>
<td>LCS External Services unable to establish ESTAE.</td>
</tr>
</tbody>
</table>

For additional information on using the CBRXLCS macro, see “Using the CBRXLCS macro in an assembler environment” on page 183.

**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 179 provides the CBRXLCS Assembler macro syntax that is used to perform the PTPDATA function.
Figure 13. Peer-to-Peer VTS data (PTPDATA) assembler macro syntax

When a value is requested, the keyword operand may be one of the following:

- The name of the field that contains the requested value
- The number, in parentheses, of a general register in the range of 2–12 that contains the address of the field

**Required parameters**

**TYPE=TAPE**

Specifies a request related to the TCDB.

**FUNC=PTPDATA**

Specifies a request for Peer-to-Peer VTS library information.

**LIBNAME=library-name**

Specifies the name of a character variable (eight-byte length) that contains the fully-specified library name. The library name must be left justified in the field and padded on the right with blanks. The library name specified must be a composite Peer-to-Peer library.

**DATATYPE=MODE**

Specifies a request for Peer-to-Peer VTS library operating mode information. The information is returned in mapping macro CBRTDI pointed to by LCSTDI@ in the LCSPL output parameter of the CBRLCSPL mapping macro.

**DATATYPE=DEVICE**

Specifies a request for Peer-to-Peer VTS library device information. The information is returned in mapping macro CBRTDI pointed to by LCSTDI@ in the LCSPL output parameter of the CBRLCSPL mapping macro.

**Optional parameters**

**SUBPOOL=subpool-number**

Specifies the name of a bit variable (1-byte length) that contains the number of the subpool from which storage for the requested information is obtained. If no subpool is specified, storage is obtained from subpool 0 in the key of the caller.

**LOC=BETWEEN | ANY**

BETWEEN 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 180 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>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful.</td>
</tr>
<tr>
<td>4</td>
<td>Warning</td>
<td>9</td>
<td>No warnings returned by PTPDATA.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>23</td>
<td>Required library name parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27</td>
<td>Invalid library name specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid parameter address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>218</td>
<td>Required DATATYPE keyword not specified.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>59</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64</td>
<td>Library record not found in TCDB for requested library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>81</td>
<td>Unable to obtain storage for TDI information.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>312</td>
<td>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).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>322</td>
<td>Command rejected by the library.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>80</td>
<td>LCS External Services unable to establish ESTAE.</td>
</tr>
</tbody>
</table>

### 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 180 provides the CBRXLCS Assembler macro syntax that is used to perform the OLN function.

```assembly
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 182 shows the fields that contain the information returned by the OLN function.

**Table 19. OLN function fields**

<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>LCSLIBNM</td>
<td>Library name</td>
</tr>
<tr>
<td>LCSLBID</td>
<td>Library ID</td>
</tr>
<tr>
<td>LCSCONSN</td>
<td>Console name</td>
</tr>
<tr>
<td>LCSLOPM</td>
<td>Outboard policy management indicator</td>
</tr>
<tr>
<td>LCSATL, LCSMTL, LCSVTS, LCSVDL, LCSVCL, LCSVE</td>
<td>Library type indicators</td>
</tr>
<tr>
<td>LCSCOMPL</td>
<td>Composite library associated with the specified distributed library</td>
</tr>
</tbody>
</table>

**Note:**

1. If you specify the library name when invoking the OLN function, the library ID is returned. If you specify the library ID when invoking the OLN function, the library name is returned.
2. A 3494 VTS tape library has both the LCSATL and the LCSVTS library type indicators set on.
3. A 3494 Peer-to-Peer VTS library has the LCSATL, LCSVTS, and either the LCSVDL or the LCSVCL library type indicators set on.
4. A TS7700 Virtualization Engine (3957-V0x or 3957-VEx) has the LCSATL, LCSVTS, LCSVE and either the LCSVDL or the LCSVCL library type indicators set on.
5. If the specified LIBNAME or LIBID is a distributed library (LCSVDL), LCSCOMPL contains the associated 8-CHAR composite library. If the associated composite library cannot be determined “UNKNOWN” will be returned in LCSCOMPL.
Return and reason codes for CBRXLCS OLN

Table 20 on page 183 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>
<thead>
<tr>
<th>Return code</th>
<th>Error type</th>
<th>Reason code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Successful</td>
<td>0</td>
<td>Successful.</td>
</tr>
<tr>
<td>8</td>
<td>Invalid request</td>
<td>9</td>
<td>Required type parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>10</td>
<td>Mutually exclusive required parameters specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>11</td>
<td>Invalid value specified for type.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>12</td>
<td>Required function parameter not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>13</td>
<td>Invalid value specified for function.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>27</td>
<td>Invalid library name specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>29</td>
<td>Invalid parameter address specified for LCSPL.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>30</td>
<td>LCSPL not aligned on fullword boundary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32</td>
<td>Required library ID/library name not specified.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>33</td>
<td>Invalid library ID specified.</td>
</tr>
<tr>
<td>12</td>
<td>Failure</td>
<td>59</td>
<td>Failure accessing library record in TCDB.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>60</td>
<td>Failure accessing the SMS storage group constructs.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>61</td>
<td>Device services failure.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>62</td>
<td>Specified library is not defined to active configuration.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>64</td>
<td>Library record not found in TCDB for requested library.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>65</td>
<td>Library logical type not defined.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>84</td>
<td>Abend occurred during LCS External Services processing.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>93</td>
<td>Library is not operational.</td>
</tr>
<tr>
<td>16</td>
<td>Environment</td>
<td>80</td>
<td>LCS External Services unable to establish ESTAE.</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>CBRXLCS</th>
<th>MF = (L, static-list-name)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBRXLCS</td>
<td>MF = (L, dynamic-list-name)</td>
</tr>
</tbody>
</table>

**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:

<table>
<thead>
<tr>
<th>CBRXLCS</th>
<th>keywords, MF = (M, dynamic-list-name, COMPLETE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBRXLCS</td>
<td>keywords, MF = (E, dynamic-list-name, COMPLETE)</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
</tr>
<tr>
<td>4</td>
</tr>
<tr>
<td>8</td>
</tr>
<tr>
<td>12</td>
</tr>
<tr>
<td>16</td>
</tr>
</tbody>
</table>

See the “CBRXLCS REASON CODES” area in “LCS external services parameter list (CBRLCSPL macro)” on page 185 for a specific description of XLCS reason codes. Topic CBRXLCS return and reason codes in z/OS DFSMSdfp Diagnosis also contains descriptions of XLCS return and reason codes.
**CBRXLCS execution environment**

The following execution environment is required for use by the CBRXLCS macro:

- Task mode
- Unlocked
- Noncross-memory mode (HASN = PASN = SASN)
- 24-bit or 31-bit addressing mode
- Primary ASC mode (not AR mode)
- You must also have TESTAUTH authorization.

**LCS external services parameter list (CBRLCSPL macro)**

The LCS External Services Parameter List (LCSPL), mapped by macro CBRLCSPL, is used to pass parameters to the LCS External Services, and to pass return and reason codes and other information back to the caller.

The storage for the LCSPL must be aligned to a fullword boundary. If this is not the case, an error is returned and the requested function is not performed.

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.

```assembly
*---------------------------------------------------------------------*
*                                                                     *
*        LIBRARY CONTROL SYSTEM (LCS) PARAMETER LIST                  *
*                                                                     *
*---------------------------------------------------------------------*
LCSPL    DSECT ,                    LCS PARAMETER LIST
SPACE 1
*---------------------------------------------------------------------*
*                                                                     *
*        CBRXLCS OUTPUT PARAMETERS                                    *
*                                                                     *
*---------------------------------------------------------------------*
LCSOPARM DS    0F                   CBRXLCS OUTPUT PARAMETER SECTION
LCSLIBNM DS    CL8                  LIBRARY NAME
LCSCONSN DS    CL8                  CONSOLE NAME
LCSLIBD 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
*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
LCSVSE   EQU   X'02'                ON IF VTS VIRTUALIZATION ENGINE
DS    XL1                  OUTPUT FLAGS
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
LCSSRCODE DS    F                    CBRXLCS RETURN CODE
LCSRREAS 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 LCSSRCODE UPON                  *
```
* COMPLETION OF LCS EXTERNAL SERVICES PROCESSING *
* *
*---------------------------------------------------------------------*
* *
LCSSUCC EQU 0 SUCCESSFUL EXECUTION
LCSWARN EQU 4 REQUEST COMPLETED WITH WARNING
* CONDITION
LCSIREQ EQU 8 INVALID REQUEST
LCSFAIL EQU 12 REQUEST FAILED
LCSENVIR EQU 16 INVALID ENVIRONMENT
 *
* CBRXLCS INPUT PARAMETERS *
* (INITIALIZED BY THE CBRXLCS MACRO EXPANSION)
* *
LCIIPARM DS F CBRXLCS INPUT PARAMETER SECTION
LCSSFGL1 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'00001000' VOLINFO=YES SPECIFIED
  LCS_USERID EQU B'00000100' USERID SPECIFIED (FUNC EJECT)
  LCS_CANCEL EQU B'00000010' 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
  *
  LGPS 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' SCNAMES 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
*
LCSSFNC DS XL1 REQUEST FUNCTION
*
LCSTVE EQU 1 TEST VOLUME ELIGIBILITY
Library control system (LCS) external services

---

LCSCUA EQU 3  \text{CHANGE USE ATTRIBUTE}
LCSONL EQU 4  \text{OBTAIN LIBRARY NAME INFORMATION}
LCSMCE EQU 5  \text{MANUAL CARTRIDGE ENTRY}
LCSQVR EQU 6  \text{QUERY VOLUME RESIDENCE}
LCSEJECT EQU 7  \text{EJECT VOLUME}
LCSIMPRT EQU 8  \text{IMPORT}
LCSEXPT EQU 9  \text{EXPORT}
LCPTPMC EQU 10  \text{PEER-TO-PEER MODE CONTROL}
LCPTPDT EQU 11  \text{PEER-TO-PEER DATA REQUEST}

* * * *

* OTHER INPUT PARAMETERS AND CONSTANTS USED TO INITIALIZE THEM
* (INITIALIZED BY THE CBXLCS MACRO EXPANSION)
* *
* * * *

LCUSE DS XL1 \text{USE ATTRIBUTE TYPE}
* VALUES ASSIGNED TO LCUSE
LCSPRIV EQU 1 \text{USE ATTRIBUTE OF PRIVATE}
LCCSSCR EQU 2 \text{USE ATTRIBUTE OF SCRATCH}

*t*
LCSSPNUM DS XL1 \text{SUBPOOL NUMBER IN WHICH TO OBTAIN}
* STORAGE FOR TVI/TDI

*t*
LCSTOR@ DS A \text{POINTER TO STORADDR STORAGE}
LCSEXPT DS XL4 \text{EXPIRATION DATE}
LCSVTPY DS A \text{POINTER TO THE TAPE DEVICE}
* SELECTION INFORMATION

*t*
LCSCB@ DS A \text{UCB ADDRESS FOR TAPE DRIVE WHOSE}
* ELIGIBILITY IS TO BE TESTED

LCVOL@ DS A \text{POINTER TO A LIST OF VOLUME SERIAL}
* NUMBERS

*t*
LCSPRIV DS CL8 \text{USERID (FUNCTION EJECT)}
LCVSOLSR DS CL6 \text{TAPE VOLUME SERIAL NUMBER}
LCSWRTPR DS CL1 \text{WRITE PROTECTION STATUS}
* VALUES ASSIGNED TO LCSWRTPR

*t*
LCSPWYES EQU C'Y' \text{WRITE PROTECT STATUS YES}
LCSPNO EQU C'N' \text{WRITE PROTECT STATUS NO}
* LCSDATAT DS XL1 \text{PEER-TO-PEER DATA TYPE}
* VALUES ASSIGNED TO LCSDATAT

*t*
LCSDATAT DS CL8 \text{STORAGE GROUP NAME}
LCSLIBID DS CL5 \text{LIBRARY ID}
LCSIOLIB DS XL1 \text{PEER-TO-PEER IO LIBRARY}
* VALUES ASSIGNED TO LCSIOLIB

*t*
LCSPRIM EQU 1 \text{PRIMARY IO LIBRARY}
LCSPREFD EQU 2 \text{PREFERRED IO LIBRARY}
LCSBALCD EQU 3 \text{BALANCE IO}
LCSIODFT EQU 4 \text{DEFAULT IO TO CE SETTING}
* LCSIMMED EQU 1 \text{IMMEDIATE COPY MODE}
LCSDFERD EQU 2 \text{DEFERRED COPY MODE}
LCSPYDF EQU 3 \text{DEFAULT TO CE SETTING}
* LCSCPYMD DS XL1 \text{PEER-TO-PEER COPYMODE}
* VALUES ASSIGNED TO LCSCPYMD

*t*
LCSIMMED DS CL8 \text{LIBRARY NAME}
LCSJOPT DS CL1 \text{EJECT OPTION OF KEEP OR PURGE}
* VALUES ASSIGNED TO LCSJOPT

*t*
LCSEXPT DS CL1 \text{KEEP TCDB RECORD ON EJECT}
LCSBURGE EQU C'P' \text{PURGE TCDB RECORD ON EJECT}
LCSQVR EQU C'Q' \text{QUERY QAM EJECT QUEUES}
LCSBULK DS CL1 \text{EJECT TO BULK OR CONVENIENCE}
* VALUES ASSIGNED TO LCSBULK

*t*
LCSBLYES EQU C'Y' \text{ATL BULK OUTPUT STATION}
LCSBLNO EQU C'N' \text{ATL CONVENIENCE OUTPUT STATION}
* LCSACME DS XL1 \text{PEER-TO-PEER SPECIAL ACCESS}
* VALUES ASSIGNED TO LCSACME

*t*
LCSUSRD DS CL8 \text{READ/WRITE DISCONNECTED}

---

Library control system (LCS) external services 187
LCSSPLOC DS XL1 SUBPOOL LOCATION SPECIFICATION
* VALUES ASSIGNED TO LCSSPLOC
LCSAN EQU 0 MAY BE ABOVE THE 16 MEG LINE
LCSBEL W 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 OF DIAGNOSTIC INFORMATION SECTION
LCSSABCD DS F SYSTEM ABEND CODE
LCSSABRC DS F ABEND REASON CODE
LCSLSBRC DS F RETURN CODE FROM DEVICE SVCS
LCSLSBRS DS F REASON CODE FROM DEVICE SVCS
LCSSMSRC DS F RETURN CODE FOR SMS SVCS
LCSSMSRS DS F RETURN CODE FROM CONSTRUCT ACCESS
* SERVICES
LCSSSABCD DS F REASON CODE FROM CONSTRUCT ACCESS
* SERVICES
LCSIPARM DS F RETURN CODE FROM UCBSCAN
LCSIPARM DS F REASON CODE FROM UCBSCAN
LCSELXLIB DS F RETURN CODE FROM TCDB LIBRARY
* RECORD INQUIRY
LCSELXVOLR DS F RETURN CODE FROM TCDB VOLUME
* RECORD INQUIRY
LCSCATRC DS F RETURN CODE FROM CATALOG
LCSCATRDS DS XL2 REASON CODE FROM CATALOG
DS XL2 RESERVED FOR IBM INTERNAL USE
LCSSAMRC DS F RETURN CODE FROM OAM
LCSSAMRS DS F REASON CODE FROM OAM
LCSCATMI DS XL2 CATALOG MODULE ID
LCSLSBFNF DS XL1 FORMAT OF SENSE RECORD CREATED BY
* 3490 CONTROL UNIT AFTER I/O ERROR
* BETWEEN HOST AND CONTROL UNIT
LCSSLBERA DS XL1 ERROR RECOVERY ACTION (ERA) CODE
* RETURNED AFTER FAILURE TO PERFORM
* REQUESTED LIBRARY FUNCTION
LCSSLBERM DS XL1 ERROR MODIFIER CODE ASSOCIATED WITH
* THE ERA CODE
LCFCFCW DS XL1 FAILING COMMAND CODE (CCW)
LCSIOST DS XL2 SUBCHANNEL STATUS INFORMATION,
* INCLUDES DEVICE STATUS FOLLOWED BY
* SUBCHANNEL STATUS
DS CL4 RESERVED FOR IBM FUTURE USE
LCSPDLENS EQU */-LCSDIAG LENGTH EQUATE FOR DIAGNOSTIC
* SECTION
* *
* LCSPL POLICY INPUT AREA
* *
* LCSPOLS DS OF LM POLICY SPECIFICATIONS
* LM STORAGE GROUP IN LCSTRGRP
LCSELMSC DS CL8 LM STORAGE CLASS SPECIFICATION
LCSELMCC DS CL8 LM MANAGEMENT CLASS SPECIFICATION
LCSELMDC DS CL8 LM DATA CLASS SPECIFICATION
* *
* LCSPL EXPANSION AREA
* *
* LCSEXPS DS OF EXPANSION AREA
DS CL48 RESERVED FOR IBM FUTURE USE
DS CL48 RESERVED FOR IBM FUTURE USE
LCSEPLEN EQU */-LCSEXPS LENGTH EQUATE FOR EXPANSION AREA
* LCSEPLEN EQU */-LCSEXPS 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 LCXVOL)
LCSVBUF DS F TOTAL LENGTH OF VOLUME LIST
* (HEADER + LIST)
**Library control system (LCS) external services**

```
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
LCSMTDSI DS F        TAPE DEVICE SELECTION INFORMATION
                     *                     (TDSI) FOR THIS VOLUME
LCSMREC DS XL1       TAPE RECORDING TECHNOLOGY
LCSMMED DS XL1       MEDIA TYPE
LCSCOMP DS CL6       COMPACTION
LCSMREC DS XL1       SPECIAL ATTRIBUTE
LCSMRET DS F         RETURN CODE FOR VOLUME
LCSMREAS DS F        REASON CODE FOR VOLUME
LCSMLEND EQU *-LCSMLIST LENGTH OF LCSMLIST

**CBXLCS 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
LCWSMMNT EQU 3      DELETED WITH MTL SOFTWARE-ONLY
                     * SPE
LCWSVAS EQU 4       VOLUME ALREADY SCRATCH
LCWSVAP EQU 5       VOLUME ALREADY PRIVATE
LCSCUADS EQU 6      CUA PROCESSING DISABLED
LCSONCUV EQU 7      CUA PROCESSING NOT PERFORMED
                     * FOR THIS VOLUME PER INSTALLATION
                     * EXIT REQUEST
LCWSWSTMP EQU 8     SCRATCH VOLUME THRESHOLD MESSAGE
                     * PROCESSING WAS NOT COMPLETED
LCSETYP EQU 9       REQUIRED TYPE PARAMETER NOT
                     * SPECIFIED
LCSETIMEX EQU 10    MUTUALLY EXCLUSIVE REQUIRED
                     * PARAMETERS SPECIFIED
LCSTITYPE EQU 11    INVALID TYPE VALUE SPECIFIED
LCSTIFUN EQU 12     REQUIRED FUNC PARAMETER NOT
                     * SPECIFIED
LCSTIFUNC EQU 13    INVALID FUNC VALUE
LCSTIRUSE EQU 14    REQUIRED USE PARAMETER NOT
                     * SPECIFIED
LCSTUSE EQU 15      INVALID USE VALUE
LCSTIRVOL EQU 16    REQUIRED VOLUME PARAMETER NOT
                     * SPECIFIED
LCSTIVOL EQU 17     INVALID VOLUME VALUE
LCSTIRUCB EQU 18    REQUIRED UCBPTR NOT SPECIFIED
LCSTIUUCB EQU 19    INVALID UCBPTR VALUE SPECIFIED
LCSTIRLST EQU 20    REQUIRED VOLLIST NOT SPECIFIED
LCSTIVL EQU 21      INVALID VOLUME LIST VALUE
LCSTISGL EQU 22     INVALID VALUE IN STORAGE GROUP LIST
                     * HEADER
LCSTIRLB EQU 23     REQUIRED LIBRARY NAME NOT SPECIFIED
LCSTIVAL EQU 24     INVALID VOLUME LIST, MIXED MEDIA,
                     * REWRITABLE AND WORM VOLUMES
LCSTIEXPND EQU 25   INVALID EXPIRATION DATE VALUE
LCSTILNDEQ EQU 26   LIBRARY NOT DEFINED TO STORAGE
                     * GROUP
LCSTILNMM EQU 27   INVALID LIBRARY NAME SPECIFIED
LCSTIWPS EQU 28    INVALID WRITE PROTECT STATUS VALUE
LCSTIBDR EQU 29    INVALID ADDRESS SPECIFIED FOR PARAMETER LIST
                     * OR MAPPING MACRO
LCSTIWDBD EQU 30   ADDRESS NOT ON WORD BOUNDARY
                     * OR LEVEL
LCSTITDS EQU 31    REQUIRED TAPE DEVICE SELECTION
                     * INFORMATION (TDXI) NOT SPECIFIED
LCSTIRID EQU 32    REQUIRED LIBRARY ID OR LIBRARY
                     * NAME NOT SPECIFIED
LCSTILD EQU 33     INVALID VALUE SPECIFIED FOR LIBRARY
                     * ID
LCSTISGNM EQU 34   INVALID STORAGE GROUP NAME
LCSTISMM EQU 35    REQUIRED MEDIA TYPE NOT SPECIFIED
                     * FOR MCE VOLUME
LCSTICOMP EQU 38   INVALID COMPACTION SPECIFIED
```
* IN TDSI
LCSISPEC EQU 39 IN TDSI
* 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
* 
LCSIIDISP 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
LCSSGNOS EQU 48 STORAGE GROUP STATE IS NOTCON,
* DISALL, OR DISNEW
LCSFNLP EQU 49 NO DEVICE POOLS EXIST TO FULFILL
* REQUEST FOR TDSI SPECIFICATION
* SPECIFIC VOLSER REQUEST FOR SCRATCH
* VOLUME
LCSFNLSR EQU 52 VOLUME(S) RESIDE OUTSIDE LIBRARY
LCSFNLCB EQU 53 LIBRARY FOR SPECIFIED VOLUME NOT
* DEFINED TO SMS CONFIGURATION
LCSFNSTG EQU 54 SMS STORAGE GROUP WAS
* NOT OF TYPE TAPE
LCSFDRNV 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
LCSFBSV EQU 61 FAILURE ACCESSING HARDWARE
* CONFIGURATION INFORMATION
LCSFLBN 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
LCSNREC 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
* (CBRXVNL) SAID TO CANCEL JOB
LCSFNVIL 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
LCSLBEJ EQU 77 DELETED WITH MTL SOFTWARE-ONLY
* SPE
LCSFXVRI EQU 78 ERROR ATTEMPTING TO RETRIEVE
* VOLUME RECORD
LCSFXVUP EQU 79 ERROR ATTEMPTING TO WRITE VOLUME
* RECORD
LCSFESTAY EQU 80 ESTAE ROUTINE NOT ESTABLISHED
LCSGETF EQU 81 GETMAIN FAILED FOR DEVICE POOL
* NAMES LIST OR LOCAL WORKING
* STORAGE
LCSEXITF EQU 82 ABNORMAL TERMINATION OCCURRED
* DURING INSTALLATION EXIT
LCSEXINVD EQU 83       INVALID RETURN CODE OR DATA
                    RETURNED FROM CHANGE USE
                    ATTRIBUTE INSTALLATION EXIT
                    (CBRUXCUA)

LCSEXABND EQU 84       ABNORMAL TERMINATION OCCURRED
                    DURING EXECUTION

LCSENDIS EQU 90       CARTRIDGE ENTRY PROCESSING HAS
                    BEEN DISABLED

LCSSENSUS EQU 91      CARTRIDGE ENTRY PROCESSING HAS
                    BEEN SUSPENDED FOLLOWING ERROR
                    INVOKING INSTALLATION EXIT

LCSNOTMT EQU 92       LIBRARY FOR MCE NOT MANUAL TAPE
                    LIBRARY

LCSLOFF EQU 93        LIBRARY OFFLINE, PENDING
                    OFFLINE, OR NOT OPERATIONAL

LCSINLIB EQU 94       SPECIFIED VOLUME ALREADY RESIDES
                    IN ANOTHER LIBRARY

LCSVETO EQU 95        INSTALLATION EXIT VETOED ENTRY
                    OF VOLUME INTO LIBRARY

LCSIGNR EQU 96        VOLUME NOT ENTERED INTO MTL BECAUSE
                    INSTALLATION EXIT SAID TO IGNORE
                    THE VOLUME

LCSDASDV EQU 97       VOLUME OF SAME VOLSER IS KNOWN DASD
                    VOLUME

LCSWARN(4)

LCSTNMT EQU 120       VOLUME IS INELIGIBLE BECAUSE
                    THE TYPE OF MEDIA DEFINED IN
                    THE VOLUME RECORD MAY NOT BE
                    MOUNTED ON SPECIFIED DEVICE
                    VOLUME IS INELIGIBLE BECAUSE
                    THE TYPE OF MEDIA DEFINED IN
                    THE TDSI DOES NOT MATCH MEDIA
                    DEFINED ON THE VOLUME RECORD

LCSVERST EQU 122      VOLUME IS INELIGIBLE BECAUSE
                    THE VOLUME RECORD REFLECTS AN
                    ERROR STATUS

LCSRNMNT EQU 123      VOLUME IS INELIGIBLE BECAUSE THE
                    SPECIFIED RECORDING TECHNOLOGY
                    IS INCOMPATIBLE WITH THE VOLUME
                    MEDIA TYPE OR THE SPECIFIED
                    DRIVE TYPE

LCSSAMEL EQU 130      SPECIFIED VOLUME ALREADY
                    RESIDES IN THIS TAPE LIBRARY

LCSLNOP EQU 131       SCRATCH VOLUME THRESHOLD PROCESS-
                    SING NOT PERFORMED BECAUSE
                    LIBRARY WAS NOT OPERATIONAL

LCSCSNT EQU 132       DELETED WITH 3590 SUPPORT

LCSSNLUR EQU 133      DELETED WITH 3590 SUPPORT

LCSWLIO EQU 134       NO TCDB RECORD BUT VOLUME RESIDES
                    IN SPECIFIED LIBRARY

LCSSMLM EQU 135       LIBRARY MISMATCH, VOLUME RESIDES
                    IN SPECIFIED LIBRARY

LCSSMNF EQU 136       LIBRARY MISMATCH, VOLUME NOT FOUND
                    IN SPECIFIED LIBRARY

LCSSMLF EQU 137       LIBRARY MISMATCH, UNABLE TO ACCESS
                    SPECIFIED LIBRARY

LCSSCNU EQU 138       LIBRARY SCRATCH COUNT NOT
                    UPDATED IN TCDB

LCSSMILN EQU 139      LIBRARY NAME MISMATCH, SPECIFIED
                    LIB NAME DID NOT MATCH MTL VOLUME
                    RECORD LIB NAME

LCSEJCND EQU 201      VOLUME ALREADY EJECTED

LCSEJEJO EQU 202      INVALID VALUE FOR EJECT OPTION

LCSEJBLK EQU 203      INVALID VALUE FOR BULK EJECT

LCIUSER EQU 204       INVALID TSO USERID SPECIFIED

LCBADRT EQU 215       NOT ALL VOLUMES HAVE THE SAME
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)
TDIMSUMS DS    F             NUMBER OF MODE CONTROL DATA ENTRIES
*                             (IF AN AX0 IS NOT AVAILABLE, AN ENTRY
*                             IS NOT RETURNED.)
TDIMSDLN DS    F             LENGTH OF ONE MODE CONTROL DATA ENTRY
TDIMSAOAR 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
TDIMAXO1 DS    XL1          AXO IDENTIFIER
TDIMODMOD DS    BL1         I/O SELECTION CRITERIA
TDIOBALN EQU   B'10000000'   BALANCED I/O SELECTION CRITERIA
TDIOPREF EQU   B'01000000'   PREFERRED I/O SELECTION CRITERIA
TDIOPRIM EQU   B'00100000'   PRIMARY I/O SELECTION CRITERIA
TDICPYMDS DS    BL1         COPY MODE AND COPY OPERATIONS
TDICPYMP EQU   B'10000000'   COPYMODE ON=IMMEDIATE/OFF=DEFERRED
TDIENABL EQU   B'00001000'   COPYOPER ON=ENABLED/OFF=DISABLED
TDIACCES DS    BL1         SPECIAL ACCESS CONTROL
TDIREDMOD EQU   B'10000000'   READ ONLY ACCESS MODE
TDIWRDSIS EQU   B'01000000'   READ/WRITE DISCONNECTED ACCESS MODE
TDIWTPTRT EQU   B'00100000'   WRITE PROTECT ACCESS MODE
TDIDMPTV DS    XL1          DEFERRED MODE PRIORITY THRESHOLD
TDIDVLDLDS DS    XL1         PRIMARY/PREFERRED I/O DISTRIBUTED LIBRARY
*                             ID
TDIDCETV DS    XL1          CE DEFAULT FOR DEFERRED MODE PRIORITY
*                             THRESHOLD VALUE
DS    CL3           RESERVED
```

Library control system (LCS) external services 193
Tape volume information (CBRTVI macro)

Tape volume information (TVI), mapped by macro CBRTVI, is used to pass information from both the TCDB and the library manager inventory about the volume specified on a CBRXLCS query volume residence request.

Here is the format for the tape volume information. The boldfaced lines of code are new for this release.
**TVIREV** DS XL1 REVISION LEVEL OF TVI
**TVISPNUM** DS XL1 SUBPOOL IN WHICH TVI WAS OBTAINED
**DS** XL1 RESERVED FOR IBM USE
**DS** F RESERVED FOR IBM USE

********************************************************************
*                                                                  *
*          VOLUME SERIAL                                           *
*                                                                  *
********************************************************************
**TVIVOLSR** DS CL6 VOLUME SERIAL NUMBER

********************************************************************
*                                                                  *
*          VOLUME INFORMATION FROM THE TCDB                        *
*                                                                  *
* NOTE: LIBRARY NAME AND CONSOLE NAME ARE FOUND IN THE LCSPL       *
* - LIBRARY NAME IS STORED IN FIELD LCSLIBNM                      *
* - CONSOLE NAME IS STORED IN FIELD LCSCONSN                      *
*                                                                  *
* IF THE LIBRARY NAME IS SPECIFIED ON THE QVR INVOCATION, LCSLIBNM *
* CONTAINS THE SPECIFIED LIBRARY AND LCSCONSN CONTAINS THE CONSOLE *
* NAME OF THE SPECIFIED LIBRARY.  THE SPECIFIED LIBRARY NAME MAY  *
* OR MAY NOT MATCH THE LIBRARY NAME IN THE VOLUME RECORD, TVILIBNM. *
*                                                                  *
* IF THE LIBRARY NAME IS NOT SPECIFIED ON THE QVR INVOCATION,      *
* AND THE VOLUME RECORD EXISTS IN THE TCDB, BOTH LCSLIBNM AND      *
* TVILIBNM FIELDS CONTAIN THE LIBRARY NAME FOUND IN THE VOLUME      *
* RECORD.  LCSCONSN CONTAINS THE CONSOLE NAME OF TVILIBNM.          *
*                                                                  *
* INCLUDE MAPPING MACRO CBRVERR TO DEFINE CONSTANTS               *
* FOR THE VALUES ASSIGNED TO TVIERROR.                            *
*                                                                  *
********************************************************************
**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 OF TAPE DEVICE SELECTION INFORMATION
**TVIIMD** DS XL1 RECORDING TECHNOLOGY
**TVIMEDIA** DS XL1 MEDIA TYPE
**TVICOMP** DS XL1 COMPACTION
**TVISPEC** DS XL1 SPECIAL ATTRIBUTE
**TVIERROR** DS H VOLUME ERROR 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
**TVINFO** DS BL1 ADDITIONAL VOLUME INFORMATION
**TVIWORM** 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
**TVONW** DS CL64 VOLUME OWNER INFORMATION
**TVCREAT** DS CL10 VOLUME RECORD CREATION DATE
**TVIENTEJ** DS CL10 LAST ENTRY OR EJECTION DATE
**TVIWRITE** DS CL10 LAST WRITTEN DATE
**TVIMOUNT** DS CL10 LAST MOUNTED DATE
**TVILMDC** DS CL8 LIBRARY MANAGER DATA CLASS NAME
* **TVILM** DS CL8 LIBRARY MANAGER STORAGE CLASS NAME
**TVILMSG** DS CL8 LIBRARY MANAGER STORAGE GROUP NAME
**TVILMBOX** DS CL10 LIBRARY MANAGER MANAGEMENT CLASS NAME
**TVIMC** DS CL8 LIBRARY MANAGER MANAGEMENT CLASS NAME
**TVICONT** DS CL8 VOLUME INFORMATION FROM LIBRARY MANAGER

********************************************************************
*                                                                  *
*          VOLUME INFORMATION FROM LIBRARY MANAGER                  *
*                                                                  *
********************************************************************
**TVIOPM** DS 0CL32 OUTBOARD POLICY MANAGEMENT
**TVILIBNM** DS CL8 LIBRARY NAME FROM VOLUME RECORD
**TVIOWNER** DS CL64 VOLUME OWNER INFORMATION
**TVICREAT** DS CL10 VOLUME RECORD CREATION DATE
**TVIENTEJ** DS CL10 LAST ENTRY OR EJECTION DATE
**TVIWRITE** DS CL10 LAST WRITTEN DATE
**TVIMOUNT** DS CL10 LAST MOUNTED DATE
**TVIEXP** DS CL10 VOLUME EXPIRATION DATE
**TVILOC** DS CL10 VOLUME LOCATION CODE
**TVINF** DS BL1 ADDITIONAL VOLUME INFORMATION
**TVIWORM** 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)
**TVILMDC** DS CL8 LIBRARY MANAGER DATA CLASS NAME
**TVILM** DS CL8 LIBRARY MANAGER STORAGE CLASS NAME
**TVILMSG** DS CL8 LIBRARY MANAGER STORAGE GROUP NAME
**TVICONT** DS CL8 VOLUME INFORMATION FROM LIBRARY MANAGER

Library control system (LCS) external services 195
TVIHAT 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 VOLUME
TVISTAT DS 0BL2 VOLUME STATUS
TVISTAT1 DS BL1 VOLUME STATUS - BYTE 1
TVINACC EQU B'10000000' VOLUME IS IN LIBRARY BUT INACCESSIBLE
TVIMNT EQU B'01000000' VOLUME IS MOUNTED
TVIMNTQ EQU B'00100000' VOLUME IS QUEUED FOR MOUNT
TVIMNTIP EQU B'00010000' VOLUME IN PROCESS OF BEING MOUNTED
TVIDMNTQ EQU B'00001000' VOLUME QUEUED FOR DEMOUNT
TVIDMNTP EQU B'00000100' VOLUME IN PROCESS OF BEING DEMOUNTED
TVEJCQ EQU B'00000010' VOLUME IS QUEUED FOR EJECT/EXPORT
TVEJCP 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
TVIBLAB EQU B'00100000' VOLUME IS MISPLACED
TVIMANEJ EQU B'00010000' VOLUME WAS MANUALLY EJECTED
* WITH FAST READY ATTRIBUTE SET
TVISTATA DS BL1 ADDITIONAL VOLUME STATUS
TVICACHE EQU B'10000000' VOLUME IS CACHE RESIDENT
TVICOPY EQU B'01000000' VALID COPY IN AT LEAST TWO DISTRIBUTED
* LIBRARIES
TVICCOPY EQU B'00100000' DUPLICATE COPY IN THE STAND ALONE
* VTS LIBRARY
TVIOPM EQU B'00010000' NON DEFAULT TVIOPM PROVIDED
TVILWORM EQU B'00001000' LOGICAL WORM VOLUME
TVIXFGL DS BL1 EXPANDED VOLUME STATUS FLAGS
TVICOMP EQU X'80' COPY CLUSTER BIT MAPPING TVICMAP
TVICMAP DS BL1 COPY CLUSTER BIT MAPPING (LEFT TO RIGHT
STARTING WITH CLUSTER 0)
TVICCL0 EQU X'80' CL0 HAS VALIDATED CONSISTENT COPY
TVICCL1 EQU X'40' CL1 HAS VALIDATED CONSISTENT COPY
TVICCL2 EQU X'20' CL2 HAS VALIDATED CONSISTENT COPY
TVICCL3 EQU X'10' CL3 HAS VALIDATED CONSISTENT COPY
TVICCL4 EQU X'08' CL4 HAS VALIDATED CONSISTENT COPY
TVICCL5 EQU X'04' CL5 HAS VALIDATED CONSISTENT COPY
TVICCL6 EQU X'02' CL6 HAS VALIDATED CONSISTENT COPY
TVICCL7 EQU X'01' CL7 HAS VALIDATED CONSISTENT COPY
DS CL23 RESERVED FOR IBM USE
DS 0D END OF VTI
TVILENGTH EQU *-TVI
SPACE 1
**********************************************
* TCDB USE ATTRIBUTE CONSTANTS
* TCDB TAPE DEVICE SELECTION INFORMATION CONSTANTS
* CONSTANTS TO DEFINE RECORDING TECHNOLOGY
TVIPRV EQU C'P' PRIVATE USE ATTRIBUTE
TVISCR EQU C'S' SCRATCH USE ATTRIBUTE
SPACE 1
**********************************************
Because a logical volume will retain its WORM state (at the library) until the volume is reused and written from load point, the TVILWORM indicator can also be returned for a scratch volume, reflecting the past usage of the volume.
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.

```
TDSI     DSECT ,  TAPE DEVICE SELECTION INFORMATION

TDSDEVT  DS   0F
TDSREC   DS   XL1  RECORDING TECHNOLOGY

TVIIDC   EQU  C'TVI '  TVI IDENTIFIER
TVIVERV  EQU  1     VERSION
TVIREVV  EQU  13    REVISION LEVEL
.END    MEND    */
```
TDSMEDIA DS XL1  MEDIA TYPE
TDSCOMP DS XL1  COMPACTION TYPE
TDSSPEC DS XL1  SPECIAL ATTRIBUTES

* -------------------------------------------------------------------- *
*                CONSTANT FOR DONTCARE OR ZERO                       *
* ZERO, OR TDSNOCAR, IS AN ACCEPTABLE VALUE FOR TDSI.              *
* -------------------------------------------------------------------- *
TDSNOCAR EQU  0

* -------------------------------------------------------------------- *
* CONSTANTS TO DEFINE RECORDING TECHNOLOGY                           *
* -------------------------------------------------------------------- *
TDSNOREC EQU  0  RECORDING TECHNOLOGY UNKNOWN OR
* UNSPECIFIED
TDS18TRK EQU  1  READ/WRITE ON 18 TRACK DEVICE
TDS36TRK EQU  2  READ/WRITE ON 36 TRACK DEVICE
TDS128TRK EQU  3  READ/WRITE ON 128 TRACK DEVICE
TDS256TRK EQU  4  READ/WRITE ON 256 TRACK DEVICE
TDS384TRK EQU  5  READ/WRITE ON 384 TRACK DEVICE
TDSEFMT1 EQU  6  READ/WRITE ON ENTERPRISE
* FORMAT 1 (EFMT1) DEVICE
TDSEFMT2 EQU  7  READ/WRITE ON ENTERPRISE
* FORMAT 2 (EFMT2) DEVICE
TDSEEFMT2 EQU  8  READ/WRITE ON ENTERPRISE ENCRYPTED
* FORMAT 2 (EWFMT2) 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 TAPE
* CARTRIDGE SYSTEM TAPE
TDSMED3 EQU  3  MEDIA3 - HIGH PERFORMANCE TAPE
* TAPE
TDSMED4 EQU  4  MEDIA4 - EXTENDED HIGH PERFORMANCE
* CARTRIDGE TAPE
TDSMED5 EQU  5  MEDIA5 - ENTERPRISE TAPE CARTRIDGE
* 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 TDSIDRC2 CAN BE USED INTERCHANGEABLY.)                *
* -------------------------------------------------------------------- *
TDSCMPNS EQU  0  COMPACTION TYPE UNKNOWN OR NOT SET
TDSNOCMP EQU  1  NO COMPACTION
TDSIDRC EQU  2  COMPACTION
TDSCOMPT EQU  2  COMPACTION

* -------------------------------------------------------------------- *
* CONSTANTS TO DEFINE SPECIAL ATTRIBUTE                             *
* -------------------------------------------------------------------- *
TDSNSPSC EQU  0  VOLUME HAS NO SPECIAL ATTRIBUTE
TDSRDCOM EQU  1  VOLUME WILL BE MOUNTED FOR READ
* ONLY - ALL READ-COMPATIBLE DEVICES MAY BE SELECTED

Library control system (LCS) external services 199
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 237.

Each of the installation exits (CBRUXENT, CBRUXEJC, CBRUXCUA, and CBRUXVNL) are linked to (on each invocation) using the MVS LINK macro and must reside in a library in the LNKLST concatenation. Because the exits are called (on each invocation) using the MVS LINK macro, a new copy of the exit can be LINKEDITED on the system at any point in time and OAM will pick up the new version. However, if the exit had been previously disabled or return code 16 had been used to bypass the exit, to re-enable the exit, you must also restart OAM or issue the LIBRARY RESET command.

Change use attribute installation exit (CBRUXCUA)

When you issue the CBRXLCS macro FUNC=CUA, the ISMF ALTER line operator from the mountable tape volume list, or the LIBRARY LMPOLICY command, the Change Use Attribute installation exit (CBRUXCUA) is called before the volume record is changed.

This installation exit is designed to allow the installation the opportunity to approve or disapprove the proposed change to the volume’s use attribute, and to view, and if necessary, to change many fields in the TCDB volume record as well as outboard policy fields, if applicable. Approval or disapproval is communicated by way of the return code which is passed back in register 15. Volume record fields are updated by changing the appropriate fields in the change use attribute installation exit parameter list (CBRUXCPL).

The change use attribute installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see z/OS DFSMSrmm Managing and Using Removable Media, z/OS DFSMSrmm Implementation and Customization Guide, and z/OS DFSMSrmm Diagnosis Guide.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample change use attribute exit (CBRSPUXC) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system.

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 = *SCRATCH*
- 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 202. 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 202, 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 202 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>
<thead>
<tr>
<th>Parameter</th>
<th>SCR-&gt;PRIV</th>
<th>PRIV-&gt;SCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume serial number</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Current use attribute</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>New use attribute</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Storage group name</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>SCR-&gt;PRIV</th>
<th>PRIV-&gt;SCR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Write protection status</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Checkpoint volume indicator</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Volume location code</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Shelf location</td>
<td>Output</td>
<td>Output</td>
</tr>
<tr>
<td>Volume owner information</td>
<td>Output</td>
<td>Output</td>
</tr>
<tr>
<td>Volume record creation date</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Last entry or eject date</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Last mounted date</td>
<td>Output/Verified</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>Last written date</td>
<td>Output/Verified</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>Tape device selection information</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Installation exit information</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Storage class name</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Data class name</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Management class name</td>
<td>Output/Verified</td>
<td>Output (ignored)</td>
</tr>
<tr>
<td>Supported functions indicators</td>
<td>Input only</td>
<td>Input only</td>
</tr>
<tr>
<td>Volume information indicators</td>
<td>Input only</td>
<td>Input only</td>
</tr>
</tbody>
</table>

If a field is described as verified, the following values are checked for validity upon return from the exit:

**Storage Group Name**
When a volume is changed from **scratch** to **private or private** to **private**, the storage group name that is supplied may be blanks. If a nonblank value is supplied, the name must be defined in the active SMS configuration as a tape storage group. In addition, if the volume is library-resident, the library must be defined to that storage group.

**Storage Class Name**
When a volume is changed from **scratch** to **private or private** to **private**, the storage class name that is supplied may be blank. If a nonblank value is supplied, the name must only conform to Storage Management Subsystem (SMS) naming conventions standards. See Syntax rules 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 fields.

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 150.

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 UXCLP 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 UXCLOPMP and UXCJOBP indicators are off.
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  CBRUXCPL PARAMETER LIST
SPACE 1
*****************************************************************************
** CHANGE USE ATTRIBUTE INSTALLATION EXIT PARAMETERS ******
*****************************************************************************
UXCPARM  DS  0D  CBRUXCPL PARAMETER SECTION
UXCLIB   DS  CL8  LIBRARY NAME
   *(INPUT VARIABLE)
UXCLDEV  DS  CL8  LIBRARY DEVICE TYPE
   *(INPUT VARIABLE)
UXCLCON  DS  CL8  LIBRARY CONSOLE NAME
   *(INPUT VARIABLE)
UXCLTYP  DS  CL1  LIBRARY LOGICAL TYPE
   * 'R' FOR AUTOMATED LIBRARY
   * 'M' FOR MANUAL LIBRARY
   *(INPUT VARIABLE)
UXCSUPPT DS  XL1  SUPPORTED FUNCTION
UXCLOPM  EQU  X'80'  ON IF OUTBOARD POLICY MANAGEMENT
UXCJOBP  EQU  X'40'  ON IF CALLING EXIT FOR JOB
UXCSEHA  DS  CL1  CURRENT USE ATTRIBUTE OF THE VOLUME
UXCSEA   DS  CL1  REQUESTED VOLUME USE ATTRIBUTE
UXCWPROT DS  CL1  WRITE PROTECTION STATUS
UXCHKPT  DS  CL1  CHECKPOINT VOLUME INDICATOR
UXCLOC   DS  CL1  VOLUME LOCATION CODE
UXCTDSI  DS  0F  TAPE DEVICE SELECTION INFORMATION
UXCREC   DS  XL1  RECORDING TECHNOLOGY
UXCMEDIA DS  XL1  MEDIA TYPE
UXCCOMP  DS  XL1  COMPACTION
```
* UXCSPEC      DS   XL1               SPECIAL ATTRIBUTE
* UXCGROUP     DS   CL8               STORAGE GROUP NAME
* UXCSHLOC     DS   CL32              SHELF LOCATION
* UXCOOWNER    DS   CL64              VOLUME OWNER INFORMATION
* UXCREAT      DS   CL10              VOLUME RECORD CREATION DATE
* UXCENTEJ     DS   CL10              LAST ENTRY OR EJECTION DATE
* UXCMOUNT     DS   CL10              LAST MOUNTED DATE
* UXCWRITE     DS   CL10              LAST WRITTEN DATE
* UXCEXPIR     DS   CL10              VOLUME EXPIRATION DATE
* UXCEXITI     DS   CL16              INFORMATION TO BE PASSED TO THE
* UXCLMOPM     DS   0CL32             OUTBOARD POLICY MANAGEMENT
* UXCLMSG      DS   CL8               LIBRARY MANAGER STORAGE GROUP
* UXCLMSC      DS   CL8               LIBRARY MANAGER STORAGE CLASS
* UXCLMMC      DS   CL8               LIBRARY MANAGER MANAGEMENT CLASS
* UXCLMDC      DS   CL8               LIBRARY MANAGER DATA CLASS
* UXCLLEN     EQU   *-UXCPL
  SPACE 1
***********************************************************************
* RETURN CODES
*  UCNOCHG       EQU  0                 CHANGE THE VOLUME USE ATTRIBUTE AS
*                  REQUESTED USING PARAMETER VALUES PASSED IN ON INPUT
*  UXCHG         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
*  UXCFAIL       EQU  12                RESERVED
*  UXCFAIL       EQU  16                DO NOT CALL THE VOLUME USE
*                  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
*  UXCREAL       EQU  C'M'              MANUAL LIBRARY
  SPACE 1
***********************************************************************
* USE ATTRIBUTE CONSTANTS
*  UXCPRIY       EQU  C'P'              PRIVATE USE ATTRIBUTE
*  UXCSCRT       EQU  C'S'              SCRATCH USE ATTRIBUTE
  SPACE 1
***********************************************************************
* TAPE DEVICE SELECTION INFORMATION CONSTANTS
*  UXNCAR        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 DEVICE
UXCEFMT2 EQU 7    READ/WRITE ON ENTERPRISE FORMAT 2 DEVICE
UXCEFMT3 EQU 8    READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2 DEVICE
UXCEFMT4 EQU 9    READ/WRITE ON ENTERPRISE FORMAT 3 DEVICE
UXCEFMT5 EQU 10   READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 3 DEVICE
UXCEFMT6 EQU 11   READ/WRITE ON ENTERPRISE FORMAT 4 DEVICE
UXCEFMT7 EQU 12   READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 4 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 'Y'    YES
UXCNO EQU 'N'    NO
UXCBLANK EQU ' '    BLANK

Installation exits 207
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:

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

**Change use attribute installation exit (CBRUXCUA) usage requirements**

The change use attribute installation exit must reside in load module CBRUXCUA. It is invoked by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-megabyte line. The installation exit must be coded and link-edited on the system as re-entrant.

Under some circumstances, CBRUXCUA may be invoked in a key other than the job key. Therefore, all storage dynamically acquired by CBRUXCUA should be obtained from subpool 227, 228, 229, 230, 231, or 241, in order to ensure that it is accessible in the program status word (PSW) key.

The following characteristics describe the execution environment in which the change use attribute installation exit is invoked:

- Task mode
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The addressing mode specified when the exit was linkage edited
- Primary ASC mode (not AR mode)
- User key, supervisor state

Mapping macro CBRUXCPL must be included by the installation exit.
Cartridge entry installation exit (CBRUXENT)

This installation exit is called to approve or disapprove entry of a cartridge into a library and to determine TCDB volume record contents for each volume that is entered into a library. If the library supports outboard policy management, the installation exit can also obtain and set outboard policy names.

The cartridge entry installation exit is supplied by DFSMSrmm. If your installation is not using DFSMSrmm, the supplied exit returns a return code of 16, indicating that the installation exit not be invoked again. For more information, see z/OS DFSMSrmm Managing and Using Removable Media, z/OS DFSMSrmm Implementation and Customization Guide, and z/OS DFSMSrmm Diagnosis Guide.

If your installation is not using DFSMSrmm and your tape management vendor has not supplied an exit, OAM provides a sample cartridge entry installation exit (CBRSPUXE) in SAMPLIB that can be customized to fit your needs. The discussion that follows will assist in determining whether the exit is needed on your system.

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 209 lists the volume-related parameters that are passed to the exit.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Input/Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXEVLXMLR</td>
<td>Volume serial number</td>
<td>Input only</td>
</tr>
<tr>
<td>UXEVATTR</td>
<td>Volume attribute</td>
<td>Input only</td>
</tr>
<tr>
<td>UXEVINFO</td>
<td>Additional volume information</td>
<td>Input only</td>
</tr>
<tr>
<td>UXEUSEA</td>
<td>Volume use attribute</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXEWPROT</td>
<td>Write protection status</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXESHLOC</td>
<td>Shelf location</td>
<td>Output</td>
</tr>
<tr>
<td>UXEGROUP</td>
<td>Storage group name</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXEOwner</td>
<td>Volume owner information</td>
<td>Output</td>
</tr>
<tr>
<td>UXECREAT</td>
<td>Volume record creation date</td>
<td>Input only</td>
</tr>
<tr>
<td>UXENEJ</td>
<td>Last entry or eject date</td>
<td>Input only</td>
</tr>
<tr>
<td>UXEMOUNT</td>
<td>Last mounted date</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXETWRITE</td>
<td>Last written date</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXEEXPIR</td>
<td>Volume expiration date</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXEEEXITI</td>
<td>Installation exit information</td>
<td>Input only</td>
</tr>
</tbody>
</table>
Table 22. Fields passed to the installation exit—CBRUXENT (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
<th>Input/Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXELMSG</td>
<td>Library manager storage group</td>
<td>Input only</td>
</tr>
<tr>
<td>UXELMSC</td>
<td>Library manager storage class</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXELMMC</td>
<td>Library manager management class</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXELMDC</td>
<td>Library manager data class</td>
<td>Output/Verified</td>
</tr>
</tbody>
</table>

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.
9. The remaining volume-related values are set to blanks. A volume record creation date of blanks indicates that the TCDB volume record does not exist.

For a known volume, whatever information existed in the volume record at the time the cartridge was entered is passed to the exit.

The UXEVATTR field can be used to determine if the volume being entered is a physical (non-VTS) volume, a logical volume, or a logical volume being imported.

If the shelf location field for a logical volume being imported indicates STACKED=volser at the beginning of the field, this information is passed to the exit and is cleared upon successful entry of the volume. This should be the exported stacked volume that was recorded in the volume record in the TCDB when the logical volume was exported.

If the cartridge entry processing in the manual tape library, was initiated with the manual cartridge entry programming interface, the 16-byte pass through value specified with the EXITINFO keyword on the CBRXLCS FUNC(MCE) macro invocation in passed to the installation exit as an input-only value. Otherwise, UXEEXITI contains binary zeros.

Since cartridge entry processing in a manual tape library can be initiated by the MCE programming interface, or the LIBRARY ENTER command, the tape device selection field UXEMEDIA may be modified.
by the installation exit. If a media type is not provided before the invocation of the exit, and the exit makes no changes, entry processing for this volume fails, but processing for other volumes continues. However, if the exit explicitly modifies the media type and specifies an invalid value, entry processing is discontinued for this and all subsequent volumes. For entry processing in an automated tape library dataserver, UXEMEDIA is an input only field (the media type returned by the vision system is used).

The following values are validity checked upon return from the exit:

- **Volume use attribute**  
  S(SCRATCH) or P(PRIVATE) can be specified.

- **Storage group name**  
  For a volume use attribute of SCRATCH, the storage group name that is supplied by the exit is ignored. OAM sets the storage group name to *SCRTCH*. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the storage group name may be set to blanks. A nonblank storage group name is always validity checked, even if the installation exit has not changed the value. The storage group name must be defined in the active SMS configuration as a tape storage group, and the library into which the volume is entered must be one of those in which the storage group resides. If the storage group name does not pass validation, and it is not provided by the installation exit, the cartridge is ejected, but cartridge entry processing continues.

- **Storage class name**  
  For a volume use attribute of SCRATCH, the storage class name that is supplied by the exit is ignored. If the library supports outboard policy management, the default policy (blanks) is set at the library.

  For a volume use attribute of PRIVATE, the storage class name that is supplied may be blank. If a nonblank volume is supplied, the name must only conform to SMS naming convention standards. See Syntax rules 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 213 for more information on these new fields in the parameter list.

The following indicators are set if the import list explicitly sets a policy name:
UXEVSGSP
The storage group name is explicitly set by the import list.

UXEVMCSP
The management class name is explicitly set by the import list.

UXEVSCSP
The storage class name is explicitly set by the import list.

UXEVDCSP
The data class name is explicitly set by the import list.

If a volume being entered has a TCDB record, the UXEGROUP field will contain the TCDB storage group, unless explicitly specified through the import list (indicated by bit flag UXEVSGSP). If the UXEVSGSP indicator is set, and the use attribute is PRIVATE, the UXEGROUP field contains the value specified in UXELMSG. This ensures that any changes through the import list are reflected in the TCDB record. UXELMSG will contain the storage group policy name that exists in the library if a nondefault policy name exists or blanks, by default. For a private volume, if the TCDB storage 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 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.
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
UXEVGSSP 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
UXEVDOSP 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
UXERECS 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)
UXEDEDEDS DS CL10  LAST WRITTEN DATE
*  (INPUT/OUTPUT VARIABLE)
UXEEXPDS 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)
UXLMDC DS CL8 LIBRARY MANAGER DATA CLASS
*   (INPUT/OUTPUT VARIABLE)
DS 0D END OF UXEPL
UXEPLLEN EQU *-UXEPL
SPACE 1
*********************************************************************
*
*        RETURN CODES
*
*********************************************************************
UXENOCHG EQU 0 PERFORM ENTER AS REQUESTED
*   USING PARAMETER VALUES PASSED
*   IN ON INPUT
UXECHG EQU 4 PERFORM ENTER REQUEST BUT NOTE
*   THAT PARAMETER VALUES HAVE
*   CHANGED ON EXIT
UXEFAIL EQU 8 DENY ENTER REQUEST (FOR AN ATLDS, THE
*   VOLUME IS EJECTED FROM THE LIBRARY)
UXEIGNORE EQU 12 IGNORE ENTER REQUEST (FOR AN ATLDS
*   THE VOLUME REMAINS IN THE LIBRARY
*   IN THE INSERT CATEGORY)
UXEDONT EQU 16 DO NOT CALL THE CARTRIDGE ENTRY
*   INSTALLATION EXIT AGAIN AND
*   PERFORM CARTRIDGE ENTRY AS
*   REQUESTED USING THE PARAMETER
*   VALUES PASSED IN ON INPUT
SPACE 1
*********************************************************************
*
*        LIBRARY LOGICAL TYPE CONSTANTS
*
*********************************************************************
UXEAUTO EQU 'C'R' AUTOMATED/REAL LIBRARY
UXEMAN EQU 'C'M' MANUAL LIBRARY
SPACE 1
*********************************************************************
*
*        VOLUME ATTRIBUTE CONSTANTS
*
*********************************************************************
UXEPHYCL EQU 0 PHYSICAL NON-VTS VOLUME
UXELOGCL EQU 1 LOGICAL VTS VOLUME
UXEIMPRT EQU 2 IMPORTED VTS LOGICAL VOLUME
SPACE 1
*********************************************************************
*
*        USE ATTRIBUTE CONSTANTS
*
*********************************************************************
UXEPRIV EQU 'C'P' PRIVATE USE ATTRIBUTE
UXESCRT EQU 'C'S' SCRATCH USE ATTRIBUTE
SPACE 1
*********************************************************************
*
*        TAPE DEVICE SELECTION INFORMATION (TDSI) CONSTANTS
*
*********************************************************************
UXENOCAR EQU 0 ZERO IS AN ACCEPTABLE VALUE FOR TDSI
*********************************************************************
*
*        CONSTANTS TO DEFINE TAPE RECORDING TECHNOLOGY
*
*********************************************************************
UXENOREC EQU 0 RECORDING TECHNOLOGY UNKNOWN OR
*   UNSPECIFIED
UXE18TRK EQU 1 READ/WRITE ON 18 TRACK DEVICE
UXE36TRK EQU 2 READ/WRITE ON 36 TRACK DEVICE
UXE128TRK EQU 3 READ/WRITE ON 128 TRACK DEVICE
UXE256TRK EQU 4 READ/WRITE ON 256 TRACK DEVICE
UXE384TRK EQU 5 READ/WRITE ON 384 TRACK DEVICE
UXEEFMT1 EQU 6 READ/WRITE ON ENTERPRISE FORMAT 1
*   (EFMT1) DEVICE
UXEEFMT2 EQU 7 READ/WRITE ON ENTERPRISE FORMAT 2
*   (EFMT2) DEVICE
UXEEFMT2 EQU 8 READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
*   (EEFMT2) DEVICE
UXEEFMT3 EQU 9 READ/WRITE ON ENTERPRISE
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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>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.</td>
</tr>
</tbody>
</table>
Perform cartridge entry and note that one or more fields in the parameter list (CBRXEPL) have changed.

Do not allow this cartridge to be entered. For an automated tape library dataserver, OAM schedules the cartridge to be ejected.

Ignore the cartridge entry request. For an automated tape library dataserver, OAM leaves the cartridge in the library (volume left in the insert category).

Do not call the cartridge entry installation exit again. Perform cartridge entry as requested using the attributes that existed at the time that the exit was originally called.

If an invalid return code is passed back, OAM discontinues cartridge entry processing.

**Note:** Once OAM is told not to invoke the installation exit again (return code 16) or cartridge entry processing is discontinued, the only way to reactivate the exit is to stop and restart OAM, or to issue the LIBRARY RESET,CBRUXENT command.

### Cartridge entry installation exit (CBRUXENT) usage requirements

The cartridge entry installation exit must reside in load module CBRUXENT. It is invoked by OAM by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-MB line. If multiple tape libraries are defined to the system, the installation exit must be coded and link-edited on the system as 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 218 lists the volume-related parameters that are passed to the exit.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Parameter description</th>
<th>Input/Output</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXJVDISP</td>
<td>Volume record disposition</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJNCALL</td>
<td>Notification call indicator</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJSTKVS</td>
<td>Stacked “container” volume</td>
<td>Input only/with export call</td>
</tr>
<tr>
<td>UXJVOLSR</td>
<td>Volume serial number</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJFLAGS/UXJCBACK</td>
<td>Failed eject notification call indicator</td>
<td>Output</td>
</tr>
<tr>
<td>UXJUSEA</td>
<td>Volume use attribute</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJWPROT</td>
<td>Write protection status</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJCHKPT</td>
<td>Checkpoint volume indicator</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJLOC</td>
<td>Volume location code</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJTDSI</td>
<td>Tape device selection information</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJGROUP</td>
<td>Storage group name</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJSHLOC</td>
<td>Shelf location</td>
<td>Output</td>
</tr>
<tr>
<td>UXJOOWNER</td>
<td>Volume owner information</td>
<td>Output</td>
</tr>
<tr>
<td>UXJCREAT</td>
<td>Volume record creation date</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJENTEJ</td>
<td>Last entry or eject date</td>
<td>Input only</td>
</tr>
<tr>
<td>UXJMOUNT</td>
<td>Last mounted date</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJWRITE</td>
<td>Last written date</td>
<td>Output/Verified</td>
</tr>
<tr>
<td>UXJEXPIR</td>
<td>Volume expiration date</td>
<td>Output/Verified</td>
</tr>
</tbody>
</table>

The fields that are not marked as input only may be modified by the exit. If it is described as output, it may be updated by the installation exit. If it is further described as verified, the contents or format of the field is validity checked before updating the TCDB volume record with information from the installation exit. Date fields are in ISO format (YYYY-MM-DD).

The 16-byte pass-through value specified with the EXITINFO keyword on the CBRXLCS FUNC(EJECT) macro invocation is passed to the installation exit as an input-only value. If the eject request has come from any source except CBRXLCS, the field contains binary zeros.

If a volume record disposition of purge (P) is returned by the installation exit, the only value retained from the parameter list is the shelf location. This enables the proper shelf location to be displayed upon eject completion.

If a volume record disposition of keep (K) is returned by the installation exit, the following values are checked for validity:
• Volume use attribute
  S (SCRATCH) or P (PRIVATE) can be specified.
• Storage group name
  For a volume use attribute of SCRATCH, OAM sets the storage group name to "SCRTCH". Any name supplied by the exit is ignored. For a volume use attribute of PRIVATE, the storage group name may be set to blanks. If a nonblank value is provided, the storage group must be part of the active configuration, and it must be a tape storage group.
• Write protection status
  Y, N, or blank can be specified.
• Checkpoint volume indicator
  Y, N, or blank can be specified.
• Last mounted date
  The date specified must be in ISO format (YYYY-MM-DD) or blanks.
• Last written date
  The date specified must be in ISO format (YYYY-MM-DD) or blanks.
• Volume expiration date
  The date specified must be in ISO format (YYYY-MM-DD) or blanks.

Shelf location and owner information are not validity checked.

If the installation exit returns with an invalid value in a volume record field, returns with an invalid return code, or abnormally terminates, cartridge eject processing is discontinued until OAM has been stopped and restarted, or the LIBRARY RESET,CBRUXEJC command has been issued to re-enable the cartridge eject installation exit.

Failed eject notification processing

If an eject request fails after the exit has been invoked, the tape configuration database, your tape management system database, and the library manager database might report the library residency of the volume differently. To help avoid these discrepancies, on the initial call to the exit (UXJNCALL value UXJEJECT), the UXJCBACK indicator can be set by the exit. If this indicator is set and the eject request then fails, a failed eject notification call is made to the exit (UXJNCALL value UXJRFAIL). This call provides an opportunity for the tape management system to update its database information on the residency of the volume.

Note: Failed eject notification support is not performed for manual tape library volumes.

Export completion processing

Unlike a physical volume, a logical volume with data cannot be removed from a VTS by ejecting it from the library.

To remove a logical volume with data from a library, the volume must be physically exported from the library. For more information on the export process, see “Exporting logical volumes from a 3494 VTS system” on page 36.

When a logical volume is successfully exported from the library, the cartridge eject installation exit is notified and a notification call indicator (UXJEXPRT) is set in field UXJNCALL. The volume serial number of the stacked container volume on which the logical volume resides can be found in the stacked volume container field, UXJSTKVS. The installation or its tape management system then stores the container information for later use when the logical volume is imported back into a library. If the TCDB is shared across multiple systems but each system has its own tape management system database, the exit can return with RC=12 (IGNORE) if the exported volume is not known to this tape management system. This leaves the volume in the exported category to be processed by a system that "owns" that volume. If appropriate for the installation, the 32-character free form shelf location field in the TCDB volume record
(located in the UXJSHLOC field of the cartridge eject installation exit parameter list) can also be used to store the container volume serial number. This would require that the volume record be kept after a logical volume is exported from the library.

If the volume record disposition returned from the exit indicates that the volume record should be kept and the shelf location returned from the exit is blank, LCS automatically stores the container volume serial number in the shelf location field of the volume record as STACKED=volser. This information can later be used in the volume-not-in-library installation exit (CBRUXVNL) to assist the installation and operator in importing a logical volume. LCS also stores this information if the exit is not to be invoked, the volume record disposition is KEEP, and the shelf location is blank.

This call to the installation exit is a notification call only because the export operation for the logical volume is near completion. This means that the logical volume has already been written to a stacked volume, which will soon be ready for removal. All cartridge eject parameter list fields that can be updated today when a physical volume is ejected from a library can be updated when a logical volume is exported from a library and are subject to the same validity checks. If the export then fails during completion processing, the library recovers by putting the exported volume back into the insert category. There is no failed eject notification call.

**Cartridge eject installation exit parameter list (CBRUXJPL)**

The cartridge eject installation exit (CBRUXEJC) is passed by way of register 1, the pointer to a parameter list mapped by CBRUXJPL. Here is the format of CBRUXJPL.

```
UXJPL  DSECT ,                CBRUXEJC PARAMETER LIST
SPACE 1
***********************************************************************
*                                                                     *
*        CARTRIDGE EJECT INSTALLATION EXIT PARAMETERS                 *
*                                                                     *
***********************************************************************
UXJPARM      DS   0D                CBRUXEJC PARAMETER SECTION
UXJLIB       DS   CL8               LIBRARY NAME
*                                     (INPUT VARIABLE)
UXJLDEV      DS   CL8               LIBRARY DEVICE TYPE
*                                     (INPUT VARIABLE)
UXJLCON      DS   CL8               LIBRARY CONSOLE NAME
*                                     (INPUT VARIABLE)
UXJLTYP      DS   CL1               LIBRARY LOGICAL TYPE
*                                     'R' FOR AUTOMATED LIBRARY
*                                     'M' FOR MANUAL LIBRARY
*                                     (INPUT VARIABLE)
DS   CL7               RESERVED
UXJLDESC     DS   CL120             LIBRARY DESCRIPTION
*                                     (INPUT VARIABLE)
DS   CL8               RESERVED
UXJVDISP     DS   CL1               VOLUME RECORD DISPOSITION
*                                     'K' KEEP VOLUME RECORD IN
*                                     THE TAPE CONFIGURATION
*                                     'P' PURGE VOLUME RECORD FROM
*                                     THE TAPE CONFIGURATION
*                                     (INPUT VARIABLE)
*                                     (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)
UXJUSEA      DS   CL1               RESERVED
UXJUSEA      DS   CL1               VOLUME USE ATTRIBUTE
```

'P' FOR PRIVATE
'S' FOR SCRATCH

UXJWPROT DS CL1 WRITE PROTECTION STATUS
'Y' FOR WRITE-PROTECTED
'N' FOR NOT WRITE-PROTECTED

UXJCHKPT DS CL1 CHECKPOINT VOLUME INDICATOR
'Y' FOR CHECKPOINT VOLUME
'N' FOR NOT CHECKPOINT VOLUME

UXJLOC DS CL1 VOLUME LOCATION CODE
'L' FOR LIBRARY-RESIDENT
'S' FOR SHELF-RESIDENT

UXJDSCI DS 0F TAPE DEVICE SELECTION INFO
UXJREC DS XL1 TAPE RECORDING TECHNOLOGY

UXJMEDIA DS XL1 MEDIA TYPE

UXJCOMP DS XL1 COMPACTION TYPE

UXJSPEC DS XL1 SPECIAL ATTRIBUTE

UXJGROUP DS CL8 STORAGE GROUP NAME

UXJSHLOC DS CL32 SHELF LOCATION

UXJOWNER DS CL64 VOLUME OWNER INFORMATION

UXJCREAT DS CL10 VOLUME RECORD CREATION DATE

UXJENTEJ DS CL10 LAST ENTRY OR EJECTION DATE

UXJMOUNT DS CL10 LAST MOUNTED DATE

UXJWRITE DS CL10 LAST WRITTEN DATE

UXJEXPIR DS CL10 VOLUME EXPIRATION DATE

UXJEXITI DS CL16 INSTALLATION EXIT INFORMATION

UXJPLLEN EQU *-UXJPL

***********************************************************************

RETURN CODES

UXJNOCHG EQU 0 PERFORM EJECT/EXPORT AS NOTIFIED
  USING PARAMETER VALUES
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

LIBRARY LOGICAL TYPE CONSTANTS

UXJAUTO EQU 'C'R' AUTOMATED/REAL LIBRARY
UXJMAN EQU 'C'M' MANUAL LIBRARY

VOLUME RECORD DISPOSITION (EJECT TYPE) CONSTANTS

Installation exits 221
UXJKEEP  EQU  C'K'  KEEP VOLUME RECORD
UXJPURGE EQU  C'P'  PURGE VOLUME RECORD

******************************************************************************
 UXJEJECT   EQU   0   EJECT REQUEST FOR A VOLUME
 UXJEXPRT   EQU   1   LOGICAL VOLUME SUCCESSFULLY EXPORTED
 UXJFAIL    EQU   2   FAILED EJECT NOTIFICATION
******************************************************************************
 UXJPRIV    EQU  C'P'  PRIVATE USE ATTRIBUTE
 UXJSCRT    EQU  C'S'  SCRATCH USE ATTRIBUTE

******************************************************************************
 UXJNOCAR    EQU  0   ZERO IS AN ACCEPTABLE VALUE FOR TDSI
******************************************************************************
 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
 UXJEFMT1    EQU  6   READ/WRITE ON ENTERPRISE FORMAT 1 (EFMT1) DEVICE
 UXJEFMT2    EQU  7   READ/WRITE ON ENTERPRISE FORMAT 2 (EFMT2) DEVICE
 UXJEEFMT2   EQU  8   READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2 (EEFMT2) DEVICE
 UXJEFMT3    EQU  9   READ/WRITE ON ENTERPRISE FORMAT 3 (EFMT3) DEVICE
 UXJEEFMT3   EQU  10  READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 3 (EEFMT3) DEVICE
 UXJEFMT4    EQU  11  READ/WRITE ON ENTERPRISE FORMAT 4 (EFMT4) DEVICE
 UXJEEFMT4   EQU  12  READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 4 (EEFMT4) DEVICE
******************************************************************************
 UXJNOMED    EQU  0   MEDIA TYPE UNKNOWN OR UNSPECIFIED
 UXJMED1     EQU  1   CARTRIDGE SYSTEM TAPE
 UXJMED2     EQU  2   ENHANCED CAPACITY TAPE
 UXJMED3     EQU  3   HIGH PERFORMANCE TAPE
 UXJMED4     EQU  4   EXTENDED HIGH PERFORMANCE TAPE
 UXJMED5     EQU  5   ENTERPRISE TAPE CARTRIDGE
 UXJMED6     EQU  6   WORM TAPE CARTRIDGE
 UXJMED7     EQU  7   ENTERPRISE ECONOMY TAPE CARTRIDGE
 UXJMED8     EQU  8   ENTERPRISE ECONOMY WORM TAPE CARTRIDGE
 UXJMED9     EQU  9   ENTERPRISE EXTENDED TAPE CARTRIDGE
 UXJMED10    EQU 10  ENTERPRISE EXTENDED WORM TAPE CARTRIDGE
 UXJMED11    EQU 11  TAPE CARTRIDGE
 UXJMED12    EQU 12  ENTERPRISE ADVANCED WORM TAPE CARTRIDGE

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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>Perform cartridge ejection and note that one or more fields in the parameter list (CBRUXJPL) have changed.</td>
</tr>
<tr>
<td>8</td>
<td>Do not allow this cartridge to be ejected.</td>
</tr>
<tr>
<td>12</td>
<td>Ignore export completion processing for this logical volume. OAM leaves the volume in the library in the exported category.</td>
</tr>
<tr>
<td>16</td>
<td>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.</td>
</tr>
</tbody>
</table>

**Note:** If an invalid return code is passed back, OAM discontinues cartridge eject processing.

**Cartridge eject installation exit (CBRUXEJC) usage requirements**

The cartridge eject installation exit must reside in load module CBRUXEJC. It is invoked by OAM through the MVS LINK macro and must reside in a library in the LNKLST concatenation. The installation exit can be executed above or below the 16-megabyte line. If multiple tape libraries are defined to the system, the installation exit must be coded and linkededited 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](z/OS DFSMSrmm Implementation and Customization 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 dataserver between job setup and library mount processing, the mount request immediately fails, since an export operation is not immediate.

**Note:** The input to the exit at device allocation does not identify the library to which the tape volume must return, because the information was erased when the volume was ejected from the library. Therefore, the exit must rely upon other sources to determine which library should receive the missing volume.

• If tape volumes are not library-resident in a tape library and are physically located in a remote area, requests for these volumes are allocated to stand-alone tape drives and are delayed until the volumes are retrieved and mounted on the stand-alone tape drives. While jobs are waiting for these tape volumes to be mounted, the system resources allocated to these tape volumes are unavailable for use by other jobs. CBRUXVNL can identify this condition and interact with the installation’s tape management system to determine the best course of action to alleviate this waste of time and resource.

• Since the ATLDS has a *finite* tape cartridge capacity, infrequently used tape volumes may be ejected until their next scheduled use. These tape cartridges should be reentered in advance of reuse to avoid job processing delays, but since this is not always possible, this exit can be used to identify and correct this condition, preventing job failures.

**Note:** With JES3, the job step notification occurs before the job being scheduled for execution. Therefore, missing tapes can be located and entered into the tape library well in advance of usage.

### Processing options for the installation exit

The following options are available to the exit:

- Continue without entering the cartridge into a library.
- Locate the requested volume and enter it into a tape library.
- Cancel the request immediately.
- Indicate that the exit not be invoked again.

### Logical volume considerations

If a logical volume is requested to be mounted, it is important that the installation exit also display the exported stacked volume that contains the logical volume. If the OAM supplied default is being used, this information is automatically displayed if the shelf location in the TCDB volume record is STACKED=volser.

### Entering tape volumes in the library using the installation exit

To enter tape volumes into the library under the direction of the exit, the following conditions must both be met:
• OAM must be up and running on at least one of the systems sharing the tape library dataserver in the SMS complex or TCDBplex.
• OAM must have been started since the most recent IPL on the system running the requested job.

When entering a volume into a tape library under the direction of CBRUXVNL, you must set the volume use attribute to PRIVATE; otherwise, the request fails. This is because only specific volume requests are handled by the exit and a specific volume request for a scratch tape is not permitted. Volume use attributes are set by default from the ISMF Library Definition or by the cartridge entry installation exit.

Perform the following steps when you enter a volume into a tape library:

• Locate the requested volume using the tape management system inventory.
• Enter the volume into a tape library (or if indicated, the specific tape library). For a logical volume, enter the required exported stacked volume and initiate a single volume import at the library manager console.
• Reply to the outstanding WTOR at the MVS console.

**Note:** If the exit is waiting for an extended period for human intervention to finish processing, this causes delays for other jobs that may be processing at the same time or that may need the same resources as the job for which the exit is active. If the volume is not entered into the library within 15 minutes, CBR3646D is issued indicating that the operator should retry or cancel the job request.

**Possible error conditions**

The installation may introduce a number of error conditions in the process of re-entering a cartridge into a library under the control of the volume not in library installation exit. The following errors may cause immediate or eventual job failures:

• Entering a volume into the wrong library (prompts the issuance of message CBR3646D)
• Setting the wrong storage group name in the cartridge entry installation exit
• Setting incorrect tape device selection information in the cartridge entry installation exit
• Setting the scratch volume use attribute in the cartridge entry installation exit incorrectly
• Inadvertently requesting a volume with a level of TDSI information not recognized by the system

**Note:** If the operator enters the volume into the wrong library, or OAM is not aware of the entry of the volume within 15 minutes, OAM issues the CBR3646D message. This allows the operator the opportunity to correct the situation and retry or cancel the operation.

The best way to avoid these errors is to not eject the volumes in the first place. If this is not practical, then the tape volume record should be kept by using the KEEP option of the LIBRARY EJECT operator command or through the ISMF Mountable Tape Volume line operator when the volume is ejected. This preserves the information about the tape volume so that the Cartridge Entry Installation Exit does not have to rebuild the tape volume record.

If a job on a lower-level system inadvertently requests a volume whose media type or recording technology is not understood at this software level, the exit can cancel the job, returning a return code 8, or it can proceed with entering the volume. If the exit proceeds and enters the volume, once it is successfully entered on an up-level system and the exit returns with a return code 4 (indicating retry), the job on the down-level system fails during job step setup on subsequent retrieval of the volume record. If the host detects that it is an up-level volume (if the TCDB volume record exists), the call to the exit is bypassed and the job is canceled.

**Job step setup**

CBRUXVNL is invoked during job step setup processing to provide an opportunity to enter the tape volume into any tape library chosen. The call to the exit is made when the first or only volume serial number specified on the DD statement or dynamic allocation request is not an online DASD volume and no record exists in the TCDB for the volume, or a record exists but indicates the volume is shelf-resident. Shelf-resident means the tape volume was ejected from the tape library with the KEEP option, which retained
the TCDB record. For new data sets, this occurs just before calling the ACS routines; for old data sets, this occurs when the TCDB search completes before device allocation.

**Note:** Refer to APAR OA11079, available at z/OS V1R4 and above, for changes to the processing related to offline DASD volumes. With this APAR installed, or starting with z/OS V1R8, during DISP=OLD processing, the CBRUXVNL exit is no longer called for offline DASD volumes.

Table 24 on page 227 lists the contents of the exit input when a volume record does not exist in the TCDB.

**Table 24. CBRUXVNL input during job step setup—No TCDB volume record**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXWHERE</td>
<td>1 indicates job step setup processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>1 indicates no TCDB record</td>
</tr>
</tbody>
</table>

Table 25 on page 227 lists the contents of the exit input when a shelf-resident tape volume record exists in the TCDB.

**Table 25. CBRUXVNL input during job step setup—Existing TCDB volume record**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXWHERE</td>
<td>1 indicates job step setup processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>2 indicates volume is shelf-resident</td>
</tr>
<tr>
<td>UXNGROUP</td>
<td>Storage group name</td>
</tr>
<tr>
<td>UXNUSA</td>
<td>Volume use attribute</td>
</tr>
<tr>
<td>UXNWPROT</td>
<td>Write protection status</td>
</tr>
<tr>
<td>UXNCHKPT</td>
<td>Checkpoint volume indicator</td>
</tr>
<tr>
<td>UXNLOC</td>
<td>Volume location code</td>
</tr>
<tr>
<td>UXNSHLOC</td>
<td>Shelf location</td>
</tr>
<tr>
<td>UXNOWNER</td>
<td>Volume owner information</td>
</tr>
<tr>
<td>UXNCREATE</td>
<td>Volume record creation date</td>
</tr>
<tr>
<td>UXNENTEJ</td>
<td>Last entry or ejection date</td>
</tr>
<tr>
<td>UXNMOUNT</td>
<td>Last mounted date</td>
</tr>
<tr>
<td>UXNWRITE</td>
<td>Last written date</td>
</tr>
<tr>
<td>UXNEXPIR</td>
<td>Volume expiration date</td>
</tr>
<tr>
<td>UXNTDI</td>
<td>Tape device selection information</td>
</tr>
</tbody>
</table>

Table 26 on page 228 lists the job information fields and possible content when invoked for job step setup. Job information is only passed to the exit during the job step setup CBRUXVNL invocation as this is the critical time for the exit to determine if the volume should be entered into a library. At device allocation and library mount processing, it has already been determined that the volume should reside in a tape library; therefore, job information is not passed to the CBRUXVNL installation exit for these invocations.
Table 26. CBRUXVNL input during job step setup—Job information fields

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNJINFO</td>
<td>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.</td>
</tr>
<tr>
<td>UXNJOBNM</td>
<td>Job Name - contains zeros if not available</td>
</tr>
<tr>
<td>UXNSTPNM</td>
<td>Step Name - contains zeros if not available</td>
</tr>
<tr>
<td>UXNPRGNM</td>
<td>Program Name - contains zeros if not available</td>
</tr>
<tr>
<td>UXNDDNM</td>
<td>DD Name - contains zeros if not available. May contain blanks if not the first data set in a concatenated data set DD statement</td>
</tr>
<tr>
<td>UXNDSN</td>
<td>Data Set Name - contains zeros if not available</td>
</tr>
<tr>
<td>UXNUNIT</td>
<td>Unit Name - contains zeros if not available</td>
</tr>
<tr>
<td>UXNDISP</td>
<td>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</td>
</tr>
<tr>
<td>UXNCATLG and UXNDEVTP</td>
<td>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.</td>
</tr>
</tbody>
</table>

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 228 lists the contents of the exit input when a volume record does not exist in the TCDB.

Table 27. CBRUXVNL input during device allocation—No TCDB volume record

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXNWHERE</td>
<td>2 indicates device allocation processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>1 indicates no TCDB record</td>
</tr>
</tbody>
</table>

Table 28 on page 229 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXNWHERE</td>
<td>2 indicates device allocation processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>2 indicates volume is shelf-resident</td>
</tr>
<tr>
<td>UXNGROUP</td>
<td>Storage group name</td>
</tr>
<tr>
<td>UXNUSEA</td>
<td>Volume use attribute</td>
</tr>
<tr>
<td>UXNWRITE</td>
<td>Write protection status</td>
</tr>
<tr>
<td>UXNCHKPT</td>
<td>Checkpoint volume indicator</td>
</tr>
<tr>
<td>UXNLOC</td>
<td>Volume location code</td>
</tr>
<tr>
<td>UXNSHLOC</td>
<td>Shelf location</td>
</tr>
<tr>
<td>UXNOWNER</td>
<td>Volume owner information</td>
</tr>
<tr>
<td>UXNCREAT</td>
<td>Volume record creation date</td>
</tr>
<tr>
<td>UXNENTEJ</td>
<td>Last entry or ejection date</td>
</tr>
<tr>
<td>UXNMOUNT</td>
<td>Last mounted date</td>
</tr>
<tr>
<td>UXNWRITE</td>
<td>Last written date</td>
</tr>
<tr>
<td>UXNEXPIR</td>
<td>Volume expiration date</td>
</tr>
<tr>
<td>UXTDSI</td>
<td>Tape device selection information</td>
</tr>
</tbody>
</table>

**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 229 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

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXNWHERE</td>
<td>3 indicates library mount processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>1 indicates no volume record in the TCDB</td>
</tr>
<tr>
<td>UXNLIB</td>
<td>Library name to which the volume must be re-entered (target)</td>
</tr>
<tr>
<td>UXNLDEV</td>
<td>Library device type of the target library</td>
</tr>
</tbody>
</table>
Table 29. CBRUXVNL input library mount processing—No TCDB volume record (continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNLCON</td>
<td>Library console name of the target library</td>
</tr>
<tr>
<td>UXNLTYP</td>
<td>Library logical type of the target library</td>
</tr>
<tr>
<td>UXNLDESC</td>
<td>Library description of the target library</td>
</tr>
</tbody>
</table>

Table 30 on page 230 lists the contents of the exit input when the volume record still exists in the TCDB.

Table 30. CBRUXVNL input library mount processing—Existing TCDB volume record

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>UXNVOLSR</td>
<td>Volume serial number</td>
</tr>
<tr>
<td>UXNWHERE</td>
<td>3 indicates library mount processing</td>
</tr>
<tr>
<td>UXNERROR</td>
<td>4 indicates volume is being ejected</td>
</tr>
<tr>
<td></td>
<td>3 indicates volume is in a different library</td>
</tr>
<tr>
<td></td>
<td>2 indicates volume is shelf-resident</td>
</tr>
<tr>
<td>UXNLIB</td>
<td>Library in which the volume must be re-entered (target)</td>
</tr>
<tr>
<td>UXNLDEV</td>
<td>Library device type of the target library</td>
</tr>
<tr>
<td>UXNLCON</td>
<td>Library console name of the target library</td>
</tr>
<tr>
<td>UXNLTYP</td>
<td>Library logical type of the target library</td>
</tr>
<tr>
<td>UXNLDESC</td>
<td>Library description of the target library</td>
</tr>
<tr>
<td>UXNLIBRS</td>
<td>Library in which the volume currently resides (might not be the same</td>
</tr>
<tr>
<td></td>
<td>library as the target resident library)</td>
</tr>
<tr>
<td>UXNGROUP</td>
<td>Storage group name</td>
</tr>
<tr>
<td>UXNUSEA</td>
<td>Volume use attribute</td>
</tr>
<tr>
<td>UXNWPROT</td>
<td>Write protection status</td>
</tr>
<tr>
<td>UXNCHKPT</td>
<td>Checkpoint volume indicator</td>
</tr>
<tr>
<td>UXNLOC</td>
<td>Volume location code</td>
</tr>
<tr>
<td>UXNSHLOC</td>
<td>Shelf location</td>
</tr>
<tr>
<td>UXNOWNER</td>
<td>Volume owner information</td>
</tr>
<tr>
<td>UXNCREAT</td>
<td>Volume record creation date</td>
</tr>
<tr>
<td>UXNENTEJ</td>
<td>Last entry or ejection date</td>
</tr>
<tr>
<td>UXNMOUNT</td>
<td>Last mounted date</td>
</tr>
<tr>
<td>UXNWRITE</td>
<td>Last written date</td>
</tr>
<tr>
<td>UXNEXPIR</td>
<td>Volume expiration date</td>
</tr>
<tr>
<td>UXNTDSI</td>
<td>Tape device selection information</td>
</tr>
</tbody>
</table>
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 OD   CBRUXVNL PARAMETER SECTION
UXNWHERE DS XL1 WHERE THE ERROR WAS FOUND
  * 1 JOB STEP SETUP PROCESSING
  * 2 DEVICE ALLOCATION PROCESSING
  * 3 LIBRARY MOUNT PROCESSING
UXNERRO1 DS XL1 ERROR INDICATOR
  * 1 VOLUME RECORD NOT IN TCBDB
  * 2 VOLUME IS SHELF RESIDENT
  * 3 VOLUME IN DIFFERENT LIBRARY
  * 4 VOLUME EJECT PENDING AND
  * EJECT CANNOT BE CANCELED
RESERVED DS CL6
UXNLIB DS CL8 LIBRARY NAME IN WHICH THE VOLUME SHOULD
  * BE ENTERED OR BLANKS
UXNDEVEV DS CL8 LIBRARY DEVICE TYPE OR BLANKS
UXNCONDS DS CL8 LIBRARY CONSOLE NAME OR BLANKS
UXNLTYPE DS CL1 LIBRARY LOGICAL TYPE OR BLANK
  * 'R' FOR AUTOMATED LIBRARY
  * 'M' FOR MANUAL LIBRARY
RESERVED DS CL7
UXNDESC DS CL120 LIBRARY DESCRIPTION OR BLANKS
UXNLINFO EQU X'80' ON IF JOB INFORMATION PROVIDED
  * (JOB STEP SETUP INVOCATION)
  * FLAG X'40' IS RESERVED
RESERVED DS CL1
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
UXNWRITE DS CL1 VOLUME LOCATION OR BLANK
  * 'L' FOR LIBRARY-RESIDENT
  * 'S' FOR SHELF-RESIDENT
UXNWORK 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
UXNTDSI DS 0F TAPE DEVICE SELECTION INFORMATION
UXNRREC DS XL1 TAPE RECORDING TECHNOLOGY OR ZERO
UXNRECI   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
RESERVED DS CL8
UXNCREAT DS CL10 VOLUME RECORD CREATION DATE YYYY-MM-DD
  * OR BLANKS
UXNENETEJ 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
RESERVED DS CL10
RESERVED DS CL4
**********************************************************************
```
* JOB INFORMATION AVAILABLE WHEN INVOKED FOR JOB STEP SETUP PROCESSING (UXNWHERE=UXNSETUP)
**
** **************************************************************
**
** JOB INFORMATION FIELDS ARE INPUT ONLY FIELDS
**
** **************************************************************

UXNJOB DS OCL120 JOB INFORMATION
UXNJOBNM DS CL8 JOB NAME
UXNSTPNM DS CL8 STEP NAME
UXNPGRNM 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, ZEROS, IF NOT SPECIFIED, OR IN SOME CASES,
* DEFAULT SETTINGS RATHER THAN ZEROS)
*
** **************************************************************

UXNDISP DS OCL17 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
UXNDEVTP DS CL4 DEVICE TYPE FROM CATALOG
* (PROVIDED IF UXNCATLG IS ON)
UXNEND DS QD END OF CBRUXVNL PARAMETER SECTION

UXNPLLEN EQU * - UXNPL LENGTH OF THE PARAMETER LIST

** **************************************************************
**
** RETURN CODES
**
** **************************************************************

UXNNORML EQU 0 PERFORM NORMAL PROCESSING
UXNRETRY EQU 4 RETRY THE FAILING OPERATION
UXNNONT EQU 8 CANCEL THE JOB STEP
UXNDONT EQU 16 DO NOT CALL THE VOLUME NOT IN LIBRARY
* INSTALLATION EXIT AGAIN AND PERFORM
* NORMAL PROCESSING

** **************************************************************
**
** WHERE CONSTANTS (UXNWHERE)
**
** **************************************************************

UXNSETUP EQU 1 DURING JOB SETUP PROCESSING
UXNALLOCT EQU 2 DURING DEVICE ALLOCATION PROCESSING
UXNLMNT EQU 3 DURING LIBRARY MOUNT PROCESSING

** **************************************************************
**
** ERROR CONSTANTS (UXNERROR)
**
** **************************************************************

UXNNTCDB EQU 1 VOLUME RECORD NOT IN TCDB
UXNDFRT EQU 2 VOLUME IS SHELF RESIDENT
UXNDFRNT EQU 3 VOLUME IN DIFFERENT LIBRARY
UXNEJECT EQU 4 VOLUME EJECT PENDING AND
* EJECT CANNOT BE CANCELED

** **************************************************************
**
** LIBRARY LOGICAL TYPE CONSTANTS (UXNLTYP)
**
** **************************************************************

UXNPRIV EQU C'P' PRIVATE USE ATTRIBUTE

** **************************************************************
**
** USE ATTRIBUTE CONSTANTS (UXNUSEA)
**
** **************************************************************

UXNPRIV EQU C'P' PRIVATE USE ATTRIBUTE

UXNSCRT EQU 'S'  SCRATCH USE ATTRIBUTE

*******************************************************************************
* LOCATION CONSTANTS (UXNLOC) *
*******************************************************************************
UXNLBRY EQU 'L'  LIBRARY RESIDENT
UXNSHLF EQU 'S'  SHELF RESIDENT

*******************************************************************************
* TAPE DEVICE SELECTION INFORMATION (TDSI) CONSTANTS *
*******************************************************************************
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 ENTERPRISE FORMAT 1
* (EFMT1) DEVICE
UXNEFMT2 EQU 6  READ/WRITE ON ENTERPRISE FORMAT 2
* (EFMT2) DEVICE
UXNEEFT2 EQU 7  READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 2
* (EEFMT2) DEVICE
UXNEFMT3 EQU 8  READ/WRITE ON ENTERPRISE FORMAT 3
* (EFMT3) DEVICE
UXNEEFT3 EQU 9  READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 3
* (EEFMT3) DEVICE
UXNEFMT4 EQU 10 READ/WRITE ON ENTERPRISE FORMAT 4
* (EFMT4) DEVICE
UXNEEFT4 EQU 11 READ/WRITE ON ENTERPRISE ENCRYPTED FORMAT 4
* (EEFMT4) DEVICE

*******************************************************************************
* MEDIA TYPE CONSTANTS *
*******************************************************************************
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
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
UXNMED12 EQU 12 MEDIA12 - ENTERPRISE ADVANCED
* WORM TAPE CARTRIDGE
UXNMED13 EQU 13 MEDIA13 - ENTERPRISE ADVANCED
* ECONOMY TAPE CARTRIDGE

*******************************************************************************
* COMPACTION CONSTANTS *
*******************************************************************************
UXNCMPNS EQU 0  COMPACTION UNKNOWN OR NOT SET
UXNIDRC EQU 2  COMPACTION
UXNCOMPT EQU 2  COMPACTION

*******************************************************************************
* SPECIAL ATTRIBUTE CONSTANTS *
*******************************************************************************
UXNNOSPC EQU 0  VOLUME HAS NO SPECIAL ATTRIBUTE
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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>8</td>
<td>Cancel. The job step or dynamic allocation is canceled.</td>
</tr>
<tr>
<td>16</td>
<td>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.</td>
</tr>
</tbody>
</table>

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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Perform normal processing.</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Code</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Perform normal processing. The job step or dynamic allocation is failed.</td>
</tr>
<tr>
<td>4</td>
<td>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.</td>
</tr>
<tr>
<td>8</td>
<td>Cancel the job step. The job step or dynamic allocation fails.</td>
</tr>
<tr>
<td>16</td>
<td>Do not call the exit again. The job step or dynamic allocation fails. The exit is not called again.</td>
</tr>
</tbody>
</table>

If the installation returns a return code 16, indicating that the exit not be invoked again, or the installation exit is deactivated as the result of an abnormal termination or an invalid return code, the exit can be reactivated by stopping and restarting the OAM address space, or by issuing the LIBRARY RESET,CBRUXVNL command.
Volume not in library installation exit (CBRUXVNL) usage requirements

The volume not in library installation exit must reside in load module CBRUXVNL. It is invoked by way of the MVS LINK macro and must reside in a library in the LNKLST concatenation.

Since the volume not in library installation exit (CBRUXVNL) receives control through an MVS LINK macro, the addressing mode on entry to the exit may be either 24-bit or 31-bit addressing mode. Also, the installation exit can be executed above or below the 16-megabyte line. The addressing mode and the residency mode are determined by whatever AMODE (for addressing mode) or RMODE (for residency mode) characteristics are assigned to the load module when it is created by the MVS Linkage Editor and Loader or the MVS Program Binder.

Because the exit may be invoked in a key other than the job key:

- All storage dynamically acquired by the exit must be obtained from subpool 227, 228, 229, 230, 231, or 241.
- The exit must be written as a reentrant program and the resulting load module must be link-edited on the system as REENTRANT.

The following characteristics describe the execution environment in which the volume not in library installation exit is invoked:

- Task mode (not SRB mode)
- Unlocked
- Noncross memory mode (HASN = PASN = SASN)
- The 24-bit or 31-bit addressing mode depending on AMODE characteristics assigned when load module was created
- APF-authorized load module or in an APF-authorized library
- Primary ASC mode (not AR mode)
- Enabled for I/O external interrupts
- PSW key of the caller might not match the job key
- State of the caller

Note: Because of the environment in which this exit can be given control, invoking dynamic allocation from within this exit is not supported and can lead to an abend.

Mapping macro CBRUXNPL must be included by the installation exit.
Appendix A. SAMPLIB members

This appendix contains information on sample library members that you can modify to suit your own business requirements:

- CBRSPPLCS, 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 201.
- CBRAPROC, which is used to create member OAM in SYS1.PROCLIB.
- CBRSPSIM, CBRSPPIM, CBRSPPIP, CBRSPSX, CBRSPPXP, and CBRSPO3 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).
- CBRSPPIM for import list volume (private request).
- CBRSPPIP for import list volume (private request). Illustrates IMPORT LIST 02 format for outboard policy management specifications.
- CBRSPSX for export list volume (scratch request).
- CBRSPPXP for export list volume (private request).
- CBRSPO3 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 CBRSPPLCS 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.
<table>
<thead>
<tr>
<th>Sample</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBRSPPLCS</td>
<td>Sample program that invokes the CBRXLCS programming interface using a transactional dataset on input.</td>
</tr>
<tr>
<td>CBRSPPUXC</td>
<td>Sample change use attribute installation exit for CBRUXCUA.</td>
</tr>
<tr>
<td>CBRSPUXE</td>
<td>Sample cartridge entry installation exit for CBRUXENT.</td>
</tr>
<tr>
<td>CBRSPUXJ</td>
<td>Sample cartridge eject installation exit for CBRUXEJC.</td>
</tr>
<tr>
<td>CBRSPUXV</td>
<td>Sample volume not in library installation exit for CBRUXVNL.</td>
</tr>
<tr>
<td>CBRAPROC</td>
<td>Sample JCL that creates the OAM started procedure in PROCLIB.</td>
</tr>
<tr>
<td>CBRSPSIM</td>
<td>SAMPLIB JCL that writes the two required files on the import list volume using a scratch volume and import list format 01.</td>
</tr>
<tr>
<td>CBRSPPIIM</td>
<td>SAMPLIB JCL that writes the two required files on the import list volume using a private volume and import list format 01.</td>
</tr>
<tr>
<td>CBRSPPIP</td>
<td>SAMPLIB JCL that writes the two required files on the import list volume using a private volume and import list format 02.</td>
</tr>
<tr>
<td>CBRSPSXP</td>
<td>SAMPLIB JCL that writes the three required files on the export list volume using a private volume and export list format 01.</td>
</tr>
<tr>
<td>CBRSPXP</td>
<td>SAMPLIB JCL that writes the three required files on the export list volume using a private volume and export list format 01.</td>
</tr>
<tr>
<td>CBRSPX03</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 LNKLST concatenation, either include
/* the DB2 load module library in the SYS1.LINKLIB
/* concatenation (LNKLSTxx) 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.
/* $L3=HDZ11C0 130 940818 TUCGRD: Added the EJECT keyword
/* $01=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
SYSPRT2 DD DSNAMES=SYS1.PROCLIB,DISP=SHR
SYSSIN DD DATA
   ADD NAME=OAM,LEVEL=01,SOURCE=0,LIST=ALL
   NUMBER NEW1=10,INCR=10
   OAM,PROC OSMC=YES,MXS=2,UNLOAD=9999,EJECT=LRW,REST=YES
IEFPROC EXEC PGM=CBROAM,REGION=0M,
   PARM=('OSMC=&OSMC,APLAN=CBROAM,MXS=&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 241.
- “Displaying tape library attributes” on page 250.
- “Redefining a tape library” on page 253.
- “Altering a tape library” on page 256.
- “Copying tape library definitions” on page 258.
- “Deleting a tape library definition” on page 259.
- “Creating a list of tape libraries” on page 268.
- “Auditing volumes in an automated tape library” on page 271.
- “Altering the volume record” on page 274.
- “Ejecting a volume from a tape library” on page 278.

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 242) 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.
When you select option 10, Library Management, the Library Management Selection Menu is displayed, as shown in Figure 17 on page 242.

Note: Since this manual deals with OAM's relationship with tape libraries, only the tape option is discussed. For more information on OAM's role with optical libraries, see z/OS DFSMS OAM Planning, Installation, and Storage Administration Guide for Object Support.

Selecting option 3, Tape Library, and pressing ENTER displays the Tape Library Application Selection panel (see Figure 18 on page 243).

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 244 and Figure 20 on page 244.
SCDS NAME and LIBRARY NAME are output fields that contain the SCDS and library name you specified in the Tape Library Management Application Selection panel.

Specify the following information for the tape library definition in the tape configuration database and in the current source control data set.

**DESCRIPTION**
A 120-byte field used for entering a description of the library definition. There are no restrictions on its content.

**LIBRARY ID**
Establishes the connection between the software-assigned library name and the tape drives that belong to the library. A valid value is entered as five hexadecimal digits. For an ATLDS, it is defined at the library by the customer engineer and must also match what is optionally specified in the HCD LIBRARY-ID parameter. This value is returned by the control unit in response to a read device.
characteristics command. For an MTL, it must match what was specified in the HCD LIBRARY-ID parameter. Valid values are 00001 – FFFFF; a default value of 00000 is not allowed.

**CONSOLE NAME**

Specifies the name of the MVS console associated with the tape library 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_28/unique_28_Connect_42_step2d” on page 73 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.

**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 244). 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
74.

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 58.

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 247). 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 247).
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 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 243) 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 248, Figure 24 on page 249, Figure 25 on page 249, and Figure 26 on page 250) are again displayed, and you enter the appropriate information for LIB2.
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  ===>  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)
After you complete these library definitions, you have two libraries—one ATLDS library, LIB1, along with an MTL library, LIB2—defined in the SMS configuration. Defining a tape library 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 dataserver by:

1. Select option 2, DISPLAY, on the Tape Library Application Selection panel (Figure 18 on page 243).
2. Press ENTER.

Figure 27 on page 250 shows the first of the two TAPE LIBRARY DISPLAY panels that are displayed.

---

The following fields are displayed:

**Panel Utilities Scroll Help**

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)

---

Figure 27. Tape Library Display Panel (Page 1 of 2)
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:

- **dddm-mm** (for an automated tape library including a virtual tape library), where **dddm** is the device type of the library, and **mmm** is the model. For a composite library that is part of a multi-cluster grid, the distributed libraries should be displayed for the underlying machine and model types. "GRID" might be displayed for the composite library’s device type
- **MANUAL** (for a Manual Tape Library)
- **--------** the value is not available.
- **???????** the value cannot be displayed due to an error.

LIBRARY ID
Establishes the connection between the software-assigned library name and the tape drives that belong to the library. A valid value is entered as five-hexadecimal digits. For an ATLDS, it is defined at the library by the customer engineer and must also match what is optionally specified in the HCD LIBRARY-ID parameter. This value is returned by the control unit in response to a read device characteristics command. For an MTL, it must match what was specified in the HCD LIBRARY-ID parameter. Valid values are 00001 - FFFFF; a default value of 00000 is not allowed.

DESCRIPTION
This is a 120-byte field that the installation uses to describe the library. There are no restrictions on its content.

CONSOLE NAME
The name of the MVS console associated with the tape library being defined. The console name provides for precise routing of console messages pertaining to a specific library. When the console name is not specified, console name routing support is not provided. The console name is passed to the installation exits for their use.

ENTRY DEFAULT DATA CLASS
Specifies the data class to be used to determine the interchange attributes for private volumes entered into the tape library. No other attributes of the data class are used. You can use the cartridge entry installation exit (CBRUXENT) to assign appropriate interchange values that override the default data class specifications.

**Note:** The specified data class name is not automatically assigned or used as the default data class policy name for outboard policy management.

ENTRY DEFAULT USE ATTRIBUTE
The default volume use attribute for the cartridges entered into the library.

**PRIVATE**
These tape cartridges can be used to satisfy specific volume requests.

**SCRATCH**
These tape cartridges can be used to satisfy nonspecific volume requests.

EJECT DEFAULT
The default action for the TCDB volume record when a tape cartridge is ejected from the library being defined.

**PURGE**
The volume record is deleted from the TCDB.

**KEEP**
The volume record is kept in the TCDB.
Note: No matter which disposition is specified, the volume record in the ATLDS library manager inventory is deleted upon cartridge ejection.

MEDIA TYPE
The following are recognized media types:

MEDIA1
IBM Cartridge System Tape

MEDIA2
IBM Enhanced Capacity Cartridge System Tape

MEDIA3
IBM High Performance Cartridge Tape

MEDIA4
IBM Extended High Performance Cartridge Tape

MEDIA5
IBM Enterprise Tape Cartridge

MEDIA6
IBM Enterprise WORM Tape Cartridge

MEDIA7
IBM Enterprise Economy Tape Cartridge

MEDIA8
IBM Enterprise Economy WORM Tape Cartridge

MEDIA9
IBM Enterprise Extended Tape Cartridge

MEDIA10
IBM Enterprise Extended WORM Tape Cartridge

MEDIA11
IBM Enterprise Advanced Tape Cartridge

MEDIA12
IBM Enterprise Advanced WORM Tape Cartridge

MEDIA13
IBM Enterprise Advanced Economy Tape Cartridge

SCRATCH THRESHOLD
The minimum acceptable number of scratch volumes for each media type in the library.

SCRATCH NUMBER
The number of tape cartridges available to satisfy nonspecific volume requests.

Figure 28 on page 253 shows the second part of the Tape Library Display panel.
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)

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 254, Figure 30 on page 254, Figure 31 on page 255, and Figure 32 on page 255) 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.
Figure 29. Tape Library Redefine Panel (Page 1 of 4)

Figure 30. Tape Library Redefine Panel (Page 2 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 268 through Figure 52 on page 271).

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 243:

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 256, Figure 34 on page 257, Figure 35 on page 257, and Figure 36 on page 258.

---

**Figure 33. Tape Library Alter Panel (Page 1 of 4)**
### Tape Library Alter Panel (Page 2 of 4)

**Command ===>**

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Scratch Threshold</th>
<th>Scratch Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media1</td>
<td>100</td>
<td>1250</td>
</tr>
<tr>
<td>Media2</td>
<td>150</td>
<td>725</td>
</tr>
<tr>
<td>Media3</td>
<td>100</td>
<td>1100</td>
</tr>
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<td>0</td>
</tr>
<tr>
<td>Media13</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

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.

---

### Tape Library Alter Panel (Page 3 of 4)

**Command ===>**

<table>
<thead>
<tr>
<th>Media Type</th>
<th>Scratch Threshold</th>
<th>Scratch Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Media1</td>
<td>100</td>
<td>1250</td>
</tr>
<tr>
<td>Media2</td>
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<td>100</td>
<td>1100</td>
</tr>
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<td>Media4</td>
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<td>0</td>
</tr>
<tr>
<td>Media5</td>
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</tr>
<tr>
<td>Media6</td>
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<td>0</td>
</tr>
<tr>
<td>Media13</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Initial Online Status (Yes, No, or Blank):  
*SYSPLX01 ===> *SYSPLX02 ===> *SYSPLX03 ===> *SYSPLX04 ===>  
SYSTM01 ===> YES SYSTM04 ===> YES SYSTM07 ===> SYSTM10 ===>  
SYSTM02 ===> SYSTM05 ===> SYSTM08 ===> SYSTM11 ===>  
SYSTM03 ===> SYSTM06 ===> SYSTM09 ===> SYSTM12 ===>

**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.
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 268 through Figure 52 on page 271). 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 259).
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 field 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 data server 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 268 through Figure 52 on page 271):

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 260, is displayed.

![Figure 38. Confirm Delete Request Panel](image_url)

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 278).

**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 242). ISMF displays the Library Management Selection menu (see Figure 17 on page 242).
2. Select option 3, TAPE LIBRARY. This in turn, displays the Tape Library Application Selection panel (Figure 18 on page 243).
   
   **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 242). ISMF displays the Volume List Selection Menu (see Figure 39 on page 261).
2. Select option 3, MOUNTABLE TAPE, which prompts the display of Mountable Tape Volume Selection Entry Panel (Figure 40 on page 262).
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 alphabets 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 ===>

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 ===>

Use a single asterisk to specify all mounted volumes that fit your other selection criteria: VOLUME SERIAL NUMBER ===>

**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.

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 136 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, *SCRTCH*, or --------- (when blank).
### 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.

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.
**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.

Figure 44. Mountable Tape Volume List Panel (part 4 of 5).

<table>
<thead>
<tr>
<th>LINE</th>
<th>VOLUME OPERATOR</th>
<th>SERIAL</th>
<th>WRITE</th>
<th>VOLUME PROTECT</th>
<th>LOCATION</th>
<th>SHELF LOCATION</th>
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<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>VOL01</td>
<td>NO</td>
<td>SHELF</td>
<td>FREE FORM LOCATION</td>
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<td>VOL02</td>
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<td>SHELF</td>
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<td>VOL07</td>
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<td>VOL09</td>
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<td>SHELF</td>
<td>SHELF LOCATION #1</td>
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<td></td>
</tr>
</tbody>
</table>

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 263 to generate the library list.

Once you have generated the library list, the tape library list panels are displayed (Figure 46 on page 268 through Figure 52 on page 271). See “Displaying tape library attributes” on page 250 for descriptions of the attributes on these panels.

---

**Figure 46. Tape Library List Panel (part 1 of 7).**

---

**Figure 47. Tape Library List Panel (part 2 of 7).**
### Figure 48. Tape Library List Panel (part 3 of 7).

<table>
<thead>
<tr>
<th>LINE OPERATOR</th>
<th>LIBRARY NAME</th>
<th>MEDIA2 SCR NUM</th>
<th>MEDIA2 SCR THR</th>
<th>MEDIA3 SCR NUM</th>
<th>MEDIA3 SCR THR</th>
<th>MEDIA4 SCR NUM</th>
<th>MEDIA4 SCR THR</th>
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<tbody>
<tr>
<td>LIB1</td>
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<td>150</td>
<td>1100</td>
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<td>1750</td>
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<td></td>
</tr>
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</table>

---

### Figure 49. Tape Library List Panel (part 4 of 7).

<table>
<thead>
<tr>
<th>LINE OPERATOR</th>
<th>LIBRARY NAME</th>
<th>MEDIA5 SCR NUM</th>
<th>MEDIA5 SCR THR</th>
<th>MEDIA6 SCR NUM</th>
<th>MEDIA6 SCR THR</th>
<th>MEDIA7 SCR NUM</th>
<th>MEDIA7 SCR THR</th>
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</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>

---
### Tape Library List Panel (part 5 of 6)

**Figure 50. Tape Library List Panel (part 5 of 6).**

<table>
<thead>
<tr>
<th>LINE OPERATOR</th>
<th>LIBRARY NAME</th>
<th>MEDIA8 SCR NUM</th>
<th>MEDIA8 SCR THR</th>
<th>MEDIA9 SCR NUM</th>
<th>MEDIA9 SCR THR</th>
<th>MEDIA10 SCR NUM</th>
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<tbody>
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<td>---(1)----</td>
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</tbody>
</table>

### Tape Library List Panel (part 6 of 7)

**Figure 51. Tape Library List Panel (part 6 of 7).**

<table>
<thead>
<tr>
<th>LINE OPERATOR</th>
<th>LIBRARY NAME</th>
<th>MEDIA11 SCR NUM</th>
<th>MEDIA11 SCR THR</th>
<th>MEDIA12 SCR NUM</th>
<th>MEDIA12 SCR THR</th>
<th>MEDIA13 SCR NUM</th>
<th>MEDIA13 SCR THR</th>
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</thead>
<tbody>
<tr>
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</table>

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

**Viewing and sorting a list**

You can sort and tailor a list with the View, Sort, and Hide options on the Mountable Tape Volume List or the Tape Library List panels. *z/OS DFSMS Using the Interactive Storage Management Facility* discusses the View, Sort, and Hide options in more detail.

**Auditing volumes in an automated tape library**

From the ISMF panels, you can use the AUDIT line operator or the ISMF AUDIT command to verify the location of the tape volumes in your tape libraries.

AUDIT provides three auditing scopes:

- Single volume audit (invoked by the AUDIT line operator)
- Volume list audit (invoked by the AUDIT command)
- Library audit (invoked by the AUDIT line operator)

**Note:** The audit functions are not supported in an MTL.

AUDIT can be invoked as an ISMF line operator on the Mountable Tape Volume List panel (single volume audit) or from the Tape Library List panel (library audit).

AUDIT can also be invoked as an ISMF command to audit all eligible volumes on the Mountable Tape Volume List (volume list audit). ISMF is an important part of the audit scheme because it allows you to start with an entire tape volume list, and then by using sorting and filtering capabilities, you can reduce that list to a subset of volumes; for example, all the volumes in a single storage group. You can then use the AUDIT command to request an audit of all volumes in that subset list.

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

You may want to use the following criteria when filtering a volume list:

- Fully or partially qualified volume serial number
- Fully or partially qualified storage group name
- Fully or partially qualified library name
- Other criteria using ISMF VIEW, SORT, and HIDE

Before scheduling an audit request for an automated tape library, ensure that the following criteria is met:
• The library must be defined in the SMS configuration.
• The library must be online, operational, and not pending offline.
• For an automated tape library dataserver, the library must not be in manual mode and the vision system must be operative.

Verifying external volume labels using the ATLDS vision system

The library vision system on an ATLDS verifies the external label on the volume at the physical location specified in the library manager data base. The cartridge is not mounted and read, only the external label is verified. The following actions are performed when an audit is requested against volumes in an automated tape library dataserver:

• The system verifies that the tape volume has an entry in the library manager.
• The visual system verifies that the tape volume is in its assigned location in the automated tape library dataserver.
• The vision system verifies that the external cartridge label of the tape volume is present and readable.
• The system verifies that the tape is accessible in the automated tape library dataserver.

Verifying VTS logical volume entries in the library manager

Because a logical volume may or may not yet exist on a physical piece of media (a stacked volume), the following actions are performed when an audit is requested against logical volumes in the virtual tape server.

• The system verifies that the logical volume has an entry in the library manager.
• If the logical volume resides on a physical piece of media, the vision system verifies that the physical volume is in its assigned location in the automated tape library dataserver.
• The vision system verifies that the external cartridge label of the physical volume is present and readable.

Verifying volumes in a 3584 Tape Library

Audit verification of a physical volume or of a logical volume whose virtual tape server resides in a 3584 tape library does not result in the library physically scanning the volume's label. Instead, the library manager queries the 3584 Library database to confirm that it has the volume in the expected cell. For a logical volume, the physical volume on which the logical volume resides is queried.

Using the AUDIT command or line operator

To perform a volume list audit from the MOUNTABLE TAPE VOLUME LIST panel, use the AUDIT command on the command line of the ISMF panel.

To perform a library audit from the TAPE LIBRARY LIST panel use the AUDIT line operator next to the tape library name. When you specify a library audit, all volume serial numbers known to that library by the host are audited.

Because a library audit and a volume list audit might take a long time to complete, a confirmation panel is displayed whenever these audits are requested. This panel gives you the opportunity to confirm or cancel the audit request. To confirm, type in Y, then press ENTER. See Figure 53 on page 273 for the Confirm Audit Request panel.
CONFIRM AUDIT REQUEST

Command ===>  
Number of Volumes to be Audited: 5

Specify the Following:
   Enter "/" to select option   _ Perform Audit

Note: If audit is performed, audit requests will be interspersed with other requests, with the audit request having low priority.

Use ENTER to Perform Operation;  
Use HELP Command for Help; Use END Command to Exit.

Figure 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 263).

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 274) is displayed.

![Figure 54. Alter from the Mountable Tape Volume Alter Entry Panel](image-url)
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 275) 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.

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 275).
Changing values associated with a tape volume

If the storage administrator types blanks over the NEW VALUE for storage group, shelf location, or owner information, the corresponding field in the tape volume record is set to blank and the NEW VALUE field shows as blank the next time the record in displayed. See Figure 57 on page 276.

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 276).

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 277) 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
```

*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 278) 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.
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 201 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 263). 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 217 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 Knowledge Center (www.ibm.com/support/knowledgecenter/SSLTBW/welcome).

If you experience difficulty with the accessibility of any z/OS information, send a detailed email message to mhrvrcfs@us.ibm.com.

Accessibility features

Accessibility features help users who have physical disabilities such as restricted mobility or limited vision use software products successfully. The accessibility features in z/OS can help users do the following tasks:

- Run assistive technology such as screen readers and screen magnifier software.
- Operate specific or equivalent features by using the keyboard.
- Customize display attributes such as color, contrast, and font size.

Consult assistive technologies

Assistive technology products such as screen readers function with the user interfaces found in z/OS. Consult the product information for the specific assistive technology product that is used to access z/OS interfaces.

Keyboard navigation of the user interface

You can access z/OS user interfaces with TSO/E or ISPF. The following information describes how to use TSO/E and ISPF, including the use of keyboard shortcuts and function keys (PF keys). Each guide includes the default settings for the PF keys.

- z/OS TSO/E Primer
- z/OS TSO/E User's Guide
- z/OS ISPF User's Guide Vol I

Dotted decimal syntax diagrams

Syntax diagrams are provided in dotted decimal format for users who access IBM Knowledge Center with a screen reader. In dotted decimal format, each syntax element is written on a separate line. If two or more syntax elements are always present together (or always absent together), they can appear on the same line because they are considered a single compound syntax element.

Each line starts with a dotted decimal number; for example, 3 or 3.1 or 3.1.1. To hear these numbers correctly, make sure that the screen reader is set to read out punctuation. All the syntax elements that have the same dotted decimal number (for example, all the syntax elements that have the number 3.1) are mutually exclusive alternatives. If you hear the lines 3.1 USERID and 3.1 SYSTEMID, your syntax can include either USERID or SYSTEMID, but not both.

The dotted decimal numbering level denotes the level of nesting. For example, if a syntax element with dotted decimal number 3 is followed by a series of syntax elements with dotted decimal number 3.1, all the syntax elements numbered 3.1 are subordinate to the syntax element numbered 3.
Certain words and symbols are used next to the dotted decimal numbers to add information about the syntax elements. Occasionally, these words and symbols might occur at the beginning of the element itself. For ease of identification, if the word or symbol is a part of the syntax element, it is preceded by the backslash (\) character. The * symbol is placed next to a dotted decimal number to indicate that the syntax element repeats. For example, syntax element *FILE with dotted decimal number 3 is given the format 3 \* FILE. Format 3* FILE indicates that syntax element FILE repeats. Format 3* \* FILE indicates that syntax element * FILE repeats.

Characters such as commas, which are used to separate a string of syntax elements, are shown in the syntax just before the items they separate. These characters can appear on the same line as each item, or on a separate line with the same dotted decimal number as the relevant items. The line can also show another symbol to provide information about the syntax elements. For example, the lines 5.1*, 5.1 LASTRUN, and 5.1 DELETE mean that if you use more than one of the LASTRUN and DELETE syntax elements, the elements must be separated by a comma. If no separator is given, assume that you use a blank to separate each syntax element.

If a syntax element is preceded by the % symbol, it indicates a reference that is defined elsewhere. The string that follows the % symbol is the name of a syntax fragment rather than a literal. For example, the line 2.1 %OP1 means that you must refer to separate syntax fragment OP1.

The following symbols are used next to the dotted decimal numbers.

? indicates an optional syntax element
The question mark (?) symbol indicates an optional syntax element. A dotted decimal number followed by the question mark symbol (?) indicates that all the syntax elements with a corresponding dotted decimal number, and any subordinate syntax elements, are optional. If there is only one syntax element with a dotted decimal number, the ? symbol is displayed on the same line as the syntax element, (for example 5? NOTIFY). If there is more than one syntax element with a dotted decimal number, the ? symbol is displayed on a line by itself, followed by the syntax elements that are optional. For example, if you hear the lines 5? , 5 NOTIFY, and 5 UPDATE, you know that the syntax elements NOTIFY and UPDATE are optional. That is, you can choose one or none of them. The ? symbol is equivalent to a bypass line in a railroad diagram.

! indicates a default syntax element
The exclamation mark (!) symbol indicates a default syntax element. A dotted decimal number followed by the ! symbol and a syntax element indicate that the syntax element is the default option for all syntax elements that share the same dotted decimal number. Only one of the syntax elements that share the dotted decimal number can specify the ! symbol. For example, if you hear the lines 2? FILE, 2.1! (KEEP), and 2.1 (DELETE), you know that (KEEP) is the default option for the FILE keyword. In the example, if you include the FILE keyword, but do not specify an option, the default option KEEP is applied. A default option also applies to the next higher dotted decimal number. In this example, if the FILE keyword is omitted, the default FILE (KEEP) is used. However, if you hear the lines 2? FILE, 2.1, 2.1! (KEEP), and 2.1.1 (DELETE), the default option KEEP applies only to the next higher dotted decimal number, 2.1 (which does not have an associated keyword), and does not apply to 2? FILE. Nothing is used if the keyword FILE is omitted.

* indicates an optional syntax element that is repeatable
The asterisk or glyph (*) symbol indicates a syntax element that can be repeated zero or more times. A dotted decimal number followed by the * symbol indicates that this syntax element can be used zero or more times; that is, it is optional and can be repeated. For example, if you hear the line 5.1* data area, you know that you can include one data area, more than one data area, or no data area. If you hear the lines 3* , 3 HOST, 3 STATE, you know that you can include HOST, STATE, both together, or nothing.

Notes:
1. If a dotted decimal number has an asterisk (*) next to it and there is only one item with that dotted decimal number, you can repeat that same item more than once.
2. If a dotted decimal number has an asterisk next to it and several items have that dotted decimal number, you can use more than one item from the list, but you cannot use the items more than once each. In the previous example, you can write HOST STATE, but you cannot write HOST HOST.
3. The * symbol is equivalent to a loopback line in a railroad syntax diagram.

+ indicates a syntax element that must be included

The plus (+) symbol indicates a syntax element that must be included at least once. A dotted decimal number followed by the + symbol indicates that the syntax element must be included one or more times. That is, it must be included at least once and can be repeated. For example, if you hear the line 6.1+ data area, you must include at least one data area. If you hear the lines 2+, 2 HOST, and 2 STATE, you know that you must include HOST, STATE, or both. Similar to the * symbol, the + symbol can repeat a particular item if it is the only item with that dotted decimal number. The + symbol, like the * symbol, is equivalent to a loopback line in a railroad syntax diagram.
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Policy for unsupported hardware

Various z/OS elements, such as DFSMS, JES2, JES3, 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.
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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)
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Programming interface information

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

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

This glossary might include terms and definitions from:

- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Electrotechnical Commission (ISO/IEC JTC2/SC1).

**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) 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.

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), 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/ESA 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 VTSs. 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 dataserver or be kept on shelf storage either at vault sites or within the data center where it can be mounted on stand-alone tape drives.

Physical volume pool

A set of stacked volumes in the VTS that 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). Members of the TS7700 product family include the TS7740 Virtualization Engine (3957-V0x), the TS7720 Virtualization Engine (3957-VEA or VEB) and the TS7760 Virtualization Engine (3957-VEC). It replaces the IBM TotalStorage 3494 Virtual Tape Server. The existing virtual tape server (VTS) concepts also apply to the virtualization engine.

Virtual volume
A tape volume that 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

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3495</td>
<td>external high-capacity input and output station feature</td>
</tr>
<tr>
<td>3592</td>
<td>integrated library manager</td>
</tr>
</tbody>
</table>

### A

**accessibility**
- contact IBM 281
  - features 281
**ACS routines, pre-ACS routines** 6
  - address space identifier (ASID) description 144
**aggregate group**
  - description 4
**alter**
- altering volume records 92
  - mountable tape volume alter entry panel 274
  - private to scratch confirmation panel 277
- the use attribute of scratch volumes 96
- updating the library record in the SCDS/TCDB 91
**alter request**
  - confirming 277
  - altering volume record 274
- altering a tape library 256
**alternate z/OS MCS console**
  - defining 61
**APARs**
- OA43490 7
**assigning policy names outboard** 115
**assistive technologies** 281
**ATLDS cartridge loaders**
  - assigning categories to 114

### B

**AUDIT**
- audit command 107
  - detecting software errors 274
  - full library 92, 271
  - identifying audit discrepancies 273
  - single volume 92, 271
  - tape libraries 271
  - verifying volume location 92, 271
  - verifying VTS logical volume entries 272
  - volume list 92, 271
**audit discrepancies**
  - identifying 273
**Automated Tape Library Dataserver (continued)**
  - coexistence support for outboard policy management 69
  - description 1
  - ejecting a tape cartridge 34
  - entering a tape cartridge into a tape library 28
  - ISMF?s role 3
  - library sharing among multiple systems 62
  - retrieving data from a disabled ATLDS 95
  - sharing with DFSMSrmm 66
  - storage configurations 42
  - 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 33
  - volume restrictions 34
**automatic class selection (ACS)**
  - changing routines 93
  - overview 5
  - writing and testing the routines 82

### C

**cache management** 15
**cartridge eject installation exit**
  - creating the exit 83
  - description 217
  - parameter description 162, 164
  - parameter list (CBRUXJPL) 220, 223
  - return codes 223
  - usage requirements 223
cartridge eject installation exit (continued)
used with EJECT function 149

cartridge entry installation exit
creating the exit 82
description 209

tape cartridge eject (EJECT) 164
tape cartridge eject query 164

parameter list (CBRUXEPL) 213
return and reason codes 217

used with MCE function 149

cartridge entry processing
without an online device 29
cartridge loader
displaying the scratch media type 113
setting the scratch media type 113
catalog
defining 79
general catalog description 6
recovering volume catalogs 93
recreating library entries 94
recreating volume entries 94
specific catalog description 6
volume catalog description 6
categories
displaying volume categories
CBRTVI macro 194
scratch, library display 121
volume display 136
error 60
library manager 64
volume 59

CBROAMxx PARMLIB member
creating or updating SETTLIB statements 74

CBRTDI macro 193
CBRTVI macro 194

CBRUXCUA
creating the exit 82
description 201
parameter list (CBRUXCPL) 205, 208
return and reason codes 208
syntax rules for outboard policy constructs 203
usage requirements 208

WORM volume use attribute 155

CBRUXEJC
creating the exit 83
description 217
parameter list (CBRUXJPL) 220, 223
return codes 223
usage requirements 223

CBRUXENT
creating the exit 82
description 209
parameter list (CBRUXEPL) 213
return codes 216
syntax rules for outboard policy constructs 212
usage requirements 217

CBRUXVNL
creating the exit 83
description 224

tape data information (CBRTDI macro) 193

return codes (continued)
device allocation 234, 235
job step processing 234

library mount 235
return codes for device allocation 234
usage requirements 235, 236

CBRLCS macro
changing VTS library operating modes (PTPMC) 176
CUA function 149
EJECT function 149
execution environment 185
EXPORT function
canceling operation 172
initiating operation 172

IMPORT function
canceling operation 174
initiating operation 174

interface 183
macro syntax
change use attribute 151
export 172
import 174
manual cartridge entry 157
obtain library name information 180
peer-to-peer data 178
peer-to-peer operating modes 178
query volume residence 165, 170
test volume eligibility 170

MCE function 149
obtaining library name information (OLN) 180
obtaining VTS library operational mode settings (PTPDATA) 178
overview 149

parameter list (LCSPL)
canceling operation 172
initiating operation 172
QVR function 150, 165

return and reason codes
CBRXLCS 184
change use attribute (CUA) 155
Change Use Attribute Installation Exit (CBRUXCUA) 208
manual cartridge entry (MCE) 161, 162
Peer-to-Peer Mode Control (PTPMC) 178
Peer-to-Peer VTS Data (PTPDATA) 179
query volume residence (QVR) 168
tape cartridge eject (EJECT) 164
tape cartridge eject query 164
test volume eligibility (TVE) 171

Volume not in Library Installation Exit (CBRUXVNL) 96, 234
tape data information 170

CBRLCS PTPMC
return and reason codes for 179
CBRLCS query volume
return and reason codes 168
change use attribute
successful processing 154
change use attribute installation exit
CBRXLCS macro syntax 151
changing from private to scratch 154
changing from scratch to private 96, 154
change use attribute installation exit (continued)
  changing to the same use attribute 155
  creating the exit 82
  CUA function 149
  CUA macro parameter description 151
description 201
  exit parameter list 205, 208
  LIBRARY LMPOLICY command 115
return and reason codes for CBRXLCS (CUA) 155
  usage requirements 208
changing use attribute
  for tape volumes 278
changing VTS library operating modes 176
checklist, tape library installation 70
class
  aggregate group 4
data class 4
  management class 4
  storage class 4
  storage group 4
using ACS routines to change 93
coexistence support
  for down-level systems 69
command
  ALTER 92, 274
  AUDIT 92, 271
  DISPLAY commands
  SETTLIB statement 120
  DISPLAY SMS,LIBRARY 121–123
  DISPLAY SMS,OAM 117
  DISPLAY SMS,STORGRP 134
  DISPLAY SMS,VOLUME 136
  EJECT 34, 92, 278
  LIBRARY DISABLE 108, 111, 112
  LIBRARY DISPCL 113, 114
  LIBRARY DISPDRV 128
  LIBRARY EJECT 105
  LIBRARY ENTER 107
  LIBRARY EXPORT 109
  LIBRARY LMPOLICY 115
  LIBRARY REQUEST 109
  LIBRARY RESET 111, 112
  LIBRARY SETCL 113, 114
  MODIFY OAM 143
  OAM AUDIT 107
  OAM DUMP 144
  OAM RESTART 104
  START OAM 102
  STOP OAM 143
  VARY MVS (tape drive) 105
  VARY SMS (tape library) 103
composite library
  defining libraries 82
defining tape storage groups 82
data class
  entry (CBRUXENT exit) 209
  entry default data class 241
import 212
using outboard policy management
display volume 136
  FUNC=CUA 151
  LIBRARY LMPOLICY 115
  QVR 165
  syntax 115
deleting expired VTS volume data 16
deleting VTS volume data 16
definition 178
data retrieval from disabled ATLDS
  altering private TCDB records 95
  changing from SMS-managed to non-SMS-managed 96
  changing the use attribute 96
  library manager database volume list 97
  library manager database volume list 97
  overview 95
  return AT LDS operational status 97
  sample JCL 95
  volume not in library exit 96
data, Peer-to-Peer VTS (PTPDATA)
definition 178
data retrieval from disabled ATLDS
  altering private TCDB records 95
definition 178
data retrieval from disabled ATLDS
  altering private TCDB records 95
definition 178
data retrieval from disabled ATLDS
  altering private TCDB records 95
definition 178
data retrieval from disabled ATLDS
  altering private TCDB records 95
definition 178

device services
querying 148
DEVSUPxx 64
diagnostic data
capturing 144
DISABLE
MVS LIBRARY DISABLE command 111, 112
MVS LIBRARY RESET command 111
disabled ATLDS, retrieving data
altering private TCDB records 95
changing from SMS-managed to non-SMS-managed 96
changing the use attribute 96
library manager database volume list 97
overview 95
return AT LDS operational status 97
sample JCL 95
volume not in library exit 96
disaster recovery (DR) test
FlashCopy 95
selective write protect 94
disaster recovery site considerations 94
DISPCL command 113
DISPDRV command 128
display
cartridge loader scratch media type 113
drive status 128
library connectivity 122
library detail 123
library status 97, 121
OAM outstanding messages 143
OAM status 117
storage group status 134
tape volume status 136
volume’s outboard policies 136
distributed library
defining libraries 82
defining tape storage groups 82
online/offline 103
peer-to-peer VTS system 18
stacked volume 126
drive
displaying status 128
varying online/offline 105
duplicate volume management 8
Eject
cartridge eject function (EJECT) 149
Cartridge Eject Installation Exit description 217
failed notification 219
line operator command 92
MVS LIBRARY EJECT command 105
overview 34
return and reason codes 164
specifying shelf location 106
volume from a tape library 92, 278
EJECT
successful processing 163
EJECT line operator parameters
specifying 279
Enter
CBRUXENT reference 209
disabling entry processing 112
enter (continued)
import reference 29
LIBRARY ENTER command 107
MCE 157
tape cartridge entry 28
entry default use attribute 245
error category 59
error count 60
Exits (installation)
CBRUXCUA 201
CBRUXEJC 36, 217
CBRUXENT 209
CBRUXVNL 224
LIBRARY RESET 112
pre-ACS routine 6
Exporting
canceling an operation 37
completion processing 219
EXPORT return and reason codes 173
FUNC=EXPORT 37, 150, 172
global resource serialization 40, 78
LIBRARY EXPORT command 109
logical volumes from a VTS 36
overview 15
status messages 37
F
F OAM,DISPLAY,SE T TLIB command
syntax 120
feedback xix
FlashCopy for disaster recovery (DR) test 95
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 33
global resource serialization (GRS)
creating the ring 78
using with cartridge entry processing 32
using with export processing 40, 78
H
hardware
3494 AT LDS
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 AT LDS
convenience input and output facility 10
external high-capacity input and output facility 9
high-capacity input and output facility 9
library manager (ATLDS) 10
hardware (continued)
3495 ATLDS (continued)
  manual mode terminal 10
  subsystem attachment 8
3584 ATLDS 12
configuration database
defining the tape drives 80
library models 41
tape subsystems 41
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 80
deleting subsystems 88
description 7
moving subsystems 88

I
IART 15
IBM TotalStorage Enterprise Tape System 3590
coeexistence support 69
description 11
storage configurations 42
identifying
  audit discrepancies 273
import
canceling an operation 31
  FUNC=IMPORT 31, 150, 174
IMPORT return and reason codes 174
LIBRARY IMPORT command 108
multiple logical volumes at the host 29
overview 15
  single logical volume at the library manager 32
  status messages 31
improved cache management 15
initial access response time 15
initial online status
description 247
installation
activating the configuration 83
building the library inventory 71
changing system libraries 71
checklist 70
creating the exit routines 82
creating the GRS 78
creating the hardware configuration 80
creating the SMS definitions 81
creating the TCDB 79
defining tape storage groups 82
display and set the cartridge loader media type 84, 113
IPLing the system 81
outboard policy management installation
  recommendations 84
  planning 41
  running the job stream 84
starting the OAM address space 83
validating the configuration 83
installation (continued)
varying the library online 83, 103
installation exit
  entering tape volumes in library with 225
installation exits
  creating the exit
    cartridge eject 83, 217
    cartridge entry 82, 209
    change use attribute 82, 201
    sample library members 237
    volume not in library 83, 224
description
  CBRUXCUA 201
  CBRUXEJC 217
  CBRUXENT 209
  CBRUXVNL 224
disabling entry processing (DISABLE) 111, 112
outboard policy management 204
re-enabling entry processing (LIBRARY RESET) 111
reenabling processing (RESET) 112
  return codes
    CBRUXCUA 208
    CBRUXEJC 223
    CBRUXENT 216
    CBRUXVNL 234, 235
sample program
  CBRAPROC, creates OAM member in PROCLIB 239
  CBRSPUXV, Volume Not in Library Exit 96
installation storage management policy
  overview 4
  planning for 41
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 271
checklist, tape library define 82
description 3
  panels
    application selection 242
    confirm audit request 272
    defining a manual library 248
    management selection menu 242
    mountable tape volume alter entry panel 274
    mountable tape volume application 260, 267
    mountable tape volume list 263, 267
    mountable tape volume selection entry panel 261
    primary option menu 241
    private to scratch confirmation panel 277
    tape library define 243
    tape library list 268
volume list selection menu 261
role with tape library dataservers 3
typical procedures
  altering a tape library definition 91
  altering the volume record 92, 274
  auditing volumes in a library 92, 271
ISMF (Interactive Storage Management Facility) (continued)
typical procedures (continued)
confirming audit request 272
creating tape library lists 268, 271
defining a tape library 82, 91, 241
defining SMS constructs 81
ejecting a volume 92, 278
generating a volume list 261
management functions 91
monitoring and maintaining SMS library definitions 92
verifying volumes in a library 271
viewing and sorting lists 271

J
JCL keyword
SMSHONOR 50
job processing for outboard policy management 204

K
keyboard
navigation 281
PF keys 281
shortcut keys 281

L
LCS (library control system)
external services
CBRXLCS description 149
LCS (Library Control System)
description 3
external services
cartridge eject (EJECT) 149
CBRXLCS return and reason codes 184
change use attribute (CUA) 149, 151
execution environment 185
EXPORT 150
IMPORT 150
LCSP parameter list 185
macro interface 151
manual cartridge entry (MCE) 149, 157
obtain library name (OLN) 151
PTPDATA 150
PTPMC 150
query volume residence (QVR) 150, 165
testing volume eligibility (TVE) 150, 170
tape data information
CBRTDI mapping macro 193
description 178
tape volume information
CBRTVI mapping macro 194
description 194
library
3953 library manager 12
adding subsystems to 87
auditing a full library 271
auditing volumes in a library 271
changing system libraries 71
defining the tape library with ISMF 82
display library status 121
library (continued)
displaying OAM status 117
displaying the cartridge loader scratch media type 113
drive status 128
ejecting a specific tape volume 105
ejecting a volume from a library 278
entering tape volumes in 225
identifying audit discrepancies 273
ISMF screens
application selection panel 242
confirm audit request 272
defining a manual library 248
management selection menu 242
mountable tape volume alter entry panel 274
tape library define panel 243
tape library list 268
library manager 10
outboard policy management 8
partitioning 63
recreating library entries 94
SCDS definition 91
setting the cartridge loader scratch media type 113
subsystem modifications 87
tape management overview 1
TCDBplex 63
using ISMF to define 91, 241
vary drive online/offline 105
vary library online/offline 103
verifying volumes in a library 260
LIBRARY IMPORT 108
library inventory
building 71
library operational states
TS7700 25
library vision system of ATLDS 272
load balancing
tape control units 28
load balancing considerations
BYDEVICES option 50
logical library partitioning 17
logical volume
building library inventory 71
canceling an export 37
canceling export considerations 225
ejecting 36
export 150, 172, 225
export pending category 139
exported category 139
exporting 36
exporting from a VTS 8
import 150, 174
import/export 15
importing
single volume 32
initiate/cancel export 109
initiate/cancel import 109
inventory 17
outboard policy management 8
remove 219
stacked volume 29

M
macros
macros (continued)
CBRLCSPL 185
CBRTDI 193
CBRTDSI 194
CBRUXCPL 205
CBRUXEPL 213
CBRUXJPL 220
CBRUXNPL 229
management
introduction to tape library
management class
description
maintaining
selective dual copy
selective peer-to-peer copy mode
manual cartridge entry (MCE)
CBRXLCS macro
overview
parameter description
return and reason codes
manual tape library
considerations
ejecting a tape cartridge
global resource serialization
hardware considerations
LIBRARY ENTER
library sharing among multiple systems
manual tape storage
partitioned
handling tape drives
role of ISMF
scratch tape management
sharing with DFSMSrm
stand-alone
storage configurations
volume requirements
volume restrictions
manual tape library (MTL)
MCS console
defining alternate console
media
displaying cartridge loader scratch media type
IBM Cartridge System Tape (MEDIA1)
IBM E
IBM Enhanced Capacity Cartridge System Tape (MEDIA2)
IBM Enterprise Economy Tape Cartridge (MEDIA7)
IBM Enterprise Economy WORM Tape Cartridge (MEDIA8)
IBM Enterprise Extended Tape Cartridge (MEDIA9)
IBM Enterprise Tape Cartridge (MEDIA5)
IBM Enterprise WORM Tape Cartridge (MEDIA6)
IBM Extended High Performance Cartridge Tape (MEDIA4)
IBM High Performance Cartridge Tape (MEDIA3)
managing multiple media formats
media selection
in ATLDS
in MTL
setting cartridge loader scratch media type
messages
format conventions
routing to console
mode control, Peer-to-Peer VTS (PTPMC)
CBRTDI macro
changing VTS library operating modes
definition
obtaining VTS using device information
parameters
return and reason codes
selective peer-to-peer copy mode
syntax
mountable tape volume application
generating a volume list
list panel, ALTER
list panel, AUDIT
list panel, EJECT
selection entry panel
mountable tape volume list
generating
MVS
commands
DISPLAY SMS,LIBRARY
DISPLAY SMS,OAM
DISPLAY SMS,STORGRP
DISPLAY SMS,VOLUME
LIBRARY DISABLE
LIBRARY DISPDVR
LIBRARY EJECT
LIBRARY EXPORT
LIBRARY IMPORT
LIBRARY RESET
LIBRARY RESTART
START OAM
STOP OAM
hardware configuration definition
MVS (continued)
  LIBRARY REQUEST 109
  OAM AUDIT 107
  partitioning 63

N
  name restrictions, tape library 241, 243
  navigation
    keyboard 281

O
  OAM (Object Access Method)
    defining elements 81
    installation checklist 71
    installation procedures
      activating the configuration 83
      building the library inventory 71
      changing system libraries 71
      creating the exit routines 82
      creating the GRS 78
      creating the hardware configuration 80
      creating the SMS definitions 81
      creating the TCDB 79
      defining tape storage groups 82
      display and set the cartridge loader media type 84, 113
      IPLing the system 81
      running the job stream 84
      starting the OAM address space 83
      validating the configuration 83
      varying the library online 83, 103
    keywords, OAMPROC, OAMTASK 71
    operating the OAM Address Space 99
    planning for 41
    role of ISMF 3
    SETTLIB statements
      CBROAMxx PARMLIB member 74
      storage management policy 4, 41
      support for tape libraries overview 2
      using ISMF to define the configuration 241
  OAM AUDIT command 107
  OAM DUMP command
    description and syntax 144
  OAM QUERY command
    command description 145
    keyword descriptions 145
    syntax 145
  obtaining library name information
    FUNC=OLN 180
    return and reason codes 183
    Successful processing 182
    VTS library device information 178
    VTS library operational mode settings 178
  online/offline
    displaying library status 121
    library connectivity 122
    varying a tape drive 105
    varying a tape library 103
  ONLYIF statement
    in an OAMplex 76
    syntax 76
  operator commands
    DISPLAY OAM,DUMP 143
  operator tasks
    DISPLAY OAM messages 143
    DISPLAY SMS,LIBRARY 121
    DISPLAY SMS,OAM 117
    DISPLAY SMS,STORGRP 134
    DISPLAY SMS,VOLUME 136
    LIBRARY DISABLE 111, 112
    LIBRARY DISPC 113
    LIBRARY DISPDRV 128
    LIBRARY EJECT 105
    LIBRARY ENTER 107
    LIBRARY EXPORT 109
    LIBRARY IMPORT 108
    LIBRARY LMPOLICY 115
    LIBRARY RESET 111, 112
    LIBRARY SETCL 113
    MODIFY OAM 143
    OAM AUDIT 107
    OAM DUMP 144
    OAM QUERY 145
    OAM RESTART 104
    overview of 99
    START OAM 102
    STOP OAM 143
    VARY MVS (tape drive) 105
    VARY SMS (tape library) 103
  outboard policy management
    assigning policy names 115
    cache management 15
    calling the entry exit 212
    displaying policy names
      CBRTVI macro 194
      QVR function 165
      volume display 136
    for VTS volumes 8
    installation recommendations 84
    migration and expected actions 86
    physical volume pooling 17
    returning from the entry exit 213
    scenarios, installation 85
    selective dual copy 18
    selective peer-to-peer copy mode 20
    test environments 86
    outstanding requests, OAM query 145
  parameter
    CBRUXCUA parameter list (CBRUXCPL) 205, 208
    CBRUXEJC parameter list (CBRUXJPL) 220, 223
    CBRUXENT parameter list (CBRUXEPL) 213
    CBRUXVNL parameter list (CBRUXNPL) 231, 234
    changing the use attribute 151
    EXPORT 172
    IMPORT 174
    LCS external services (LCSPL) 185
    manual cartridge entry 158
    OLN 180
    PTPDATA 178
    PTPMC 176
    query volume residence 166
    tape cartridge eject 162
parameter (continued)
test volume eligibility 170, 172, 174
partitioned ATLDS
tape drives in 65
partitioned MTL
tape drives in 66
partitioning
tape libraries among multiple sysplexes 63
peer-to-peer data (PTPDATA)
overview 150
Peer-to-Peer VTS data (PTPDATA)
definition 178
obtaining VTS library operational mode settings 178
parameters 179
return and reason codes 179
Peer-to-Peer VTS mode control (PTPMC)
CBRTDI macro 193
changing VTS library operating modes 176
definition 176
obtaining VTS using device information 178
parameters 176
return and reason codes 178
selective peer-to-peer copy mode 20
syntax 176
peer-to-peer VTS subsystem
using with GDPS 19
Peer-to-Peer VTS Subsystem
defining 82
description 18
library ID 81
performance scaling 56
performance segmentation 57
physical volume
eject 219
vision system 272
physical volume pooling 17
planning
analyzing the processing environment 41
hardware recommendations 41
managing multiple media formats 47
OAM installation 41
tape cartridge capacities 48
TDSI considerations 47
policy names
setting outboard using keywords 155
policy names outboard 115
pre-ACS routine installation exit 6
preferred mode
in TS7700 51
private volume
altering in the TCDB 95
Change Use Attribute Installation Exit (CBRXCUA)
description 201
changing from private to scratch 154
changing from scratch to private 96, 154
changing to the same use attribute 155
CUA function 149
defining eject default attribute 245
defining entry default attribute 245
description 7
detecting software errors 59
managing in a library sharing environment 63
private to scratch confirmation panel 277
private volume (continued)
restrictions 33
PROCLIB
SAMPLIB member CBRAPROC 77, 239
updating 77
programming interface information 288
PTPDATA (peer-to-peer data)
overview 150
Q
query device services 148
query volume residence (QVR)
CBRTVI macro 194
CBRXLCS macro 165
description 145, 150
macro parameter description 166
return and reason codes 168
successful processing 167
R
RACF
facility class profile 80
VOLCAT considerations 6
read compatibility 48
recovery
disaster recovery site considerations 94
library entries 94
volume catalogs 93
volume entries 94
requirements
media 47
tape volume 33
volser uniqueness 32, 33
RESET
MVS LIBRARY RESET command 112
RESTART command 104
restrictions
tape library name 243
volume serial number 34
retrieving data from a disabled ATLDS
altering private TCDB records 95
changing from SMS-managed to non-SMS-managed 96
changing the use attribute 96
library manager database volume list 97
overview 95
return ATLDS operational status 97
sample JCL 95
volume not in library exit 96
return and reason codes
for CBRXLCS PTPMC 179
for CBRXLCS query volume 168
return codes
CBRXCUA 208
CBRXEJC 223
CBRXENT 216
CBRXVNL
device allocation 234, 235
job step processing 234
library mount 235
CBRXLCS
CBRXLCS 184
S
sample programs
CBRAPROC, creates OAM member in PROCLIB 239
SAMPLIB members
CBRAPROC 239
SCDS (source control data set)
activating 83
defining a tape library 91
updating the library record 91
validating 83
scratch threshold settings and allocation 58
scratch volume
Change Use Attribute Installation Exit (CBRUXCUA)
description 201
changing to private from scratch 96, 154
changing to scratch from private 154
changing to the same use attribute 155
changing use attribute with CBRSPUXC 96
CUA function 149
defining the default entry use attribute 245
description 7
displaying the cartridge loader scratch media type 113
error count 60
MTL tape management 8
private to scratch confirmation panel 277
restrictions 33
scratch count 123
setting cartridge loader scratch media type 113
tape management 7
scratch volume counts
displaying 60
selective dual copy 18
selective peer-to-peer copy 20
selective peer-to-peer dual copy 20
selective write protect 94
sending to IBM
reader comments xix
SETALLOC command
BYDEVICES option 50
for load balancing 50
TAPELIB_PREF parameter 50
SETOSMC
F OAM,DISPLAY,SETOSMC command
description 121
keyword parameters 121
SETTLIB
using 74
SETTLIB statement
description 74
shortcut keys 281
SMS (Storage Management Subsystem)
aggregate group 4
automated tape storage 1
cartridge entry processing 32
configuration elements 4
constructs 4
creating definitions with ISMF 81
creating the SMS definitions 79
data class construct 4
DFSMSrmm support for sharing TLDS 66
display commands for:
cartridge loader scratch media type 113
drive status 128
library status 121
OAM status 117
storage group status 134
volume status 136
management class 4
manual tape storage overview 2
outboard policy management 151
partitioning 63
setting the cartridge loader scratch media type 113
sharing tape volumes 66
sharing, multiple SMS complexes 62
stopping OAM 143
storage class construct 4
storage group construct 4
storage management policy overview 4
support for libraries 2
system group description 4
SMSSHONOR
JCL keyword 50
software volume categories
description 57
TCDB volume error status field and the MTL 60
updating the TCDB volume error status field in an ATLDS 59
stacked volume
composite library 126
description 14
distributed library 126
export 36
exported category 139
identification of 29
import 29
importing
status message 31
logical volume 29
reuse 31
START OAM command syntax 102
status
drive 128
library 121
OAM 117
returning the library manager to operational status 97
storage class 134
volume 136
storage group
definition 5
blank storage group 5
maintaining 91

storage group (continued)
description 4
displaying status 134
maintaining 93
mountable tape volume selection panel 82, 91, 262
storage management
tape volume cache 15
storage management policy
overview 4
subsystems
adding to a library 87
Summary of changes xxii, xxiii
syntax
CBRLCS macro
FUNC=CUA 151
FUNC=EXPORT 172
FUNC=IMPORT 174
FUNC=MCE 157
FUNC=OLN 180
FUNC=PTPDATA 178
FUNC=PTPMC 176
FUNC=QVR 165
FUNC=TVE 170
DISPLAY SMS,LIBRARY 121
DISPLAY SMS,OAM 117
DISPLAY SMS,STORGRP 134
DISPLAY SMS,VOLUME 136
LIBRARY DISABLE 111, 112
LIBRARY DISPCL 113
LIBRARY DISPDRV 128
LIBRARY EJECT 105
LIBRARY ENTER 107
LIBRARY EXPORT 109
LIBRARY LMPOLICY 115
LIBRARY REQUEST 110
LIBRARY RESET 111, 112
LIBRARY SETCL 113
MODIFY OAM 143
OAM AUDIT 107
OAM DUMP 144
OAM QUERY 145
OAM RESTART 104
PTPDATA function 179
PTPMC function 176
START OAM 102
STOP OAM 143
VARY SMS 103, 105
syntax diagrams
how to read xv
system
cartridge entry processing 32
connectivity, displaying 128
libraries, changing 71
library sharing among multiple systems 62
system group definition 4
TCDBplex 63
system group overview 4
system-managed tape
demand allocation with 50

T
tape
application selection 242
tape (continued)
automated tape storage 1
bulk entry and eject 9
Cartridge Eject Installation Exit (CBRUXEJC) 217
Cartridge Entry Installation Exit (CBRUXENT) 209
Change Use Attribute Installation Exit (CBRUXCUA) 201
defining a manual library 248
displaying tape drive status 128
displaying the cartridge loader scratch media type 113
EJECT line operator 278
ejecting from an automated tape library dataserver 34
entering a cartridge into an automated tape library dataserver 28
entering a cartridge into an manual tape library 149
management selection menu 242
media requirements 47
media types
cartridge system tape (MEDIA1) 210
enhanced capacity cartridge system tape (MEDIA2) 210
extended high performance cartridge tape (MEDIA4) 33, 210
high performance cartridge tape 33, 210
MEDIA1 (Cartridge System Tape) 42, 57, 132, 245
MEDIA10 (Enterprise Extended WORM Tape Cartridge) 42, 57, 132, 245
MEDIA11 (Enterprise Advanced Tape Cartridge) 42, 57, 132, 245
MEDIA12 (Enterprise Advanced WORM Tape Cartridge) 42, 57, 132, 245
MEDIA13 (Enterprise Advanced Economy Tape Cartridge) 42, 57, 132, 245
MEDIA2 (Enhanced Capacity Cartridge System Tape) 42, 57, 132, 245
MEDIA3 (High Performance Cartridge Tape) 42, 57, 132, 245
MEDIA4 (Extended High Performance Cartridge Tape) 42, 57, 132, 245
MEDIA5 (Enterprise Tape Cartridge) 42, 57, 132, 245
MEDIA6 (Enterprise WORM Tape Cartridge) 42, 57, 132, 245
MEDIA7 (Enterprise Economy Tape Cartridge) 42, 57, 132, 245
MEDIA8 (Enterprise Economy WORM Tape Cartridge) 42, 57, 132, 245
MEDIA9 (Enterprise Extended Tape Cartridge) 42, 57, 132, 245
mountable tape volume application 260
mountable tape volume selection entry panel 261
primary option menu 241
private volume description 7
scratch tape description 7
setting outboard policy names 115, 152
setting the cartridge loader scratch media type 113
tape library define 243
tape library list panel 268
terminology 1
volume list selection menu 261
Volume not in Library Installation Exit 224
volume requirements 33
volume restrictions 34
volume types 7
tape configuration database (TCDB)
tape configuration database (TCDB) (continued)
altering records 95
changing the use attribute 96
changing to non-SMS-managed 96
coeexistence support 69
defining the eject default attribute 245
description 57
ICF support 6
library manager volume list 97
maintaining 91
monitoring 91
operational status 97
partitioning 63
querying volume residency 150
retrieving data from 95
TCDBplex 63
using the sample exit (CBRUXVNL) 96
volume expiration date 61
tape control units
load balancing 28
tape device selection information (TDSI)
as used by CBRXLCS 198
attributes 48
coeexistence considerations 69
coeexistence support 69
definition 47
parameter list 198
processing for volumes 158
tape drives
in partitioned AT LDS 65
in partitioned MTL 66
Tape Encryption Support 55
tape libraries
associating console names with 61
tape library
altering 256
copying definitions 258
customizing 69
defining 241
deleting definition 259
displaying attributes of 250
installing support for 69
redefining 253
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 42
3495 AT LDS
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 (AT LDS) 10
manual mode terminal 10
storage configurations 42
subsystem attachment 3495 AT LDS 13
3584 subsystem attachment 12
3590 tape systems 11
automated tape storage overview 1
Tape Library Dataserver (continued)
defining a tape library
defining a composite library 241
field parameters 244
name restrictions 243
ejecting a tape cartridge 34
entering a tape cartridge (automated tape library
dataserver) 28
installation checklist 70
library sharing among multiple systems 62
manual tape storage overview 2
retrieving data from a disabled AT LDS 95
sharing with DFSMSrmm 66
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 33
volume restrictions 34
tape subsystems
limitation on scratch allocations 87
tape virtualization
TS7680 27
tape volume
changing values for 276
tape volume cache
storage management of 15
tape volume information
adding values to 275
tape volume information (TVI)
description 194
mapping macro 194
tape volumes
accessing 34
altering volume records 92
changing default scratch categories 65
changing use attribute 278
ejecting a volume 92
entering in library 225
entering into MTL 107
exporting from a VTS 109
importing into a VTS 108
managing 92
processing default categories 65
sharing between SMSplex and non-MVS platform 66
tape volume cache 15
TAPELIB_PREF parameter
BYDEVICES option 50
for load balancing 50
TCDBplex
assigning volumes to 65
test volume eligibility (TVE)
CBRXLCS macro syntax 170
description 150
return and reason codes 171, 184
successful processing 171
test volume eligibility 170, 172, 174
threshold, scratch 58
trademarks 288
TS7680 tape virtualization 27
TS7700 Virtualization Engine
  affinity list support 51
  balanced mode in 51
  copy mode options 25
  device allocation assistance (DAA) 51
  grid 21
  INISH deck example 54
  JES3 considerations 51, 52
  library operational states 25
  preferred mode in 51
  programming considerations 167
  scratch allocation assistance 51
  specific allocation assistance 51
TS7720 Virtualization Engine (3957-VEx) 22
TS7760 Virtualization Engine (3957-VEC) 23

U
UNIT parameter
  SMSHONOR keyword 50
usage requirements
  CBRUXCUA 208
  CBRUXEJC 223
  CBRUXENT 217
  CBRUXVNL 235
user interface
  ISPF 281
  TSO/E 281

V
validity checking, constructs 117
VARY SMS command
  tape drive 105
  tape library 103
verify
  external volume label 272
  prerequisites 69
  testing volume eligibility (TVE) 150
  volume location 92, 271
  VTS logical volume entries 272
virtual tape server
  cache management 11
  description 11
  exporting logical volumes 36
  importing logical volumes 29, 32
  logical library partitioning 17
  outboard policy management 8
  peer-to-peer data (PTPDATA) 178
  peer-to-peer mode control (PTPMC) 176
  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 38, 109
VOLCAT (continued)
  allocation considerations with 7
  RACF considerations 6
  volume
  altering the volume record 95, 274
  auditing a tape library 271
  cartridge entry
    CBRUXEPL policy fields 213
    changing from private to scratch 154
    changing from scratch to private 154
    changing to non-SMS-managed 96
    checking volser for uniqueness 32
    confirm audit request 272
    confirming private to scratch alteration 277
CUA
    CBRUXCPL policy fields 205
    parameters for policy names 155
    defining scratch threshold limits 245
    defining the eject default attribute 245
    displaying the cartridge loader scratch media type 113
    displaying volume status 136
    duplicate volume management 8
    ejecting a specific volume 105
    ejecting from a library 278
    entering a tape cartridge (automated tape library dataserver) 28
    error status, audit results 273
    importing logical volumes 108, 115
    ISMF mountable tape volume application
      alter entry panel 274
      selection entry panel 261
      volume list selection menu 261
LIBRARY LMPOLICY command 115
    policy names outboard 115
    private volume description 7
    query volume residence (QVR) 150
    record 6
    recovering volume catalogs 93
    recovering volume entries 94
    restrictions 34
    retrieving from a disabled ATLDS 95
    scratch tape description 7
    serial number criteria 262
    setting outboard policy names 151
    setting the cartridge loader scratch media type 113
    sharing 66
    software volume categories 57
    specifying volume location 106
    tape types 7
    tape volume information description 194
    testing volume eligibility (TVE) 150
    verify external volume label 272
    volume not in library installation exit 96, 224
  volume allocation
    VOLCAT considerations 7
  volume error status field
    resetting 60
  volume expiration date 107
  volume not in library installation exit
    creating the exit 83, 96
    description 96, 224
    parameter list 96, 231, 234
  return codes
volume not in library installation exit (continued)
return codes (continued)
device allocation 96, 234, 235
job step processing 96, 234
library mount 96, 235
return codes for device allocation 234
usage requirements 96, 235, 236
volumes
using in different TCDBplexes 65
VTS
larger logical volume sizes 14

W
WORM
changing the use attribute 46, 155
considerations 46
write once, read many 46

Z
z/OS
running as guest under z/VM 69
z/OS MCS console
defining alternate console 61
z/VMS
running z/OS as guest 69