



**EMC**  
**NetWorker Restore Node for EDM**  
Version 1.0.0

**SOFTWARE REFERENCE**  
P/N 300-002-345  
REV A01

**EMC Corporation**  
*Corporate Headquarters:*  
Hopkinton, MA 01748-9103  
1-508-435-1000  
[www.emc.com](http://www.emc.com)

**Copyright © June 2005 EMC Corporation. All rights reserved.**

Printed May, 2005

EMC believes the information in this publication is accurate as of its publication date. The information is subject to change without notice.

THE INFORMATION IN THIS PUBLICATION IS PROVIDED "AS IS." EMC CORPORATION MAKES NO REPRESENTATIONS OR WARRANTIES OF ANY KIND WITH RESPECT TO THE INFORMATION IN THIS PUBLICATION, AND SPECIFICALLY DISCLAIMS IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Use, copying, and distribution of any EMC software described in this publication requires an applicable software license. Trademark Information

EMC<sup>2</sup>, EMC, ApplicationXtender, Celerra, CentraStar, CLARiiON, CLARAlert, Connectrix, Dantz, Direct Matrix Architecture, DiskXtender, Documentum, EmailXtender, EmailXtract, HighRoad, Legato, Navisphere, RepliStor, PowerPath, ResourcePak, Retrospect, Smarts, SnapView/IP, SRDF, Symmetrix, TimeFinder, VisualSAN, and where information lives are registered trademarks and EMC ControlCenter, EMC Developers Program, EMC OnCourse, EMC Proven, EMC Snap, EMC Storage Administrator, Access Logix, ArchiveXtender, Automated Resource Manager, AutoSwap, AVALONidm, C-Clip, Celerra Replicator, Centera, CLARevent, CopyCross, CopyPoint, DatabaseXtender, Direct Matrix, DiskXtender 2000, EDM, E-Lab, EmailXaminer, Engenuity, eRoom, FarPoint, FLARE, InfoMover, MirrorView, NetWin, NetWorker, OnAlert, OpenScale, Powerlink, RepliCare, SafeLine, SAN Advisor, SAN Copy, SAN Manager, SDMS, SnapSure, SnapView, StorageScope, SupportMate, SymmAPI, SymmEnabler, Symmetrix DMX, and VisualSRM are trademarks of EMC Corporation. All other trademarks used herein are the property of their respective owners.

**Preface**..... vii

**Chapter 1 Introduction**

Software Components ..... 1-2  
Dedicated Library Manager Configuration ..... 1-3  
Shared Library Manager Configuration ..... 1-3  
Restore Overview ..... 1-3  
EDM, NetWorker and AlphaStor Terminology ..... 1-4

**Chapter 2 Configuration**

Installing and Configuring Oracle..... 2-2  
    Installation ..... 2-2  
    Configuration ..... 2-2  
Installing and Configuring SAP R3 on Oracle..... 2-4  
    Installation ..... 2-4  
    Configuration ..... 2-4  
Installing and Configuring Sybase ..... 2-5  
    Installation ..... 2-5  
    Configuration ..... 2-5  
Installing and Configuring Informix..... 2-7  
    Installation ..... 2-7  
    Configuration ..... 2-7  
Installing and Configuring Microsoft SQL Server ..... 2-9  
    Configuration ..... 2-9  
Installing and Configuring Microsoft Exchange Server..... 2-10  
    Configuration ..... 2-10  
Installing and Configuring Lotus Notes..... 2-11  
    Configuration ..... 2-11

<b>Chapter 3</b>	<b>Restore Processing</b>	
	Restore Overview .....	3-2
	How the Restore Node Processes a Restore.....	3-3
	Restoring Databases .....	3-4
	Restoring Using Backup to Disk .....	3-4
	Restoring from Duplicate Media.....	3-5
	Restoring from Defective Media .....	3-5
	Restoring Files with ACL Settings .....	3-5
	Administrator Restore Permissions .....	3-6
	NDMP Restore Processing .....	3-6
	Restore Locations.....	3-7
	Local Restore .....	3-7
<b>Chapter 4</b>	<b>Configuring Library Managers</b>	
	The Library Manager Configuration Tool.....	4-2
	Listing Library Units .....	4-4
	Configuring a Dedicated Library Manager .....	4-5
	Preparing for the Configuration.....	4-5
	Running AUTOCONFIG.....	4-6
	Converting from Dedicated to Shared Library Managers .....	4-9
	SCSI Address.....	4-14
	Deconfiguring a Library Manager .....	4-14
	Displaying SAN Devices .....	4-16
	Configuring DDS for SAN .....	4-17
	Installing Device Drivers .....	4-17
	Setting Up Drivers for Fibre Channel Devices .....	4-19
	Reviewing the hba_devices.log File.....	4-20
	Removing Device Drivers .....	4-21
	Configuring a Dedicated NDMP Library Manager.....	4-21
	Configuring a Shared NDMP Library Unit .....	4-22
	Library Units in the Restore Node Console.....	4-27
	Configuring a Dedicated Static-Split Library Unit .....	4-27
	Static-Split Library Unit for Restore Node and NDMP ....	4-28
	Troubleshooting .....	4-28
	Configuring a Drive .....	4-28
	Configuring a Drive Using Multiple Library Units.....	4-28
	Detecting a Mechanical Problem.....	4-29
<b>Chapter 5</b>	<b>Volume Management</b>	
	Volume Management Overview.....	5-2
	Volumes and the Volume Catalog .....	5-2

The Volume Manager .....	5-3
Library Managers .....	5-4
NDMP Static-Split Library Unit for Restore Node .....	5-5
The lmconfig Utility .....	5-5
Offline and Offsite Library Managers .....	5-6
Volume Management Tasks .....	5-6
The Notify Daemon .....	5-7
Viewing Volume Management Processes .....	5-7
rvmoper UNIX Group .....	5-7
Volume Lifecycle .....	5-8
If a Drive Becomes Dirty .....	5-10
Stopping and Starting the elm Processes .....	5-10
Restarting the Restore Node and AlphaStor Software .....	5-11
Library Unit Operations .....	5-12
Mounting and Dismounting Volumes .....	5-14
Mounting Volumes .....	5-14
Ejecting Media from a Library Unit .....	5-14
Ejecting Media at the Command Line .....	5-15
Performing Drive Scheduling .....	5-15
Drive Preemption .....	5-15
Performing Library Unit Inventories .....	5-16
Inventory Table .....	5-17
Inventory Process .....	5-17
Delta Inventory .....	5-18
Barcode Inventory .....	5-19



---

*As part of an effort to improve and enhance the performance and capabilities of its product line, EMC from time to time releases revisions of its hardware and software. Therefore, some functions described in this software reference guide may not be supported by all revisions of the software or hardware currently in use. For the most up-to-date information on product features, refer to your product release notes.*

*If a product does not function properly or does not function as described in this software reference guide, please contact your EMC representative.*

### **Audience**

This guide is part of the EMC NetWorker Restore Node for EDM documentation set, and is intended for use by system administrators who will manage daily operations using this product, NetWorker, and AlphaStor.

Readers of this guide are expected to be familiar with the following topics:

- ◆ UNIX (primarily Solaris) system administration
- ◆ Network environment specific to your location
- ◆ Existing EDM configuration
- ◆ NetWorker software (future backup operations)
- ◆ AlphaStor software (shared library management)

### **Conventions Used in This Guide**

EMC uses the following conventions for notes, cautions, warnings, and danger notices.

---

A note presents information that is important, but not hazard-related.

---



## CAUTION

A caution contains information essential to avoid data loss or damage to the system or equipment. The caution may apply to hardware or software.

## Typographical Conventions

EMC uses the following type style conventions in this guide:

AVANT GARDE	Keystrokes
<b>Palatino, bold</b>	<ul style="list-style-type: none"> <li>◆ Dialog box, button, icon, and menu items in text</li> <li>◆ Selections you can make from the user interface, including buttons, icons, options, and field names</li> </ul>
<i>Palatino, italic</i>	<ul style="list-style-type: none"> <li>◆ New terms or unique word usage in text</li> <li>◆ Command line arguments when used in text</li> <li>◆ Book titles</li> </ul>
<i>Courier, italic</i>	Arguments used in examples of command line syntax.
Courier	System prompts and displays and specific filenames or complete paths. For example:  <pre>working root directory [/user/emc]:  c:\Program Files\EMC\Symapi\db</pre>
<b>Courier, bold</b>	<ul style="list-style-type: none"> <li>◆ User entry. For example: <pre>symmpoll -p</pre></li> <li>◆ Options in command line syntax</li> </ul>

## Where to Get Help

For questions about technical support, call your local sales office or service provider.

If you have a valid EMC service contract, contact EMC Customer Service at:

**United States:** (800) 782-4362 (SVC-4EMC)

**Canada:** (800) 543-4782 (543-4SVC)

**Worldwide:** (508) 497-7901

Follow the voice menu prompts to open a service call and select the applicable product support.

If you are located outside North America, call the nearest EMC office for technical assistance.

### **Sales and Customer Service Contacts**

For the list of EMC sales locations, please access the EMC home page at:

**<http://emc.com/contact/>**

For additional information on the EMC products and services available to customers and partners, refer to the EMC Powerlink Website at:

**<http://powerlink.emc.com>**

### **Your Comments**

Your suggestions will help us continue to improve the accuracy, organization, and overall quality of the user publications. Please send a message to **[techpub\\_comments@emc.com](mailto:techpub_comments@emc.com)** with your opinions of this guide.



The role of the NetWorker Restore Node for EDM (Restore Node) is to recover previously backed up EDM data, such as databases and file systems. The EDM data is stored on media managed by both dedicated and shared Library Managers.

This chapter contains the following:

- ◆ Software Components ..... 1-2
- ◆ Dedicated Library Manager Configuration ..... 1-3
- ◆ Shared Library Manager Configuration ..... 1-3
- ◆ Restore Overview ..... 1-3
- ◆ Port Control ..... 1-3

## Software Components

The required Restore Node software components include the following:

- ◆ EDM Version 5.1.0, patch 4 (PE510\_04)
- ◆ Solaris 9 (12/02) server

Additional Restore Node software components include the following:

- ◆ NetWorker server release 7.2 build 198
- ◆ AlphaStor 3.0.9 (for shared Library Managers)

EMC Professional Services personnel install the software.

In Restore Node environments, both NetWorker and existing EDM client software must coexist. There is a need to manually configure the application (database) specific backup interfaces so that the data saves to the correct NetWorker server.

The following are supported database clients:

- ◆ Oracle
- ◆ SAP R/3 on Oracle
- ◆ Sybase
- ◆ Informix
- ◆ Microsoft SQL Server
- ◆ Microsoft Exchange Server
- ◆ Lotus Notes Domino Server

Refer to the EDM 5.1.0, and NetWorker 7.2 documentation for a detailed list of supported database backup clients.

---

## Dedicated Library Manager Configuration

Dedicated Library Managers are controlled by the Restore Node software.

The lmconfig process that manages volumes located in physical library-units and offline and offsite locations. A Library Manager manages drive scheduling, volume mounts and dismounts, volume injects and ejects, and library-unit inventories.

---

## Shared Library Manager Configuration

Shared Library Managers are controlled by the AlphaStor software.

The lmconfig process manages volumes located in physical library units for online locations only. Drive scheduling, volume mounts and dismounts, volume injects and ejects, and library-unit inventories are managed by the AlphaStor software.

Shared library management provides the ability to share the tape library unit between the Restore Node and the NetWorker software (server and storage node). The shared library manages many of its user-level operations to the tape library unit. The shared library manager also provides the ability for the Restore Node to mount and dismount tapes in a shared environment. The Restore Node server provides restore only capability for existing EDM backup data. There are several configuration scenarios of shared Library Managers.

---

## Restore Overview

The Restore Node can restore any data previously backed up by EDM 5.1.0 software as long as the media on which the backup data resides is available.

For the EDM information in following chapters, refer to the *EMC Data Manager Release 5.1.0 Software Reference Guide*:

- ◆ Logging and Reporting
- ◆ Managing Your EDM System
- ◆ Directory Structure
- ◆ Port Control

## EDM, NetWorker and AlphaStor Terminology

Table 1-1 compares EDM terminology with the similar or like-defined NetWorker and or AlphaStor terminology. For a complete glossary of terms for EDM, NetWorker, and AlphaStor refer to the respective documentation.

Table 1-1 Like Terms for EDM and NetWorker/AlphaStor (Sheet 1 of 5)

EDM Term & Description	NetWorker/AlphaStor Term & Description
<p><u>work group</u> Set of work items to be backed up to the same set of media. Each work group is uniquely named and includes a list of like work items (you cannot mix file system, PC, and database work items in the same work group).</p>	<p><u>client</u> A computer that accesses the NetWorker server to back up or recover files. Clients may be workstations, computers, or file servers.</p>
<p><u>work item</u> Client resource to be backed up. A resource can be a UNIX file system, data on a PC server, or an Oracle, Sybase, or Informix database. Each work item is uniquely named and specifies the file systems, database, or PC data to be backed up. You cannot mix file system, database, and PC work items in one work group.</p>	<p><u>save set</u> A save set is the smallest data unit that NetWorker backs up. Typically a save set is specified as an attribute associated with a client configuration resource. A save set can be composed of one or more files and/or one or more file systems on a single machine.</p>
<p><u>template</u> A set of specifications for scheduling backups and the use of media. Each template is uniquely named and includes a list of work group names, the name of the trailset (defines media use), and scheduling parameters, including the rotation period for scheduling full backups, weekend backup policy, and weeknight backup shift lengths.</p>	<p><u>group</u> A client or group of clients configured to start backing up files to the NetWorker server at a designated time of day.</p>
<p><u>trailset</u> A trail, or set of trails to which the backup data is written, constituting a complete set of full and incremental backups for a rotation period. While uniqueness is provided by the combination of template, trailset, and trail names, it is helpful to give a unique name for each trailset instance.</p>	<p><u>pool</u> A pool defines specific criteria that an incoming save set save stream must meet to be written to a volume. If the save set does not match the pool criteria, the data cannot be written to that pool. NetWorker shipped with several pre-configured pools, including "Default" that will accept any backed up data.</p>

Table 1-1 Like Terms for EDM and NetWorker/AlphaStor (Sheet 2 of 5)

EDM Term & Description	NetWorker/AlphaStor Term & Description
<p><u>media duplication</u> Feature that enables you to create a duplicate set of backup media, automatically or manually, after each backup session.</p>	<p><u>clone</u> Cloning creates a reproduction of backed up save sets on another volume (of any media type). Clones share the same ssid and save set entries in the media database as the source save set. Because the same ssid is used, the entries in the client file index do not need to be modified. NetWorker clone The NetWorker process used to make an exact copy of saved data (save sets), which are indexed and tracked.</p>
<p><u>backup configuration</u> Set of parameters on the backup server used to define what data gets backed up, when it gets backed up, where it is backed up, how backups are processed, and who can run backups and restores. These parameters are edited through the Backup Configuration window and stored in the /usr/epoch/EB/config/eb.cfg file.</p>	<p><u>configuration resource</u> A configuration resource is anything that a NetWorker administrator needs to manage or a user might want to locate, such as a storage device, a backup schedule, or an event notification. Administrators define the configuration resources in their NetWorker environment by assigning values to the resource attributes. These resource definitions are stored as the configuration resource database in the file /nsr/nsr.res and /nsr/nsrjb.res.</p>
<p><u>save set record</u> Data that is saved on backup media from a single backup of a single work item. A save set record contains the template name, work item name, the backup level, start and completion times, expiration time, and the backup trail. The save set record is used to find the volume containing the backup data and the associated backup catalog.</p>	<p><u>media database</u> The media database is a NetWorker server database that maintains entries for each backed up save set and volume. The entries describe the storage location of data and the lifecycle status of all save sets and volumes managed by the NetWorker server.</p>

Table 1-1 Like Terms for EDM and NetWorker/AlphaStor (Sheet 3 of 5)

EDM Term & Description	NetWorker/AlphaStor Term & Description
<p><u><i>offsite_0</i></u>            Volumes that reside in the offsite Library Manager (<i>offsite_0</i>) represent those volumes located beyond the building's boundaries, such as an offsite archival location. A volume logically enters the offsite Library Manager when you eject a volume from a library unit or the offline Library Manager.</p>	<p><u><i>offsite</i></u>            The AlphaStor location for a volume physically located outside the library or data center. Offsite locations should match the NetWorker retention policy.            Onsite            The AlphaStor location for a volume that is physically located inside the library or data center. Onsite locations should match the NetWorker browse policy.</p>
<p><u><i>maximum concurrent backups</i></u>            Backup configuration parameters for limiting concurrent processing of work items at various points in the system. There is a parameter for the server software as a whole, each trail, local client software, and all remote client software (applies to network backup of file systems only).</p>	<p><u><i>parallelism</i></u>            NetWorker supports client parallelism and server parallelism. A NetWorker server can accept as many savestreams from client save operations as are specified as the value of server parallelism. A NetWorker client can support as many concurrent save sessions as are specified as the value of client parallelism.</p>
<p><u><i>backup levels 0-9</i></u>            Specifies a backup in which EDM Backup copies only those files changed since the last backup of a lower level, with level zero a full backup.            incremental backup            Backup method that copies only those client files changed since the previous backup of any level.</p>	<p><u><i>backup level</i></u>            Refers to a backup schedule. A full backup saves all files in the specified save sets. Levels one through nine back up files changed since the last lower-numbered backup. An incremental (<i>incr</i>) backs up all files changed since the last backup. A manual backup operation receives a level "manual." When indexes are backed up, NetWorker backs up records that have changed; the entire file is not backed up except as a level full.</p>

Table 1-1 Like Terms for EDM and NetWorker/AlphaStor (Sheet 4 of 5)

EDM Term & Description	NetWorker/AlphaStor Term & Description
<p><u><i>volume lifecycle</i></u> Stages through which media (tapes and optical disks) pass in the EDM system. New media begins as unlabeled and moves to available (ready for general use for any trail) or allocated (ready for a particular trail only) depending on which template you choose during the labeling process. Other states include foreign (non-EDM media), uncataloged (labeled on another EDM server), erasing (optical disks only), and expired (no longer writable, just readable).</p> <p><u><i>media name</i></u> Serial set of volumes of a particular media type. Each set is written to the course of one rotation period and then a new set of volumes begins. The media name specification also defines how long to save the backup data and its associated online catalogs and records. While uniqueness is provided by the combination of template, media set, and media names, an unique name is helpful for each media set instance.</p>	<p><u><i>retention policy</i></u> A NetWorker policy that specifies how long data on a volume is retained for data recovery before it is recycled. Any volume with one or more protected files cannot be recycled.</p> <p><u><i>recyclable</i></u> The NetWorker status of a volume whose data has exceeded both its browse and retention policies and is available for relabeling.</p>
<p><u><i>library unit</i></u> Robotic library unit that automatically manages the media placement. Most library units are equipped with an inlet to insert and eject media, robotics to move media physically, one or more internal drives, internal storage slots, and in many models, a barcode scanner.</p>	<p><u><i>library</i></u> A storage unit for media volumes a device can access. A library can be automated (accessible by robot) or manual (accessible by a human operator). An automated library uses a robotic arm to move the volumes among various components located within it, including storage slots, media devices (drives), media-access ports (mailboxes), and transports. The term library can refer to a variety of robotic units, including autochanger, autoloader, carousel, datawheel, jukebox, and near-line storage.</p>

Table 1-1 Like Terms for EDM and NetWorker/AlphaStor (Sheet 5 of 5)

EDM Term & Description	NetWorker/AlphaStor Term & Description
<p><u><i>rotation period</i></u> Backup configuration parameter in the schedule template. The period of days during which a full backup performed for each work item covered by a template (for automatic scheduling). For custom scheduling, this is the schedule period.</p>	<p><u><i>backup cycle</i></u> Backup cycle refers to a backup schedule. A backup cycle is the period extending from one full backup to the next.</p>
<p><u><i>backup activity monitoring</i></u> Allows viewing and management of active, successful, and failed work items through the EDM graphical-user interface.</p>	<p><u><i>notification</i></u> A notification is a configuration resource that associates a NetWorker trigger event (backup) with a specific action the NetWorker server takes in response. NetWorker is shipped with several preconfigured notification messages.</p>
<p><u><i>Library Manager (dedicated)</i></u> Controlled by the NetWorker Restore Node for EDM software. Process (Imconfig) that manages volumes located in physical library units and offline and offsite locations. A Library Manager manages drive scheduling, volume mounts and dismounts, volume injects and ejects, and library unit inventories. See also offline_0 and offsite _0.</p>	<p><u><i>Library Manager (shared)</i></u> Controlled by the AlphaStor software. Process (Imconfig) that manages volumes located in physical library units. A Library Manager manages drive scheduling, volume mounts and dismounts, volume injects and ejects, and library unit inventories.</p>

---

This chapter describes the manual client installation and configuration processes required for the database-specific backup interface. This enables database data to be saved to the correct NetWorker backup server.

The vendor-specific backup interfaces are manipulated to cross between Restore Node and the NetWorker software. Where there are no changes to application or database environments, only the NetWorker environment is explained. When changes are necessary, instructions are included on how to switch from Restore Node to NetWorker. Any differences specific to a particular host-operating system are outlined.

This chapter contains installation and configuration instructions for the following supported database clients:

- ◆ Installing and Configuring Oracle..... 2-2
- ◆ Installing and Configuring SAP R3 on Oracle..... 2-4
- ◆ Installing and Configuring Sybase ..... 2-5
- ◆ Installing and Configuring Informix..... 2-7
- ◆ Installing and Configuring Microsoft SQL Server ..... 2-9
- ◆ Installing and Configuring Microsoft Exchange Server ..... 2-10
- ◆ Installing and Configuring Lotus Notes..... 2-11

## Installing and Configuring Oracle

The vendor-specific implementation of the Oracle backup interface `libobk.xx` depends upon which backup application requests the operation.

Each time a switch between Restore Node and NetWorker occurs, all Oracle databases on the client are stopped and the NetWorker specific version of `libobk.xx` must be relinked to Oracle. However, in most cases you must rebuild the Oracle binaries. Refer to the Oracle documentation for detailed instructions.

---

### Installation

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module, for Oracle, Administrator's Guide*
- ◆ *NetWorker Module, for Oracle, Installation Guide*
- ◆ *NetWorker Module, for Oracle, Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data:
  - a. Shutdown the Oracle server and the Oracle listener process:

```
sqlplus '/ as sysdba' shutdown  
lsnrctl stop
```

- b. Create the following link for 64-bit Oracle:

```
/u01/app/oracle/product/9.2.0/lib/libobk.so ->  
/usr/epoch/EB_DB/libobk_64.so.1
```

- c. Start the Oracle server and the Oracle listener process:

```
sqlplus '/ as sysdba' start  
lsnrctl start
```

- d. Perform the restore.

2. Use NetWorker to backup data from Restore Node:
  - a. Shut down the Oracle server and the Oracle listener process:

```
sqlplus '/ as sysdba' stop  
lsnrctl stop
```

b. Create the following link for 64-bit Oracle:

```
/u01/app/oracle/product/9.2.0/lib/libobk.so ->  
/usr/lib/libnwor.a.so
```

c. Start the Oracle server and the Oracle listener process:

```
sqlplus '/ as sysdba' start
```

```
lsnrctl start
```

d. Run a backup using the rman command file

`backup_script.networker` and verify the backups are written to the NetWorker Administrator user interface.

3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:

- *NetWorker Module for Oracle Administrator's Guide*
- *NetWorker Module for Oracle Installation Guide*
- *NetWorker Module for Oracle Release Supplement*

## Installing and Configuring SAP R3 on Oracle

The vendor-specific implementation of the SAP R3 backup interface library depends upon which backup application requests the operation.

Each time a switch between Restore Node and NetWorker occurs, all SAP R3 databases on the client are stopped and the NetWorker specific version of the library must be relinked to SAP R3. However, in most cases you must rebuild the oracle binaries. Refer to the SAP R3 documentation for detailed instructions.

### Installation

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for SAP R3 on Oracle Administrator's Guide*
- ◆ *NetWorker Module for SAP R3 on Oracle Installation Guide*
- ◆ *NetWorker Module for SAP R3 on Oracle Release Supplement*

### Configuration

1. Use Restore Node to restore existing EDM data:
  - a. Make a copy of the `NetWorker.utl` file.
  - b. Create the following link for the Restore Node:
 

```
/usr/sap/<ORACLE_SID>/SYS/exe/run/backint ->
/usr/epoch/EB_DB/backint
```
  - c. Verify the links for Oracle `libobk.so`.
  - d. Run the backup `$ORACLE_HOME/saptools/brbackup` and tail the `backups.log` file to verify that the messages are written there.
2. Use NetWorker to backup data from Restore Node:
  - a. Copy the `NetWorker.utl` file.
  - b. Create the following link for the Restore Node:
 

```
/usr/sap/<ORACLE_SID>/SYS/exe/run/backint ->
/usr/sbin/backint
```
  - c. Verify the links for Oracle `libobk.so` file.

- d. Run the `brbackup` command and tail it to the `backups.log` file to verify that the messages are written there.
  - e. Verify that the backups also are written to the NetWorker Administrator program user interface.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
    - *NetWorker Module for SAP R3 on Oracle Administrator's Guide*
    - *NetWorker Module for SAP R3 on Oracle Installation Guide*
    - *NetWorker Module for SAP R3 on Oracle Release Supplement*

---

## Installing and Configuring Sybase

The vendor-specific implementation of the Sybase backup interface library depends upon which backup application requests the operation.

Each time a switch between Restore Node and NetWorker occurs, all Sybase databases on the client are stopped and the NetWorker specific version of the library must be relinked to Sybase. However, in most cases you must rebuild the oracle binaries. Refer to the Sybase documentation for detailed instructions.

---

### Installation

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for Sybase Administrator's Guide*
- ◆ *NetWorker Module for Sybase Installation Guide*
- ◆ *NetWorker Module for Sybase Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data:
  - a. Load the database model from EPOCH.
  - b. Create and verify the following symbolic link:

```
/sybase/12.5/ASE-12_5/lib/libbms.so ->  
/usr/epoch/EB_DB/libbms.so
```

- c. Tail the backups.log on the EDM server to verify that messages are written to it.
  2. Use NetWorker to backup data from Restore Node:
    - a. Create a symbolic link:

```
/Sybase/12.5/ASE-12_5/lib/libbms.so ->
/usr/lib/libbms.so
```
    - b. Perform a backup:

```
isql -Usa -Pmanager -SSYBASE
1> dump database model to "bms::"
2> go
3> dump database model to
"bms::ledmb033.SYBASE.master"
4> go
```
    - c. Verify the backups are written to the NetWorker Administrator user interface.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
  - *NetWorker Module for Sybase Administrator's Guide*
  - *NetWorker Module for Sybase Installation Guide*
  - *NetWorker Module for Sybase Release Supplement*

---

## Installing and Configuring Informix

The vendor-specific implementation of the Informix backup interface library is depends upon which backup application requests the operation.

Each time a switch between Restore Node and NetWorker occurs, all Informix databases on the client are stopped and the NetWorker specific version of the library must be relinked to Informix However, in most cases you must rebuild the oracle binaries. Refer to the Informix documentation for detailed instructions.

---

### Installation

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for Informix Administrator's Guide*
- ◆ *NetWorker Module for Informix Installation Guide*
- ◆ *NetWorker Module for Informix Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data:
  - a. Make a copy of the  
`$INFORMIXHOMEDIR/etc/onconfig.servername` file.
  - b. Create the following link:  

```
/usr/lib/ibsad001.so ->  
/usr/epoch/EB_DB/ibsad001.s0.1
```
  - c. Run the backup using the `onbar -b -L 0` command and tail the `backups.log` file to verify that the messages are written there.

---

It is not necessary to shutdown the Informix server because the library is loaded when the `onbar` command runs.

---

2. Use NetWorker to backup data from Restore Node:
  - a. Make a copy of the  
`$INFORMIXHOMEDIR/etc/onconfig.servername` file.
  - b. Create the following link for the Restore Node:  

```
/usr/lib/ibsad001.so -> /usr/lib/libxnmi.so.1
```

- c. Run the backup using the `onbar -b -L 0` command and tail the `/Informix/log/bar_act.log` and the `/nsr/applogs/xbsa.messages` files to verify the backups are controlled by the NetWorker software.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
  - *NetWorker Module for Informix Administrator's Guide*
  - *NetWorker Module for Informix Installation Guide*
  - *NetWorker Module for Informix Release Supplement*

---

## Installing and Configuring Microsoft SQL Server

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for Microsoft SQL Server Administrator's Guide*
- ◆ *NetWorker Module for Microsoft SQL Server Installation Guide*
- ◆ *NetWorker Module for Microsoft SQL Server Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data.
2. Use NetWorker to backup data from Restore Node.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
  - *NetWorker Module for Microsoft SQL Server Administrator's Guide*
  - *NetWorker Module for Microsoft SQL Server Installation Guide*
  - *NetWorker Module for Microsoft SQL Server Release Supplement*

## Installing and Configuring Microsoft Exchange Server

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for Microsoft Exchange Server Administrator's Guide*
- ◆ *NetWorker Module for Microsoft Exchange Server Installation Guide*
- ◆ *NetWorker Module for Microsoft Exchange Server Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data.
2. Use NetWorker to backup data from Restore Node.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
  - *NetWorker Module for Microsoft Exchange Server Administrator's Guide*
  - *NetWorker Module for Microsoft Exchange Server Installation Guide*
  - *NetWorker Module for Microsoft Exchange Server Release Supplement*

---

## Installing and Configuring Lotus Notes

Initial installation is completed by EMC Professional Services.

For detailed instructions on installing and configuring the NetWorker Module software for scheduled and manual backups, refer to the:

- ◆ *NetWorker Module for Lotus Administrator's Guide*
- ◆ *NetWorker Module for Lotus Installation Guide*
- ◆ *NetWorker Module for Lotus Release Supplement*

---

### Configuration

1. Use Restore Node to restore existing EDM data.
2. Use NetWorker to backup data from Restore Node.
3. Use the configuration tool to create NetWorker Group, Pool, and Client resources for the corresponding EDM configuration. For detailed information, refer to the:
  - *NetWorker Module for Lotus Administrator's Guide*
  - *NetWorker Module for Lotus Installation Guide*
  - *NetWorker Module for Lotus Release Supplement*



---

This chapter provides the information required to initiate and monitor data and file system restores in a network or NDMP environment. It describes also the technical processes of NetWorker Restore Node for EDM restores.

This chapter contains the following:

- ◆ Restore Overview ..... 3-2
- ◆ How the Restore Node Processes a Restore ..... 3-3
- ◆ NDMP Restore Processing ..... 3-6

## Restore Overview

Restores of existing EDM backups are initiated from the Restore Node or from the client to which you want to restore data. Restore utilities are accessed:

- ◆ in the Restore Node Console
- ◆ by using the `ebrestore` command at the command line
- ◆ by using the `edmcrestore` command on the client

The data was saved originally using any of the following backup paths:

- ◆ Network
- ◆ Symmetrix Path
- ◆ Symmetrix Connect
- ◆ NDMP (Network Data Management Protocol)

For information about restoring data using Symmetrix Connect, refer to the *EMC Data Manager Symmetrix Connect User Guide*.

Backup components related to the original backup processing include the following:

- ◆ Work item
- ◆ Work group
- ◆ Schedule template
- ◆ Media

For more information, refer to the EDM Release 5.1.0 documentation.

Media management for the Restore Node software can now be configured using either of the following types of Library Managers:

- ◆ A dedicated Library Manager is configured on the Restore Node using the existing EDM services to provide media management. No AlphaStor configuration is required.
- ◆ A shared Library Manager is configured on the Restore Node using AlphaStor services to provide media management.

For complete details on dedicated and shared Library Managers, refer to *Configuring Library Managers* on page 4-1.

Back up catalogs were initially created during backup. Browse through the directories to select the data, and start the restore. When the restore is initiated, the Restore Node:

- ◆ locates all data
- ◆ restores the data to the client(s)
- ◆ creates and stores log files about restore activity on itself and the clients

Self-service data retrieval are configured so users on client systems can restore files.

---

## How the Restore Node Processes a Restore

Previously backed-up data is restored using the Restore Node software, if it is online during the restore.

When using the restore utilities in the Restore Node console, `ebrestore`, or by running `edmcrestore` from the client, options become available for restoring backed-up data. After searching for, and selecting the data to be restored, the Restore Node locates the original backup save set records for each file. The backup save set records identify the backup catalogs, which contain information about the original backup data and its location.

Database clients provide database system restores through interactions with the standard backup utilities provided by the database vendor for use with their databases. For example, the Oracle client supports backups by *Oracle7i* Enterprise Backup Utility (EBU) and *Oracle8i* Recovery Manager (RMAN). Depending on the database client, restores can be initiated from the database system or the Restore Node.

---

When offline database backups are restored, ensure that all streams are selected from the same backup date to avoid a failure.

---

The Restore Node connects to the client to which the existing backup data is to be restored, and invokes a restore agent on the client. The restore engine provides the client restore agent. This agent contains information about each of the selected files to restore. The backup data is read from the media residing in the attached library unit. After reading the data, it is sent to the client.

If data is restored to the original client, the data then overwrites any data that existing on that client unless otherwise specified.

Information about the restored data is written to a recoveries log file located on the client. The recoveries log includes:

- ◆ the name of the user performing the restore operation
- ◆ the total amount of data restored
- ◆ the date and time of the restore

Data can be recovered from different backup save sets, one work item at a time. This causes the restore program to combine catalogs in order to reproduce the file system, state at the time of the request.

---

## Restoring Databases

The client software receives restore requests from the database restore utility at a database, tablespace, or data file granularity, and sends the requests to the Restore Node. The data is retrieved from the media and then sent to the client software. The client software passes the data on to the database restore utility.

Databases also can be restored through Symmetrix Connect by using the `ebrestore` and `eb_dc_restore` commands. Refer to the *EMC Data Manager Symmetrix Connect User Guide* for more information.

For more details on restoring databases, refer to *Configuration* on page 2-1, and the *EMC Data Manager Release 5.1.0 Software Reference Guide*.

---

## Restoring Using Backup to Disk

The Restore Node Backup to Disk feature enables you to run restore operations to and from file volumes. The original EDM backed-up files to an accessible directory (for example, a local file system). The Restore Node performs data restoration from disk rather than tape media.

For more information about this feature, refer to *EMC Data Manager Backup to Disk*.

---

## Restoring from Duplicate Media

You can restore backups from duplicate media. If the original media is physically present in a library unit (not offline or offsite), the Restore Node automatically restores from the original.

If the original media is offline or offsite (true for dedicated Library Managers only), but up-to-date duplicate media is physically present in a library unit, the Restore Node automatically uses the duplicate media. An up-to-date duplicate implies that no additional backups were appended to the original since the duplicate completed. Therefore, the duplicate media is an exact duplicate of the original media.

For dedicated Library Managers only, if both the original and up-to-date duplicates are offline or offsite, processing is suspended until the library unit injects the appropriate media into the drive. In the Restore Node console, a media request prompts you for the original or current duplicate media. Either media must be loaded into the library unit for the restore process.

For shared Library Manager configuration, import media if a restore is required.

---

If during a restore, the system determines the original media was modified since the last duplication, the duplicate media is not substituted for the original media.

---

---

## Restoring from Defective Media

If original media in your library unit is too defective to use for restore purposes, and a valid, current duplicate is available, eject the defective media and then restore from the duplicate media.

---

## Restoring Files with ACL Settings

For detailed information on restoring files with ACL settings, refer to the EDM 5.1.0 documentation.

## Administrator Restore Permissions

As administrator, you have permission to restore backed-up data with full permissions as system administrator from the Restore Node or any client computer. Use the Restore window to browse the backups of any client and change the destination client for the restore. For detailed information on client user restore modes, refer to the EDM 5.1.0 documentation.

## NDMP Restore Processing

In the restore process, data can be viewed, required objects can be marked for restore, and where to put the data. You can use the Restore Wizard in the EMC Data Manager Console to browse and mark NDMP data for restore. You also can start, monitor, and cancel a restore once it is in progress. A restore also can be completed by using the `ebrestore` command.

Note the following about NDMP restores:

- ◆ The Restore Node does not support client-initiated restores of existing NDMP backups. Restores must be initiated from the Restore Node as no client software resides on the NDMP host.
- ◆ When restoring NDMP data using the Restore Node Console, the overwrite policy is Always for NDMP backups, and the Data Path is NDMP. Select an In Place or Specified Location. If you choose Specified Location, supply the full path-name; you cannot browse for this information.
- ◆ When restoring existing NDMP backed-up data from data that originally resided on Celerra storage, restore the data to Celerra storage.
- ◆ File names of deleted files and both file names for a renamed file appear in the list of restorable objects. Therefore, if a file was renamed or deleted and later a Level 9 NDMP backup was performed, select the files to restore with this in mind.

- ◆ For Celerra, UNIX-named pipes were backed-up, however they are restored as regular files.
- ◆ If a file server data mover or storage processor has failover capability enabled, a different Data Mover or service processor can pick up its tasks. However, if this failover occurs during an NDMP restore, the restore fails. If the failed Data Mover or service processor is an NDMP host running the data service, access to the data that the host serves will have failed over to a new NDMP host. In this case, restart the restore operation.

Abnormal termination of NDMP restore operations may prevent normal volume dismount from drives, which can impact future restores. If this occurs, dismount the volume(s) manually to free up the drive(s).

## Restore Locations

Table 3-1 lists available locations for restoring data backed-up on a NAS device.

**Table 3-1 NDMP Restore Options**

If the restore is ...	You can restore NDMP data to ...
In Place Restore	its original location.
Out of Place Restore	a new location on the same NDMP file server.
Cross Restore	another NDMP host of the same type. For example, data that was backed-up on one Celerra system may be restored to another Celerra system.

## Local Restore

If you request your restore to be performed as a local restore, and the library unit in which the volume resides does not have any drives attached to the NDMP host required for local restore, the restore fails. Either move the volume into a library unit that does have one or more drives attached to the required NDMP host, or perform the restore operation without specifying it be local.



This chapter provides information about installing device drivers and configuring dedicated and shared Library Managers for library units connected to the Restore Node, NetWorker and AlphaStor. It also provides information about configuring an NDMP-attached library unit.

The chapter contains the following:

- ◆ The Library Manager Configuration Tool ..... 4-2
- ◆ Listing Library Units ..... 4-4
- ◆ Configuring a Dedicated Library Manager..... 4-5
- ◆ Converting from Dedicated to Shared Library Managers ..... 4-9
- ◆ Deconfiguring a Library Manager..... 4-14
- ◆ Displaying SAN Devices..... 4-16
- ◆ Configuring DDS for SAN..... 4-17
- ◆ Installing Device Drivers ..... 4-17
- ◆ Removing Device Drivers..... 4-21
- ◆ Configuring a Dedicated NDMP Library Manager ..... 4-21
- ◆ Configuring a Dedicated Static-Split Library Unit ..... 4-27
- ◆ Troubleshooting..... 4-28

This chapter includes procedures performed at the command line; for more information about each referenced command, refer to its man page. For information about using the NetWorker Restore Node for EDM Console, refer to Help in the Console, and the *EMC Data Manager Console User Guide*.

## The Library Manager Configuration Tool

Library Managers manage several types of libraries including tape library and disk library units using the `lmconfig` utility. Disk library units are file-system based, and tape libraries manage removable tapes and automated changes in access to, and from tape drives. The disk library unit simulates the changes in access on disk in a file-system to allow an application to have access to the already existing disk based backup media for Restore Node restores.

For Tape library units, dedicated and shared Library Managers provide the ability to share the tape library unit between the Restore Node and NetWorker software. The shared library is managed by AlphaStor for many of its user-level operations to the tape library unit. The shared Library Manager also provides the ability for the Restore Node to mount and dismount tapes in an environment shared with NetWorker. The Restore Node server provides restore only capability for existing EDM backup tapes to restore the data. The shared library allows the Restore Node to share tape library units with NetWorker server and NetWorker storage nodes. Tape and disk library units are hardware device or devices bundled as a unit to store data. lists device types and whether they are supported for dedicated and shared Library Managers.

**Table 4-1 Supported Device Types**

Device Type	Support for Dedicated Libraries	Support for Shared Libraries
ACSLs	Yes	Separate package
Tape Library Unit	Yes	Use AlphaStor
Disk Library Unit	Yes	Use AlphaStor
DDS for SAN Attached	Yes	No

The `lmconfig` utility enables you to:

- ◆ list currently configured Library Managers
- ◆ view devices visible on the SAN
- ◆ install and remove device drivers
- ◆ configure and deconfigure Library Managers
- ◆ access help for a brief description of main menu entries



### **CAUTION**

**Do NOT manually edit any of the files modified by `lmconfig`. For assistance with this file, contact EMC Customer Service.**

The `lmconfig` utility resides in `/usr/epoch/bin`. Make sure the path-name is defined in your `PATH` environment variable.

To use the `lmconfig` utility as root, start `lmconfig` to display the main menu:

```
# lmconfig
```

```
EMC LIBRARY MANAGER CONFIGURATION TOOL
```

```
Main Menu
```

```
1 LIST           Show configured TLUs and unconfigured devices
2 ZONESCAN      Show devices visible on the SAN
3 DISCOVER      Set up drivers for new fibre channel devices
4 AUTOCONFIG    Automatically configure library units
5 REMOVE        Deinstall EMC device drivers
6 DECONFIGURE   Deconfigure library units
7 HELP
```

Choose the configuration operation you want (1,2,3,4,5,6,7,q)?

The main menu provides the following options. Note that the `INSTALL` and `DISCOVER` options do not appear simultaneously in the menu.

- LIST                    Show configured library units and unconfigured devices.
- ZONESCAN                Show devices visible on the SAN.
- INSTALL                 Install device drivers.
- DISCOVER                Set up drivers for new fibre channel devices.
- AUTOCONFIG             Configure a library unit automatically

- REMOVE                Deinstall device drivers.
- DECONFIGURE        Deconfigure a library unit.
- HELP

## Listing Library Units

To view a list of currently configured library units residing in `/usr/epoch/etc/lm`, select 1 LIST in the main menu. The displayed information includes the library unit, and the SCSI device name, addresses for the robot and each drive. (The LIST option does *not* display NDMP devices because they are not locally attached.)

Main Menu

```

1 LIST                Show configured TLUs and unconfigured devices
2 ZONESCAN          Show devices visible on the SAN
3 DISCOVER          Set up drivers for new Fibre Channel devices
4 AUTOCONFIG        Automatically configure library units
5 REMOVE            Deinstall EMC device drivers
6 DECONFIGURE       Deconfigure library units
7 HELP
```

Choose the configuration operation you want (1,2,3,4,5,6,7,q)? 1

=====

Configured Library Units

=====

Getting configurations ...

## Configuring a Dedicated Library Manager

The AUTOCONFIG option in the `lmconfig` main menu automatically configures a Library Manager for each library unit attached to the Restore Node. The AUTOCONFIG option:

- ◆ configures offline and offsite Library Managers if necessary
- ◆ searches for, and gathers information about, all device nodes in the system
- ◆ configures a library manager for each library unit
- ◆ automatically unloads all drives and places the media into empty slots

Because the operation is automatic, it is not necessary to know the system board numbers of a device, SCSI bus numbers, target IDs, or LUN numbers.

When AUTOCONFIG is finished, `lmconfig`:

- ◆ creates a subdirectory on the Restore Node in  
`/usr/epoch/etc/lm`
- ◆ copies a sample configuration file into the directory and modifies it
- ◆ creates a link to the executable file
- ◆ adds the pathname of the new Library Manager to the `vmconfig` file

You can also use enhanced `lmconfig` to run AUTOCONFIG and tell it not to prompt any questions. If it detects media in a drive, it unloads the media, without prompting you, and configures any unconfigured library units. Run enhanced `lmconfig` by using the CLI command:

```
# lmconfig -A
```

### Preparing for the Configuration

Before you configure a Library Manager, verify:

- The system hardware configuration is valid.
- Library units are properly cabled, powered up, and online.

- ❑ For NDMP if applicable:
  - NDMP hosts are on the network and online
  - you know the number of NDMP hosts that you want to configure, and related information for each host (user name, password, etc.)
- ❑ The successful installation of the device drivers
- ❑ The Restore Node rebooted.
- ❑ All library unit drives are operational.
- ❑ At least one piece of media is loaded into each library unit.

---

## Running AUTOCONFIG

AUTOCONFIG is a menu option in the `lmconfig` main menu. To run AUTOCONFIG:

1. As root, start `lmconfig`:

```
# lmconfig
```
2. Enter the number that represents AUTOCONFIG at the prompt.

## Choosing Library Managers to Configure

When you run AUTOCONFIG, it checks for all devices and displays a list of the unconfigured devices it finds. Specify the devices you want to configure.

1. Enter **a** for all devices, or use a comma-separated list to select a subset of the listed library units.
2. Enter the physical location of the library unit; for example, the name of the room where the library unit is located.

```
.....
```

```
Getting Info on Library Unit #0 : ATL : ACL 452: CD55
```

```
The robot on library unit 0 is located at:
```

```
=== TARGET:0 LUN:1 ===
```

```
Number of drives = 4
```

```
Number of slots = 52
```

```
Number of inlets = 1
```

```
= = = = = = = = = = = = = = = =
```

```
Loading Drive 0. Please Wait.....
```

```
Waiting for drive to be ready ..
```

```
Found Drive 0 : Quantum : DLT7000 : CD55
```

**Selecting the Cleaner Barcode Default for Dedicated Library Managers**

AUTOCONFIG prompts you to accept or decline a default barcode for cleaning cartridges. If you enter **y** (yes), the dedicated Library Manager recognizes any tape media with a barcode of CLNXXX (where XXX is a three-digit number from 000 to 999) as a cleaner, and does not place it in the drive during an inventory. Enter **n** (no) to override the default barcode.

```
Do you want to accept the default
barcode of CLNXXX for tape cleaners (y,n)[Y]? y
::::::::::::::::::::::::::::::::::::::::
```

---

```
Finished configuring library unit(s).
```

---

**Viewing Log Files**

After configuring all library units, confirmation of the completed configuration appears, as shown above. You can view the resulting log files which contain information about library unit configuration.

**Completing the Configuration**

When configuration is complete:

1. Exit `lmconfig` by entering **q** (quit).
2. Reboot the Restore Node by entering the following:

```
# shutdown -y -i6 -g0
```

Step 2 reboots the system that starts the `vmdaemon`, `ebfsd`, and `vmdupd` daemons. The Restore Node software does not run until these daemons start. A full inventory begins after the reboot; the time period for completing an inventory depends on the amount of media the library unit contains.

## Converting from Dedicated to Shared Library Managers

For the conversion of media to AlphaStor control, before using the `lmconfig` utility to configure an AlphaStor Library Manager, use the `as_prepare_media` tool to prepare the existing EDM.

The `as_prepare_media` tool deletes volume entries from the EDM volume management catalog that are not relevant. It identifies volumes required to be ejected from the existing EDM library units prior to the configuration of the AlphaStor library manager. The AlphaStor software requires all media to have a valid barcode and the `as_prepare_media` identifies volumes that require barcodes or any barcodes to be fixed.

The `as_convert_media` tool passes control of EDM media to an AlphaStor server during configuration.

For more information on the refer to the `as_convert_media` utility man page.

The following is an example of the `lmconfig` utility and the output when completing a standard conversion from an existing dedicated EDM tape library unit to a shared AlphaStor Library Manager:

1. As root, start `lmconfig` to display the main menu:

```
# lmconfig
```

2. Choose option **4 AUTOCONFIG** from the main menu. The following reminder messages appear.

```
EMC LIBRARY MANAGER CONFIGURATION TOOL
```

```
Main Menu
```

- |               |   |
|---------------|---|
| 1 LIST        | Show configured TLUs and unconfigured devices |
| 2 ZONESCAN    | Show devices visible on the SAN               |
| 3 DISCOVER    | Set up drivers for new fibre channel devices  |
| 4 AUTOCONFIG  | Automatically configure library units         |
| 5 REMOVE      | Deinstall EMC device drivers                  |
| 6 DECONFIGURE | Deconfigure library units                     |
| 7 HELP        |   |

```
Choose the configuration operation you want (1,2,3,4,5,6,7,q)? 4
```

---

Make sure the following are all true before continuing:

- 1.The library units were set up, cabled correctly, powered on, and online.
- 2.Drivers have been successfully installed and the system rebooted.
- 3.All library unit drives are operational.
- 4.At least one piece of media is in each library unit.
- 5.For NDMP attached library units, make sure the NDMP hosts are on the network and online.
- 6.For EDM\_DSTOR library unit, the directory must be valid and accessible from the EDM.

```
Do you want to continue with autoconfiguration (y,n)? y
```

3. Enter **y** (yes) to run the configuration. If the library units are configured, a message states the configuration failed. AUTOCONFIG detects media in a drive and unloads the drive automatically.
4. Indicate you want to continue configuring an AlphaStor library unit and view the information that follows.

```

=====
Starting AUTOCONFIG v5.3
=====

Do you want to configure an AlphaStor library unit (y,n)[n]? y
The valid media types which can be converted to AlphaStor control are:
  DLT

Enter the type of media the AlphaStor will control (<string>,q)[DLT]?
NOTE: The following configured library units support media type "DLT":
  atl_p1000_0 [DLT]
They will be automatically deconfigured after the AlphaStor library unit is
configured.
Is this ok (y,n)? y
Enter AlphaStor host name (<string>)[ledma160]?
Enter the maximum number of drives which can be used concurrently (<integer>)? 2

You have entered
Media type   : DLT
Host        : ledma160

```

The library unit name contains the manufacturer, drive type, and model number. For more information on library unit manufacturers, drive types, and model numbers, refer to the *EDM Release 5.1.0 Software Reference Guide*.

5. When asked if you want to discover NDMP attached devices, answer no and then view the information that follows:

Do you want to discover NDMP attached devices to be configured for the AlphaStor (y,n)[n]? n

Converting media type "DLT" to AlphaStor control

Note: This can take a long time. Please be patient.

allocated volume 4607E4CCC52E0F2E (AYP238) in "atl\_p1000\_0", slot 6: assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

Note: Ignoring phantom volume 580852EA1F5FD906 (non-existing original volume of duplicate 6F085317B4BDA60D)

uncataloged volume 0000000000000000 (CDG073) in "offline\_0": assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

unverified volume 0000000000000000 (BYQ173) in "as\_dlt\_0": assign to AlphaStor location "VAULT", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

allocated volume 6F085317B4BDA60D (CQH743) in "atl\_p1000\_0", slot 8: assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

Note: Ignoring phantom volume EF07E4AF4051FE5A (non-existing original volume of duplicate 4607E4CCC52E0F2E)

allocated volume 9608B727ED442252 (DAD356) in "atl\_p1000\_0", slot 11: assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

unlabeled volume 0000000000000000 (AYP240) in "atl\_p1000\_0", slot 0: assign to AlphaStor location "Offline", pool "<default>", delete from VM database

unlabeled volume 0000000000000000 (CPC166) in "atl\_p1000\_0", slot 1: assign to AlphaStor location "Offline", pool "<default>", delete from VM database

foreign volume 0000000000000000 (BON272) in "atl\_p1000\_0", slot 2: delete from VM database

foreign volume 0000000000000000 (CLZ522) in "atl\_p1000\_0", slot 3: delete from VM database

allocated volume 31054098A551AE8C (DPD524) in "atl\_p1000\_0", slot 7: assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

allocated volume 7208B7238521D1B1 (CFJ698) in "atl\_p1000\_0", slot 10: assign to AlphaStor location "Offline", pool "EDM\_DLT\_ledma160", change luname in VM database to "as\_dlt\_0"

```
Number of volumes processed: 11, converted to AlphaStor: 9
Checking for configured EDM physical LUs supporting media type "DLT" which
would need to be automatically deconfigured.
EDM Physical LU "atl_p1000_0" supports media type "DLT" and is being
automatically deconfigured.
```

```
atl_p1000_0 removed.
```

```
Deleting "DLT" media marked for deletion from the VM catalog
Now deleting volumes previously marked for deletion...
```

```
Complete.
```

```
=====
```

```
Continuing with the autoconfiguration...
```

```
Do you want to discover NDMP attached devices (y,n)[n]?
```

```
Do you want to configure Restore to disk (edm_dstor) (y,n)[n]?
```

```
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

```
Finished configuring library unit(s).
```

```
=====
Autoconfiguration successful
=====
```

---

## SCSI Address

For dedicated Library Managers, the SCSI address contains the SCSI target ID and logical unit number, or LUN, of the library unit robot and drive(s), as shown.

```
.  
. .  
.  
lmconfig completed configurations:  
  offline_0  
  offsite_0  
  atl_452_0  
    Robot 0 : 0 1  
    Drive 0 : 0 0
```

---

## Deconfiguring a Library Manager

When you deconfigure a Library Manager, `lmconfig` deletes its subdirectory and the contents. If media still resides in the library unit, it does not appear in subsequent status reports (i.e., running `evmstat -c`), until you reconfigure the library unit.

Deconfigure a Library Manager whenever you permanently remove a library unit from the Restore Node.

To deconfigure a Library Manager:

1. As root, start `lmconfig`:  

```
# lmconfig
```
2. Choose 6 DECONFIGURE in the main menu. A list appears of currently installed Library Managers.

3. Enter the number(s) that correspond to the Library Manager(s) to deconfigure.

Main Menu

```
1 LIST          Show configured TLUs and unconfigured devices
2 ZONESCAN     Show devices visible on the SAN
3 INSTALL      Install EMC and set up device drivers
4 AUTOCONFIG   Automatically configure library units
5 REMOVE       Deinstall EMC device drivers
6 DECONFIGURE  Deconfigure library units
7 HELP
```

Choose the configuration operation you want (1,2,3,4,5,6,7,q)? 6

Choose one or more Library Manager configurations to be removed

```
1 offline_0
```

The `lmconfig` utility then:

- ◆ removes the subdirectory and its contents from `/usr/epoch/etc/lm`
- ◆ deletes the Library Manager from the `vm.cfg` file
- ◆ notifies the Volume Manager to reread the file and terminate the associated Library Manager daemon

---

If you inadvertently remove the offline or offsite Library Manager, `lmconfig` replaces it automatically. Select the `CONFIGURE` option in the `lmconfig` main menu.

---

When the main menu reappears, select another option or `q` (quit) to exit `lmconfig`.

## Displaying SAN Devices

Use `lmconfig`'s `ZONESCAN` option to view devices zoned with the Restore Node and to verify that zoning and Fibre Channel connections are online.

Only port worldwide names (WWN) can be zoned. When creating a zone, view only the port and device port WWNs.

Do the following:

1. As root, start `lmconfig`:

```
# lmconfig
```

2. When the main menu appears, type `2` to run `ZONESCAN`.

A list of all devices on the SAN available to the Restore Node appears, as shown in the sample output on the next page. Symmetrix disks also may appear in the list (not shown in the sample output), but will not be configured.

3. Verify from the list that all devices are accessible.
4. If the message `No fibre-channel devices found` appears, the problem may be because:
  - no fibre-channel devices were found
  - no fibre-channel host bus adapters were found
  - the library version is incorrect

5. If no fibre-channel devices were found, check zoning information at the switch. If the library version is incorrect, update to the latest version.
6. If a device does not appear in the list, verify that:
  - all SCSI and fibre channel connections are secure
  - the switch has a zone
  - all devices are online

If a device still does not appear in the list, reboot the Restore Node and begin at step 1 of this procedure.

---

## Configuring DDS for SAN

DDS for SAN attached devices is always configured for dedicated Library Managers. Refer to the *NetWorker, Release 7.2, Administrator's Guide* for more details on DDS for SAN attached devices.

---

## Installing Device Drivers

Use the following `lmconfig` procedure to install device drivers. When installing device drivers, ensure that at least one operational library unit is connected to the Restore Node. For more details on installing device drivers, refer to the *EDM Version 5.1.0 Software Reference Guide*.

---

This option is available only for new Restore Node installations, at install time, or if you remove device drivers during configuration.

---

1. As root, start `lmconfig`:

```
# lmconfig
```

2. Choose **3 INSTALL** from the main menu and enter **y** (yes) to begin driver installation. The script displays messages that confirm driver installation.

#### Main Menu

```

1 LIST           Show configured TLUs and unconfigured devices
2 ZONESCAN      Show devices visible on the SAN
3 INSTALL       Install EMC and set up device drivers
4 AUTOCONFIG    Automatically configure library units
5 REMOVE        Deinstall EMC device drivers
6 DECONFIGURE   Deconfigure library units
7 HELP

```

Choose the configuration operation you want (1,2,3,4,5,6,7,q)? **3**

Initializing ... Done

Ignore messages that indicate failure of no driver installation.

3. Shut down the Restore Node to the PROM level to enable a reconfiguration reboot:
 

```
# shutdown -y -i6 -g0
```
4. After the Restore Node shuts down and reboots, log in as root and restart `lmconfig`.

The Restore Node probes the bus for all attached devices and assigns device nodes in the file-system that represent each detected device. It also configures the logical namespace in the `/dev` directory and the physical namespace in the `/devices` directory.

## Setting Up Drivers for Fibre Channel Devices

To change or add a Fibre Channel device (for example, a library unit) in the SAN, use `lmconfig`'s DISCOVER option. This option sets up the necessary drivers for Fibre Channel devices. In the main menu, the DISCOVER option replaces the INSTALL option if device drivers are already installed; the INSTALL option is unavailable.

The DISCOVER option also:

- ◆ scans for all devices in the zones
- ◆ reads the binding information from the `sd.conf` file
- ◆ configures the `sjb.conf` and `st.conf` files with the appropriate LUNs and binding
- ◆ creates the directory: `/usr/epoch/etc/dev/hw/fibre_adapters/<host adapter card>`

A log file called `hba_devices.log` contains information about the devices each HBA card port detects.

To use the DISCOVER option:

1. As root, start `lmconfig`:
 

```
# lmconfig
```
2. Type 3 to configure the drivers for Fibre Channel devices.

```
EMC LIBRARY MANAGER CONFIGURATION TOOL
Main Menu
  1 LIST          Show configured TLUs and unconfigured devices
  2 ZONESCAN     Show devices on the SAN visible to the Restore
Node
  3 DISCOVER     Set up drivers for new fibre channel devices
  4 AUTOCONFIG   Automatically configure library units
  5 REMOVE       Deinstall EMC device drivers
  6 DECONFIGURE  Deconfigure library units
  7 HELP
Choose the configuration operation you want (1,2,3,4,5,6,7,q)? 3
Initializing ... Done

Building driver configuration files ... Done.
The Restore Node needs to be restarted to accept the changes.
```

3. Type `y`, or press `Enter`, to reboot the Restore Node when prompted.

To view a list of configured and unconfigured devices, run the LIST procedure from the main menu.

---

### Reviewing the hba\_devices.log File

Information is available on the devices each HBA card port detects in the log file `hba_devices.log`. This log provides:

- ◆ vendor information
- ◆ library unit or drive types
- ◆ current hardware revision numbers
- ◆ target and LUN numbers
- ◆ World Wide Names (WWNs)

The log file resides in the directory `/usr/epoch/etc/dev/hw/fibre_adapters`. It displays information similar to the following:

```
/usr/epoch/etc/dev/hw/fibre_adapters/fcaw0
root@nature.1:hw/fibre_adapters/fcaw0# more hba_devices.log
+-----+
| Vendor | Product ID | Rev | Tar | LUN | WWN |
+-----+
| ATL | P3000 | 1.21 | 0 | 1 | 20020060451603d6 |
+-----+
| QUANTUM | DLT7000 | 2564 | 0 | 2 | 20020060451603d6 |
+-----+
| QUANTUM | DLT7000 | 2564 | 0 | 4 | 20020060451603d6 |
+-----+
| QUANTUM | DLT7000 | 2564 | 0 | 6 | 20020060451603d6 |
+-----+
| QUANTUM | DLT7000 | 2564 | 0 | 8 | 20020060451603d6 |
+-----+
| QUANTUM | DLT7000 | 2564 | 0 | 10 | 20020060451603d6 |
+-----+
```

## Removing Device Drivers

Use the following procedure to remove (deinstall) device drivers.

1. As root, start `lmconfig`:  

```
# lmconfig
```
2. Select 5 REMOVE from the main menu.
3. When prompted, type `y` (yes) to confirm the removal.

### Main Menu

1 LIST	Show configured TLUs and unconfigured devices
2 ZONESCAN	Show devices visible on the SAN
3 DISCOVER	Set up drivers for new Fibre Channel devices
4 AUTOCONFIG	Automatically configure library units
5 REMOVE	Deinstall EMC device drivers
6 DECONFIGURE	Deconfigure library units

## Configuring a Dedicated NDMP Library Manager

For complete details and examples on configuring attached (dedicated) NDMP Library Managers, refer to the *EDM Release 5.1.0 Software Reference Guide*.

## Configuring a Shared NDMP Library Unit

This section provides details and an example of the `lmconfig` utility when configuring a shared NDMP Library Manager. Use the following procedure to configure NDMP-attached library units. Before beginning:

- ◆ Verify the library units and NDMP hosts are on the network and online.
  - ◆ know the number of NDMP hosts you want to configure, and the host user name, password, and so on.
1. Start the `lmconfig` utility:  

```
# lmconfig
```
  2. When the `lmconfig` tool menu appears, select the `AUTOCONFIG` option and then note the parameter information that follows.

## EMC LIBRARY MANAGER CONFIGURATION TOOL

## Main Menu

- 1 LIST            Show configured TLUs and unconfigured devices
- 2 ZONESCAN      Show devices on the SAN visible to the Restore Node
- 3 DISCOVER      Set up drivers for new fibre channel devices
- 4 AUTOCONFIG    Automatically configure library units
- 5 REMOVE        Deinstall EMC device drivers
- 6 DECONFIGURE   Deconfigure library units
- 7 HELP

Choose the configuration operation you want (1,2,3,4,5,6,7,q)? 4

---

Make sure the following are all true before continuing:

- 1.The library units were set up, cabled correctly, powered on, and online.
- 2.Drivers have been successfully installed and the system rebooted.
- 3.All library unit drives are operational.
- 4.At least one piece of media is in each library unit.
- 5.For NDMP attached library units, make sure the NDMP hosts are on the network and online.
- 6.For EDM\_DSTOR library unit, the directory must be valid and accessible from the EDM.

Do you want to continue with autoconfiguration (y,n)? y

3. When asked if you want to continue and configure a shared library unit with NDMP-attached devices, answer yes to both questions. View the information that follows.

```

Do you want to continue with autoconfiguration (y,n)? y
=====
Starting AUTOCONFIG v5.3
=====
Do you want to configure an Alpha Stor library unit (y,n)[n]? y
The valid media types which can be converted to AlphaStor control are:
      DLT
Enter the type of media the AlphaStor will control (<string>)[DLT]? DLT
NOTE: The following configured library units support media type "DLT":
      atl_p1000_0 [DLT], atl_p1000_1 [DLT], np_atl_p1000_0 [DLT]
They will be automatically deconfigured after the AlphaStor library unit is
configured.
Is this ok (y,n)? yes
Enter AlphaStor host name (<string>)[ledma165]? ledma165
Enter the maximum number of drives which can be used concurrently (<integer>)? 4

You have entered
Media type   : DLT
Host        : ledma165
Concurrency  : 4

Is this correct (y,n)? yes

Do you want to discover NDMP host to be configured for the AlphaStor (y,n)[n]? yes
=====
The following is needed to configure NDMP-attached tape library units:

1) Provide the number of NDMP hosts required for configuration.
2) For each NDMP host:
   a) Obtain the necessary credentials (user name, password, etc.).

How many NDMP hosts do you want to configure (<integer>)? 1
You have entered 1.
Is this correct (y,n)? yes
-----

```

4. Continue viewing the output and respond to prompts as appropriate.

NDMP Server #1

Enter NDMP host name or IP address (<string>,q)? ledmb119

Enter NDMP port at the host (<integer>)[10000]? 10000

Enter NDMP user name : ndmp

Enter NDMP password :

Please re-type password :

You have entered

Host : ledmb119

Port : 10000

User name : ndmp

Is this correct (y,n)? yes

ledmb119: Testing for the NDMP TAPE Service.....OK

=====

Converting media type "DLT" to AlphaStor control

Note: This can take a long time. Please be patient.

allocated volume 2508065149D4E29C (CQH735) in "atl\_p1000\_0", slot 0: assign to AlphaStor location "insidedp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume AD080F5F50EEC2A6 (CQH698) in "atl\_p1000\_0", slot 18: assign to AlphaStor location "insidedp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume D4F3CFF79C9C91EA (AXQ926) in "atl\_p1000\_1", slot 11: assign to AlphaStor location "insidesp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume 190809B1358F6F41 (DKQ834) in "atl\_p1000\_0", slot 13: assign to AlphaStor location "insidedp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume F4081EA15805E365 (CQJ271) in "atl\_p1000\_1", slot 1: assign to AlphaStor location "insidesp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume A3080F70878DE53C (CPC150) in "atl\_p1000\_0", slot 21: assign to AlphaStor location "insidedp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume 110805F46765098B (TEST26) in "atl\_p1000\_0", slot 20: assign to AlphaStor location "insidedp1000", pool "EDM\_DLT\_ledma165", change luname in VM database to "as\_dlt\_0"

allocated volume CE0805644F78692C (BOF422) in "atl\_p1000\_0", slot 6: assign to AlphaStor location

```

"insidedp1000", pool "EDM_DLT_ledma165", change luname in VM database to
"as_dlt_0"
cleaner volume 0000000000000000 (CLN144) in "np_atl_p1000_0", slot 24: delete
from VM database, eject from LU
allocated volume 0308055BD85E102A (CPC100) in "atl_p1000_0", slot 22: assign
to AlphaStor location "insidedp1000", pool "EDM_DLT_ledma165", change luname
in VM database to "as_dlt_0"
allocated volume 83081ECB76AC5011 (DF0332) in "atl_p1000_1", slot 0: assign
to AlphaStor location "insidesp1000", pool "EDM_DLT_ledma165", change luname
in VM database to "as_dlt_0"
allocated volume 2808058D256512E0 (BDE097) in "atl_p1000_0", slot 9: assign
to AlphaStor location
.
.
.
Number of volumes processed: 44, converted to AlphaStor: 41
Checking for configured EDM physical LUs supporting media type "DLT" which would
need to be automatically deconfigured.
EDM Physical LU "atl_p1000_0" supports media type "DLT" and is being automatically
deconfigured.
    atl_p1000_0 removed.
EDM Physical LU "atl_p1000_1" supports media type "DLT" and is being automatically
deconfigured.
    atl_p1000_1 removed.
EDM Physical LU "np_atl_p1000_0" supports media type "DLT" and is being
automatically deconfigured.
    np_atl_p1000_0 removed.
Deleting "DLT" media marked for deletion from the EDM VM catalog
Now deleting volumes previously marked for deletion...
    Complete.

```

```

=====

```

```
"Continuing with the autoconfiguration..."
```

```
Do you want to discover NDMP attached devices (y,n)[n]? no
Do you want to configure EDM Backup/Restore to disk (edm_dstor) (y,n)[n]? no
::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::::
```

```
Finished configuring library unit(s).
```

```
=====
Autoconfiguration successful
=====
```

## Library Units in the Restore Node Console

All tape library units in the Restore Node console may be identified by their icons. All NDMP library unit names start with `np` and include the letters *NDMP* (except for static-split TLUs). The Restore Node Console displays all detected library units. However, the Restore Node uses only NDMP drives to restore NDMP host data.

## Configuring a Dedicated Static-Split Library Unit

This section describes how to configure a dedicated static-split library unit.

If you are configuring a tape library unit in which the drives are split for use by the Restore Node and one or more NDMP hosts, and this static-split TLU is the only TLU attached to the Restore Node. Run the following command to complete the configuration:

```
# eb_server_config
```

For more information on this command and its options, refer to the `eb_server_config` man page.

---

### Static-Split Library Unit for Restore Node and NDMP

If you have configured a tape library unit so that its drives are split between the Restore Node and one or more NDMP hosts, the drives appear as either amber-colored (Restore Node attached), or green (NDMP attached) in the Library Units tree panel object. In this case, however, the library unit name does not include an NDMP designation.

---

## Troubleshooting

The following are two common problems that may occur when configuring Library Managers.

---

### Configuring a Drive

If a drive other than drive 0 fails while configuring a library unit, a message prompts with the option to configure the library unit with the drives that AUTOCONFIG detected.

- ◆ If you enter **n** (no), the library unit configuration stops.
- ◆ If you enter **y** (yes), AUTOCONFIG completes the configuration with the discovered drives.

---

### Configuring a Drive Using Multiple Library Units

If you try to configure more than one library unit at once, and media is stuck in a drive, AUTOCONFIG can fail to configure the Library Managers. You must manually reboot the Restore Node and remove the media from the drive.

To enable AUTOCONFIG to perform a multi library unit configuration:

1. Turn off the library unit.
2. Remove the volume from the drive.
3. Check that the drive cables are properly connected.
4. Reboot the Restore Node.
5. Log in as root.
6. Start the `lmconfig` utility and select 5 AUTOCONFIG in the main menu.

---

## **Detecting a Mechanical Problem**

If a mechanical problem prevents the media from being moved, AUTOCONFIG fails. If you cannot fix the problem, shut off the problem library unit and then run AUTOCONFIG again to configure the remaining library units. If the problem persists, contact either EMC Customer Service or your library unit vendor for assistance.



---

For dedicated Library Managers, the Restore Node volume management software manages and monitors library units and media. The volume management software supports only read operations in the Restore Node. It is not possible to use available, free or unlabeled media as the volume management software does not support label or write operations to tape or disk for shared Library Managers. Now AlphaStor software is used to manage and monitor library units and media.

All volume states that were previously supported in EDM are still supported in Restore Node. Tracking volume lifecycle is supported for both dedicated and shared Library Managers.

This chapter contains the following:

- ◆ Volume Management Overview ..... 5-2
- ◆ Volume Lifecycle ..... 5-8
- ◆ Stopping and Starting the elm Processes..... 5-10
- ◆ Library Unit Operations..... 5-12

This chapter includes restore procedures performed at the command line. For information about using the The NetWorker Restore Node for EDM console to manage media, refer to the *EMC Data Manager Console User Guide*.

---

## Volume Management Overview

Volume management software manages the media and library units that store data. This section describes the following topics:

- ◆ Volumes and the Volume Catalog
- ◆ The Volume Manager
- ◆ Library Managers
- ◆ Volume Management Tasks
- ◆ The Notify Daemon

---

### Volumes and the Volume Catalog

Volume labels enable the identification and tracking of each volume. The volume catalog contains entries for each volume, including:

- ◆ volume ID
- ◆ volume sequence number
- ◆ physical location (optional)
- ◆ volume state
- ◆ optional tape barcode ID

---

Tape barcode ID is optional for dedicated Library Managers, but required for shared Library Managers.

- ◆ media type
- ◆ library unit name

The volume catalog is an integral part of volume management and, in the case of a major system malfunction, necessary for rebuilding the Restore Node. All volume management system files must be backed up daily by using NetWorker.

To ensure that the Restore Node accesses the correct volume each time, volume management checks the volume label against the volume catalog entry. When conducting an inventory in a tape library unit, the barcode inventory feature greatly reduces the inventory time by scanning each tape in the library unit without having to load it first.

## The Volume Manager

The Volume Manager is the principal process in volume management functions. It manages information about a volume lifecycle. Restore Node performs volume operations outlined in Table 5-1:

**Table 5-1 Media Request Support**

Function	Support for Dedicated Libraries	Support for Shared Libraries
injecting new tape media into a library unit	Yes	Use AlphaStor and import media
allocating media to an application	No	No
inventorying a tape library unit	Yes	Use AlphaStor to perform a robot inventory
ejecting a tape volume from a library unit	Yes	Use AlphaStor to export media
importing a volume into a library unit from another server	Yes	Yes, the import function scans electronic labels
moving a tape volume from an offline shelf to an offsite vault	Yes	Use AlphaStor or equivalent NetWorker functionality

The Volume Manager then updates the volume catalog with information about related volumes.

The Volume Manager works in conjunction with EBFS (Epoch Bitfile System) to enable applications such as restore. The Volume Manager interacts with dedicated and shared Library Managers to manage library unit operations, and the notify daemon, that provides up-to-date volume management status and information.

## Library Managers

Individual Library Managers coordinate library unit operations. An application such as restore sends a request for a volume to the volume manager, which, in turn, passes the request to the appropriate Library Manager for processing. The following are the two types of Library Managers that can be configured for the Restore Node:

- ◆ A dedicated Library Manager is configured on the Restore Node using the already existing EDM services to provide media management. No AlphaStor configuration is required.
- ◆ A shared Library Manager is configured on the Restore Node using AlphaStor services to provide media management.

When the Library Manager completes the operation, it uses the notify daemon (notd) to inform the volume manager and the Restore Node Console of the operation.

In the Restore Node console, a library unit icon represents the Library Manager for each attached library unit. Particular icons identify library units that are:

- ◆ online — Media is in the library unit
- ◆ offline — Media is not in the library unit but is onsite
- ◆ offsite — Tape media is out of the building

---

offline and offsite library units are supported for dedicated Library Managers only.

---

Refer to *Offline and Offsite Library Managers* on page 5-6.

Library Managers control and support the following library unit operations listed in Table 5-2:

**Table 5-2 Dedicated and Shared Support for Library Managers**

Function	Support for Dedicated Library Managers	Support for Shared Library Managers
tape inventories	Yes	Use AlphaStor
drive preemption	Yes	No
robot movement for mounting and dismounting tape media	Yes	Yes
use of tape or DISK drives	Yes	Yes (tape only)
injecting media into or ejecting media from the tape inlet (if present)	Yes	Use AlphaStor

---

### NDMP Static-Split Library Unit for Restore Node

For dedicated Library Managers, a library unit can be configured so its drives are split between the Restore Node and one or more NDMP host, for exclusive use by each and the Restore Node controls the robot. In the Restore Node console, drives attached to the Restore Node appear as amber icons; NDMP-attached drive icons are green. The library unit name or icon does not have an NDMP designation.

---

### The lmconfig Utility

The `lmconfig` utility creates a separate directory in `/usr/epoch/etc/lm` for each configured Library Manager. The name of each dedicated Library Manager follows a convention based on the library unit it supports. For shared Library Managers, the naming convention is based on the media type it controls.

## Offline and Offsite Library Managers

In the Restore Node console, offline-shelf and offsite-vault media icons represent the dedicated Library Managers that hold information about media in offline and offsite locations. You can view the media that resides in both the offline and offsite library units, eject tape volumes to an offline or offsite location, and record the physical location of the media:

- ◆ Offline media is usually stored nearby and onsite.
- ◆ Offsite tape media is typically moved to a location beyond your site's boundaries, such as an offsite archival location.

Only media with a volume or barcode label can reside in an offline or offsite library unit. Unlabeled tapes with no barcode disappear from the volume catalog when ejected from the library unit. AlphaStor manages this capability for shared Library Managers.

## Moving Media Offsite Before the End of its Rotation Period

If you move tape media offsite before its rotation period ends and media is the current media in the set, the restore operation requiring media fails.

## Volume Management Tasks

The following tasks, listed in Table 5-3 are supported using the Restore Node console:

Table 5-3 Supported Restore Node Console Tasks

Function	Support for Dedicated Libraries	Support for Shared Libraries
monitoring volume activity on the NetWorker Restore Node for EDM	Yes	Limited
injecting and ejecting tape media from the library unit	Yes	Use AlphaStor
labeling blank media for use in Restore Node	No	No
checking for outstanding volume requests	Yes	Use AlphaStor (this requires additional steps)
initiating partial or complete library unit inventories	Yes	Use AlphaStor

---

## The Notify Daemon

The volume manager and each Library Manager communicate with each other and the Restore Node console through the notify daemon, `notd`. The notify daemon enables the Restore Node console to display up-to-date status and information as volume management processes occur. The notify daemon also allows multiple running copies of the Library Manager to stay synchronized with the `vm` daemon.

---

## Viewing Volume Management Processes

Use the `evmlistd` command to view a list of volume management processes at the command line.

---

### **rmoper UNIX Group**

Normally, users who are not logged in as root can monitor only volume management activity. However, if you are a member of the `rmoper` UNIX group, you can perform volume management functions at the command line, such as injecting and ejecting volumes from a library unit.

---

This only applies to command-line functions.

## Volume Lifecycle

A volume's lifecycle begins when new media is labeled and it becomes a volume as defined in Table 5-4. When the library unit loads a volume, it reads the label for the volume state, or its current use.

Table 5-4 Volume Lifecycle (Sheet 1 of 2)

A Current Use of ...	has a Volume State of ...	which indicates that ...
Cleaner	N/A	the media is dedicated to cleaning tape drives. A tape library unit typically contains one or more cleaning cartridges, although it depends on the number of cleaners that have been injected into the library unit. The Library Manager configures a DLT cleaner for a maximum of 20 uses.
Duplicate	Allocated	the tape volume is currently an allocated duplicate of an existing backup volume.
Expired	Expired	the tape volume has reached its pre-set maximum number of allocations (usage). A volume's usage count can be checked in the Restore Node Console.
Expired Cleaner	N/A	uses for the cleaner are expired and it is no longer available for cleaning tape drives.
Foreign	Foreign	previously-used media is from a non-EDM system. Foreign media can be mounted to read or extract its data, but the unverified volume will not be used.
Free	Available	the <code>as_recycle_media</code> tool manages allocation for shared Library Managers.
Out of Place	Out of Place	the media is allocated and is in a format that the current library unit does not recognize. This is probably media that an NDMP backup created and is then injected into a non-NDMP library unit, or vice versa.  to use this media for restore from the media, eject it and inject it into an appropriate library unit. After the media has expired (through <code>ebexpire</code> ), you can use it in its current location.

Table 5-4 Volume Lifecycle (Sheet 2 of 2)

A Current Use of ...	has a Volume State of ...	which indicates that ...
Uncataloged	Uncataloged	the volume must be imported for the volume manager to add an entry to the receiving server's volume catalog, but the volume retains its original volume ID and volume sequence number.
Free	Unlabeled	<p>the volume does not have a label. This is the state of new media. You can either label the media or leave it unlabeled until an application labels the media by using it.</p> <p>When you insert unlabeled media into a library unit, the Library Manager assigns it a slot number. It then moves the media into the slot and notifies the Volume Manager to add an entry for the unlabeled media to the volume catalog</p>
Unverified	Unverified	<p>the Library Manager has not yet read or is unable to recognize the volume's label. Volumes can become unverified if:</p> <ul style="list-style-type: none"> <li>the volume has just been injected and the Library Manager has not yet finished reading its label</li> <li>the media is of an unknown type</li> <li>an error occurred while the Library Manager read the volume label</li> <li>a hardware problem occurred</li> <li>a user has placed several volumes into a library unit through the mass-load door and run a barcode-only inventory for dedicated Library Managers only</li> </ul> <p>The volume is unused for dedicated Library Managers</p> <p>For shared Library Managers, labels are deleted by the <code>as_prepare_media</code> tool during the <code>Imconfig</code> operation</p> <p>Generally, you should inventory unverified volumes so that the Library Manager can properly read the volume label. For a library unit that supports barcodes, perform a barcode and label inventory (recommended); for a non-barcode library unit, perform a label inventory,</p>

---

## If a Drive Becomes Dirty

Automatic drive cleaning is only supported for dedicated Library Managers.

If a tape drive becomes dirty while the Library Manager is reading the media label, the Library Manager automatically dismounts the volume, disables the drive, and marks the drive dirty. The Library Manager tries to read the volume label in another drive. If this second drive also becomes dirty, the Library Manager dismounts the media, places it back in its slot, and marks the volume as unverified and offline. It disables this second drive and marks the drive as dirty.

If the tape library unit contains a cleaner cartridge, it automatically uses that cartridge to clean the drive and enable it. If no cleaner resides in the library unit, inject a cleaner cartridge to initiate automatic cleaning. You must then perform a mount request, (or an inventory), of that slot using a barcode/label inventory, or label inventory, to verify the unverified media. If the volume remains unverified after an inventory, remove the media from the library unit and discard it.

---

## Stopping and Starting the elm Processes

The elm process is made of the following sub-processes:

- ◆ lmdaemon
- ◆ vmdaemon
- ◆ notd



### CAUTION

**Only EMC Field Service personnel should shut down the elm processes, unless EMC Customer Service instructs you otherwise.**

When the Restore Node begins, it starts the elm processes:

- ◆ Starts the notify daemon, notd.
- ◆ Sets the parameters defined in its configuration file (vm.cfg).
- ◆ Starts a Library Manager daemon (lmd) for each configured Library Manager.

When you shut down and restart the Restore Node, volume management automatically shuts down and restarts. However, you may need to restart the `vmdaemon` manually if it fails to run or determine that one or more processes are in an unknown state. Volume management does not automatically recover from unexpected `vmdaemon` failures.

---

## Restarting the Restore Node and AlphaStor Software

1. To recover from a failure, on the Restore Node use the following command to stop and restart the Restore Node:

```
edmproc -restart
```

2. To stop and restart the AlphaStor processes, use the following commands:

```
/etc/init.d/lgtoas.d stop
```

```
/etc/init.d/lgtoas.d start
```

3. To stop and restart only the AlphaStor robot processes, use the following commands:

```
/etc/init.d/lgtorobotdcp.d stop
```

```
/etc/init.d/lgtorobotdcp.d start
```

```
/etc/init.d/lgtorobotlcp.d stop
```

```
/etc/init.d/lgtorobotlcp.d start
```

4. Before using these commands, verify no restore processes are running.

## Library Unit Operations

Table 5-5 lists the library unit operations handled by Library Managers.

**Table 5-5 Library Manager Tasks**

Function	Support for Dedicated Libraries	Support for Shared Libraries
Library Managers handle the following library unit operations.	Yes	Use AlphaStor
Mounting and Dismounting Volumes	Yes	Use AlphaStor
Ejecting Media from a Library Unit	Yes	Use AlphaStor
Performing Library Unit Inventories of a Library Unit.	Yes	Use AlphaStor

For dedicated Library Managers, media typically enters a tape library unit through an automatic or manual inlet. If a library unit has an automatic inlet, the Library Manager polls the inlet periodically for incoming tapes. If the library unit has a manual inlet, inform the Library Manager when you place a tape into the inlet.

When a Library Manager detects media in an inlet, it first checks the library unit for an available slot. If a slot is available, the robot moves the tape from the inlet into the available slot. This slot becomes the volume home slot. The Library Manager inventories the volume and sends its information, via the notify daemon (notd) to the volume manager. The volume manager creates an entry in the volume catalog and notifies the library unit manager to display the new volume.

Use AlphaStor software for shared Library Managers.

## Importing a Volume

The Restore Node imports media only when it has an uncataloged status. You must inject uncataloged media into a library unit before importing it.

The Restore Node generally uses the import feature for restore or disaster-recovery purposes, so you can transfer one or more volumes from one Restore Node to another.

You can import a volume through the Restore Node console, or by using the **evmimport** command for dedicated Library Managers:

```
# evmimport -v -l at1_452_0 -s 39
```

The `-s` option is unavailable for shared Library Managers.

You can import a volume through the Restore Node console, or by using the **evmimport** command for dedicated and shared Library Managers:

```
# evmimport -v -l at1_452_0 -b <barcode>
```

This command adds the volume information to the volume catalog.

To perform a restore operation, run `ebimport` after `evmimport` and refer to their man pages for more information.

## Gathering Media Information

This is supported only with the barcode library-unit name specified for shared Library Managers.

When the Restore Node imports a volume or `evmimport` runs, fields such as Volume ID reflect the import operation. View this status in the Restore Node console.

## Inserting Cleaning Cartridges into Library Units

Cleaning functionality is unavailable for shared Library Managers.

For complete details, refer to the *EDM Release 5.1.0 Software Reference Guide*.

## When Drives are Busy

Media injection functionality is unavailable for shared Library Managers. The AlphaStor software must be used for this functionality.

---

## Mounting and Dismounting Volumes

Library Managers handle media mount and dismount requests on a priority basis. The following sections describe mounting and dismounting media.

---

### Mounting Volumes

Shared Library Managers do NOT mount volumes, or disable drives in Restore Node. Shared Library Managers use the AlphaStor vaulting capability to mount media, dismount media, and if a drive becomes disabled.

For complete details for dedicated Library Managers, refer to the *EDM Release 5.1.0 Software Reference Guide* for the following topics:

- ◆ If a Drive Becomes Disabled
- ◆ If a Volume is Offline or Offsite
- ◆ Dismounting Media

---

### Ejecting Media from a Library Unit

Use the AlphaStor GUI for shared Library Manager support.

When you eject media from a library unit, the dedicated Library Manager schedules the media for removal. Information about each ejected volume moves into the offline Library Manager. If media is ejected and moved to an offsite location, information moves briefly into the offline Library Manager and then to the offsite Library Manager.

When the Volume Manager receives an eject request, it first checks the catalog for the location of the volume and sends a request to the appropriate Library Manager for processing. The Library Manager, upon receipt, schedules the eject request.

If the volume is in a drive at the time the Library Manager processes the eject request, the Library Manager waits for receipt of a dismount request before ejecting the media from the library unit.

After the Library Manager ejects a volume, it cancels all outstanding requests for that media. The Library Manager sends notification to the volume manager to close the request; the Restore Node Console then displays the change.

---

## Ejecting Media at the Command Line

---

Use the AlphaStor software for shared Library Manager support.

---

For complete details on ejecting media for dedicated Library Managers, refer to the *EDM Release 5.1.0 Software Reference Guide*.

---

## Performing Drive Scheduling

Each Library Manager handles drive scheduling based on a priority the application establishes. When a Library Manager receives a request (for example, a mount request), it adds the request to a prioritized work queue. When a drive becomes available, the Library Manager services the next request with the highest priority. For shared Library Managers, the priority of a drive mount request is performed in a queue by AlphaStor. AlphaStor also will queue mount requests for the Restore Node and NetWorker software.

---

## Drive Preemption

---

AlphaStor does not support preemption for shared Library Managers.

---

Drive preemption occurs when media is mounted in a drive and an application with a higher priority makes a mount request for media. (The Library Manager determines preemption of a volume based on the priority of the volume in the queue.) If no other drives are available, the Library Manager recommends preemption of the volume with the lower priority. Thus, the drive becomes available to the volume with the higher priority.

An application such as restore with a mounted and open volume, periodically polls the Volume Manager to determine whether to remove the volume from the drive. The Volume Manager, in turn, asks the Library Manager to check for mounts of volumes with a higher priority. If a volume with a higher priority requires mounting, the Library Manager notifies the application and closes the volume in the drive. After the drive is closed, the Library Manager dismounts the volume and the drive becomes available to the high priority volume.

If all application requests are of equal priority for dedicated Library Managers, the Volume Manager schedules them on a round-robin basis. For example, if five volumes are of equal priority and only one drive is available, each application uses the drive.

Preemption is not supported for NDMP-restore operations.

### Preemption Using Static-Split Tape Library Units

For dedicated Library Managers only, if a static-split tape library unit is being used in a Restore Node and NDMP environment, applications are preempted only by other applications with the same mover type (Restore Node or NDMP).

### LM\_MAX\_RESIDENT\_TIME and LM\_MIN\_RESIDENT\_TIME

The LM\_MAX\_RESIDENT\_TIME and LM\_MIN\_RESIDENT\_TIME functionality is not supported for shared Library Managers.

Two parameters in the `lm.cfg` file essentially govern drive usage: LM\_MAX\_RESIDENT\_TIME and LM\_MIN\_RESIDENT\_TIME.

- ◆ LM\_MAX\_RESIDENT\_TIME is the maximum time (in seconds) that a volume can remain in a drive before allowing preemption by a volume of the same priority. The default value for a drive is 7200 seconds (two hours).
- ◆ LM\_MIN\_RESIDENT\_TIME is the minimum time (in seconds) that a volume with a lower priority can be in a drive before allowing preemption for a volume of a higher priority. The default value for a drive is 120 seconds (two minutes).

### Performing Library Unit Inventories

For dedicated Library Managers, EMC recommends performing label and barcode inventory for library units supporting barcodes. For shared Library Managers, refer to the AlphaStor documentation for equivalent functionality. On-demand inventories for shared Library Managers unsupported.

For most library units, a Library Manager inventories each volume that enters a library unit through the inlet. If a library unit does not have an inlet, update the Library Manager by running an inventory whenever library unit contents are changed or bypassed. Ensure that a library unit is inventoried anytime normal operations (for example, move media using the front-panel switches of the library unit, or opening its main door and moving media).

The inventory type you perform is based on the changes (if any) made inside the library unit after opening the door. If a library unit door is opened, manually move the volume, shut the door, and then the status of the library unit's media becomes unknown. To recover from this state, run a label and barcode inventory to allow the Library Manager to identify the media in each slot.

---

If the library unit has an inlet, lock the front access door and always use the inlet to insert and remove media. If opening the access door is required to insert and remove multiple volumes, perform a barcode/label inventory after each move.

---

---

## Inventory Table

For dedicated Library Managers, when the vmdaemon starts each Library Manager, the Library Manager creates and maintains its `volid.dat` inventory table in the subdirectory `/usr/epoch/etc/lm/<library unit name>`. The `volid.dat` inventory table includes:

- ◆ a volume ID
- ◆ a barcode label (if supported)
- ◆ a slot number
- ◆ a drive location for each volume in the library unit, if the volume is mounted

During an inventory, the Library Manager compares the slot contents of the library unit with the information in the inventory table. If it finds any discrepancies, the Library Manager updates its table and sends the changes to the Volume Manager for cataloging.

For shared Library Managers, refer to the AlphaStor documentation for equivalent functionality.

---

## Inventory Process

When a Library Manager receives a request for an inventory, it first notifies the EMC Data Manager console that an inventory is in progress and displays inventory status. The Library Manager creates a list of slots to inventory, based on the specified inventory.

As the Library Manager inventories each volume in its list, it updates the slot contents in the inventory table. If it detects any changes, the Library Manager sends the slot contents to the Volume Manager for cataloging.

An inventory can be scheduled during normal operations. An inventory always has a low priority to ensure that maximum performance is maintained. The Library Manager processes incoming requests of a higher priority, such as mount and dismount requests, before handling an inventory. If a mount request comes in for a volume already in the inventory queue, the Library Manager inventories the media and removes it from the queue.

After the Library Manager inventories the last item in the list, it informs the Volume Manager with the notify daemon it has completed the inventory. The Volume Manager modifies the volume catalog based on the changes the Library Manager has provided, and updates the status in the Restore Node console.

---

Inventories of large library units can tie up the Volume Manager for a long time, and are not recommended during heavy restore processing.

---

---

## Delta Inventory

When a delta inventory is performed, the Library Manager:

- ◆ Checks each library unit slot to determine which slots have changed.
  - If the slot was full and is now empty, the Library Manager marks the slot as empty and removes the media from its inventory table.
  - If the slot was empty and is now full, the Library Manager marks the slot as needing verification.
  - If the barcode of a volume in a slot is different from the barcode of a volume that was previously in the slot, the Library Manager marks the slot as needing verification.
  - If the slot has not changed, the Library Manager skips it.
- ◆ Creates a work order for each slot that needs verification and inventories each item by using the specified verification criteria.

---

## Barcode Inventory

---

Barcodes are required for shared Library Managers. For more information, refer to *Importing a Volume* on page 5-13.

If a library unit is equipped and configured to read barcode labels, both the barcode and the volume label can be verified.

The Library Manager does a barcode inventory by scanning the barcode label of each volume in the inventory queue. Because this operation does not require the Library Manager to mount the media, a barcode inventory takes significantly less time to complete than a label inventory. The Library Manager updates the barcode ID for each volume in its inventory table and informs the Volume Manager of any changes.

If volumes become rearranged, run a label and barcode inventory rather than the simple barcode inventory. This averts barcode ID and volume ID mismatch and other related problems that could arise in the volume catalog.

---

Do not use duplicate barcodes. Attempting to add duplicate barcode volumes to the system causes unpredictable results.

---

