



Hitachi TagmaStore®
Adaptable Modular Storage
and Workgroup Modular Storage
IBM® AIX® Host Installation Guide

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- Updated the document to include *Hitachi TagmaStore® Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780) and *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738).

Preface

This host installation guide describes and provides instructions for installing and configuring devices on the Adaptable Modular Storage disk system for operation with an IBM AIX® operating system. This guide assumes that the user:

- Has a background in data processing and understands direct-access storage device systems and their basic functions.
- Is familiar with the Adaptable Modular Storage or Workgroup Modular Storage system.
- Is familiar with the IBM AIX operating system and the IBM® RISC System/6000 (RS/6000®), POWERstation®, POWERserver®, and/or SP system.
- Is familiar with the AIX Journaled File System, system commands, and utilities.

Note: The terms “Adaptable Modular Storage” and “Workgroup Modular Storage” refer to the entire Hitachi Adaptable and Workgroup Modular Storage system family, unless otherwise noted. Refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User’s Guide* (MK-95DF714), *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User’s Guide* (MK-95DF713) or *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738) for more information about the Adaptable Modular Storage and Workgroup Modular Storage systems.

For more information about IBM AIX, consult the IBM AIX online help and/or user documentation, or contact IBM technical support.

Microcode Version

This document revision applies to TagmaStore™ Adaptable Modular Storage and Workgroup Modular Storage versions 2.0 and higher.

Convention for Storage Capacity Values

Storage capacity values for hard disk drives (HDDs) on the AMS and WMS systems are calculated based on the following values:

1 KB = 1,000 bytes
1 MB = 1,0002 bytes
1 GB = 1,0003 bytes
1 TB = 1,0004 bytes

Storage capacity values for logical units (LUs) on the AMS and WMS systems are calculated based on the following values:

1 KB = 1,024 bytes
1 MB = 1,0242 bytes
1 GB = 1,0243 bytes
1 TB = 1,0244 bytes

Referenced Documents

- *Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage: Storage Navigator - Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore Adaptable Modular Storage and Workgroup Modular Storage: Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore Adaptable Modular Storage: Storage Navigator Web User's Guide* (MK-95DF719)
- *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780)
- *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User and Reference Guide* (MK-95DF714)
- *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User and Reference Guide* (MK-95DF713)
- *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738)

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Contents

Chapter 1	Introduction.....	1
1.1	Adaptable Modular Storage System	2
Chapter 2	Preparing for New Device Configuration.....	3
2.1	Configuration Requirements	4
2.2	Installing an Adaptable Modular Storage System	6
2.3	Preparing to Connect Adaptable Modular Storage	7
2.3.1	Setting Host-Specific Parameters for Adaptable Modular Storage Ports.....	9
2.4	Connecting the Adaptable Modular Storage System to an IBM AIX System	11
2.5	Verifying New Device Recognition	12
Chapter 3	Configuring New Devices	13
3.1	Changing Device Parameters	14
3.1.1	Changing Device Parameters for Adaptable Modular Storage	14
3.1.2	Special Instructions for Using Emulex Lightpulse LP8000 Adapter.....	16
3.2	Assigning New Devices to Volume Groups and Setting Partition Size	19
3.3	Creating, Mounting, and Verifying File Systems	21
3.3.1	Creating File System	21
3.3.2	Mounting and Verifying File Systems	24
Chapter 4	Troubleshooting	25
4.1	Troubleshooting.....	25
4.2	Calling Hitachi Data Systems Technical Support Center	26
Appendix A	Online Device Install and Uninstall.....	27
Appendix B	AIX Command Line Commands.....	29
	Acronyms and Abbreviations.....	31

List of Figures

Figure 2.1	Port Information Example.....	8
Figure 2.2	Verifying New Device Recognition.....	12
Figure 3.1	Verifying Device Parameters using Isattr -E -1 hdiskx Command.....	15
Figure 3.2	Verifying Device Parameters using Iscfg -vl hdisk1 Command.....	15
Figure 3.3	Changing Device Parameters for Emulex Lightpulse LP8000 Adapter (Command Line).....	17
Figure 3.4	Changing Device Parameters When Using an Emulex Lightpulse LP8000 Adapter (SMIT).....	18
Figure 3.5	Assigning Devices to Volume Groups and Setting Partition Size.....	20
Figure 3.6	Adding a Journaled File System Using SMIT.....	22
Figure 3.7	Verifying Creating Journaled File System.....	22
Figure 3.8	Determining Maximum File System Size.....	23
Figure 3.9	Verifying Auto-Mounted File Systems.....	24
Figure 3.10	Final File System Verification.....	24

List of Tables

Table 2.1	Fibre-Channel Adapters.....	5
Table 2.2	Available AL-PA Values.....	10
Table 2.3	Device Data Table (Sample).....	12
Table 3.1	R/W Time-Out and Queue Type Requirements.....	14
Table 3.2	Partition Sizes for Disk Devices.....	20
Table 4.1	Troubleshooting.....	25
Table B.1	Commands and Usage.....	29

Chapter 1 Introduction

Welcome to the IBM® AIX® Host Installation Guide for Hitachi TagmaStore® Adaptable Modular Storage and Workgroup Modular Storage.

This guide describes the requirements and procedures for connecting Adaptable Modular Storage and Workgroup Modular Storage systems to an IBM AIX system. It also describes how to configure the new Adaptable Modular Storage disk devices for operation with the IBM AIX operating system. The Hitachi Data Systems representative performs the initial physical installation of the Adaptable Modular Storage system. The user then configures the new Adaptable Modular Storage devices with assistance as needed from the Hitachi Data Systems representative.

Configuring Adaptable Modular Storage disk devices for IBM AIX operations involves the following:

- Changing device parameters (section 3.1)
- Assigning new devices to volume groups and setting partition sizes (section 3.2)
- Creating Journaled File Systems (section 3.3.1)
- Mounting and verifying file systems (section 3.3.2)

Note on the term “SCSI disk”: The Adaptable Modular Storage logical devices are defined to the host as SCSI disk devices, even though the interface is fibre-channel.

1.1 Adaptable Modular Storage System

The Hitachi Adaptable Modular Storage Series system is a high-performance, medium-capacity storage system, with added features for increasing data accessibility and enabling continuous user data access. The architecture of the Adaptable Modular Storage enables the user to scale the system to meet a wide range of capacity and performance requirements. The Adaptable Modular Storage system provides connectivity to most open systems through a standard fibre-channel interface.

For more information about the Adaptable Modular Storage system, refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User's Guide* (MK-95DF714), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User's Guide* (MK-95DF713), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), the *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738), or contact your Hitachi Data Systems account team.

Chapter 2 Preparing for New Device Configuration

This chapter covers the following topics:

- Configuration requirements (section 2.1)
- Installing an Adaptable Modular Storage system (section 2.2)
- Preparing to connect Adaptable Modular Storage (section 2.3)
- Connecting the Adaptable Modular Storage system to an IBM AIX system (section 2.4)
- Verifying new device recognition (section 2.5)

2.1 Configuration Requirements

The requirements for undertaking an Adaptable Modular Storage IBM AIX configuration are:

- **Hitachi TagmaStore Adaptable Modular Storage system**

The Storage Navigator software for Adaptable Modular Storage is required to configure the fibre-channel (FC) ports on the Adaptable Modular Storage system.

Note: The availability of Adaptable Modular Storage features and functions depends on the level of microcode installed on the Adaptable Modular Storage system.

- **IBM RS/6000[®], POWERstation[®], POWERserver[®], or SP series system**

- **IBM AIX operating system, version 5L (5.1 and 5.2)**

Important: Contact IBM to make sure the most current operating system patches are installed on the IBM system(s).

Note: Hitachi Data Systems plans to support future releases of IBM AIX. For the latest information about AIX version support, contact your Hitachi Data Systems account team. For the latest Hitachi Data Systems Object Data Manager (ODM) updates, always contact your Hitachi Data Systems technical representative.

- **Root (superuser) login access to the IBM system**

- **Fibre-channel adapters**

Be sure to install all utilities, tools, and drivers that come with the adapter(s).

- The Adaptable Modular Storage system supports full-speed (1 and 2 Gbps), shortwave, non-OFC (open fibre control) optical fibre-channel interface and multimode optical cables with SC and/or LC connectors. Do not connect any OFC-type fibre-channel interface to the Adaptable Modular Storage system.

Note: It is recommended that users read all vendor release notes and vendor installation guides before setting up HBA configuration files.

- **High-availability (HA) software (optional)**

The Adaptable Modular Storage currently supports the following HA software products for the IBM AIX operating system. Contact your Hitachi Data Systems account team for the latest information about supported software products.

- Hitachi Dynamic Link Manager™ for path failover
- VERITAS™ Volume Manager™ (VxVM) for logical volume management

Note: If you plan to connect different types of servers to the Adaptable Modular Storage system via the same fabric switch, you must use the **zoning** function of the fabric switch.

- The fibre-channel adapters and drivers listed in Table 2.1 have been verified for use with the Adaptable Modular Storage system. For information about the driver requirements for other fibre-channel adapters, refer to the user documentation for the adapter or contact the vendor.

Table 2.1 Fibre-Channel Adapters

Fibre-Channel Adapter	Driver(s)	AIX Operating System Version
Emulex® Lightpulse™ LP8000®	V4.0.2.2	AIX 4.3.3
IBM 6227	AIX bundle	4.3.3/5.1
IBM 6228	AIX bundle	4.3.3/5.1

Note: For information regarding fibre-channel adapters and drivers compatible with IBM AIX operating version 5.2, contact your Hitachi Data Systems technical representative.

2.2 Installing an Adaptable Modular Storage System

The Adaptable Modular Storage system comes with all hardware and cabling required for installation. Installing the Adaptable Modular Storage system involves the following:

■ Installing Hardware

A Hitachi Data Systems representative performs hardware installation as specified in Hitachi TagmaStore Adaptable Modular Storage Maintenance Manual. Follow all precautions and procedures in the Adaptable Modular Storage maintenance manual. Check all specifications to ensure proper installation and configuration. Hardware installation includes:

- Assembling all hardware and cabling
- Installing latest microcode level
- Creating RAID groups and LUNs and formatting LUNs using the Storage Navigator Adaptable Modular Storage software. For information and instructions about using Storage Manager, refer to the following documents:
 - *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
 - *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
 - *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)
- Installing fibre-channel adapters and cabling

■ Adaptable Modular Storage Fibre Channel Ports

Fibre topology parameters for each Adaptable Modular Storage fibre-channel port depend on the type of device to which the Adaptable Modular Storage port is connected. Determine topology parameters supported by the device, and set your topology accordingly (see section 2.3.1.1).

Use Storage Navigator for Adaptable Modular Storage software to configure Adaptable Modular Storage fibre ports. For instructions about using Storage Navigator, refer to the following documents:

- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

2.3 Preparing to Connect Adaptable Modular Storage

Before connecting an Adaptable Modular Storage system, perform the following tasks:

- Set the host-specific parameters for Adaptable Modular Storage fibre-channel ports (see section 2.3.1)
- Configure Adaptable Modular Storage fibre-channel ports (see section 2.3.1.1)

Use Storage Navigator Adaptable Modular Storage software to configure Adaptable Modular Storage ports (see Figure 2.1). Key configuration selections include:

- **Topology (Connection):** Loop or Point-to-Point
- **Port Option:** Optional settings on the port that describe how the host accesses the port. Multiple options can be selected: reset/LIP mode (signal), reset/LIP mode (process), reset/ALL LIP port mode, reset target (reset bus device) mode, etc.
- **Host mode:** Standard, Open VMS, Wolfpack, TRESPASS, etc. Select the host mode for the connected platform to enable the host to “see” all LUNs on the port.
- **Extended Host Mode (Host Mode2):** Optional settings on the port describe how the host accesses the port. Multiple options can be selected: VxVM DMP mode, Sun™ connection mode, report inquiry page 83H, UA (06/2A00) suppress mode, etc.

For instructions about using Storage Navigator, refer to the following documents:

- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

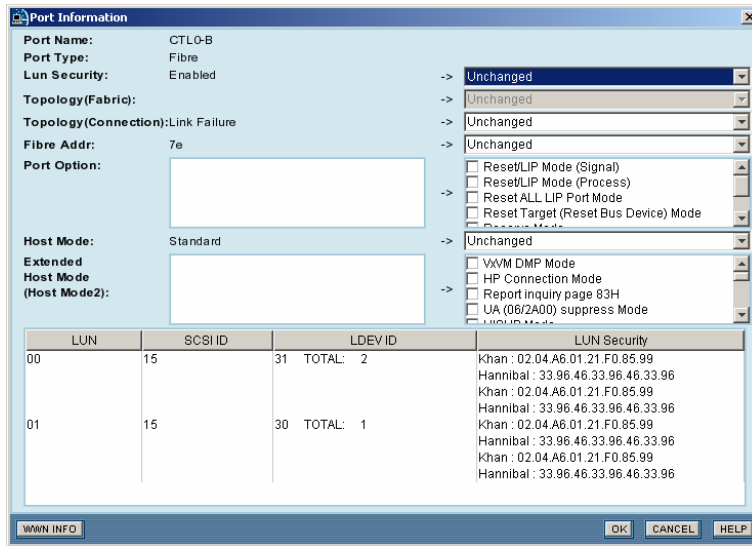


Figure 2.1 Port Information Example

2.3.1 Setting Host-Specific Parameters for Adaptable Modular Storage Ports

Adaptable Modular Storage ports must be configured for the connected operating system. Use Storage Navigator Adaptable Modular Storage software to configure Adaptable Modular Storage fibre ports. For instructions about using Storage Navigator, refer to the following documents:

- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Modular Command Line Interface (CLI) User's Guide* (MK-95DF712)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator - Modular Graphical User Interface (GUI) User's Guide* (MK-95DF711)
- *Hitachi TagmaStore Adaptable Modular Storage - Storage Navigator Web User's Guide* (MK-95DF719)

2.3.1.1 Fibre Topology

Configure Adaptable Modular Storage FC ports to define fibre topology parameters and port addresses. Adaptable Modular Storage systems support up to 512 LUNs. You will select appropriate settings for each Adaptable Modular Storage FC port based on the device to which the port is connected. Determine the topology parameters supported by the device, and set your topology accordingly.

Note: If you plan to connect different types of servers to the Adaptable Modular Storage via the same fabric switch, use either **zoning** on the switch or the Hitachi Volume Security (LUN Management) feature on Adaptable Modular Storage, or a combination of both.

For an IBM AIX configuration with HDLM and HACMP using a 6227 or 6228 HBA connected to the 9500 through a 3200 Brocade switch, the recommended parameters are:

- Data Share mode = use
- UA (06/2A00) suppress mode enable
- Logical unit reset mode enable
- NACA enable
- Wolfpack mode enable (for online LUN formatting)

Note: Online format will only function in AIX with Wolfpack mode ON and NO HDLM.

2.3.1.2 Port Address

In fabric environments, the port addresses are assigned automatically by fabric switch port number and are not controlled by Adaptable Modular Storage port settings. In FC arbitrated-loop (FCAL) environments, port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID, or port address). The host communicates with devices comprising the loop with 8-bit AL-PA (see Table 2.2).

Table 2.2 shows available Adaptable Modular Storage AL-PA values. Fibre-channel protocol uses AL-PAs to communicate on the fibre-channel link, but the platform host adapter software driver translates the AL-PA value assigned to the Adaptable Modular Storage port to a SCSI TID. Refer to Appendix B for a description of the AL-PA-to-TID translation.

Note on loop ID conflict: The IBM AIX system assigns port addresses from lowest (01) to highest (EF). To avoid loop ID conflict, assign port addresses from highest to lowest (i.e., starting at EF). The AL-PAs should be unique for each device on the loop to avoid conflicts.

Table 2.2 Available AL-PA Values

EF	CD	B2	98	72	55	3A	25
E8	CC	B1	97	71	54	39	23
E4	CB	AE	90	6E	53	36	1F
E2	CA	AD	8F	6D	52	35	1E
E1	C9	AC	88	6C	51	34	1D
E0	C7	AB	84	6B	4E	33	1B
DC	C6	AA	82	6A	4D	32	18
DA	C5	A9	81	69	4C	31	17
D9	C3	A7	80	67	4B	2E	10
D6	BC	A6	7C	66	4A	2D	0F
D5	BA	A5	7A	65	49	2C	08
D4	B9	A3	79	63	47	2B	04
D3	B6	9F	76	5C	46	2A	02
D2	B5	9E	75	5A	45	29	01
D1	B4	9D	74	59	43	27	
CE	B3	9B	73	56	3C	26	

2.4 Connecting the Adaptable Modular Storage System to an IBM AIX System

The Adaptable Modular Storage system comes with all the hardware and cabling required for connection to host system(s). Connecting the Adaptable Modular Storage system involves the following. Some of these steps are performed by the Hitachi Data Systems representative, while other steps are performed by the user.

Note: The Hitachi Data Systems representative must use the Adaptable Modular Storage maintenance manual during all installation activities. Follow all precautions and procedures in the maintenance manual, and always check all specifications to ensure proper installation and configuration.

1. **Verify system installation.** The Hitachi Data Systems representative verifies the fibre-port address configuration and the status of the fibre-channel adapters and LUNs (normal).
2. **Connect the Adaptable Modular Storage to the IBM AIX system.** Install the fibre cables between the Adaptable Modular Storage and the IBM AIX system.
3. Run the `cfgmgr` command to recognize LUNs.

2.5 Verifying New Device Recognition

Before configuring new Adaptable Modular Storage disk devices, verify that host system recognizes new devices. The host system automatically creates a device file for each new device recognized. Hitachi Data Systems recommends that devices be installed and formatted with the fibre ports configured before the host system is powered on. If the system is not restarted, user must issue the `cfgmgr` command to force the system to check buses for new devices.

To verify new device recognition:

1. Log in to host system as `root`.
2. Use the `lsdev -C -c disk` command to display the system device data (see Figure 2.2).
3. Make a blank table for recording Adaptable Modular Storage device data (see Table 2.3). Table must include device file name, bus number, TID, LUN, and device type for each new device. Use the `lsattr -El hdiskx` command to view TID and LUN for fibre disks if the location code does not include them.
4. Record device information for all new devices in your device data table (see Table 2.3). You will need this information in order to change device parameters.

```
# lsdev -C -c disk
hdisk0 Available 10-68-00-0,0 16 Bit SCSI Disk Drive
hdisk1 Available 00-01-00 N/A
hdisk2 Available 00-01-00-2,1 N/A
  ↩ Device file name = hdiskx.
:
#
```

← *Display device data.*
← *Hardware address.*
← *New device.*
← *New device.*

Figure 2.2 Verifying New Device Recognition

Table 2.3 Device Data Table (Sample)

Device File Name	Hardware Address
hdisk1	
hdisk2	
hdisk3	
hdisk4	
hdisk5	
hdisk6	
hdisk7	
hdisk8	
hdisk9	
(and so on...)	

Chapter 3 Configuring New Devices

After Adaptable Modular Storage installation and connection procedures have been performed, new Adaptable Modular Storage devices are ready to be configured for use.

Configuring Adaptable Modular Storage disk devices is performed by the user and requires root (superuser) access to the AIX system. Host modes for Adaptable Modular Storage fibre ports must already be set and configured. If any of these steps is performed after the AIX system is powered on, you must stop and restart the system or run `cfgmgr` before configuring new devices.

Configuring Adaptable Modular Storage SCSI disk devices for IBM AIX operations involves the following:

- Changing disk device parameters (section 3.1)
- Assigning new disk devices to volume groups and setting the partition sizes (section 3.2)
- Creating, mounting and verifying Journaled File Systems (section 3.3)

Online device install: For information about configuring newly installed Adaptable Modular Storage devices without rebooting the AIX system, refer to Appendix A.

3.1 Changing Device Parameters

3.1.1 Changing Device Parameters for Adaptable Modular Storage

Note: If you use an Emulex Lightpulse LP8000[®] adapter, refer to section 3.1.2 for adapter-specific instructions.

When device files are created, the IBM system sets device parameters to system default values. You must change read/write (r/w) time-out, queue type, and queue depth parameters for each new Adaptable Modular Storage device. Table 3.1 specifies the r/w time-out and queue type requirements for Adaptable Modular Storage devices as well as queue depth requirements.

AIX uses Logical Volume Manager (LVM) (accessed from within SMIT[®]) to manage data storage. You can use either SMIT or the AIX command line to perform this procedure. Ensure that parameters are set for all Adaptable Modular Storage devices.

Table 3.1 R/W Time-Out and Queue Type Requirements

Parameter Name	Default Value	Required Value for Adaptable Modular Storage
Read/write time-out	30	60
Queue type	Simple	Simple
Queue depth per LU (see Note)	1	≤ 32

Note: You can adjust the queue depth for Adaptable Modular Storage devices later as needed (within the specified range) to optimize device I/O performance.

To change device parameters using SMIT:

1. Enter `smit` on the command line to start SMIT.
2. On the SMIT System Management screen, select **Devices** to display Devices screen.
3. Select **Fixed Disk** to bring up Fixed Disk screen.
4. Select **Change/Show Characteristics of a Disk** to go to Disk screen.
5. Select the desired device from the **Disk** menu to display the Change/Show Characteristics on a Disk screen.
6. Enter the desired queue depth (refer to Table 3.1), queue type (simple), and read/write time-out value (60), then press **Enter** to complete parameter changes.
7. Repeat steps 5 and 6 for each new device on the Adaptable Modular Storage system.
8. Use the `lsattr -E -l hdiskx` command to verify that parameters for all devices were changed successfully.

To change the device parameters from the AIX command line:

1. At the AIX command line prompt, enter `lsattr -E -l hdiskx` to display parameters for specified device, where 'hdiskx' is the device file name (for example, hdisk2) or use `smit/Devices/Fixed Disk/Change Show Characteristics of a Disk`.
2. Change the device parameters by using the `chdev -l hdiskx -a rw_timeout='60' -a q_type='simple' -a queue_depth='x'` command. (x is used to indicate desired queue depth, within limits specified in Table 3.1.)
3. Repeat steps 1 and 2 for each new device on the Adaptable Modular Storage system.
4. Use either the `lsattr -E -l hdiskx` or `lscfg -vl hdisk1` command (see Figures 3.1 and 3.2) to verify that parameters for all devices were changed successfully.

Note: A list of commands is provided in Appendix B.

```
#lsattr -E -l hdiskx
scsi_id      0xef                SCSI ID
lun_id       0x0                LUN ID
location     Location Label
ww_name      0x500490e802757500  FC World Wide Name for this LUN
pvid         000432871c6bbceb00000000000000000  Physical volume identifier
queue_depth  2                    Queue DEPTH
q_type       simple          Queuing TYPE
q_err        yes             Use QERR bit
clr_q        no              Device CLEARS its Queue on error
rw_timeout   60              READ/WRITE time out value
start_timeout 60             START unit time out value
reassign_to  120             REASSIGN time out value
```

Figure 3.1 Verifying Device Parameters using `lsattr -E -l hdiskx` Command

```
#lscfg -vl hdisk1
DEVICE      LOCATION      DESCRIPTION
hdisk1      20-58-01      Other FC SCSI Disk Drive
Manufacturer.....HITACHI
Machine Type and Model.....DF500          Type of device emulation
ROS Level and ID.....20202020
```

Figure 3.2 Verifying Device Parameters using `lscfg -vl hdisk1` Command

3.1.2 Special Instructions for Using Emulex Lightpulse LP8000 Adapter

To use an Emulex Lightpulse LP8000 host adapter, delete existing Adaptable Modular Storage disk devices, change device parameter settings, and re-create Adaptable Modular Storage disk devices.

Instructions for AIX Command Line

1. Delete existing device parameters using `rmdev -l hdiskx -d` command.
2. Change LUN queue depth parameter by using `chdev -l lpfcx -a lun_queue_depth='1'` command.
 - `lpfcx` is host adapter's device file name, (e.g., `lpfc0`)
3. Change linkdown parameter using `chdev -l lpfcx -a linkdown_tmo='z'` command.
 - If you are using alternate path software, `z = 60`.
 - If you are not using alternate path software, `z = 180`.
4. Change `nodev_holdio` parameter by using `chdev -l lpfcx -a nodev_holdio='1'` command.
5. Repeat above steps for each installed LP8000 adapter.
6. Verify that parameters were successfully changed using `lsattr -E -l lpfcx` command.
7. Since devices (hdisks) were deleted, run `cfmgr` to rediscover hdisks.

Figure 3.3 shows how to use the command line to display device parameters for an Emulex Lightpulse LP8000 adapter.

```
#lsattr -E -1
bus_intr_lvl      83          N/A False
intr_priority     4           N/A False
bus_mem_addr      0xa8000000  N/A False
bus_io_addr       0xffffc00   N/A False
dma_window        64M         N/A True
xmt_queue_size    256         N/A True
topology          4           N/A True
ip_class          3           N/A True
fcp_class         3           N/A True
sli               2           N/A True
network_on        0           N/A True
fcp_on            1           N/A True
num_iocbs         512         N/A True
num_bufs          512         N/A True
fcpfabric_tmo     0           N/A True
use_adisc         0           N/A True
first_check       1           N/A True
linkdown_tmo      180         N/A True
scan_down         1           N/A True
fabric_reg        1           N/A True
log_only          1           N/A True
log_verbose       0           N/A True
post_ip_buf       128         N/A True
ack0              0           N/A True
automap           1           N/A True
no_device_delay   0           N/A True
lun_queue_depth   1           N/A True
tgt_queue_depth   0           N/A True
zone_rscn         0           N/A True
nodev_holdio     1           N/A True
check_cond_err    0           N/A True
delay_rsp_err     0           N/A True
rscn_adisc        0           N/A True
rscn_ns_delay     0           N/A True
dqfull_throttle   1           N/A True
```

Figure 3.3 Changing Device Parameters for Emulex Lightpulse LP8000 Adapter (Command Line)

Figure 3.4 shows how to use SMIT to change device parameters for an Emulex Lightpulse LP8000 adapter.

```

                                Characteristics of a Fibre Channel Adapter

Type or select values in entry fields.
Press Enter AFTER making all desired changes.

[MORE..15]                                     [Entry Fields]
  Extra FCP timeout for fabrics                [0]
  Use ADSIC instead of PDISC for discovery     [0]
  Linkdown Timeout for recovery             [180]
  Scandown ALPAs on Discovery                  [1]
  Issue Fabric Registration                    [1]
  Logging to log file only                     [1]
  Logging verbosity flag                       [0]
  Buffers to post to IP ring                   [128]
  ACK0 support                                 [0]
  Auto assignment of scsi ids                  [1]
  No FCP device failed I/O Usec delay         [0]
  Number of FCP commands per LUN           [1]
  Number of FCP commands per target           [0]
  Force NameServer check for RSCN DIDs        [0]
  Hold I/O errors if device disappears     [1]
  Delay for NameServer login on RSCN          [0]
  Treat check condition as FCP RSP err        [0]
  Treat FCP RSP err as no_device_delay        [0]
  Send ADISC instead of PLOGI for RSCN        [0]
  Apply change to DATABASE only                no
[BOTTOM]

F1=Help           F2=Refresh           F3=Cancel           F4=List
Esc+5=Reset       Esc+6=Command       Esc+7=Edit          Esc+8=Image
Esc+9=Shell       Esc+0=Exit          Enter=Do

```

Figure 3.4 Changing Device Parameters When Using an Emulex Lightpulse LP8000 Adapter (SMIT)

3.2 Assigning New Devices to Volume Groups and Setting Partition Size

After device parameters have been changed, you can assign new SCSI disk devices to new or existing volume groups. Partition size is also set during this procedure. Table 3.2 lists partition sizes for standard LUs.

Notes:

- If configuring storage devices for databases that use a “raw” partition, do not assign those devices to volume groups.
- If other AIX versions are operating, read display items using appropriate versions.

To assign SCSI disk devices to volume groups and set partition size:

1. At AIX command line prompt, enter `smit` to start SMIT. System Management screen displays.

Note: If SMIT is not installed, refer to IBM AIX user guide for instructions about assigning new devices to volume groups using AIX commands.

2. Select **System Storage Management (Physical & Logical Storage)** to display System Storage Management screen.
3. Select **Logical Volume Manager** to display Logical Volume Manager screen.
4. Select **Volume Groups** to display Volume Group screen.
5. Select **Add a Volume Group** to display Add a Volume Group screen.
6. Add a Volume Group panel (see Figure 3.5) lets you assign one or more devices (physical volumes) to a new volume group and set physical partition size. To assign one or more devices to a volume group and set partition size:
 - a) Move cursor to **VOLUME GROUP name** entry field. Enter name of new volume group (e.g., 9200vg0). A volume group can contain multiple hdisk devices, depending on the application.
 - b) Move to **Physical partition SIZE in megabytes** field and press F4 key. When size menu appears, select correct partition size for device(s).
 - c) Move to **PHYSICAL VOLUME names** entry field. Enter device file name(s) for desired device(s) (e.g., hdisk1), or press F4 and select device file name(s) from the list.
 - d) Move to **Activate volume group AUTOMATICALLY** entry field and enter **yes** to activate volume group automatically at system restart.

Note: If using HACMP, enter **no**.

7. Select volume group, partition size, and physical volume(s) on Add a Volume Group screen and press **Enter**.
8. When confirmation screen opens, select **Yes** to assign the specified device(s) to specified volume group with specified partition size.

9. Command Status screen appears. To ensure that devices have been assigned to a volume group, wait for **OK** to appear on the Command Status line. To continue creating volume groups, press **F3** until the Add a Volume Group screen appears.
10. Repeat steps 2 through 9 until all new disk devices are assigned to a volume group.

```

                                Add a Volume Group
Type or select values in entry fields.
Press Enter AFTER making all desired changes.
                                [Entry Fields]
VOLUME GROUP name                [9200vg0]          ← Enter volume group.
Physical partition SIZE in megabytes 4              ← Enter partition size.
PHYSICAL VOLUME names            [hdisk1]          ← Enter device file name(s).
Activate volume group AUTOMATICALLY yes           ← Enter no for HACMP.
at system restart
Volume Group MAJOR NUMBER        []
*Create VG Concurrent Capable?
*Auto-varyon in Concurrent Mode?
F1=Help      F2=Refresh      F3=Cancel      F4=List
F5=Reset     F6=Command     F7=Edit       F8=Image
F9=Shell     F10=Exit      Enter=Do

```

* These lines are added in AIX version 4.3.

Figure 3.5 Assigning Devices to Volume Groups and Setting Partition Size

Table 3.2 Partition Sizes for Disk Devices

LU Size (MB)	Partition Size (MB)
Less than 2032	2
2033-4064	4
4065-8128	8
8129-16256	16
16257-32512	32
32513-65024	64
65025-130048	128
130049-260096	256
260097-520192	512
more than 520193	1024

3.3 Creating, Mounting, and Verifying File Systems

After assigning disk devices to volume groups and setting partition sizes, you can create file systems.

Note: If configuring storage devices for databases that use a “raw” partition, create a logical volume only.

3.3.1 Creating File System

1. At AIX command line prompt, enter `smit` to start SMIT. System Management screen appears.
Note: If SMIT is not installed, refer to IBM AIX user guide for instructions about creating file systems using AIX commands.
2. Select **System Storage Management (Physical & Logical Storage)** System Storage screen displays.
3. Select **File Systems** File System screen displays.
4. Select **Add/Change/Show/Delete File Systems** Add/Change screen displays.
5. Select **Journaled File Systems** Journaled File System screen displays.
6. Select **Add Standard Journaled File System** Volume Group Name screen displays.
7. Move cursor to selected volume group and press `Enter`.
8. Select desired value, then press `Enter` key. **Add a Journaled File System** screen displays (see Figure 3.6).
9. Move to **SIZE of file system** field and enter desired file system size (see Table 3.2).
10. Move to **Mount Point** field and enter desired mount point name (e.g., `/9200_VG00`). Record mount point name and file system size. You will be prompted to enter this information again.
11. Move to **Mount AUTOMATICALLY** field. Enter `yes` to auto-mount the file systems.
Note: If you are using HACMP, do not set file systems to auto-mount.
12. Move to **Number of bytes per inode** field, and enter correct value for selected device.
13. Ensure file system size, mount point name, auto-mount options, and number of bytes per inode are correct. Press `Enter` to create Journaled File System.
14. The Command Status screen appears. To ensure that Journaled File System has been created, wait for `OK` to appear on Command Status line (see Figure 3.7).

15. Repeat steps 2 through 14 for each Journaled File System that you want to create. To continue creating Journaled File Systems press F3 until you return to **Add a Journaled File System** screen.
16. To exit SMIT, press F10.

```

Add a Journaled File System
Type or select values in entry fields.
Press Enter AFTER making all desired changes.

Volume group name          [Entry Fields]
                           9200vg0
SIZE of file system (in 512-byte blocks) [4792320]
MOUNT POINT                [/9200VG00]      ← Enter mount point name.
Mount AUTOMATICALLY at system restart?  yes          ← Enter no for HACMP.
PERMISSIONS                read/write
Mount OPTIONS              []
Start Disk Accounting?     no
Fragment Size (bytes)      4096
Number of bytes per inode  4096
Compression algorithm      no
*Allocation Group Size (Mbytes)
F1=Help      F2=Refresh      F3=Cancel      F4=List
F5=Reset     F6=Command     F7=Edit       F8=Image
F9=Shell     F10=Exit       Enter=Do

```

* This line is added in AIX version 4.3.

Figure 3.6 Adding a Journaled File System Using SMIT

```

COMMAND STATUS
Command : OK          stdout : yes          stderr : no

  Before command completion, additional instructions may appear below.

Based on the parameters chosen, the new /9200VG00 JFS file system
is limited to a maximum size of 134217728 (512 byte blocks)
New Filesystems size is 4792320

F1=Help      F2=Refresh      F3=Cancel      F6=Command
F8=Image     F9=Shell        F10=Exit       /=Find
n=Find Next

```

Figure 3.7 Verifying Creating Journaled File System

When determining file system size at **Add a Journalled File System**, note that IBM AIX already uses an unspecified amount of disk space. You must determine the remaining size available for physical partitions.

Calculate file system size for these devices as follows:

1. Display number of free physical partitions (FREE PPs) and physical partition size (PP SIZE) using `lsvg` command (see Figure 3.8).

2. Calculate maximum file system size as follows:

$$(\text{FREE PPs} - 1) \times (\text{PP SIZE}) \times 2048$$

Example for a device is shown in Figure 3.8:

$$\text{Maximum file system size is: } (733 - 1) \times (64) \times 2048 = 95944704$$

```
# lsvg 9200vg0
VOLUMEGROUP: 9200vg0          VG IDENTIFIER: 0083665612e98521
VG STATE: active              PP SIZE: 64 megabyte(s)
VG PERMISSION: read/write     TOTAL PPs: 733 (46912 megabytes)
MAX LVs: 256                  FREE PPs: 733 (46912 megabytes)
LVs: 0                        USED PPs: 0 (0 megabytes)
OPEN LVs: 0                   QUORUM: 2
TOTAL PVs: 1                  VG DESCRIPTORS: 2
STALE PVs; 0                  STALE PPs 0
ACTIVE PVs: 1                 AUTO ON: yes
Concurrent: Non-Capable       Auto-Concurrent: Disabled
VG Mode: Non-Concurrent
```

Figure 3.8 Determining Maximum File System Size

3.3.2 Mounting and Verifying File Systems

After creating Journaled File Systems, mount file systems and verify that file systems were created correctly and are functioning properly.

To mount and verify file systems:

1. At AIX command line prompt, enter `mount <mount_point_name>` (e.g. `mount/9200_VG00`).
2. Repeat step 1 for each new file system.
3. Verify size of file systems you have created using `df` command.
Note: File system capacity is listed in 512-byte blocks by default. To list capacity in 1024-byte blocks, use `df -k` command.
4. Verify that the new devices and file systems are fully operational by performing some basic operations (e.g., file creating, copying, deleting) on each device (see Figure 3.9).
5. At next system restart, verify that file systems have successfully auto-mounted by using `mount` or `df` command to display all mounted file systems (see Figure 3.10). File systems that were not auto-mounted can be set to auto-mount using SMIT Change a Journaled File System screen.

Note: If you are using HACMP, do not set file systems to auto-mount.

```
# cd /9200VG00                                     ← Go to mount point.
# cp /smit.log /9200VG00/smit.log.back1           ← Copy file.
# ls -l 9200VG00                                   ← Verify file copy.
-rw-rw-rw-  1  root  system      375982 Nov 30 17:25 smit.log.back1
# cp smit.log.back1 smit.log.back2               ← Copy file again.
# ls -l                                           ← Verify copy again.
-rw-rw-rw-  1  root  system      375982 Nov 30 17:25 smit.log.back1
-rw-rw-rw-  1  root  system      375982 Nov 30 17:28 smit.log.back2
# rm smit.log.back1                               ← Remove test file.
# rm smit.log.back2                               ← Remove test file.
```

Figure 3.9 Verifying Auto-Mounted File Systems

```
# df                                               ← List mounted file systems.
File system 512-blocks free %Used Iused %Iused Mounted on
/dev/hd4      8192    3176  61%   652   31% /
/dev/hd2     1024000 551448  46%  6997    5% /usr
/dev/hd9var   8192     5512  32%    66    6% /var
/dev/hd3     24576   11608  52%    38    0% /tmp
/dev/hd1      8192     7840   4%    17    1% /home
/dev/lv00    4792320 4602128  4%    16    1% /9900VG00 ← New filesystem.
/dev/lv01    4792320 4602128  4%    16    1% /9200VG01 ← New filesystem.
/dev/lv02   14401536 13949392  4%    16    1% /9200VG02 ← New filesystem.
```

Figure 3.10 Final File System Verification

Chapter 4 Troubleshooting

4.1 Troubleshooting

For troubleshooting information about Adaptable Modular Storage system, refer to the *Hitachi TagmaStore Adaptable Modular Storage Model AMS1000 User and Reference Guide* (MK-95DF780), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS500 User's Guide* (MK-95DF714), the *Hitachi TagmaStore Adaptable Modular Storage Model AMS200 User's Guide* (MK-95DF713), or the *Hitachi TagmaStore Workgroup Modular Storage Model WMS100 User and Reference Guide* (MK-95DF738). Table 4.1 lists potential error conditions during Adaptable Modular Storage IBM AIX configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, ask your Hitachi Data Systems Customer Service representative for help, or call the Hitachi Data Systems Support Center for assistance.

Table 4.1 Troubleshooting

Error Condition	Recommended Action
The system does not recognize logical devices.	Ensure that READY indicator lights on Adaptable Modular Storage system are ON. The LUNs for each port must start at 0 and continue sequentially without skipping numbers. RSD: LUN # need not start at 0 or contiguous. Run <code>cfgmgr</code> to recheck the fibre channel for new devices.

4.2 Calling Hitachi Data Systems Technical Support Center

If you need to call a Hitachi Data Systems Technical Support Center, provide as much information about the problem as possible. Include circumstances surrounding the error or failure, and the exact content of messages displayed. Worldwide Hitachi Data Systems Technical Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-446-0744
- Hitachi Data Systems Europe
Contact Hitachi Data Systems Local Support
- Hitachi Data Systems Asia Pacific
North Ryde, Australia
011-61-2-9325-3300

Appendix A Online Device Install and Uninstall

After initial installation and configuration of the Adaptable Modular Storage system, additional devices can be installed or uninstalled online without having to restart the system. After online installation, the disk device parameters for the new volumes/LUNs must be changed as specified in Chapters 2 and 3.

1. Log in to the IBM system as **root**.
2. At the AIX command line prompt, enter **smit** to start SMIT. This brings up the System Management screen.

Note: If SMIT is not installed, refer to the IBM AIX user guide for instructions about assigning new devices to volume groups using AIX commands.

3. Select **Devices** to bring up the Devices screen.
4. Select **Install/Configure Devices Added after IPL** to bring up the Install/Configure Devices Added after IPL screen. With the **cfgmgr** command, the AIX system then scans the busses for new devices.
5. Verify new device recognition using the **lsdev -C -c disk** command as described in section 2.5. Make sure to record the device file names for the new devices.
6. Configure the new devices for AIX operations as described in Chapter 2 and Chapter 3.

Appendix B AIX Command Line Commands

Table B.1 lists AIX command-line commands and their usage.

Table B.1 Commands and Usage

Commands	Use
<code>lsdev -Cc disk</code>	List all disks on the system.
<code>lscfg -vL hdiskx</code>	List VPD information for the disk.
<code>lsattr -El hdiskx</code> <code>lsattr -El lpfcx</code> <code>lsattr -El fcsx</code>	List disk device attributes. List Emulex adapter attributes. List IBM adapter attributes (can also use <code>lsattr -El fscix</code>).
<code>Chdev -l hdiskx -a rw_timeout=60 -a q_type='simple' -a queue_depth='x'</code>	<i>Change disk device default attributes</i>
<code>cfgmgr</code>	Discover devices added after IPL.
<code>errpt</code>	Show AIXerror log.
<code>Rmdev -dl hdiskx</code>	Logically remove a disk device from the system.
For Emulex LP8000	
<code>Chdev -l lpfcx -a lun_queue_depth='1' -a linkdown_tmo='z' -a nodev_holdio='1'</code> Where, Z = 60 if using alternate path software Z = 180 if not using alternate path software	Change default attribute(s) for Emulex adapter.

Acronyms and Abbreviations

AL	arbitrated loop
AL-PA	arbitrated loop physical address
FC	fibre channel
FCA	fibre channel adapter
FC-AL	fibre channel-arbitrated loop
FCP	fibre channel protocol
HACMP	High Availability Cluster Multi-Processing
HBA	host bus adapter
HRX	Hitachi RapidXchange
I/O, IO	input/output
IBM	International Business Machines Corporation
LU	logical unit
LUN	logical unit number
LUSE	LUN Expansion
LVM	Logical Volume Manager
PC	personal computer system
PCI	peripheral component interconnect
r/w	read/write
RISC	reduced-instruction-set computer
SCSI	small computer system interface
SMIT	System Management Interface Tool
TID	target ID

