



**Hitachi TagmaStore®
Adaptable Modular Storage and
Workgroup Modular Storage
Windows 2000/2003 Server Host
Installation Guide**

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- Updated contact information in Section 4.2.
- Updated Appendix C (iSCSI information).
- 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 configuring the devices on the Adaptable Modular Storage and Workgroup Modular Storage systems for operation with the Microsoft® Windows® 2000/2003 Server operating system (OS). This configuration guide assumes that the user:

- Has a background in data processing and understands direct-access storage device (ASD) systems and their basic functions.
- Is familiar with the Hitachi Adaptable Modular Storage or Workgroup Modular Storage system.
- Is familiar with the Microsoft Windows 2000/2003 Server and/or Windows 2000/2003 Server Professional operating systems, the Windows 2000 server/workstation, and the fibre-channel adapters.

For more information about Windows 2000/2003 Server, consult the Windows 2000/2003 Server online help and/or user documentation, or contact Microsoft technical support.

Notes:

- 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.
- The use of Hitachi TagmaStore Adaptable Modular Storage series products and all other Hitachi Data Systems products is governed by the terms of your agreement(s) with Hitachi Data Systems.

Microcode Level

This document revision applies to TagmaStore Adaptable Modular Storage microcode versions 1.0 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 (kilobyte) = 1,000 bytes
- 1 MB (megabyte) = 1,000² bytes
- 1 GB (gigabyte) = 1,000³ bytes
- 1 TB (terabyte) = 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 (kilobyte) = 1,024 bytes
- 1 MB (megabyte) = 1,024² bytes
- 1 GB (gigabyte) = 1,024³ bytes
- 1 TB (terabyte) = 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 AMS500 User and Reference Guide*, MK-95DF714
- *Hitachi TagmaStore® Adaptable Modular Storage Model AMS200 User and Reference Guide*, MK-95DF713
- *Hitachi TagmaStore® Hitachi Dynamic Link Manager User's Guide for Windows Systems*, MK-92DLM129

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Thank you! (All comments become the property of Hitachi Data Systems Corporation.)

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Chapter 1 Introduction

Welcome to the Windows® 2000/2003 Server 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 a Windows 2000/2003 Server system. It also describes how to configure the new Adaptable Modular Storage disk devices for operation with the Windows 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.

Configuration of the Adaptable Modular Storage disk devices for Windows 2000/2003 Server operations includes:

- Setting the host-specific parameters (section 2.3.1)
- Configuring the host fibre-channel adapters (section 2.3.2)
- Writing the signatures (section 3.1)
- Creating and formatting the partitions (section 3.2)
- Verifying file system operations (section 3.3)
- Disabling the "Write Cache Option" on Hitachi Data Systems external disks (section 3.5)

Note on the term "SCSI disk": The Adaptable Modular Storage logical devices are defined to the host as SCSI disk devices, whether the interface is SCSI or 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 to a Windows system (section 2.4)

2.1 Configuration Requirements

The following are requirements for undertaking an Adaptable Modular Storage Windows 2000/2003 Server configuration. For information about using Internet Small Computer System Interface (iSCSI), refer to Appendix C.

- **Hitachi Adaptable Modular Storage system**

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

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

- **Windows 2000 Server/Workstation**

Refer to the Microsoft® user documentation for PC server hardware requirements.

- **Windows 2000 Server or Windows 2000 Professional operating system**

Important: Contact Microsoft to make sure that the most current OS patches are installed.

- **Windows 2003 Server/Workstation**

Refer to the Microsoft user documentation for PC server hardware requirements.

- **Windows 2003 Server operating system IA32, IA64**

For the latest information on Windows 2003 version support, contact your Hitachi Data Systems account team.

Note: For more information on supported Windows 2000/2003 Server versions, please contact Hitachi Data Systems.

- **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.

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

The Adaptable Modular Storage currently supports the following HA software products for the Windows OS. Please contact your Hitachi Data Systems account team for the latest information on supported software products:

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

2.2 Installing an Adaptable Modular Storage System

The Adaptable Modular Storage system comes with all the hardware and cabling required for installation. Installation of the Adaptable Modular Storage system involves the following activities.

■ Hardware installation

The Hitachi Data Systems representative performs the hardware installation as specified in the 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.
- Upgrading to the latest microcode level.
- Creating RAID groups and LUNs and formatting LUNs using the Storage Navigator Adaptable Modular Storage software. For information and instructions on 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 the fibre-channel adapters and cabling.

■ Adaptable Modular Storage FC Port

The 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 the topology parameters supported by the device, and set your topology accordingly.

You use the Storage Navigator Adaptable Modular Storage software to configure the Adaptable Modular Storage fibre ports. For instructions on 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 the Adaptable Modular Storage fibre-channel port(s) (see section 2.3.1).
- Verify host bus adapter installation (see section 2.3.2).

2.3.1 Setting Host-Specific Parameters for the Adaptable Modular Storage Ports

The Adaptable Modular Storage ports must be configured for the connected operating system. Use the Storage Navigator Adaptable Modular Storage software to configure the Adaptable Modular Storage fibre ports. For instructions on 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

You configure the Adaptable Modular Storage FC ports to define the fibre topology parameters and port addresses. The Adaptable Modular Storage systems support up to 512 LUNs. You will select the 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, you must use either **zoning** on the switch or the Hitachi Volume Security (LUN Management) feature on the Adaptable Modular Storage, or a combination of both.

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 the Adaptable Modular Storage port settings. In FC arbitrated-loop (FCAL) environments, the port addresses are set by entering an AL-PA (arbitrated-loop physical address, or loop ID, or port address). The host communicates with the devices comprising the loop with 8-bit AL-PA (see Table 2.1).

Table 2.1 shows the available Adaptable Modular Storage AL-PA values ranging from 01 to EF. Fibre-channel protocol uses the AL-PAs to communicate on the fibre-channel link, but the software driver of the platform host adapter translates the AL-PA value assigned to the Adaptable Modular Storage port to a SCSI TID. See Appendix B for a description of the AL-PA-to-TID translation.

Note on loop ID conflict: The Windows system assigns port addresses from lowest (01) to highest (EF). To avoid loop ID conflict, assign the 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. Do not use more than one port address with the same TID in same loop (e.g., addresses EF and CD both have TID 0, see Table B.1 in Appendix B).

Table 2.1 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	—

2.3.2 Verifying the Host Fibre-Channel Adapter Installation

Before the Adaptable Modular Storage is connected to the Windows 2000/2003 Server system, verify the FC adapter installation. To ensure that the host fibre configuration is correct, you will verify recognition of the FCA and the FCA driver.

To verify the fibre-channel host configuration:

1. Log in to the Windows system as **administrator**, and make sure that all existing devices are powered on and properly connected to the Windows 2000/2003 Server system.
2. Display the host configuration. Make sure that the host recognizes the following four classes of fibre information (underlined in the following example): **fibre channel adapter**, **SCSI bus characteristics**, **world wide name**, and **FCA driver**. If this information is not displayed or if error messages are displayed, the host environment may not be configured properly.

Note: For information on the HBA-specific text displayed on screen, refer to the user documentation for the HBA.

2.4 Connecting the Adaptable Modular Storage System to the Windows System

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

1. **Verify system installation.** The Hitachi Data Systems representative verifies the fibre port address configuration and the status of the FC adapters and LDEVs (normal).
2. **Shut down the Windows 2000 system.** The user shuts down and powers off the Windows system before connecting the Adaptable Modular Storage:
 - a) Shut down the Windows 2000 system.
Note: You do not have to shut down the Windows display.
 - b) Power off all peripheral devices except for the Adaptable Modular Storage system.
 - c) Power off the Windows system. You are now ready to connect the Adaptable Modular Storage system.

3. **Connect the Adaptable Modular Storage to the Windows 2000 system.** The Hitachi Data Systems representative installs the fibre-channel cables between the Adaptable Modular Storage and the Windows system.

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.

4. **Power on the Windows 2000 system.** The user or Hitachi Data Systems representative powers on the Windows 2000 system after connecting the Adaptable Modular Storage system:
 - a) Power on the Windows 2000 system display.
 - b) Power on all peripheral devices. The Adaptable Modular Storage system should already be on and the fibre-channel ports should already be configured. If the Adaptable Modular Storage fibre ports are configured after the Windows system is powered on, the system must be restarted to recognize the new devices.
 - c) Confirm the ready status of all devices.
 - d) Power on the Windows 2000 system.

Chapter 3 Configuring New Devices

After Adaptable Modular Storage installation and connection procedures have been performed, the devices on the Adaptable Modular Storage system are ready to be configured for use. Configuration of the Adaptable Modular Storage devices is performed by the user and requires administrator access to the Windows 2000/2003 Server system. The activities involved in device configuration are:

- Writing signatures on the new devices (section 3.1)
- Creating and formatting partitions on new devices (section 3.2)
- Verifying system operations (section 3.3)
- Verifying auto-mount of new devices (section 3.4)
- Disabling “Write Cache” option on Hitachi Data Systems external disks (section 3.5)

Note: Chapter 4 provides troubleshooting information, while Appendix B provides instructions for configuring the Windows 2000 boot disk on the Adaptable Modular Storage system.

3.1 Writing Signatures

The first step in configuring the new devices is to write a signature on each device. If you are running Windows 2000 server, refer to section 3.1.1. If you are running Windows 2003 server, refer to section 3.1.2.

3.1.1 Writing Signatures Using Windows 2000

This section describes how to write a signature on each device using the Win2000 Disk Management. You must write a signature on each disk device to enable the Win2000 system to vary the device online. The 32-bit signature identifies the disk to the Win2000 system. If the disk's TID and/or LUN is changed, or if the disk is moved to a different controller, the Disk Management and Windows 2000/2003 Server fault-tolerant driver will continue to recognize it.

Note: The Win2000 system assigns the disk numbers sequentially starting with the local disks and then by adapter, and by TID/LUN. If the Adaptable Modular Storage is attached to the first adapter (displayed first during system start-up), the disk numbers for the new devices start at 1 (the local disk is 0). If the Adaptable Modular Storage is not attached to the first adapter, the disk numbers for the new devices start at the next available disk number. For example, if 40 disks are attached to the first adapter (disks 1-40) and the Adaptable Modular Storage is attached to the second adapter, the disk numbers for the Adaptable Modular Storage start at 41.

To write the signatures on the new disk devices (see Figure 3.1):

1. From the **Start-Programs** menu, select **Administrative Tools (Computer Management)**, and then select **Disk Management** to start the Disk Manager. Initialization takes a few seconds.
2. When the Disk Management notifies you that one or more disks have been added, select **OK** to allow the system configuration to be updated.
Note: The Disk Management will notify you if you removed any disks.
3. You may want to reboot your system after adding new devices.
4. The Disk Management displays each new device by disk number and asks if you want to write a signature on the disk (see Figure 3.2). You may only write a signature once on each device. For all SCSI disk devices, select **OK** to write a signature.
5. After you write or decline to write a signature on each new device, the Disk Management main panel displays the devices by disk number (see Figure 3.1). The total capacity and free space are displayed for each disk device with a signature. **Configuration information not available** or an "Unknown" status indicates no signature. Do not exit the Disk Manager yet. You will create partitions on the new SCSI disk devices next.

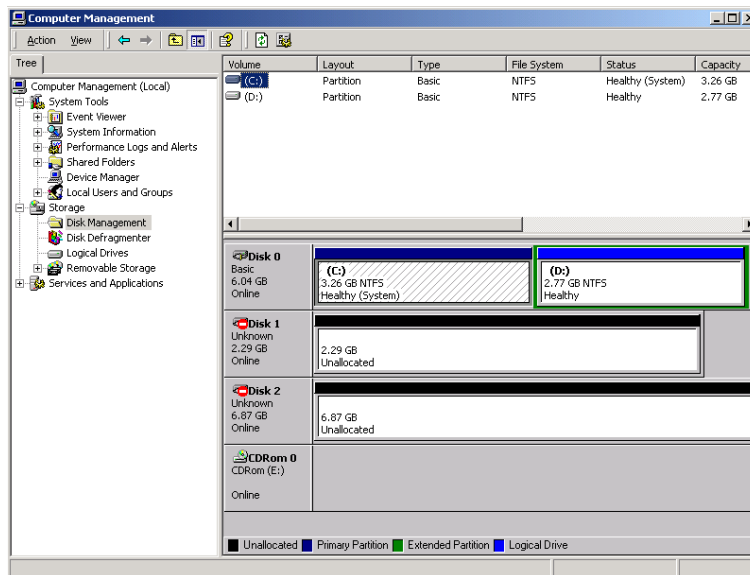


Figure 3.1 Disk Management Panel showing New Devices

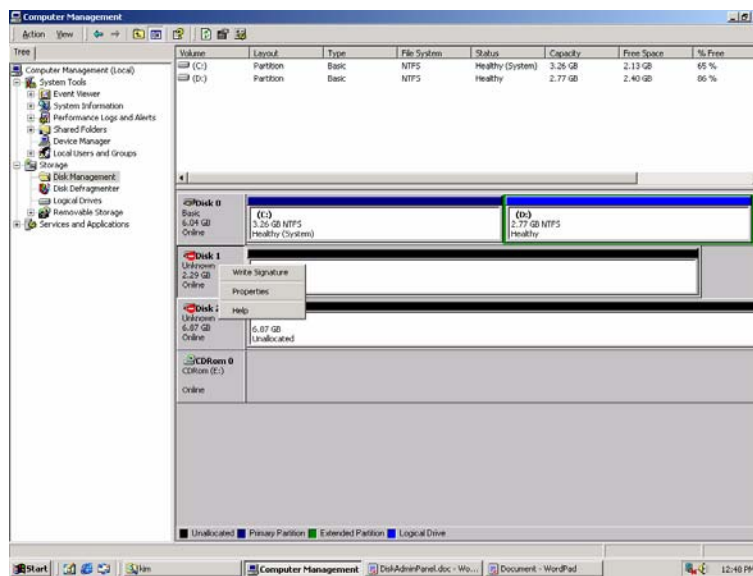


Figure 3.2 Writing Signatures

3.1.2 Writing Signatures using Windows 2003 Server

This section describes how to write a signature on each device using the Windows 2003 Disk Management. You must write a signature on each SCSI disk device to enable the Windows 2003 system to vary the device online. For MSCS environments, you must also write signatures on the FX and other raw devices. The 32-bit signature identifies the disk to the Windows 2003 system. If the disk's TID and/or LUN are changed, or even if the disk is moved to a different controller, the Disk Management and Windows 2003 fault-tolerant driver will continue to recognize it.

Note: The Windows 2003 system assigns the disk numbers sequentially starting with the local disks and then by adapter, and by TID/LUN. If the Universal Storage Platform is attached to the first adapter (displayed first during system start-up), the disk numbers for the new devices start at 1 (the local disk is 0). If the Universal Storage Platform is not attached to the first adapter, the disk numbers for the new devices start at the next available disk number. For example, if 40 disks are attached to the first adapter (disks 1-40) and the Universal Storage Platform is attached to the second adapter, the disk numbers for the Universal Storage Platform start at 41.

To write the signatures on the new disk devices (see Figure 3.3):

1. From the **Start-Programs** menu, select **Administrative Tools (Computer Management)**, and then select **Disk Management** to start the Disk Manager. Initialization takes a few seconds.
2. When the Disk Management notifies you that one or more disks have been added, select **OK** to allow the system configuration to be updated.

Note: The Disk Management will notify you if you removed any disks.

3. The Disk Management now displays each new device by disk number and asks if you want to write a signature on the disk (see Figure 3.4). You may only write a signature once on each device. To verify the device type for each disk number, for all SCSI disk devices, select **OK** to write a signature. For FX devices without MSCS, select **No**. For FX devices with MSCS, select **Yes** and observe this warning:

WARNING: After a signature has been written on an FX device, there is no way to distinguish the FX device from a SCSI disk device. The user must exercise extreme caution not to accidentally partition and format an FX device. This will overwrite any data on the FX device and also prevent the FX software from accessing the device.

4. After you write or decline to write a signature on each new device, the Disk Management main panel displays the devices by disk number (see Figure 3.1). The total capacity and free space are displayed for each disk device with a signature. **Configuration information not available** or an "Unknown" status indicates no signature. Do not exit the Disk Manager yet. You will create partitions on the new SCSI disk devices next.

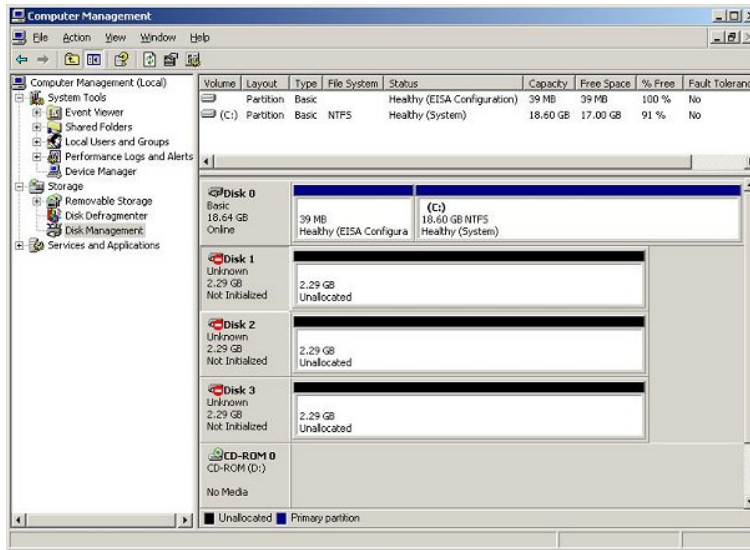


Figure 3.3 Disk Management Panel showing New Devices

Note: In this example, disk 0 is the local disk.

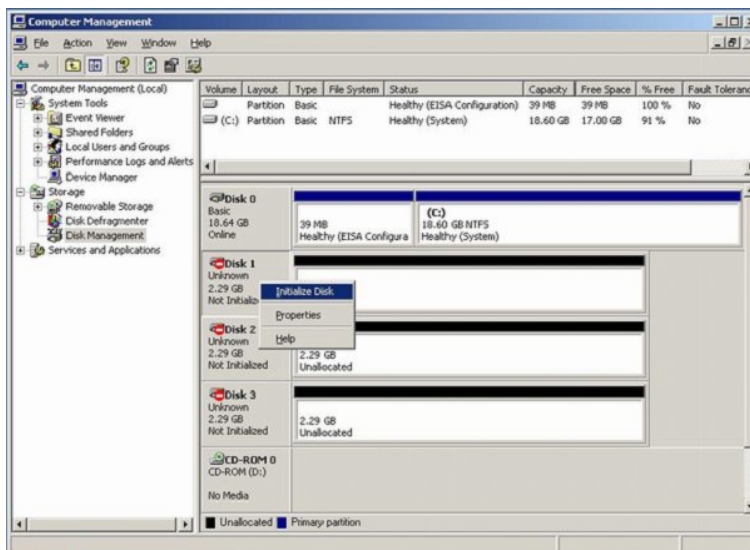


Figure 3.4 Writing Signatures

3.2 Creating and Formatting Partitions

After you write the signatures on the new devices, you create and format the partitions on the new SCSI disk devices.

Dynamic Disk is supported with no restrictions for the Universal Storage Platform connected to the Windows 2003 operating system. For more information, refer to the Microsoft Windows online help.

To create and format partitions on the new SCSI disk devices:

1. On the Disk Management main panel, select the unallocated area for the SCSI disk you want to partition, select the **Action** menu and select **Create Partition** to launch the New Partition Wizard.
2. The Select Partition Type panel appears first (see Figure 3.5). Select the desired type of partition, and then select **Next**.
3. The Specify Partition Size panel appears next (see Figure 3.6). Specify the desired partition size. If the size is greater than 1024 MB, you will be asked to confirm the new partition. Select **Next**.
4. The Assign Drive Letter or Path panel appears next (see Figure 3.7). You can either select a drive letter or path, or specify no drive letter or drive path. Select **Next**.
5. The Format Partition panel appears (see Figure 3.8). Select **Format this partition with the following settings**, and select the following options:
 - **File System:** Select **NTFS** (enables the Windows 2003 system to write to the disk).
 - **Allocation unit size:** **Default**. Do not change this entry.
 - **Volume label:** Enter a volume label, or leave this field blank for no label.
 - **Format Options:** Select **Perform a Quick Format** to decrease the time required to format the partition. Select **Enable file and folder compression** only if you want to enable compression.
6. Select **Next** to format the partition as specified. When the format warning is displayed (this new format will erase all existing data on disk), select **OK** to continue. The Format panel displays the progress of the format partition operation.
7. When the format operation is complete, select **OK**. The New Partition Wizard displays the new partition (see Figure 3.9). To close the New Partition Wizard, select **Finish**.
8. Verify that the Disk Management main panel displays the correct file system (NTFS) for the formatted partition (see Figure 3.10). The word **Healthy** indicates that the partition has been created and formatted successfully.
9. Repeat steps 1 through 8 for each new SCSI disk device. When you are finished creating and formatting partitions, exit the Disk Management. When the disk configuration change message appears, select **Yes** to save changes.

Note: Be sure to make your new Emergency Repair Disk using RDISK.EXE.

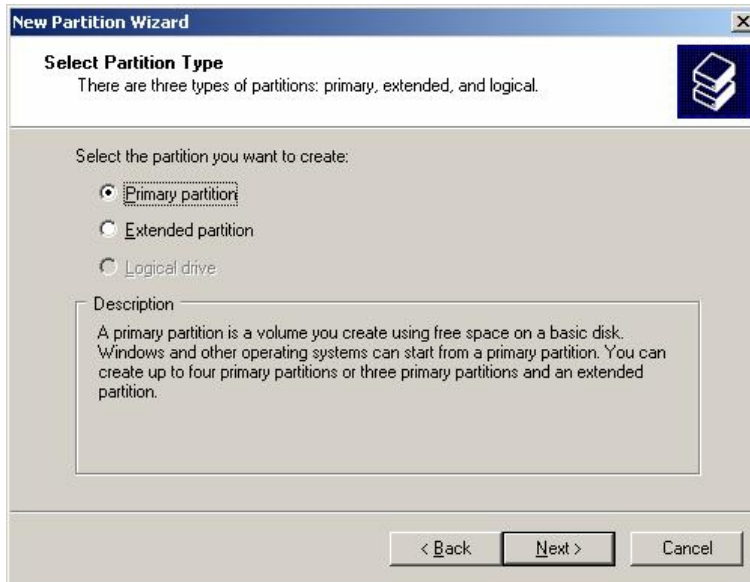


Figure 3.5 New Partition Wizard Panel

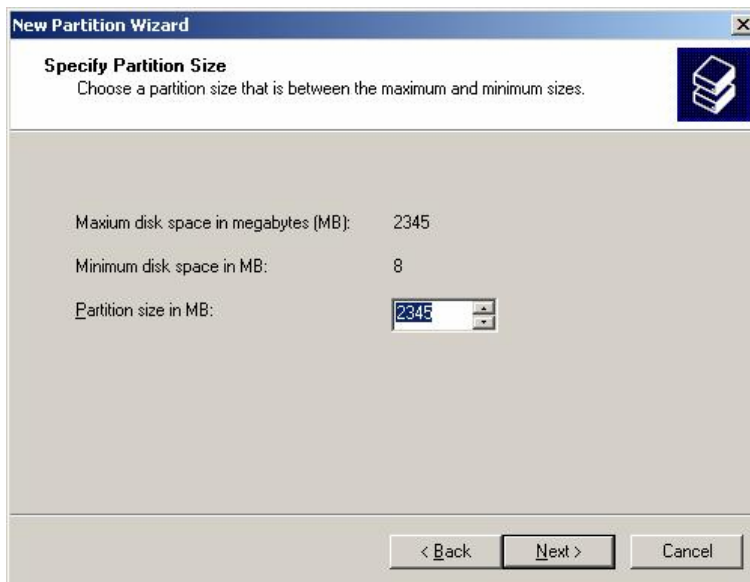


Figure 3.6 Specifying Partition Size



Figure 3.7 Assigning Drive Letter or Path

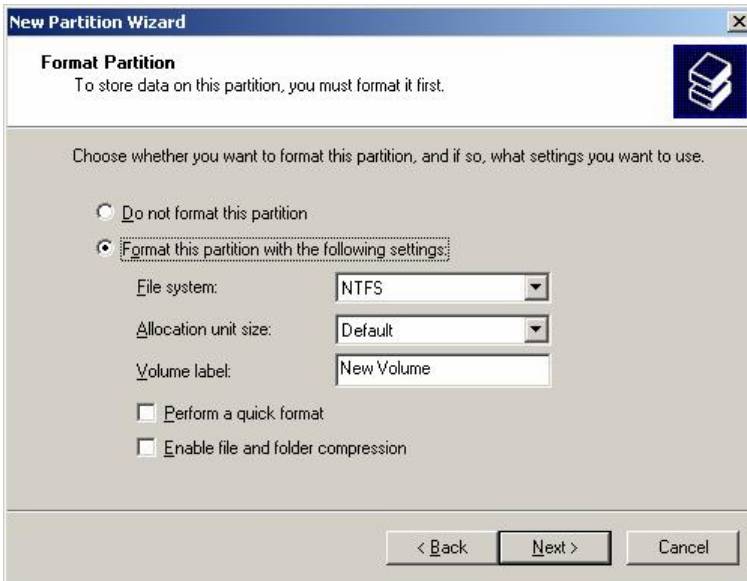


Figure 3.8 Formatting Partition

Note: NTFS is a requisite for MSCS cluster configuration.

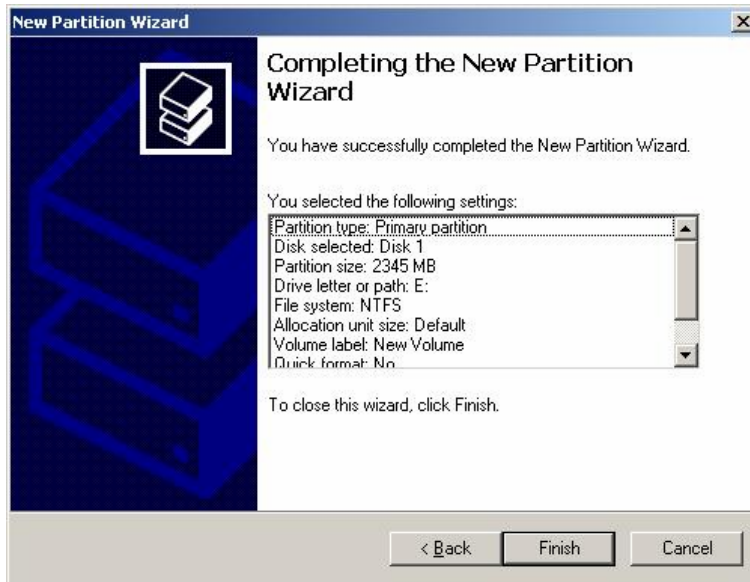


Figure 3.9 Successful Partition Format Confirmation Panel

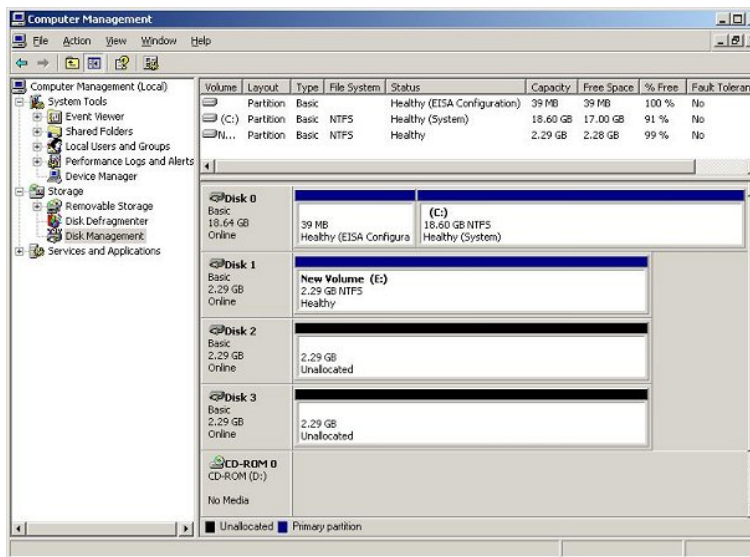


Figure 3.10 Verifying Formatted Partition

3.3 Verifying File System Operations

After creating and formatting the partitions, verify that the file system is operating properly on each new SCSI disk device. If you are running Windows 2000 server, refer to section 3.3.1. If you are running Windows 2003 server, refer to section 3.3.2.

3.3.1 Verifying File System Operations using Windows 2000

After creating and formatting the partitions, verify that the file system is operating properly on each new SCSI disk device (OPEN-x, OPEN VIR, and LUSE). The file system enables the Win2000 system to access the devices. You can verify file system operation easily by copying a file onto each new device. If the file is copied successfully, this verifies that the file system is operating properly (i.e., the Win2000 system can access the new device).

To verify file system operations for the new SCSI disk devices:

1. From the Win2000 desktop, double-click **My Computer** to display all connected devices. All newly partitioned disks should display in this window (see Figure 3.11).
2. Select the device you want to verify, and then display its Properties (select the **File** menu, and then select **Properties**, or right-mouse-click the device and select **Properties**).
3. On the Properties panel (see Figure 3.12), verify that the properties are correct: label (optional), type, capacity, and file system.
4. Copy a file to the new device (select a small file to speed things along).
5. Display the contents of the new device to make sure that the copy operation completed successfully (see Figure 3.13). The copied file should be displayed with the correct file size. If desired, compare the copied file with the original file to verify no differences.
6. Delete the copied file from the new device and verify the file was deleted successfully.
7. Repeat steps 2 through 6 for each new SCSI disk device.

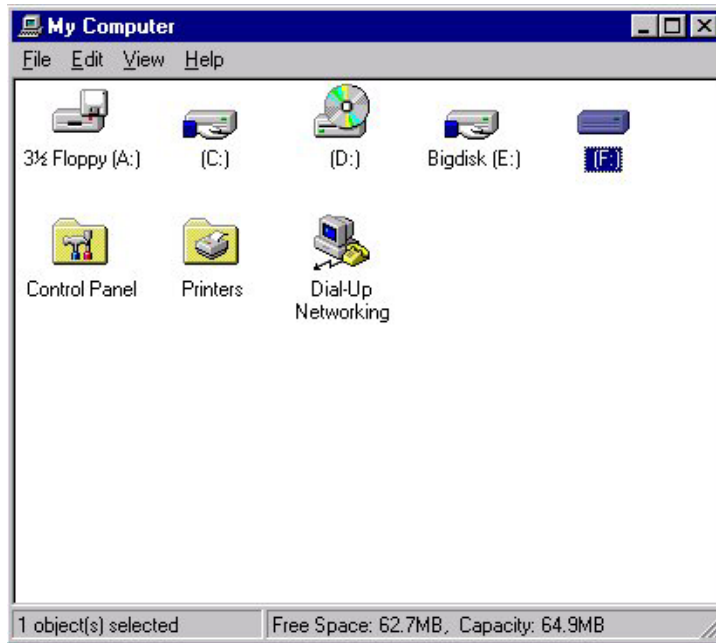


Figure 3.11 Displaying Connected Devices

Note: In this example, [F:] is the only new device.

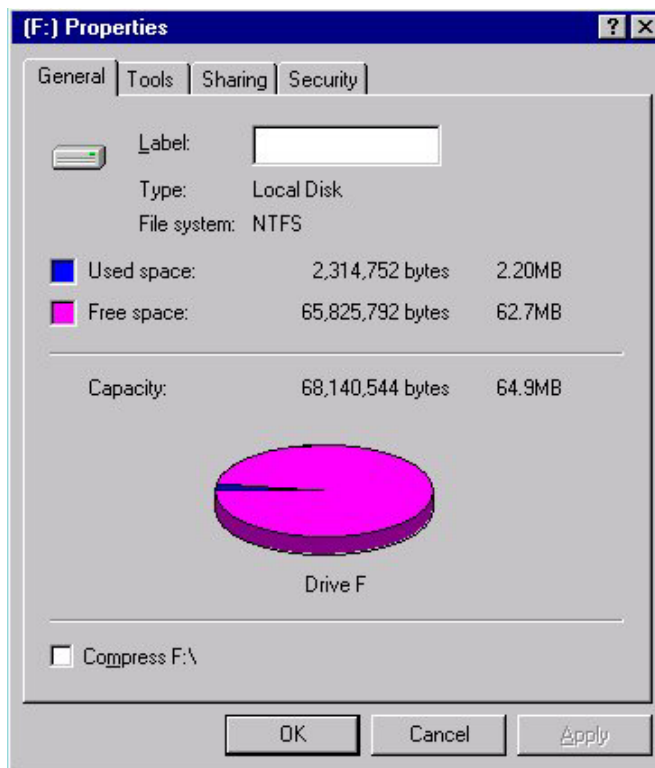


Figure 3.12 Verifying New Device Properties

```
Command Prompt
C:\WINNT>dir notepad.exe
Volume in drive C has no label.
Volume Serial Number is BC35-7D44

Directory of C:\WINNT
10/13/96  06:38p                45,328 NOTEPAD.EXE
           1 File(s)              45,328 bytes
           2,480,414,720 bytes free

C:\WINNT>copy notepad.exe f:
           1 file(s) copied.

C:\WINNT>dir f:\notepad.exe
Volume in drive F has no label.
Volume Serial Number is DCA0-7FBB

Directory of f:\
10/13/96  06:38p                45,328 NOTEPAD.EXE
           1 File(s)              45,328 bytes
           65,763,840 bytes free

C:\WINNT>
```

Figure 3.13 Verifying File Copy Operation

3.3.2 Verifying File System Operations Using Windows 2003

After creating and formatting the partitions, verify that the file system is operating properly on each new SCSI disk device. The file system enables the Windows 2003 system to access the devices. You can verify file system operation easily by copying a file onto each new device. If the file is copied successfully, this verifies that the file system is operating properly (i.e., the Windows 2003 system can access the new device).

To verify file system operations for the new SCSI disk devices:

1. From the Windows 2003 desktop, double-click **My Computer** to display all connected devices. All newly partitioned disks should display in this window (see Figure 3.14).
2. Select the device you want to verify, and then display its Properties (select the **File** menu, and then select **Properties**, or right-mouse-click on the device and then select **Properties**).
3. On the Properties panel (see Figure 3.15), verify that the properties are correct: label (optional), type, capacity, and file system.
4. Copy a file to the new device (select a small file to speed things along).
5. Display the contents of the new device to make sure that the copy operation completed successfully (see Figure 3.16). The copied file should be displayed with the correct file size. If desired, compare the copied file with the original file to verify no differences.
6. Delete the copied file from the new device, and verify the file was deleted successfully.
7. Repeat steps 2 through 6 for each new SCSI disk device.

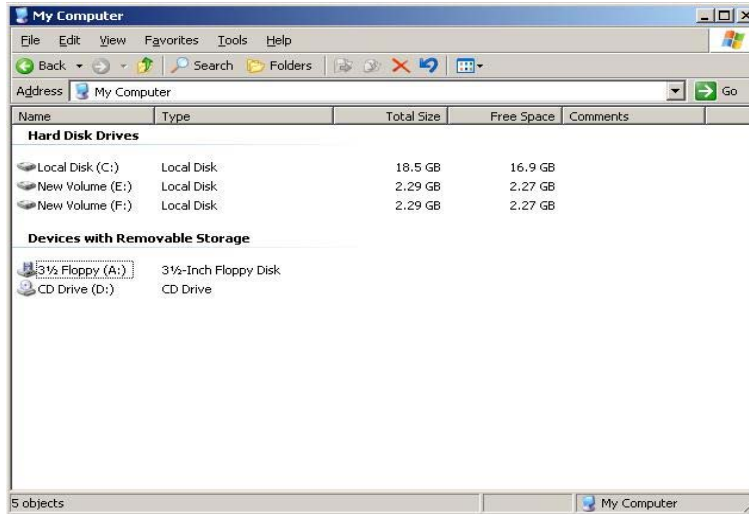


Figure 3.14 Displaying Connected Devices

Note: In this example, (E:) and (F:) are the new devices.

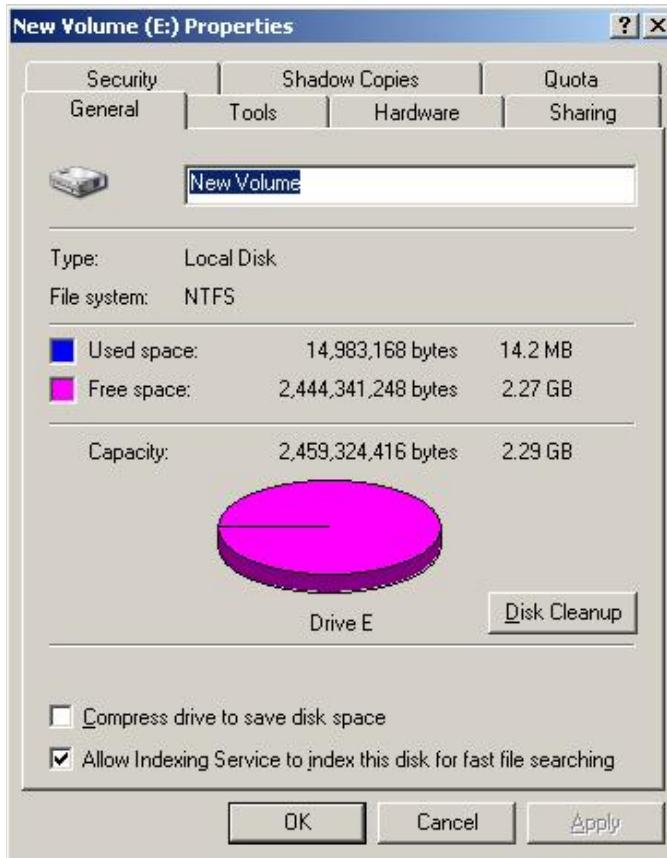


Figure 3.15 Verifying New Device Properties

```
C:\ Command Prompt
C:\WINDOWS>dir NOTEPAD.EXE
Volume in drive C has no label.
Volume Serial Number is A4C3-7DFB

Directory of C:\WINDOWS

03/25/2003  05:00 AM                68,096 NOTEPAD.EXE
             1 File(s)                68,096 bytes
             0 Dir(s) 18,235,052,032 bytes free

C:\WINDOWS>copy NOTEPAD.EXE E:\NOTEPAD.EXE
1 file(s) copied.

C:\WINDOWS>dir E:\NOTEPAD.EXE
Volume in drive E is New Volume
Volume Serial Number is 1C6C-E2D6

Directory of E:\

03/25/2003  05:00 AM                68,096 NOTEPAD.EXE
             1 File(s)                68,096 bytes
             0 Dir(s)  2,444,271,616 bytes free

C:\WINDOWS>
```

Figure 3.16 Verifying File Copy Operation

3.4 Verifying Auto-Mount

The last step in configuring the new devices is to verify that all new devices are automatically mounted at system boot-up. To verify auto-mount of the new devices:

1. Shut down and then restart the Windows 2000/2003 Server system.
2. Open **My Computer**, and verify that all new SCSI disk devices are displayed.
3. Verify that the Win2000 system can access each new device by repeating the procedure explained previously:
 - a) Verify the device properties for all new devices.
 - b) Copy a file to each new device to make sure that the devices are functioning properly.

3.5 Disabling the “Write Cache” Option on Hitachi Data Systems External Disks

WARNING: Be sure that all HDS external disks are configured with the “Write Cache Option” disabled. There is strong potential for data loss if this feature is enabled. The write cache option is strictly a JBOD or internal disk setting and should never be used on intelligent disks.

To disable the “Write Cache Option”:

1. Right-click My Computer
2. Click Manage.
3. Click Device Manager.
4. Click the “+” sign next to Disk Drives.
5. Double-click the first external HDS disk drive.
6. Click the Policies or Disk Properties tab.
7. Ensure that “Enable Write Caching on the Disk” is disabled (no check-mark). See Figure 3.17.

Note: If the Enable Write Cache option is gray, the feature is already disabled (see Figure 3.18).

8. Repeat this procedure for all HDS external disk drives.

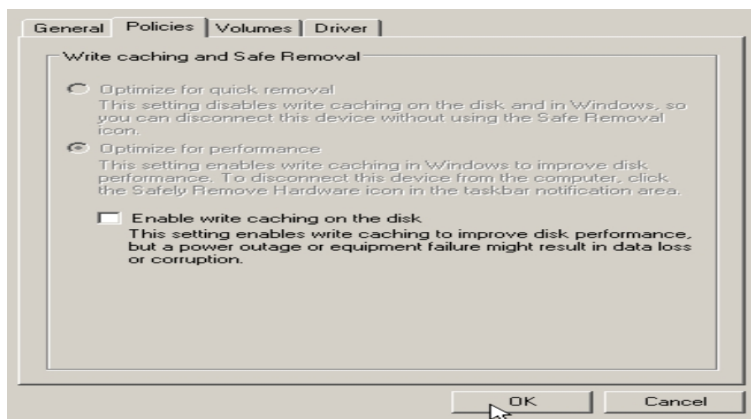


Figure 3.17 Enable Write Caching on Disk (disabled)



Figure 3.18 Enable Write Cache (already disabled)

Chapter 4 Troubleshooting

4.1 Troubleshooting

For troubleshooting information about Adaptable Modular Storage system, refer to the *Hitachi TagmaStore® Adaptable Modular Storage Model AMS500 User's Guide* (MK-95DF714) or *Hitachi TagmaStore® Adaptable Modular Storage Model AMS200 User's Guide* (MK-95DF713).

Table 4.1 lists potential error conditions during Adaptable Modular Storage Windows 2000/2003 Server configuration and provides instructions for resolving each condition. If you are unable to resolve an error condition, please contact your Hitachi Data Systems representative or VAR for help, or call the Hitachi Data Systems Support Center for assistance.

Table 4.1 Error Conditions and Recommended Actions

Error Condition	Recommended Action
The devices are not recognized by the system.	Make sure that the READY indicator lights on the Adaptable Modular Storage system are ON. Make sure that the fibre cables are correctly installed and firmly connected.
The Win2000 system does not reboot properly after hard shutdown.	If the Win2000 system is powered off unexpectedly (without the normal shutdown process), wait three minutes before restarting the Win2000 system. This allows the Adaptable Modular Storage internal time-out process to purge all queued commands so that the Adaptable Modular Storage is available (not busy) during system startup. If the Win2000 system is restarted too soon, the Adaptable Modular Storage will continue trying to process the queued commands and the Win2000 system will not reboot successfully.

4.2 Calling the Hitachi Data Systems Support Center

If you need to call the Hitachi Data Systems Support Center, make sure to provide as much information about the problem as possible, including the circumstances surrounding the error or failure and the exact content of any error messages displayed on the host system(s).

The worldwide Hitachi Data Systems Support Centers are:

- Hitachi Data Systems North America/Latin America
San Diego, California, USA
1-800-446-0744
1-619-537-3000
- 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 Configuring the Boot Disk on the Adaptable Modular Storage

You can configure the Windows 2000/2003 Server boot disk with Hitachi Dynamic Link Manager version 2.0.1 or greater.

For assistance, please contact your Hitachi Data Systems representative.

Appendix B SCSI TID Map for Fibre-Channel Adapters

When an arbitrated loop (AL) is established or re-established, the port addresses are assigned automatically to prevent duplicate TIDs. When using the SCSI over fibre-channel protocol (FCP) there is no longer a need for target IDs in the traditional sense. SCSI is a bus-oriented protocol requiring each device to have a unique address since all commands go to all devices. For fibre channel, the AL-PA is used instead of the TID to direct packets to the desired destination. Unlike traditional SCSI, once control of the loop is acquired, a point-to-point connection is established from initiator to target. To enable transparent use of FCP, Windows NT® “maps” a TID to each AL-PA.

Table B.1 identifies the fixed mappings between the bus/TID/LUN addresses assigned by Windows and the FC native addresses (AL_PA/SEL_ID) for FC adapters where ScanDown = 0 (default).

Notes:

- When Adaptable Modular Storage devices and other types of devices are connected in the same arbitrated loop, the mappings defined in Table B.1 cannot be guaranteed.
- The Emulex driver emulates six SCSI busses per adapter to map all 126 possible AL-PAs to target IDs. The first bus (bus 0) is a dummy bus.

Table B.1 AL-PA to SCSI TID Mapping (t value)

AL-	t	AL-	t	AL-	t	AL-	t	AL-	t	AL-	t	AL-	t		
EF	0	CD	0	B2	0	98	0	72	0	55	0	3A	0	25	0
E8	1	CC	1	B1	1	97	1	71	1	54	1	39	1	23	1
E4	2	CB	2	AE	2	90	2	6E	2	53	2	36	2	1F	2
E2	3	CA	3	AD	3	8F	3	6D	3	52	3	35	3	1E	3
E1	4	C9	4	AC	4	88	4	6C	4	51	4	34	4	1D	4
E0	5	C7	5	AB	5	84	5	6B	5	4E	5	33	5	1B	5
DC	6	C6	6	AA	6	82	6	6A	6	4D	6	32	6	18	6
DA	7	C5	7	A9	7	81	7	69	7	4C	7	31	7	17	7
D9	8	C3	8	A7	8	80	8	67	8	4B	8	2E	8	10	8
D6	9	BC	9	A6	9	7C	9	66	9	4A	9	2D	9	0F	9
D5	10	BA	10	A5	10	7A	10	65	10	49	10	2C	10	08	10
D4	11	B9	11	A3	11	79	11	63	11	47	11	2B	11	04	11
D3	12	B6	12	9F	12	76	12	5C	12	46	12	2A	12	02	12
D2	13	B5	13	9E	13	75	13	5A	13	45	13	29	13	01	13
D1	14	B4	14	9D	14	74	14	59	14	43	14	27	14	00	-
CE	15	B3	15	9B	15	73	15	56	15	3C	15	26	15		

Appendix C Using iSCSI

This appendix provides information about using the DF700 with iSCSI.

The topics covered in this chapter are:

- Requirements for using iSCSI (section C.1)
- iSCSI guidelines (section C.2)
- Installing Microsoft iSCSI initiator (section C.3)

C.1 Requirements for Using iSCSI

The following list describes the requirements for using the DF700 with iSCSI. For current requirements, please contact your Hitachi Data Systems representative.

- DF700 hardware with an iSCSI interface board installed
- Storage Navigator Modular version 3.00 or later
- For WMS100, AMS200 and AMS500, microcode version 0730/B or higher is required. For AMS1000, micro code version 0732/A or higher is required.
- A switch, network-interface card (NIC), and host bus adapter (HBA) directly connected to the DF700 iSCSI port. The switch, NIC, and HBA must support Institute of Electrical and Electronics Engineers (IEEE) 802.3ab 1000Base-T, full-duplex operations.
- Category 5e (enhanced Category 5) or Category 6 network cabling
- The latest Service Packs and patches for your operating system and NIC drivers. Operation under virtual OS environment is not supported.
- A host with an iSCSI interface that is either a network port on the host motherboard or a NIC that is recommended by the vendor of the host.
- If using the DF700 iSNS client, Microsoft iSNS Server 3.0 must be installed on the same IP-SAN.

Note: The DF700 does not support iSCSI communications using Microsoft Windows® 2000.

C.2 Guidelines

Observe the following guidelines when using iSCSI with the DF700:

- iSCSI is not available when a host (OS or driver) cannot identify an LU without LUN0. You must set H-LUN = 0 to the target.
- The computer running the Windows operating system must be powerful enough to run the OS without stress. We recommend using a computer equipped as follows:
 - Processor: Intel® Pentium® 4
 - Clock: 2 GHz or faster
 - Random Access Memory (RAM): At least 512 MB
- The host computer equipped with the NIC and running iSCSI software initiator must also be sufficiently powerful. Otherwise, concurrent applications running on the host may suffer from performance degradation.
- Do not change the Challenge Handshake Authentication Protocol (CHAP) authentication settings that correspond to hosts that are logging in to the DF700. If you disable CHAP authentication for the DF700 iSCSI while it is communicating with Microsoft iSCSI software initiator using CHAP authentication, the host will not be able to access the target device without rebooting.
- We recommend you use Microsoft-approved NICs that have the Microsoft logo.
- Use all service packs and patches for the latest version of the OS and NIC drivers.
- Use Microsoft iSCSI software initiator version 2.0. The DF700 iSCSI does not support lower versions of Microsoft iSCSI software initiator. For the higher version, please refer to the most recent product announcement or contact your local Hitachi sales office for information on feature and product availability.
- We recommend you stop all other services used by operating systems and applications that are not being used to eliminate extraneous operations and reduce server loads.

C.3 Installing Microsoft iSCSI Initiator

Microsoft iSCSI Software Initiator is the iSCSI software initiator driver for Windows 2000/2003 provided by Microsoft. It includes both the Microsoft iSCSI Initiator service and the Microsoft iSCSI Initiator software driver. Microsoft iSCSI software initiator makes it possible for businesses to take advantage of existing network infrastructure to enable block-based storage over wide distances, without having to invest in additional hardware

To install Microsoft iSCSI Software Initiator, use the following procedures in the following section.

C.3.1 Downloading Microsoft iSCSI Software initiator

1. Open a Web browser and connect to www.microsoft.com.
2. Click **Downloads** and move to the Microsoft Download Center.
3. Search the iSCSI initiator.
4. Select Microsoft iSCSI software initiator that matches your operating system and host, then download the software.

C.3.2 Installing Microsoft iSCSI Software Initiator

1. Double-click the file you downloaded from the Microsoft site.
2. When the screen in Figure C.1 appears, click the **Next** button.



Figure C.1 Software Update Installation Wizard – Screen 1

3. When the screen in Figure C.2 appears, select **Initiator Service** and **Software Initiator**, then click the **Next** button.

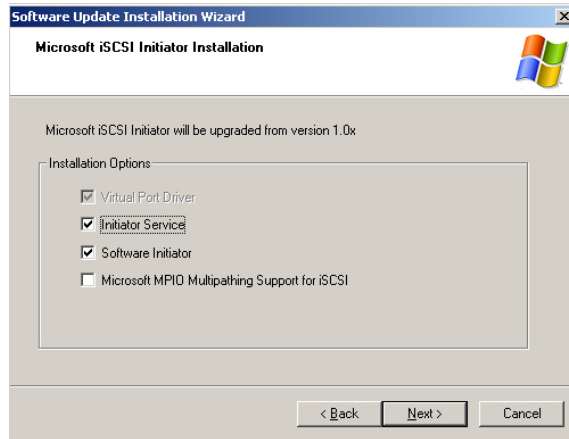


Figure C.2 Software Update Installation Wizard – Screen 2

4. When the License Agreement appears (see Figure C.3), read it, then click **I Agree** and **Next**.

Note: You must agree to the License Agreement to install the software.

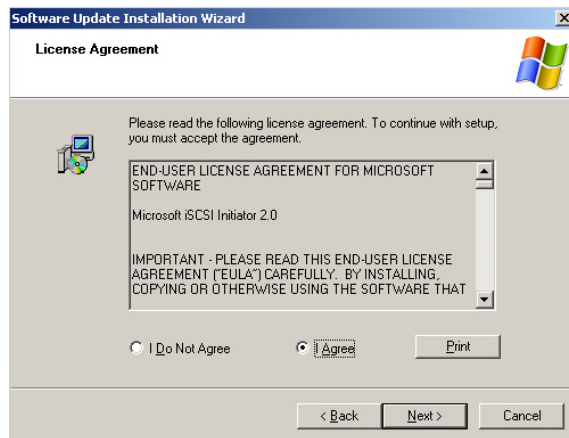


Figure C.3 Software Update Installation Wizard – Screen 3 (License Agreement)

5. The installation is completed. When the screen in Figure C.4, click the **Finish** button.

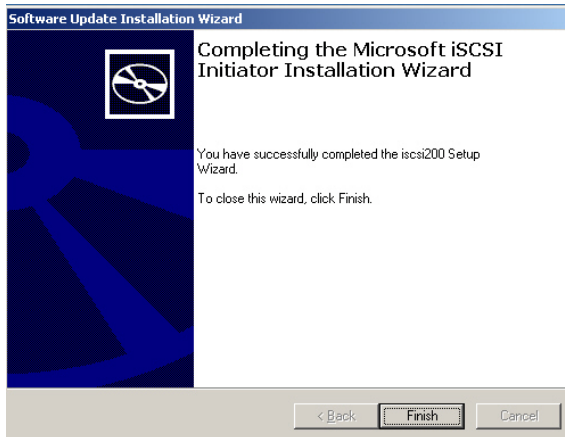


Figure C.4 Software Update Installation Wizard –Screen 4

C.3.3 Setting Up Microsoft iSCSI Software Initiator

1. On your Windows server, open the Windows control panel. Then open the iSCSI Initiator Properties dialog box (see Figure C.5).

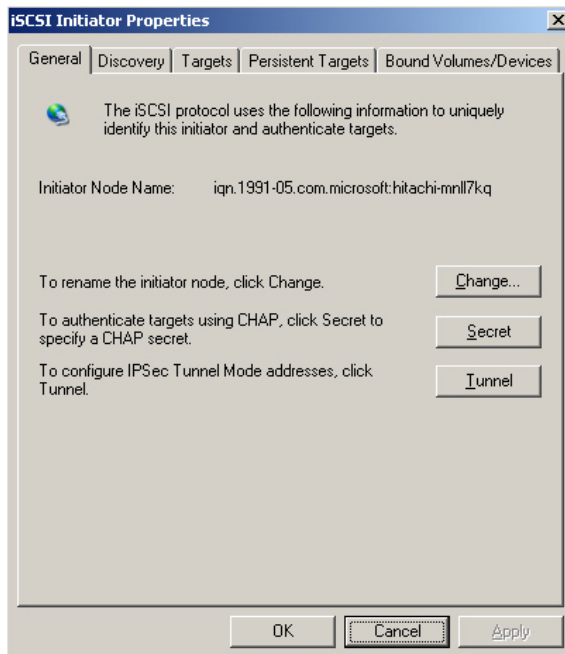


Figure C.5 iSCSI Initiator Properties

2. When applying two-way authentication (i.e. Mutual CHAP. step 16 in this procedure), click the **Secret** button on the **General** tab, enter the host secret, and click the **OK** button.

Note: CHAP is a protocol for authenticating the peer of a connection and is based upon the peers sharing a secret (a security key similar to a password). The length of the secret security key must be from 12-characters (96 bits) to 16-characters. The CHAP secret is case sensitive. For security, each typed letter appears as a dot (see Figure C.6).

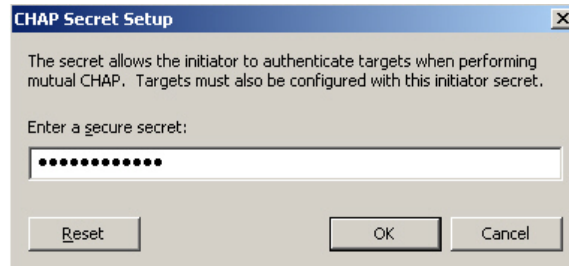


Figure C.6 CHAP Secret Setup

3. Click the **Discovery** tab (see Figure C.7).

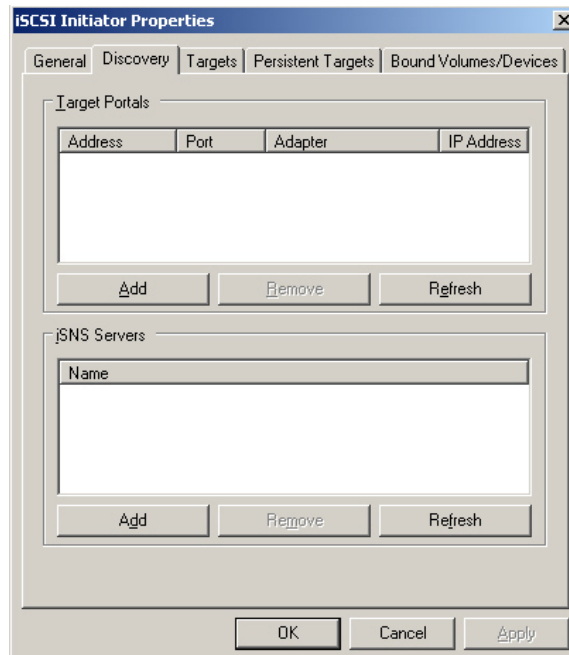


Figure C.7 iSCSI Initiator Properties

4. Microsoft iSNS Server is used for discovery of targets on an iSCSI network If iSNS is used, click the **Add** button, enter the address of the iSNS server (see Figure C.8). Then skip to step 11.

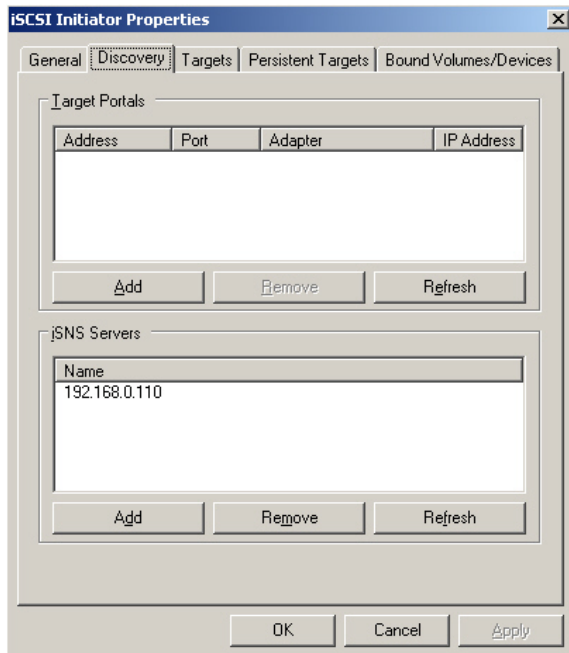


Figure C.8 iSCSI Initiator Properties (Enter the iSNS Server Address)

5. Under Target Portals, click Add button and add the target to be connected.
6. In the Add Target Portal dialog box, specify the target's Internet Protocol (IP) address and, if appropriate, change the default port number from 3260.

Note: Be sure you do not have a firewall blocking that's blocking the TCP port specified under Port.

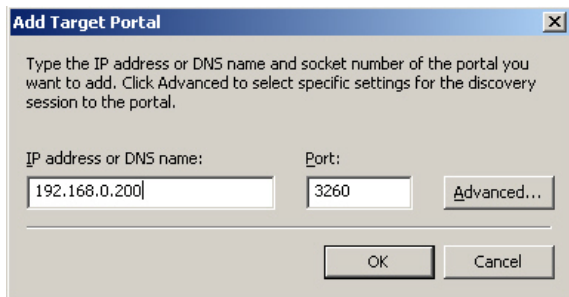


Figure C.9 Add Target Portal

7. Click the Advanced button. The Advanced Settings dialog box appears (see Figure C.10).

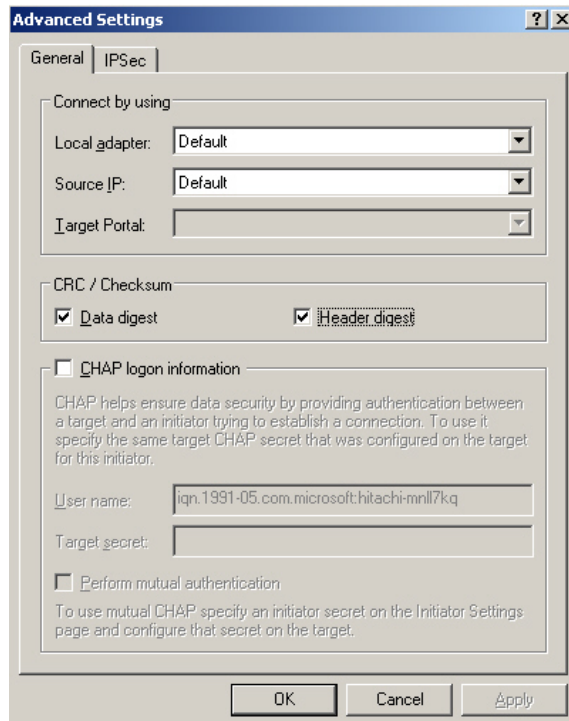


Figure C.10 Enable CRC/Checksum

8. Under **CRC/Checksum**, check **Data digest** and **Header digest**.

Note: Enabling **Header digest** may decrease performance by nearly 90%, depending on network configuration, host performance, and host applications. **iSCSI Data digest** and **Header digest** should be used with an L3 switch or router that is in the path of the hosts and DF700 iSCSI port.

9. Click the **OK** button.

Note: The DF700 iSCSI does not support CHAP authentication in the discovery session.

10. Click the **OK** button. The iSCSI Initiator Properties dialog box reappears (see Figure C.11).

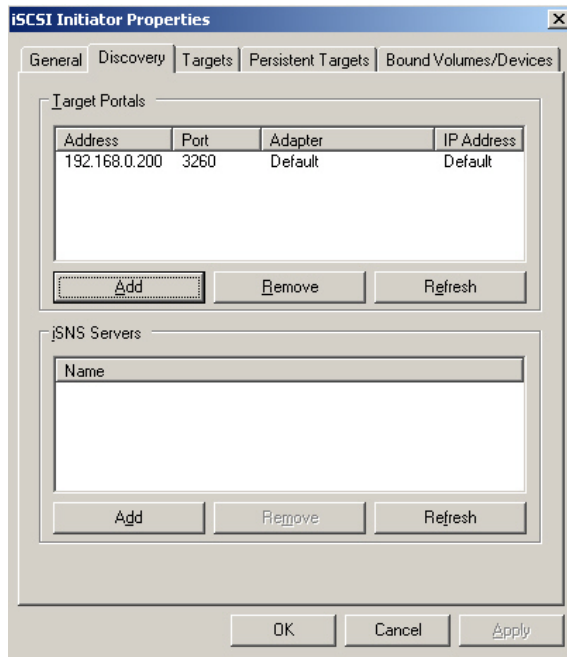


Figure C.11 iSCSI Initiator Properties

11. Click the Targets tab. You will see that the target is available, but the status is inactive (see Figure C.12).

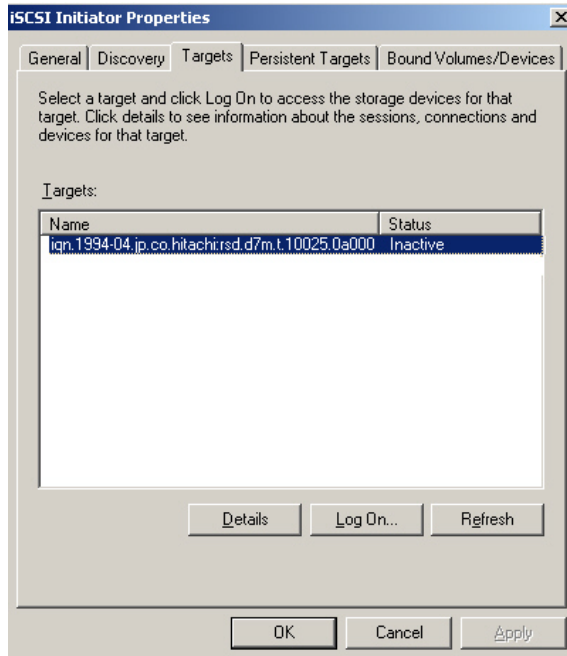


Figure C.12 iSCSI Initiator Properties

12. Select the target to login from the displayed target, then click the Log On button. The Log On to Target dialog box appears (see Figure C.13).

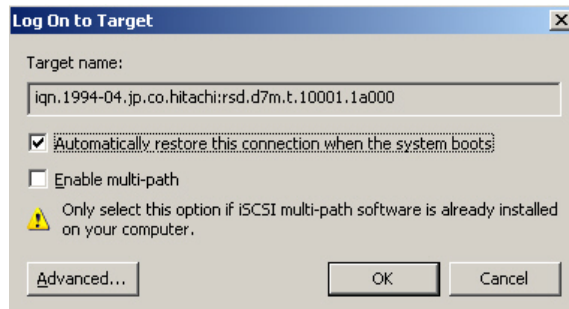


Figure C.13 Log On to Target

13. To reboot the host each time a reconnection is performed automatically, check **Automatically restore this connection when the system boots** (see Figure C.13).
14. Click the **Advanced** button.
15. Under **CRC /Checksum**, check **Data digest** and **Header digest** (see Figure C.14).

Note: Enabling **Header digest** may decrease performance by nearly 90%, depending on network configuration, host performance, and host applications. **iSCSI Data digest** and **Header digest** should be used with an L3 switch or router that is in the path of the hosts and DF700 iSCSI port.

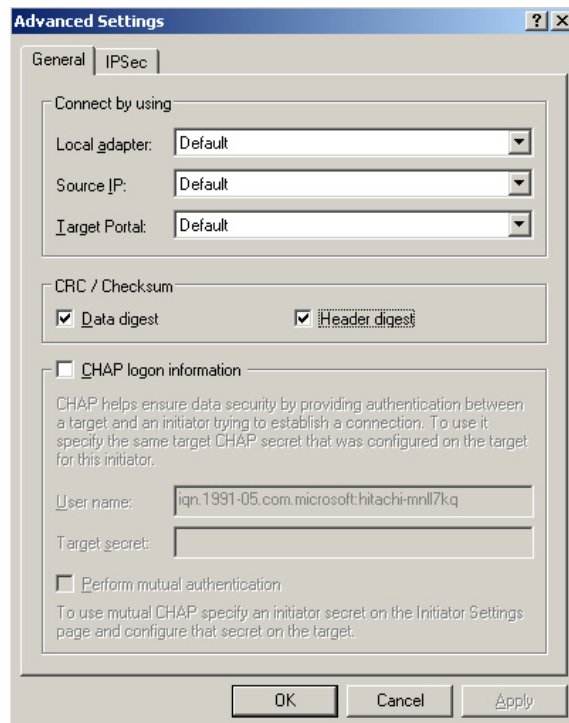


Figure C.14 Advanced Settings – Screen 1

16. If the CHAP authentication will be performed at login from this initiator, click CHAP Logon Information. Then enter the username and target secret in the appropriate fields (see Figure C.15). The length of the secret security key must be from 12-characters (96 bits) to 16-characters.
17. If mutual authentication is to be performed, click **Perform mutual authentication** and specify as the secret the same host secret entered in step 2.

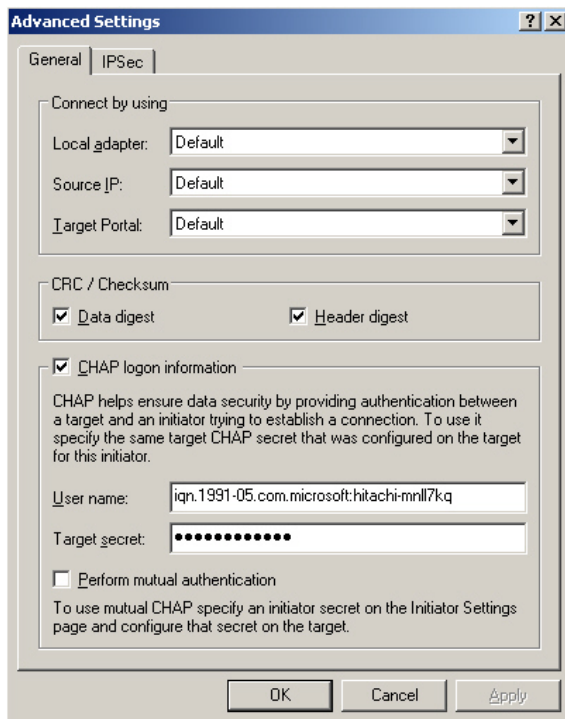


Figure C.15 Advanced Settings – Screen 2

18. Click the OK button. The Targets tab reappears.
19. Under Targets, verify that the status of the selected target became Connected (see Figure C.16).

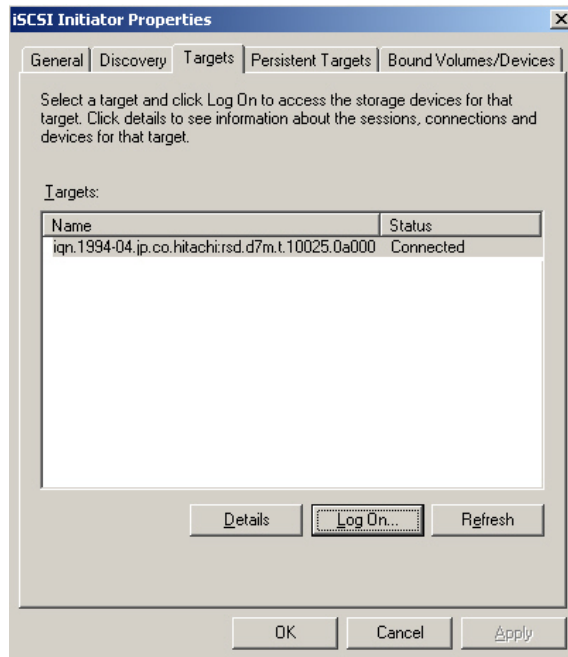


Figure C.16 iSCSI Initiator Properties

20. Click the OK button.

Disk drive authentication and formatting for iSCSI are the same as drives connected via fibre channel. Perform the appropriate processing for the added disk drive from **Control Panel → Management Tool → Computer Management → Disk Management**.

Note: If the setting of the partition and the format are performed in the area where the data is already stored, the data will be destroyed. Perform these procedures after verifying that there is no valuable data stored in the target area where these operations are to be performed.

Acronyms and Abbreviations

AL	arbitrated loop
AL-PA	arbitrated loop physical address
CLI	Command Line Interface
FC	fibre channel
GUI	graphical user interface
HBA	host bus adapter
HDS	Hitachi Data Systems
I/O	input/output
LDEV	logical device
LU	logical unit
LUN	logical unit number, logical unit
LUSE	LU Size Expansion
MB	megabyte
NTFS	NT File System
OFC	open fibre control
PC	personal computer system
SCSI	small computer system interface

