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UltraSCSI Hard Disk Drive Storage Solution for Windows NT Clusters

*Storage***Works**

Application Note
EK–SMA14–AN. C01

This Application Note explains requirements and installation of StorageWorks Deskside Storage Enclosures and StorageWorks Building Blocks (SSBs – hard drive system building blocks), in a Windows NT Cluster environment. Visit Our Web Site for the Latest Information

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Check our web for the latest drivers, technical tips, and documentation. We can be found in the technical area of our web page:

http://www.storage.digital.com/

> **NOTE**
>
> This Application Note applies to DIGITAL Clusters for Windows NT (DIGITAL P/N QB-53V9A-5A) and Microsoft Cluster Server (MSCS - included with Windows NT Enterprise Server Edition) on Intel platforms.

Introduction

Windows NT Clusters provides a high-availability solution for today's PC client/server LANs. It enables two Windows NT Intel systems to be coupled together, via a shared SCSI, to create a single system environment, or cluster. End-users have access to all the cluster resources, such as shared disks, file shares, and database applications, without having to know the names of the individual servers in the cluster. If one server system fails, the second server in the cluster immediately assumes its workload, reconnects clients, and fails over shared storage and file shares.

Digital Equipment Corporation's StorageWorks family of storage subsystem products is the ideal storage solution for Windows NT Clusters installations. The StorageWorks family easily adapts to different configurations as well as being extensible and expandable to support changing computing needs. StorageWorks components are qualified, warranted, and supported by DIGITAL in Windows NT Cluster environments.

This note focuses on the UltraSCSI Deskside Storage Enclosure (BA356-KH) and UltraSCSI wide disk drives (RZ1BB-VW, RZ1CB-VW, RZ1CD-VW, RZ1DB-VW, and RZ1EF-VW). For additional information about configuring UltraSCSI storage subsystems, refer to the *UltraSCSI Configuration Guideline* (EK-ULTRA-CG.)

The use of differential components – differential SCSI Adapters, differential converters, and differential cabling, is specified for this application. Use of differential components allows the SCSI bus interconnect length to approach 25 meters, an advantage when creating a clusters configuration.

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1 SETUP – UltraSCSI Wide Dual BA356-KH Configuration

1.1 Configuring the Shared Servers/Storage Enclosure SCSI Bus Interconnect

The components of the cluster are connected through the SCSI bus. The recommended configuration for two BA356-KH StorageWorks Wide Deskside Expansion Enclosures is shown below. Figure 1 shows the storage enclosures connected at each end of the shared differential SCSI bus.

The differential end-of-bus termination is provided by the Differential UltraSCSI Personality module (See Figure 2) located in the Deskside Expansion Enclosures. DIP switches located on the Differential UltraSCSI Personality module are set to enable SCSI bus termination and to specify the enclosure device IDs (See Figure 3).

Figure 1 Dual BA356-KH Enclosure Configuration for Windows NT Clusters
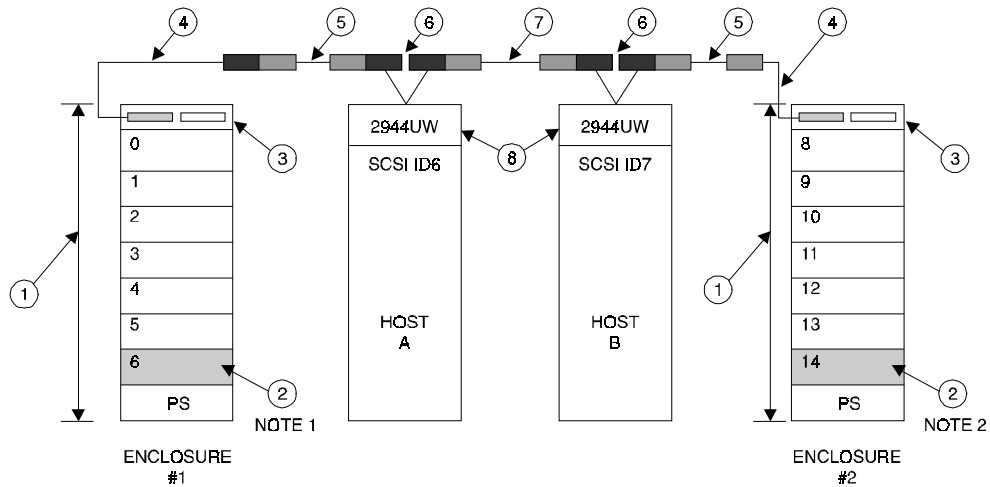
NOTES

1. Enclosure #1/SCSI ID6 may **only** be used for a redundant power supply.
2. Enclosure #2/SCSI ID14 may be used for a redundant power supply **or** a disk drive.

Table 1 Parts List for Dual BA356-KH Enclosure Configuration

KEY	PART NUMBER	QUANTITY	DESCRIPTION
1	BA356-KH	2	UltraSCSI Wide Differential Deskside Expansion Enclosure (includes 1 Power Supply - BA35X-HH, and a Differential UltraSCSI Personality module – BA35X-DA)
2	BA35X-HH	1	2nd power supply (180 watts) – for redundancy
3	DS–BA35X–DA	2	Differential UltraSCSI Personality Module∗
4	DS–BN37A–05	2	5.0 meter VHDCI male to VHDCI male∗∗
5	DS–BN38E–0B	2	0.2 meter VHDCI female to Straight HD68 male
6	DS–BN21W–0B	2	"Y" Cable, 0.15 meter, one HD68 male to two HD68 females
7	DS–BN21K–05	1	5.0 meter HD68 male to Right HD68 male∗∗
8	SWXA3-BD	2	PCI to SCSI, Ultra Wide, Differential Host Adapter

∗   The Differential UltraSCSI Personality module is part of the BA356-KH UltraSCSI Wide Differential Deskside Expansion Enclosure. The BA356-KH UltraSCSI Wide Differential UltraSCSI enclosure will accept only one Personality module.

∗∗ The sum of the lengths of these cables <u>must not</u> exceed 24 meters.

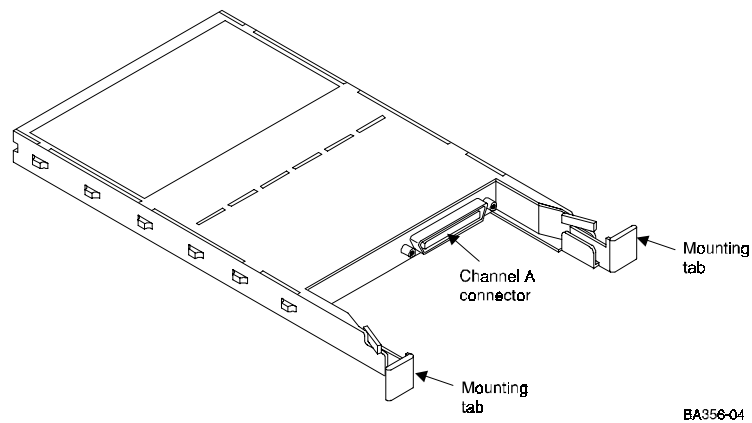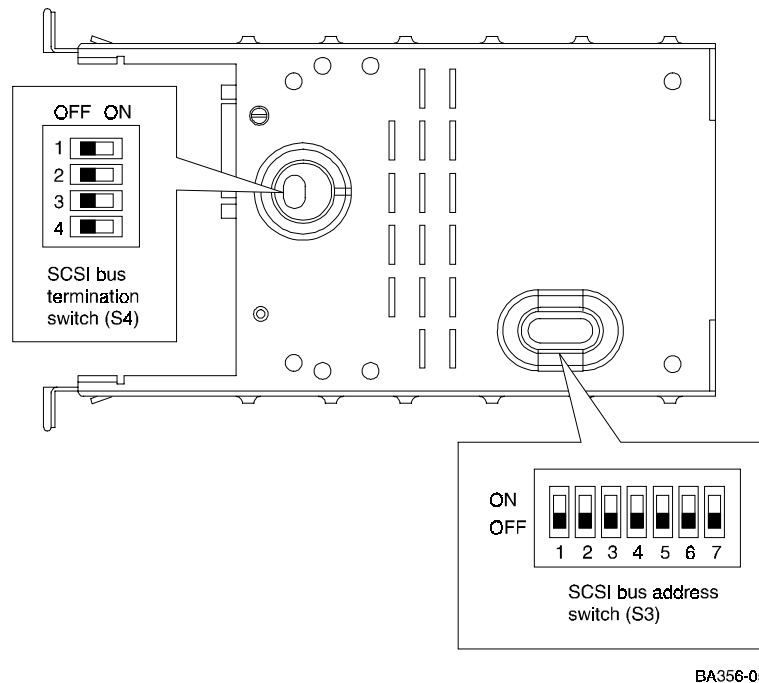**Figure 2 Differential UltraSCSI Personality Module (Bottom view)**

BA356-04

Figure 3 DIP Switch Location on Differential UltraSCSI Personality Module (Top view)

BA356-05

NOTE

Switch position may be described as "ON", "OFF", "CLOSED", or "OPEN". In this Application Note:

      "ON" = "CLOSED"
      "OFF" = "OPEN"

In all cases the SCSI bus termination switch (S4) will have all four DIP switches in the "OFF" position. The SCSI bus address switch (S3) will have all seven DIP switches in the "OFF" position for the enclosure with SCSI ID0 through SCSI ID5. The SCSI bus address switch (S3) will have DIP switches 1, 2, and 3 in the "ON" position and switches 4, 5, 6, and 7 in the "OFF" position for the enclosure with SCSI ID8 through SCSI ID14. Refer to Figure 3 and Table 2.

Table 2 DIP Switch Settings for Differential UltraSCSI Personality Module

DIP Switch Number	Switch S3 for SCSI IDs 0–5	Switch S3 for SCSI IDs 8–14	Switch S4 for Bus Termination
1	OFF	ON	OFF
2	OFF	ON	OFF
3	OFF	ON	OFF
4	OFF	OFF	OFF
5	OFF	OFF	N/A
6	OFF	OFF	N/A
7	OFF	OFF	N/A

1.2 UltraSCSI Wide Dual StorageWorks Deskside Enclosure Application (BA356-KH) With Windows NT Clusters

- Applies to DIGITAL part number BA356-KH
- Two storage enclosures per SCSI bus
- Up to 13 drives
- UltraSCSI Wide disk drives
- Uses one Differential UltraSCSI Personality module BA35X-DA per enclosure

Table 3 Compatible Disk Drives Parts List

StorageWorks Part Number	Description	Spindle Speed	Quantity
DS-RZ1BB-VW	2.10 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 13 drives
DS-RZ1CB-VW	4.29 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 13 drives
DS-RZ1CD-VW	4.29 GB UltraSCSI Wide Disk Drive	10000 rpm	up to 13 drives
DS-RZ1DB-VW	9.10 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 13 drives
DS-RZ1EF-VW	18.2 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 13 drives

2.0   SETUP – UltraSCSI Wide Single BA356-KH Configuration

2.1 Configuring the Shared Servers/Storage Enclosure SCSI Bus Interconnect

The components of the cluster are connected through the SCSI bus. The recommended configuration for the StorageWorks Deskside Expansion Enclosure (BA356-KH) is shown in Figure 4.

The figure shows the subsystem connected at one end of the shared differential SCSI bus. The differential end-of-bus termination is provided by the Differential UltraSCSI Personality module located in the Deskside Expansion Enclosure. DIP switches located in the Differential UltraSCSI Personality module are set to enable SCSI bus termination and to specify the enclosure device IDs.

Figure 4 Single BA356-KH Enclosure Configuration with Clusters for Windows NT
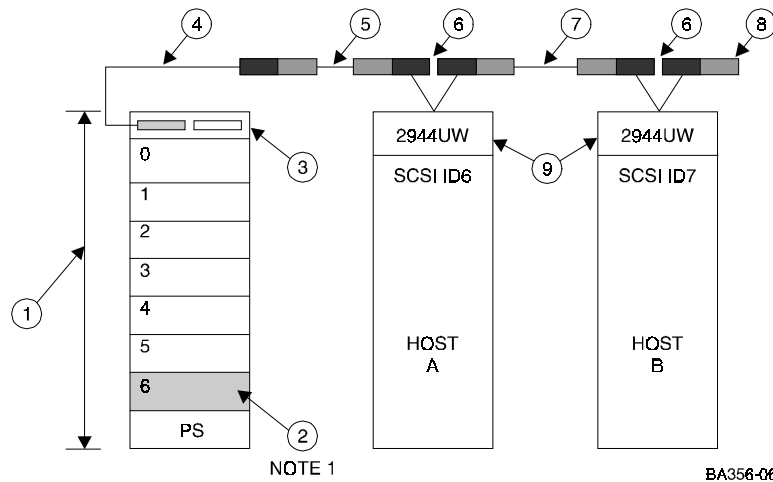
NOTE 1:

Enclosure SCSI ID6 cannot be used for a disk drive because that ID is taken by the host. It may be used as a redundant power supply position.

Table 5 Parts List for Single BA356-KH Enclosure Configuration

KEY	PART NUMBER	QUANTITY	DESCRIPTION
1	BA356-KH	1	UltraSCSI Wide Differential Deskside Expansion Enclosure (includes 1 Power Supply - BA35X-HH, and a Differential UltraSCSI Personality module – BA35X-DA)
2	BA35X-HH	1	2nd power supply (180 watts) – for redundancy
3	DS–BA35X–DA	1	Differential UltraSCSI Personality Module∗
4	DS–BN37A–05	1	5.0 meter VHDCI male to VHDCI male∗∗
5	DS–BN38E–0B	1	0.2 meter VHDCI female to Straight HD68 male
6	DS–BN21W–0B	2	"Y" Cable, 0.15 meter, one HD68 male to two HD68 females
7	DS–BN21K–05	1	5.0 meter HD68 male to Right HD68 male∗∗
8	H879–AA	1	HD68 SCSI-3 Wide Differential Terminator (male)
9	SWXA3-BD	2	PCI to SCSI, Ultra Wide, Differential Host Adapter

∗ The Differential UltraSCSI Personality module is part of the BA356-KH UltraSCSI Wide Differential Deskside Expansion Enclosure. The BA356-KH UltraSCSI Wide Differential UltraSCSI enclosure will accept only one Personality module.

∗∗ The sum of the lengths of these cables <u>must not</u> exceed 24 meters.

2.2 StorageWorks Deskside Enclosure Application (BA356-KH) for Windows NT Clusters

- Applies to DIGITAL part number BA356-KH

- Limit of one shelf per SCSI bus

- Up to 6 SCSI drives per Figure 4

- One Differential UltraSCSI Personality module BA35X-DA per enclosure

Table 6 Compatible Disk Drives Parts List

StorageWorks Part Number	Description	Spindle Speed	Quantity
DS-RZ1BB-VW	2.10 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 6 drives
DS-RZ1CB-VW	4.29 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 6 drives
DS-RZ1CD-VW	4.29 GB UltraSCSI Wide Disk Drive	10000 rpm	up to 6 drives
DS-RZ1DB-VW	9.10 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 6 drives
DS-RZ1EF-VW	18.2 GB UltraSCSI Wide Disk Drive	7200 rpm	up to 6 drives

3.0   Adapter Setup

- Differential end-of-bus termination is provided by the BA35X-DA.
- Single ended end-of-bus internal shelf termination is provided by the BA35X-DA Personality module in each Deskside Expansion Enclosure.

For each Adaptec 2944UW, the SCSI*Select* utility must be invoked (Ctrl A) from each host to:

- select SCSI ID 6 or 7 (each adapter must be different)
- disable Power-On Reset
- set host adapter SCSI termination to Low Off/High Off

3.1 Installing an Adaptec Host Adapter (Intel Systems)

To install an Adaptec 2944UW host adapter into a PC host server, follow these steps:

1. Turn off power to the PC server and disconnect the power cord.
2. Consult the PC server documentation to remove the cover of the server case.
3. Remove the host adapter from the anti-static bag. (If you need to put the host adapter down, place it on top of the bag).
4. Remove the bulkhead cover of an empty 5-volt PCI bus mastering slot.
5. Insert the host adapter into the slot as show in Figure 5.
6. Press down on the host adapter firmly, so the contacts are securely seated in the slot.
7. Tighten the host adapter against the server frame with the screw shown in Figure 5.

Repeat steps 1 through 7 to install a host adapter in the second host system.

Figure 5 Installing an Adaptec Host Adapter
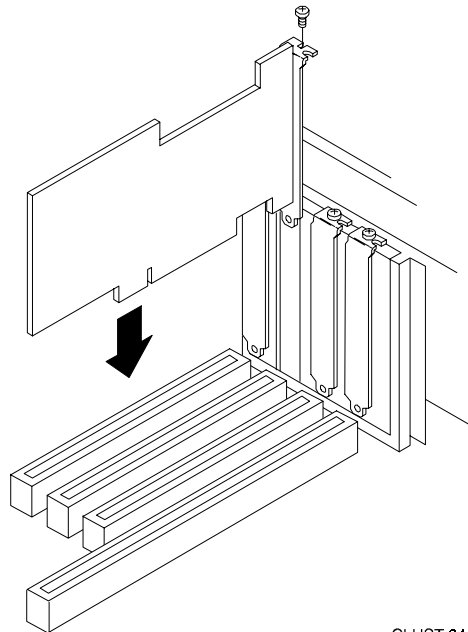
CLUST-04

3.2 Adaptec Host Adapter Configuration

Run the Host Adapter Utility to set a unique SCSI ID for each host adapter. Set the host adapter in Host A to SCSI ID 6 and the host adapter in Host B to SCSI ID 7.

Deactivate the on-board termination and disable the power-on reset of an Adaptec Host Adapter using the Adaptec SCSI*Select* Utility.

3.3 Setting Adaptec Host Adapter SCSI IDs

To set the SCSI ID for a host adapter, follow these steps:

> **NOTE**
>
> The following special condition applies to invoking the SCSI *Select* Utility as described in Step 1.

1. Turn on the power to Host A. While the server boots, simultaneously press the **Ctrl** and **A** keys to invoke the SCSI*Select* Utility. The SCSI*Select* Utility option menu is displayed.

2. Highlight the `Configure/View Host Adapter Settings` option and press the **Enter** key to select. The configuration menu is displayed.

3. The `Host Adapter SCSI ID` option appears highlighted. Press the **Enter** key and a list of SCSI IDs is displayed.

4. Highlight 6 (for Host A) or 7 (for Host B) and press the **Enter** key.

5. Go to 3.4 *Deactivating On-Board Termination through the BIOS*.

3.4 Deactivating On-Board Termination through the BIOS

To deactivate on-board termination with the SCSI*Select* Utility, follow these steps:

1. Highlight the Host Adapter SCSI Termination option and press the **Enter** key. A list of termination settings is displayed.

2. Highlight `Low Off/High Off` and press the **Enter** key.

3. Go to 3.5 *Disabling Power-On Reset.*

3.5 Disabling Power-On Reset

To disable power-on reset, follow these steps:

1. Highlight `Advanced Configuration Options` from the SCSI*Select* Utility Configuration menu and press the **Enter** key. The Advanced configuration menu is displayed.

2. Highlight the `Reset SCSI Bus at IC Initialization` option. Press the **Enter** key. A list of reset options is displayed.

3. Highlight `Disabled` and press the **Enter** key.

4. Press the **Esc** key to return to the Configuration menu.

5. Press the **Esc** key again and save the changes that you made when prompted.

6. Press the **Esc** key to exit the SCSISelect Utility.

Go back to the following sections:

1. 3.3 *Setting Adaptec Host Adapter SCSI IDs* and repeat same steps on Host B.

2. 3.4 *Deactivating On-Board Termination through the BIOS*.

3. 3.5 *Disabling Power-On Reset*, then go to 3.6 *Booting Windows NT*.

3.6 Booting Windows NT

Boot Windows NT on both servers if Windows NT did not already boot when you exited the host adapter BIOS.

3.7 Installing Adaptec Host Adapter Device Drivers

To install Adaptec host adapter device drivers, follow these steps (Adaptec Windows NT diskette contains the appropriate drivers):

1. Log onto the Windows NT system with Administrator privileges.

2. Click on the `Windows NT Setup` icon in the main program group.

3. Select the `Options` menu in the Windows NT Setup window.

4. Select the `Add/Remove SCSI Adapter` function.

5. Click on the `Add` button in the dialog box.

6. A warning message is displayed; click on the `OK` button in the `Confirm` box.

7. From the list of adapters on the display, scroll to the end of the list, and select `Other`. You may have to click on the list to reveal all of the options including the "`Other`" option. The `Insert Disk` window is displayed.

8. Insert the Adaptec Family Driver set diskette for Windows NT, which came with the adapter in your platform kit, into your system's floppy drive.

9. Type, for example: **A:\winnt\4_0** and click OK. Windows NT Setup momentarily displays a window and then displays the Select OEM Option window.

10. Click OK to select the driver entry displayed in the Select OEM Option window. The Select SCSI Adapter Option window is displayed.

11. Click Install to add the selected driver displayed in the Select SCSI Adapter Option window. The SCSI Adapter Setup Window is displayed.

12. Click Close to close the SCSI Adapter Setup Window.

13. Restart the server for the new driver to take effect.

Repeat steps 1–13 on the other server.

4.0 Verifying Adapter Installation

4.1 Two Intel-based Servers (Adaptec 2944UW)

1. Boot NT Operating System for Host A.

2. Verify that the 2944UW banner is displayed signifying that the System has properly configured the 2944UW adapter.

3. After NT boots, launch Disk Administrator and verify that either formatted or raw partitions exist for each of the devices you have configured on the shared bus.

> **NOTE**
>
> See Windows NT manual for information on partition assignments with Windows NT Disk Administrator Host A/Host B.

4. Partition and format drives.

5. Boot NT Operating System for Host B

6. Again verify that the 2944UW banner is displayed indicating that the System has properly configured the 2944UW adapter

7. Launch Disk Administrator. Verify that formatted partitions exist for each of the devices you have configured on the shared bus.

8. Go to Cluster Management software to complete the procedures for creating your Windows NT cluster.

5.0 Installing Windows NT Clusters Software

See that product's documentation for further instructions.