

TruCluster Software Products

Hardware Configuration Technical Update for StorageWorks RAID Array 3000

January 1999

Product Version: TruCluster Production Server
Software Version 1.5 and TruCluster
Available Server Software Version 1.5

Operating System and Version: Compaq's DIGITAL UNIX Version
4.0D

This technical update describes how to configure the hardware for the TruCluster Production Server Software Version 1.5 and TruCluster Available Server Software Version 1.5 products with a StorageWorks RAID Array 3000 storage subsystem.

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About This Technical Update

This technical update provides important information about using the StorageWorks RAID Array 3000 (RA3000) with the TruCluster Production Server Software Version 1.5 and TruCluster Available Server Software Version 1.5 products.

Audience

If your plans to configure the hardware for TruCluster Production Server Software Version 1.5 or TruCluster Available Server Software Version 1.5 include a StorageWorks RAID Array 3000 (RA3000) storage subsystem, read this addendum to the TruCluster Software Products *Hardware Configuration* manual.

Organization

This technical update contains:

- An introductory chapter
- A chapter covering the configuration of the TruCluster Production Server Software Version 1.5 and TruCluster Available Server Software Version 1.5 products using a StorageWorks RAID Array 3000 storage subsystem
- A chapter covering the cable reconfiguration necessary within the RA3000 pedestal when the expansion pedestal option is added

Introducing the StorageWorks RAID Array 3000 Storage Subsystem

This technical update to the TruCluster Software Products *Hardware Configuration* manual provides important information about support for the StorageWorks RAID Array 3000 (RA3000) with the TruCluster Production Server Software and TruCluster Available Server Software Version 1.5 products.

1.1 StorageWorks RAID Array 3000 General Overview

The StorageWorks RAID Array 3000 (RA3000) is a low-end, standalone UltraSCSI RAID subsystem that incorporates the latest in RAID technology. It supports RAID levels 0, 1, 0+1, 4, 5, and JBOD disks.

The RA3000 storage subsystem has fully redundant components to eliminate single points of failure. It comes with a standard uninterruptible power supply (UPS) for cache data protection during power outages.

The RA3000 uses the dual-ported HSZ22 controller. Optional dual redundant controllers with mirrored write-back cache provide maximum data integrity.

The StorageWorks Command Console (SWCC) V2.0 (or higher) client graphical user interface (GUI) runs on a Microsoft® Windows® 95 or Windows NT® PC connected directly to the RA3000 by a serial line.

After the first virtual disk has been created, you can also communicate with your RAID Array 3000 over a TCP/IP network provided the V2.0 (or higher) SWCC Agent has been installed on the Digital UNIX member system.

The RA3000 is available as:

- DS-SWXRA-GH—A rackmount subsystem (standard RETMA or metric cabinet) containing a controller shelf with one HSZ22 controller, an uninterruptible power supply (UPS), two host I/O modules, a device I/O module, and one 6-slot device expansion shelf. Up to three additional expansion shelves (DS-SWXRA-GN) may be added to provide a maximum of 24 storage devices.
- DS-SWXRA-GA—A deskside pedestal subsystem that includes one HSZ22 controller. The base pedestal accommodates up to seven storage

devices. The included battery backup subsystem is a free-standing UPS. An expansion pedestal option (DS-SWXRA-GD) increases the storage capacity of the subsystem to 14 storage devices.

A second HSZ22 controller option (DS-HSZ22-AA) can be added to either RA3000 subsystem.

1.2 RAID Array 3000 Restrictions

The following restrictions are imposed for initial support of the StorageWorks RAID Array 3000 (RA3000) subsystem on TruCluster Software Products:

- The RA3000 is only supported on TruCluster Production Server Software Version 1.5 and TruCluster Available Server Software Version 1.5 with Compaq's DIGITAL UNIX Version 4.0D after installation of the following operating system patch. The DIGITAL UNIX and TruCluster patches are included in one kit.
 - Compaq's DIGITAL UNIX and TruCluster Patch Kit #3:
DUV40DAS00003-19981208.tar (or later)

The patch may be obtained from the Software Patch (ECO) Access Web site by selecting Browse Patch Tree at the following URL:

<http://www.service.digital.com/patches/>
- The HSZ22 requires Version D11s firmware.
- StorageWorks Command Console (SWCC) Revision 2.0 (or higher) is required.
- The following member systems are supported:
 - AlphaServer 800
 - AlphaServer 1000A
 - AlphaServer 1200
 - AlphaServer 4x00
- The member systems require system SRM console firmware from the Alpha Systems Firmware 5.3 Update CD.
- The KZPBA-CB UltraSCSI host adapter is the only SCSI bus host adapter supported with the RA3000 with the TruCluster products. The KZPBA-CB requires ISP 1020/1040 firmware Version 5.57, available with the system SRM console firmware on the Alpha Systems Firmware 5.3 Update CD.
- The controller will not operate without at least one 16 MB SIMM installed in its cache.

- The device expansion shelf (DS-SWXRA-GN) for the rackmount version must be at revision level B01 or higher.
- The DS-BA35X-FA single-ended personality module used in the DS-SWXRA-GN UltraSCSI storage expansion shelves must be at revision H01 or higher.

2

Using the StorageWorks RAID Array 3000 in a TruCluster Configuration

This chapter describes how to install the hardware for a TruCluster Production Server Software or TruCluster Available Server Software configuration which includes the StorageWorks RAID Array 3000 (RA3000) storage subsystem.

2.1 RA3000 Installation Overview

Review the restrictions in Section 1.2 before installing any TruCluster Production Server Software or TruCluster Available Server Software hardware.

See the following TruCluster Software Products manuals for assistance in cluster configuration, installation, and administration:

- *Hardware Configuration*—Describes how to set up the systems that are to become cluster members, and how to configure cluster shared storage.
- *Software Installation*—Describes how to install TruCluster Software products.
- *Administration*—Describes administration tasks, such as those required to set up an ASE. It also shows how to configure, start, and manage distributed raw disk (DRD) services and other available services.

See the following TruCluster technical updates:

- *Hardware Configuration Technical Update for DS-DWZZH-03 UltraSCSI Hub*
- *Hardware Configuration Technical Update for DS-DWZZH-05 UltraSCSI Hub*
- *Hardware Configuration Technical Update for KZPBA-CB*

These technical updates may be obtained from the Web at the following URL:

http://www.unix.digital.com/faqs/publications/pub_page/update_list.html

See the following StorageWorks manuals for more information on the StorageWorks RAID Array 3000 or UltraSCSI configuration:

- *Command Console V2.0 for RAID Array 3000 User's Guide* (AA-RBF2A-TE)—A graphical user interface (GUI) for managing StorageWorks RAID products from a console running on a Windows 95 or Windows NT PC.
- *Getting Started RAID Array 3000 for Digital UNIX Installation Guide* Describes how to unpack and set up your RA3000 subsystem components, how to prepare your host system for use with the RA3000, how to install the SWCC and create your first virtual disk, and how to communicate over a TCP/IP connection.
- *StorageWorks RAID Array 3000 Controller Shelf Hardware User's Guide* (EK-SMCPQ-UG)—Provides an overview and physical description and describes the major features and characteristics of the RA3000 rack mount subsystem. It also provides installation and cabling procedures.
- *RAID Array 3000 Storage Subsystem Hardware User's Guide* (EK-SMCPO-UG)—Provides an overview and physical description of the RA3000 pedestal subsystem and describes how to install the expansion pedestal option and how to convert the UltraSCSI bus in the base pedestal from a split-bus to a through-bus configuration.
- *RAID Array 3000 Storage Subsystem Second Controller Option Installation Guide* (EK-SM3KC-IG)—Includes the steps required to install a second HSZ22 controller option in the pedestal or controller shelf enclosures. This includes saving the existing configuration using the StorageWorks Command Console (SWCC), upgrading the firmware, and installing the cache memory SIMM modules to accommodate the second controller.
- *RAID Array 3000 Storage Subsystem Expansion Pedestal Option Installation Guide* (EK-SM3KA-IG)—Describes how to install the expansion pedestal option and how to convert the UltraSCSI bus in the base pedestal from a split-bus to a through-bus configuration. The information in this guide is basically a reprint of Chapter 4 from the *RAID Array 3000 Storage Subsystem Hardware User's Guide*.
- *UltraSCSI Configuration Guidelines* (EK-ULTRA-CG)—Provides UltraSCSI configuration rules and describes UltraSCSI components.
- *StorageWorks Solutions BA356-SB 16-Bit Shelf User's Guide* (EK-BA356-UG)—Describes the major StorageWorks 16-bit components (such as shelves, power units, StorageWorks building blocks (SBBS) and SCSI buses, personality modules, and cables), status displays, specifications, and replacement procedures.
- *StorageWorks SBB Shelf I/O Modules User's Guide* (EK-SBBIO-UG)—Describes the 8-bit and 16-bit shelf I/O modules that can be used with the BA356-series 16-bit SBB storage shelves.

The following sections describe how to install and configure the hardware for a TruCluster Production Server Software or TruCluster Available Server Software configuration that includes the StorageWorks RAID Array 3000 subsystem.

2.2 Installing and Configuring a TruCluster Configuration with a StorageWorks RAID Array 3000

This section provides details on how to install and configure the hardware to support the StorageWorks RAID Array 3000 (RA3000) in a TruCluster configuration.

The qualification and use of the DS-DWZZH-series UltraSCSI hubs in TruCluster configurations allows the cluster to be cabled in two different ways:

- Preferred method with radial connection to a DWZZH UltraSCSI hub and internal termination: The KZPBA-CB internal termination resistor SIPs are not removed. The host adapters are connected directly to a DWZZH UltraSCSI hub port. There can be only one member system or controller port connected to each hub port.

The use of a DWZZH UltraSCSI hub in a TruCluster configuration is preferred because it:

- Improves the reliability of the detection of cable faults
 - Provides for automatic termination of the UltraSCSI bus upon a fault or cable removal
 - Is easier to cable the configuration, and therefore less prone to human error
- Old method with external termination: Shared SCSI bus termination is external to the KZPBA-CB UltraSCSI host adapter. This is the old method used to connect a PCI SCSI adapter to the cluster; remove the adapter termination resistor SIPs and install a BN21W-0B Y cable and an H879-AA terminator for external termination. This allows the removal of a SCSI bus cable from the host adapter without affecting SCSI bus termination.

This method may be used with or without a DWZZH UltraSCSI hub with the following restrictions:

- You may use external termination and Y cables with a DWZZH-03 UltraSCSI hub to achieve a 4-member cluster configuration.
- You may not use external termination and Y cables with a DWZZH-05 UltraSCSI hub.

Follow the steps in Table 2-1 to start the procedure to configure the hardware for a TruCluster Production Server or TruCluster Available

Server configuration using an RA3000 storage subsystem. For TruCluster Available Server Software, skip the first step as you do not use Memory Channel. Also, you may save time by installing the Memory Channel adapters, redundant network adapters (if applicable), as well as the KZPBA-CB UltraSCSI host adapters all at the same time.

Follow the directions in the referenced documentation, or the steps in the referenced sections and tables at each step, returning to Table 2–1 when you have completed the steps in the referenced section or table.

Table 2–1: Configuring TruCluster Hardware for Use with the RA3000

| Step | Action | Refer to: |
|------|---|--|
| 1 | Power down the system and install the Memory Channel module(s), cables, and hub(s), if a hub is required. | TruCluster Software Products <i>Hardware Configuration</i> Chapter 5 ^a b |
| 2 | Install network adapters if required to provide network failover for TruCluster Available Server Software. Install Ethernet or FDDI network adapters. Install ATM adapters if using ATM. | User's guide for the applicable Ethernet or FDDI adapter, and the user's guide for the applicable system <i>ATMworks 350 Adapter Installation and Service</i> |
| 3 | KZPBA-CB termination The preferred method of radial connection to a DWZZH: Ensure that the eight KZPBA-CB internal termination resistor SIPs, RM1 - RM8, are installed Using external termination and Y cables: Remove the eight KZPBA-CB internal termination resistor SIPs, RM1 - RM8 | <i>KZPBA-CB PCI-to-Ultra SCSI Differential Host Adapter User's Guide</i> Section 2.2.2 and Figure 2–1 Section 2.2.2 and Figure 2–1 |
| 4 | Install the KZPBA-CB UltraSCSI host adapter in the PCI slot corresponding to the logical bus to be used for the shared SCSI bus. Ensure that the number of adapters are within limits for the system, and that the placement is acceptable. | <i>KZPBA-CB PCI-to-Ultra SCSI Differential Host Adapter User's Guide</i> |

Table 2–1: Configuring TruCluster Hardware for Use with the RA3000 (cont.)

| Step | Action | Refer to: |
|------|--|---|
| 5 | Power up the system and use the <code>show config</code> and <code>show device console</code> commands to display the installed devices and information about the KZPBA-CBs on the AlphaServer systems. Look for QLogic ISP1020 in the <code>show config display</code> and <code>isp</code> in the <code>show device display</code> to determine which devices are KZPBA-CBs. | Section 2.2.3 and Example 2–1 through Example 2–4 |
| 6 | If necessary, update the SRM firmware. | Firmware release notes for the system (see Section 2.2.1) |

Note

The SRM console firmware includes the ISP1020/1040-based PCI option firmware, which includes the KZPBA-CB. When you update the SRM console firmware, you are enabling the KZPBA-CB firmware to be updated. On a power-up reset, the SRM console loads KZPBA-CB adapter firmware from the console system flash ROM into NVRAM for all Qlogic ISP1020/1040-based PCI options, including the KZPBA-CB PCI-to-Ultra SCSI adapter.

| | | |
|---|---|---|
| 7 | Use the <code>show pk*</code> or <code>show isp*</code> console commands to determine the KZPBA-CB SCSI bus ID, and then use the <code>set console</code> command to set the SCSI bus ID. | Section 2.2.4 and Example 2–5 through Example 2–7 |
|---|---|---|

Notes

Ensure that the SCSI ID that you use is distinct from all other SCSI IDs on the same shared SCSI bus. If you do not remember the other SCSI IDs, or do not have them recorded, you must determine these SCSI IDs.

If you are using a DS-DWZZH-05, you cannot use SCSI ID 7 for a member systems' host adapter; SCSI ID 7 is reserved for DS-DWZZH-05 use.

If you are using a DS-DWZZH-05 and fair arbitration is enabled, you must use the SCSI ID assigned to the hub port the adapter will be connected to.

You will have problems if you have two or more SCSI adapters at the same SCSI ID on any one SCSI bus.

| | |
|---|---|
| 8 | Repeat steps 1 through 7 for any other member systems. |
| 9 | Cable the member system to the RAID Array 3000 subsystem: |

Table 2–1: Configuring TruCluster Hardware for Use with the RA3000 (cont.)

| Step | Action | Refer to: |
|------|--|-----------|
| | The preferred method of radial connection to a DWZZH UltraSCSI hub | Table 2–2 |
| | Using external termination and Y cables | Table 2–3 |

^aSkip this step for the TruCluster Available Server Software product.

^bIf you install additional PCI adapters or an extra network adapter at this time, delay testing the Memory Channel adapter(s) until you have installed all hardware.

Table 2–2 provides the steps necessary to connect the member systems to an RA3000 storage subsystem using radial connection to a DWZZH UltraSCSI hub.

Notes

All configuration illustrations assume that a second, redundant HSZ22 controller is installed to achieve active/active or active/passive failover.

See the RA3000 documentation for information about configuring the storage devices.

Table 2–2: Installing Cables for RA3000 Radial Configuration with a DWZZH UltraSCSI Hub

| Step | Action | Refer to: |
|------|--|---|
| 1 | Install a BN38C HD68 to VHDCI cable between each KZPBA-CB UltraSCSI host adapter and a DWZZH port. The DWZZH accepts the VHDCI connector. ^a | Figure 2–4 through Figure 2–7 |
| 2 | Install BN37A cables: ^b | |
| | RA3000 controller shelf with active/passive failover: Install a BN37A cable between any DWZZH-03 port or the DWZZH-05 controller port and the RA3000 controller shelf Host 0 I/O module Host In port. | Figure 2–2 and Figure 2–4 |
| | RA3000 pedestal with active/passive failover: Install a BN37A cable between any DWZZH-03 port or the DWZZH-05 controller port and the RA3000 pedestal Host 0 port. | Figure 2–3 and Figure 2–5 or Figure 2–6 |

Table 2–2: Installing Cables for RA3000 Radial Configuration with a DWZZH UltraSCSI Hub (cont.)

| Step | Action | Refer to: |
|------|--|---------------------------|
| | RA3000 controller shelf with active/active or active/passive failover: Install a BN37A cable between any DWZZH-03 port or the DWZZH-05 controller port and the RA3000 controller shelf Host 0 I/O module Host In port. Install a BN37A-0E 0.5 meter cable between the Host 0 I/O module Host Out port and the Host 1 I/O module Host In port. | Figure 2–2 and Figure 2–7 |
| | RA3000 pedestal with active/active or active/passive failover: Install a BN37A cable between the DWZZH-05 controller port and the RA3000 pedestal Host 0 port. Install a second BN37A cable between a DWZZH-05 host port and the RA3000 pedestal Host 1 port. | Figure 2–3 and Figure 2–8 |

Note

If you connect a DWZZH-05 host port to an RA3000 pedestal host port to provide active/active failover, you must disable fair arbitration on the DWZZH-05 by placing the fair arbitration switch in the `DISABLE` position.

^aThe maximum length of the SCSI bus segment, including the BN38C cable and internal device length, must not exceed 25 meters.

^bThe maximum length of the SCSI bus segment, including the BN37A cables and internal device length, must not exceed 25 meters.

Table 2–3 provides the steps necessary to connect the member systems to an RA3000 storage subsystem using external termination and Y cables.

Table 2–3: Installing Cables for RA3000 Configuration Using External Termination and Y Cables

| Step | Action | Refer to: |
|------|--|--------------------------------|
| 1 | Install a BN21W-0B Y cable on each KZPBA-CB UltraSCSI host adapter to be connected to the shared SCSI bus. | Figure 2–9 through Figure 2–11 |
| 2 | Install an H879-AA terminator on one leg of the BN21W-0B Y cable of the member systems that will be on the end of the shared SCSI bus. The RA3000 controller shelf Host I/O module or pedestal provides active termination for the other end of the shared SCSI bus. | Figure 2–9 through Figure 2–11 |
| 3 | Install SCSI bus cables: | |

Table 2–3: Installing Cables for RA3000 Configuration Using External Termination and Y Cables (cont.)

| Step | Action | Refer to: |
|------|---|-------------|
| | RA3000 pedestal with active/passive failover: Install a BN38C HD68 to VHDCI cable between the BN21W-0B Y cable of one member system and the RA3000 Host 0 port. Install a BN21K, BN21L, or BN31G cable between the BN21W-0B Y cables of all other member systems. ^a | Figure 2–9 |
| | RA3000 controller shelf with active/passive failover: Install a BN38C HD68 to VHDCI cable between the BN21W-0B Y cable of one member system and the RA3000 Host 0 I/O module Host In connection. Install a BN21K, BN21L, or BN31G cable between the BN21W-0B Y cables of all other member systems. ^a | Figure 2–10 |
| | RA3000 controller shelf with active/active or active/passive failover: Install a BN38C HD68 to VHDCI cable between the BN21W-0B Y cable of one member system and the RA3000 Host 0 I/O module Host In connection. Install a BN37A-0E 0.5-meter VHDCI cable between the RA3000 controller shelf Host 0 I/O module Host Out port and the Host 1 I/O module Host In port. Install a BN21K, BN21L, or BN31G cable between the BN21W-0B Y cables of all other member systems. ^b | Figure 2–11 |
| | RA3000 mid-bus controller shelf with active/active or active/passive failover: Install a BN38C HD68 to VHDCI cable between the BN21W-0B Y cable of one member system and the RA3000 Host 0 I/O module Host In connection. Install a second BN38C HD68 to VHDCI cable between the BN21W-0B Y cable of another member system and the RA3000 Host 1 I/O module Host Out connection. This disables the termination on the Host 1 I/O module. Install a BN37A-0E 0.5-meter VHDCI cable between the RA3000 controller shelf Host 0 I/O module Host Out port and the Host 1 I/O module Host In port. The connection to Host 0 I/O module Host Out port disables the termination on that Host I/O module. Install a BN21K, BN21L, or BN31G cable between the BN21W-0B Y cables of any other member systems. ^c | Figure 2–12 |

Note

You cannot create a mid-bus configuration using a RA3000 pedestal. The member systems on one SCSI bus segment connected to the Host 0 port would see some devices. The member systems on the other SCSI bus segment connected to the Host 1 port would not be able to see the same devices.

^aThe maximum length of the SCSI bus segment, including the combined length of the BN38C and BN21K (or BN21L or BN31G) cables and internal device length, must not exceed 25 meters.

^bThe maximum length of the SCSI bus segment, including the combined length of the BN38C and BN37A cables and internal device length, must not exceed 25 meters.

Table 2–3: Installing Cables for RA3000 Configuration Using External Termination and Y Cables (cont.)

^cThe maximum length of the SCSI bus segment, including the combined length of the BN38C, BN37A-0E, and BN21K (or BN21L or BN31G) cables and internal device length, must not exceed 25 meters.

The following sections describe how to install a KZPBA-CB UltraSCSI PCI adapter in more detail. Section 2.2.5 provides illustrations of cluster configurations.

2.2.1 Obtaining the Firmware Release Notes

You may be required to update the system or SCSI controller firmware during an Available Server or Production Server installation, so you may need the firmware release notes. Obtain the firmware release notes from the current Alpha Systems Firmware Update CD-ROM.

Note

To obtain the firmware release notes from the Firmware Update Utility CD-ROM, your kernel must be configured for the ISO 9660 Compact Disk File System (CDFS).

To obtain the release notes for the firmware update follow these steps:

1. At the console prompt, or using the system startup log if the DIGITAL UNIX operating system is running, determine the drive number of the CD-ROM.
2. Boot the DIGITAL UNIX operating system if it is not already running.
3. Log in as root.
4. Place the Alpha Systems Firmware Update CD-ROM applicable to the DIGITAL UNIX version installed (or to be installed) into the drive.
5. Mount the CD-ROM as follows (/dev/rz4c is used as an example CD-ROM drive):

```
# mount -rt cdfs -o noversion /dev/rz4c /mnt
```

6. Copy the appropriate release notes to your system disk. In this example, obtain the firmware release notes for the AlphaServer 4000/4100 from the Alpha Firmware Update 3.9 CD-ROM:

```
# cp /mnt/doc/alpha4100_v48_fw_relnote.txt as4100-rel-notes
```

7. Unmount the CD-ROM drive.

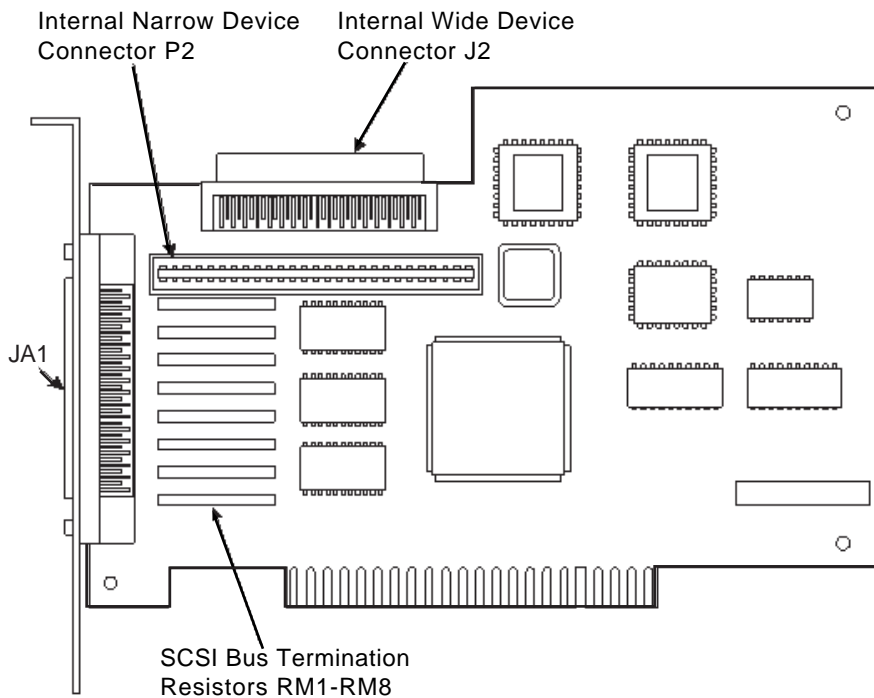
```
# umount /mnt
```

8. Print the release notes.

2.2.2 KZPBA-CB Termination Resistors

The KZPBA-CB internal termination is disabled by removing the termination resistors RM1 through RM8, as shown in Figure 2-1.

Figure 2-1: KZPBA-CB Termination Resistors



ZK-1451U-AI

2.2.3 Displaying KZPBA-CB Adapters with the show Console Commands

Use the `show config` and `show device console` commands to display system configuration. Use the output to determine which devices are KZPBA-CBs, and to determine their SCSI bus IDs.

Example 2-1 shows the output from the `show config` console command on an AlphaServer 4100 system.

Example 2-1: Displaying Configuration on an AlphaServer 4100

```
P00>>> show config
                Digital Equipment Corporation
                AlphaServer 4x00

Console V5.1-3  OpenVMS PALcode V1.19-
14, Digital UNIX PALcode V1.21-22

Module
System Motherboard          Type    Rev    Name
Memory 64 MB SYNC           0       0000  mem0
Memory 64 MB SYNC           0       0000  mem1
Memory 64 MB SYNC           0       0000  mem2
Memory 64 MB SYNC           0       0000  mem3
CPU (4MB Cache)             3       0000  cpu0
CPU (4MB Cache)             3       0000  cpu1
Bridge (IOD0/IOD1)         600     0021  iod0/iod1
PCI Motherboard             8       0000  saddle0

Bus 0  iod0 (PCI0)
Slot  Option Name           Type    Rev    Name
1     PCEB                  4828086 0005  pceb0
2     S3 Trio64/Trio32     88115333 0000  vga0
3     DECchip 21040-AA     21011   0024  tulip0
4     DEC KZPSA            81011   0000  pks1
5     DEC PCI MC           181011  000B  mc0

Bus 1  pceb0 (EISA Bridge connected to iod0, slot 1)
Slot  Option Name           Type    Rev    Name

Bus 0  iod1 (PCI1)
Slot  Option Name           Type    Rev    Name
1     NCR 53C810           11000   0002  ncr0
2     NCR 53C810           11000   0002  ncr1
3     QLogic ISP1020       10201077 0005  isp0
4     QLogic ISP1020       10201077 0005  isp1
5     DEC KZPSA            81011   0000  pks0
```

Example 2-2 shows the output from the `show config` console command entered on an AlphaServer 8200 system.

Example 2-2: Displaying Configuration on an AlphaServer 8200

```
>>> show config
      Name           Type    Rev    Mnemonic
TLSB
4++   KN7CC-AB       8014   0000   kn7cc-ab0
```

Example 2-2: Displaying Configuration on an AlphaServer 8200 (cont.)

```
5+   MS7CC           5000   0000   ms7cc0
8+   KFTIA           2020   0000   kftia0

C0  Internal PCI connected to kftia0   pci0
0+  QLogic ISP1020 10201077   0001   isp0
1+  QLogic ISP1020 10201077   0001   isp1
2+  DECchip 21040-AA 21011   0023   tulip0
4+  QLogic ISP1020 10201077   0001   isp2
5+  QLogic ISP1020 10201077   0001   isp3
6+  DECchip 21040-AA 21011   0023   tulip1

C1  PCI connected to kftia0
0+  KZPAA           11000   0001   kzpaa0
1+  QLogic ISP1020 10201077   0005   isp4
2+  KZPSA           81011   0000   kzpsa0
3+  KZPSA           81011   0000   kzpsa1
4+  KZPSA           81011   0000   kzpsa2
7+  DEC PCI MC      181011   000B   mc0
```

Example 2-3 shows the output from the `show device console` command entered on an AlphaServer 4100 system.

Example 2-3: Displaying Devices on an AlphaServer 4100

```
P00>>> show device
polling ncr0 (NCR 53C810) slot 1, bus0 PCI, hose 1 SCSI Bus ID 7
dka500.5.0.1.1   Dka500           RRD45   1645
polling ncr1 (NCR 53C810) slot 2, bus0 PCI, hose 1 SCSI Bus ID 7
dkb0.0.0.2.1   DKb0             RZ29B   0007
dkb100.1.0.2.1  DKb100           RZ29B   0007
polling isp0 (QLogic ISP1020) slot 3, bus 0 PCI, hose 1 SCSI Bus ID 7
dkc0.0.0.3.1   DKc0             HSZ70   V70Z
dkc1.0.0.3.1   DKc1             HSZ70   V70Z
dkc2.0.0.3.1   DKc2             HSZ70   V70Z
dkc3.0.0.3.1   DKc3             HSZ70   V70Z
dkc4.4.0.3.1   DKc4             HSZ70   V70Z
dkc5.0.0.3.1   DKc5             HSZ70   V70Z
dkc6.0.0.3.1   DKc6             HSZ70   V70Z
dkc100.1.0.3.1  DKc100           RZ28M   0568
dkc200.2.0.3.1  DKc200           RZ28M   0568
dkc300.3.0.3.1  DKc300           RZ28     442D
polling isp1 (QLogic ISP1020) slot 4, bus 0 PCI, hose 1 SCSI Bus ID 7
dkd0.0.0.4.1   DKd0             HSZ50-AX X29Z
dkd1.0.0.4.1   DKd1             HSZ50-AX X29Z
dkd2.0.0.4.1   DKd2             HSZ50-AX X29Z
dkd100.1.0.4.1  DKd100           RZ26N   0568
dkd200.1.0.4.1  DKd200           RZ26     392A
dkd300.1.0.4.1  DKd300           RZ26N   0568
polling kzpsa0 (DEC KZPSA) slot 5, bus 0 PCI, hose 1 TPwr 1 Fast 1 Bus ID 7
kzpsa0.7.0.5.1  dke TPwr 1 Fast 1 Bus ID 7 L01 All
dke100.1.0.5.1  DKe100           RZ28     442D
```


Example 2-3: Displaying Devices on an AlphaServer 4100 (cont.)

```
dke200.2.0.5.1   DKe200           RZ26      392A
dke300.3.0.5.1   DKe300           RZ26L     442D
polling floppy0 (FLOPPY) pceb IBUS hose 0
dva0.0.0.1000.0 DVA0             RX23
polling kzpsa1 (DEC KZPSA) slot 4, bus 0 PCI, hose 0 TPwr 1 Fast 1 Bus ID 7
kzpsa1.7.0.4.1   dkf TPwr 1 Fast 1 Bus ID 7 E01 A11
dkf100.1.0.5.1   DKf100           RZ26      392A
dkf200.2.0.5.1   DKf200           RZ28      442D
dkf300.3.0.5.1   DKf300           RZ26      392A
polling tulip0   (DECchip 21040-AA) slot 3, bus 0 PCI, hose 0
ewa0.0.0.3.0     00-00-F8-21-0B-56 Twisted-Pair
```

Example 2-4 shows the output from the show device console command entered on an AlphaServer 8200 system.

Example 2-4: Displaying Devices on an AlphaServer 8200

```
>>> show device
polling for units on isp0, slot0, bus0, hose0...
polling for units on isp1, slot1, bus0, hose0...
polling for units on isp2, slot4, bus0, hose0...
polling for units on isp3, slot5, bus0, hose0...
polling for units kzpaa0, slot0, bus0, hose1...
pke0.7.0.0.1     kzpaa4           SCSI Bus ID 7
dke0.0.0.0.1     DKE0             RZ28      442D
dke200.2.0.0.1   DKE200           RZ28      442D
dke400.4.0.0.1   DKE400           RRD43     0064

polling for units isp4, slot1, bus0, hose1...
dkf0.0.0.1.1     DKF0             HSZ70     V70Z
dkf1.0.0.1.1     DKF1             HSZ70     V70Z
dkf2.0.0.1.1     DKF2             HSZ70     V70Z
dkf3.0.0.1.1     DKF3             HSZ70     V70Z
dkf4.0.0.1.1     DKF4             HSZ70     V70Z
dkf5.0.0.1.1     DKF5             HSZ70     V70Z
dkf6.0.0.1.1     DKF6             HSZ70     V70Z
dkf100.1.0.1.1   DKF100           RZ28M     0568
dkf200.2.0.1.1   DKF200           RZ28M     0568
dkf300.3.0.1.1   DKF300           RZ28      442D

polling for units on kzpsa0, slot 2, bus 0, hose1...
kzpsa0.4.0.2.1   dkg TPwr 1 Fast 1 Bus ID 7 L01 A11
dkg0.0.0.2.1     DKG0             HSZ50-AX X29Z
dkg1.0.0.2.1     DKG1             HSZ50-AX X29Z
dkg2.0.0.2.1     DKG2             HSZ50-AX X29Z
dkg100.1.0.2.1   DKG100           RZ26N     0568
dkg200.2.0.2.1   DKG200           RZ28      392A
```

Example 2–4: Displaying Devices on an AlphaServer 8200 (cont.)

```
dkg300.3.0.2.1    DKG300                RZ26N    0568

polling for units on kzpsa1, slot 3, bus 0, hose1...
kzpsa1.4.0.3.1    dkh      TPwr 1 Fast 1 Bus ID 7  L01 A11
dkh100.1.0.3.1    DKH100                RZ28     442D
dkh200.2.0.3.1    DKH200                RZ26     392A
dkh300.3.0.3.1    DKH300                RZ26L    442D

polling for units on kzpsa2, slot 4, bus 0, hose1...
kzpsa2.4.0.4.1    dki      TPwr 1 Fast 1 Bus ID 7  L01 A10
dki100.1.0.3.1    DKI100                RZ26     392A
dki200.2.0.3.1    DKI200                RZ28     442C
dki300.3.0.3.1    DKI300                RZ26     392A
```

2.2.4 Displaying Console Environment Variables and Setting the KZPBA-CB SCSI ID

The following sections show how to use the `show console` command to display the `pk*` and `isp*` console environment variables and set the KZPBA-CB SCSI ID on various AlphaServer systems. Use these examples as guides for your system.

Note that the console environment variables used for the SCSI options vary from system to system. Also, a class of environment variables (for example, `pk*` or `isp*`) may show both internal and external options.

Compare the following examples with the devices shown in the `show config` and `show dev` examples to determine which devices are KZPBA-CBs on the shared SCSI bus.

2.2.4.1 Displaying KZPBA-CB `pk*` or `isp*` Console Environment Variables

To determine the console environment variables to use, execute the `show pk*` and `show isp*` console commands.

Example 2–5 shows the `pk` console environment variables for an AlphaServer 4100.

Example 2–5: Displaying the pk* Console Environment Variables on an AlphaServer 4100 System

```
P00>>>show pk*
pka0_disconnect      1
pka0_fast            1
pka0_host_id         7

pkb0_disconnect      1
pkb0_fast            1
pkb0_host_id         7

pkc0_host_id         7
pkc0_soft_term       diff

pkd0_host_id         7
pkd0_soft_term       on

pke0_fast            1
pke0_host_id         7
pke0_termpr         1

pkf0_fast            1
pkf0_host_id         7
pkf0_termpr         1
```

Comparing the `show pk*` command display in Example 2–5 with the `show config` command in Example 2–1, you determine that the first two devices are for `ncr0` and `ncr1` (`pka` and `pkb`). The next two devices are for the KZPBA-CBs, `isp0` and `isp1` (`pkc` and `pkd`). The last two devices are for KZPSA-BBs, `pks0` and `pks1` (`pke` and `pkf`).

Example 2–5 shows two `pk*0_soft_term` environment variables; `pkc0_soft_term` which is `on`, and `pkd0_soft_term` which is `diff`.

The `pk*0_soft_term` environment variable applies to systems using the QLogic ISP1020 SCSI controller, which implements the 16-bit wide SCSI bus and uses dynamic termination.

The QLogic ISP1020 module has two terminators, one for the low 8 bits and one for the high 8 bits. There are five possible values for `pk*0_soft_term`:

- `off`—Turns off both low 8 bits and high 8 bits
- `low`—Turns on low 8 bits and turns off high 8 bits
- `high`—Turns on high 8 bits and turns off low 8 bits
- `on`—Turns on both low 8 bits and high 8 bits

- `diff`—Places the bus in differential mode

As the KZPBA-CB (ISP1040) termination is determined by the presence or absence of internal termination resistor SIPS RM1 through RM8, the `pkb0_soft_term` environment variable has no meaning; therefore, it may be ignored.

Example 2–6 shows the use of the `show isp*` console command to display the console environment variables for KZPBA-CBs on an AlphaServer 8x00.

Example 2–6: Displaying Console Variables for a KZPBA-CB on an AlphaServer 8x00 System

```
P00>>> show isp*
isp0_host_id      7
isp0_soft_term    on

isp1_host_id      7
isp1_soft_term    on

isp2_host_id      7
isp2_soft_term    on

isp3_host_id      7
isp3_soft_term    on

isp5_host_id      7
isp5_soft_term    diff
```

Both Example 2–2 and Example 2–4 show five `isp` devices; `isp0`, `isp1`, `isp2`, `isp3`, and `isp4`. In Example 2–6, the `show isp*` console command shows `isp0`, `isp1`, `isp2`, `isp3`, and `isp5`.

The console code that assigns console environment variables counts every I/O adapter including the KZPAA, which is the device after `isp3`, and therefore logically `isp4` in the numbering scheme. The `show isp` console command skips over `isp4` because the KZPAA is not a QLogic 1020/1040 class module.

Example 2–2 and Example 2–4 show that `isp0`, `isp1`, `isp2`, and `isp3` are on the internal KFTIA PCI bus and not on a shared SCSI bus. Only `isp5`, the KZPBA-CB, is on a shared SCSI bus. The other three shared SCSI buses use KZPSA-BBs.

2.2.4.2 Setting the KZPBA-CB SCSI ID

After you determine the console environment variables for the KZPBA-CBs on the shared SCSI bus, use the `set` console command to set the SCSI ID. For a TruCluster configuration, you will most likely have to set the SCSI ID for all KZPBA-CB UltraSCSI adapters except one. And, if you are using a DS-DWZZH-05, you will have to set the SCSI IDs for all KZPBA-CB UltraSCSI adapters.

Note

You will have problems if you have two or more SCSI adapters at the same SCSI ID on any one SCSI bus.

If you are using a DS-DWZZH-05, you cannot use SCSI ID 7 for a KZPBA-CB UltraSCSI adapter; SCSI ID 7 is reserved for DS-DWZZH-05 use.

Use the `set` console command as shown in Example 2-7 to set the SCSI ID. In this example, the SCSI ID is set for KZPBA-CB `pkc` on the AlphaServer 4100 shown in Example 2-5.

Example 2-7: Setting the SCSI Bus ID

```
P00>>> show pkc0_host_id
7
P00>>> set pkc0_host_id 6
P00>>> show pkc0_host_id
6
```

2.2.5 Cabling Illustrations

This section provides illustrations and tables that are helpful while you are configuring clusters.

Figure 2-2 shows the front view of the StorageWorks RAID Array 3000 controller shelf.

Figure 2–2: StorageWorks RAID Array 3000 Controller Shelf Front View

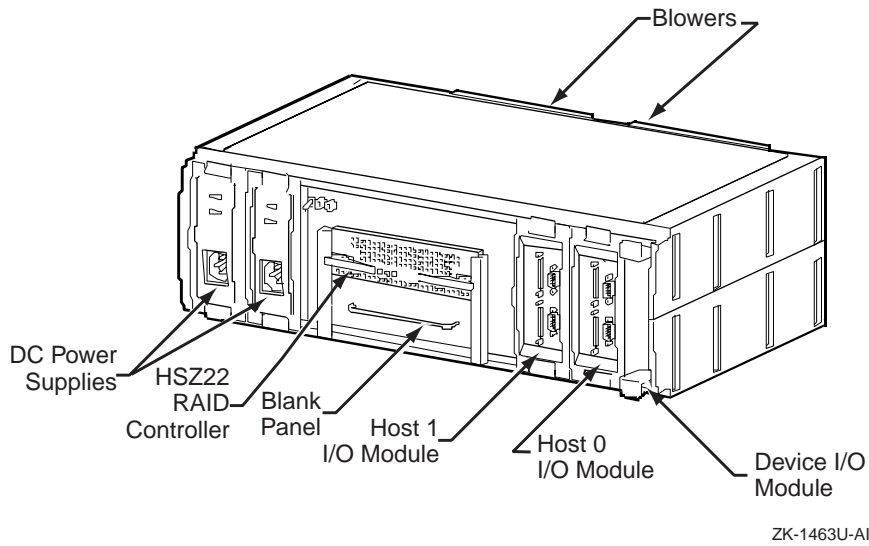
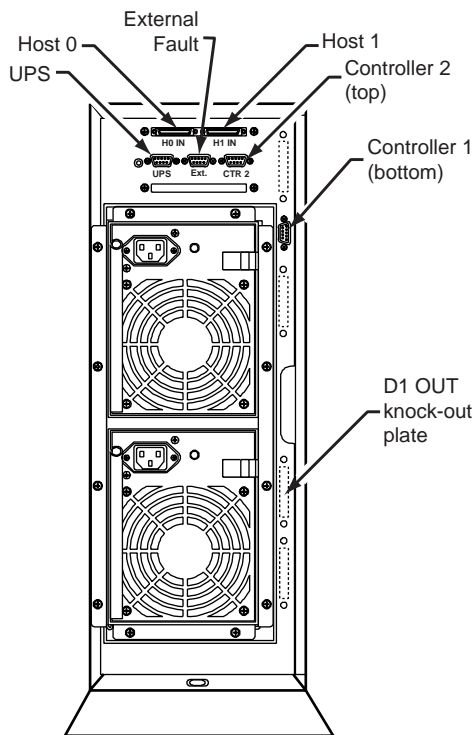


Figure 2–3 shows the rear view of the StorageWorks RAID Array 3000 pedestal.

Figure 2-3: RAID Array 3000 Pedestal Rear View

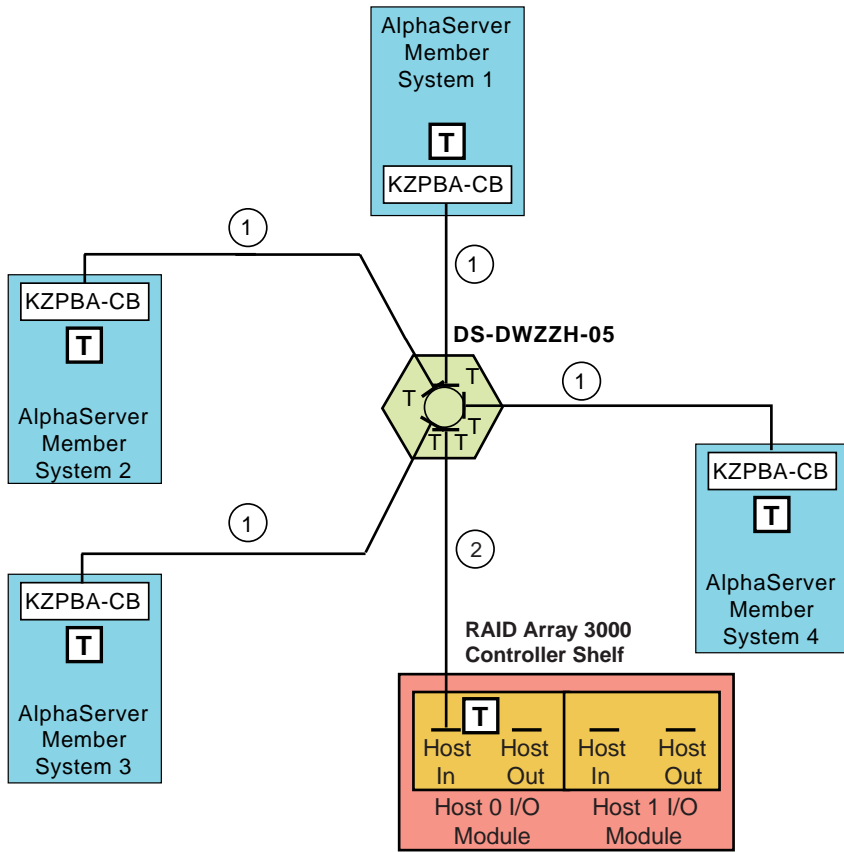


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In the configurations shown in Figure 2-4 through Figure 2-12, it is assumed that the RA3000 contains two HSZ22 controllers.

Figure 2-4 shows a four-member TruCluster configuration and an RA3000 controller shelf with active/passive failover radially connected to a DS-DWZZH-05 UltraSCSI hub. Table 2-4 describes the callouts.

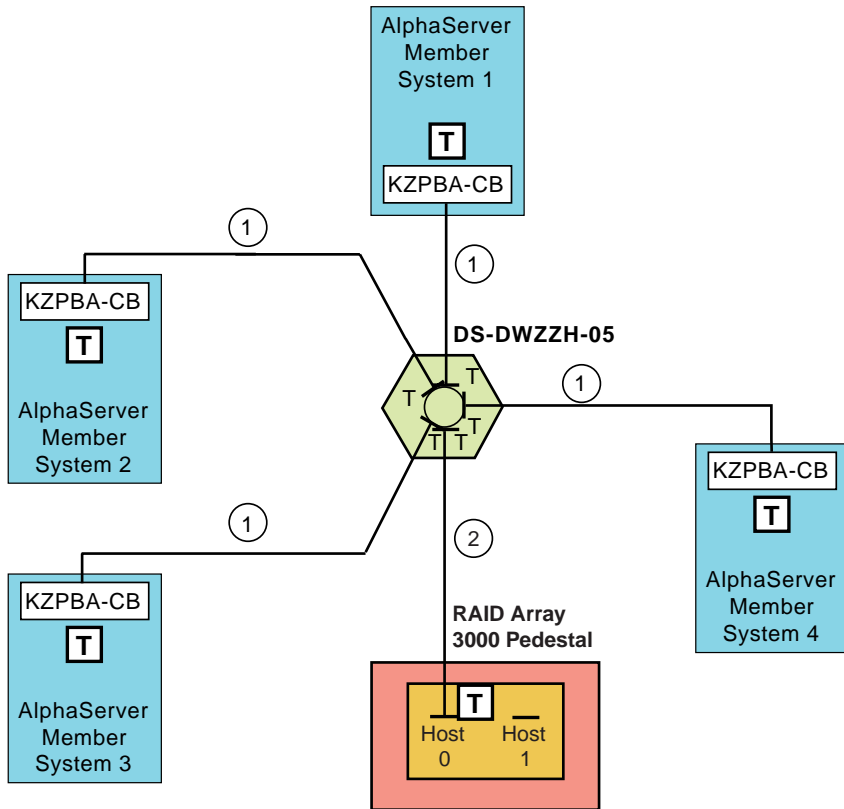
Figure 2-4: TruCluster Configuration with an RA3000 Controller Shelf with Active/Passive Failover and a DWZZH-05 UltraSCSI Hub



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Figure 2-5 shows a four-member TruCluster configuration and an RA3000 pedestal with active/passive failover radially connected to a DS-DWZZH-05 UltraSCSI hub. The RA3000 controller shelf contains internal termination. Table 2-4 describes the callouts.

Figure 2-5: TruCluster Configuration with an RA3000 Pedestal with Active/Passive Failover and a DWZZH-05 UltraSCSI Hub



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Figure 2-6 shows a two-member TruCluster configuration and an RA3000 pedestal with active/passive failover radially connected to a DS-DWZZH-03 UltraSCSI hub. The RA3000 pedestal contains internal termination. Table 2-4 describes the callouts.

Figure 2-6: TruCluster Configuration with an RA3000 Pedestal with Active/Passive Failover and a DWZZH-03 UltraSCSI Hub

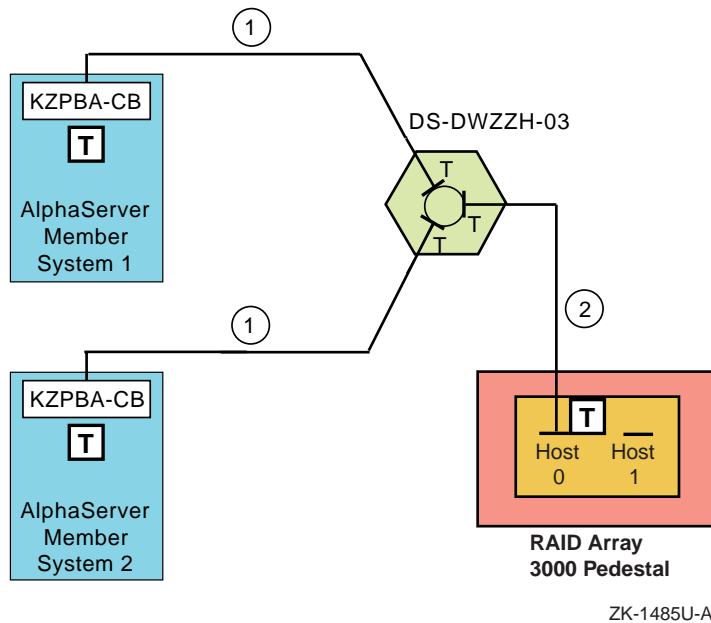


Table 2-4 shows the components used to create the clusters shown in Figure 2-4, Figure 2-5, and Figure 2-6.

Table 2-4: Hardware Components Used in the Configurations Shown in Figure 2-4, Figure 2-5, and Figure 2-6

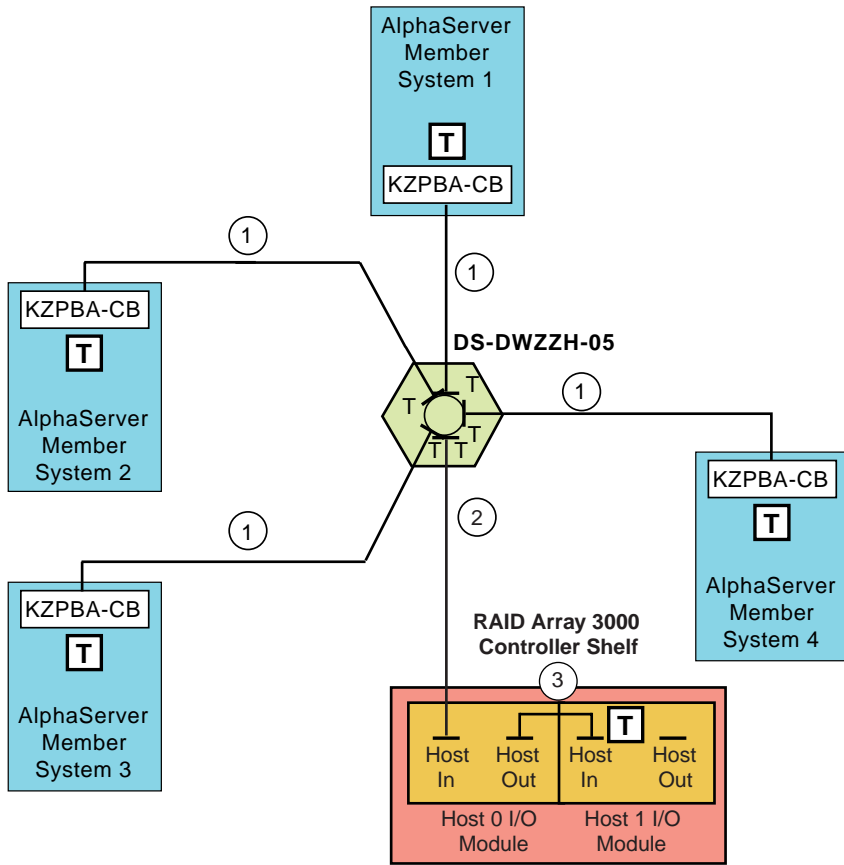
| Callout Number | Description |
|----------------|--|
| 1 | BN38C HD68 to VHDCI cable ^a |
| 2 | BN37A VHDCI cable ^b |

^aThe maximum length of the SCSI bus segment, including the combined length of BN38C cables and internal device length, must not exceed 25 meters.

^bThe maximum length of the SCSI bus segment, including the BN37A cables and internal device length, must not exceed 25 meters.

Figure 2-7 shows a four-member TruCluster configuration and an RA3000 controller shelf with active/active or active/passive failover radially connected to a DS-DWZZH-05 UltraSCSI hub.

Figure 2-7: TruCluster Configuration with an RA3000 Controller Shelf with Active/Active or Active/Passive Failover and a DWZZH-05 UltraSCSI Hub



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Table 2-5 shows the components used to create the cluster shown in Figure 2-7.

Note

In Figure 2-7, Host 0 I/O module is connected to Host 1 I/O module to provide all available SCSI targets (16 LUNs) on a single connection to the RA3000.

Table 2–5: Hardware Components Used in the Configuration Shown in Figure 2–7

| Callout Number | Description |
|----------------|--|
| 1 | BN38C HD68 to VHDCI cable ^a |
| 2 | BN37A VHDCI cable ^b |
| 3 | BN37A-0E 0.5-meter VHDCI cable |

^aThe maximum length of the SCSI bus segment, including the combined length of BN38C cables and internal device length, must not exceed 25 meters.

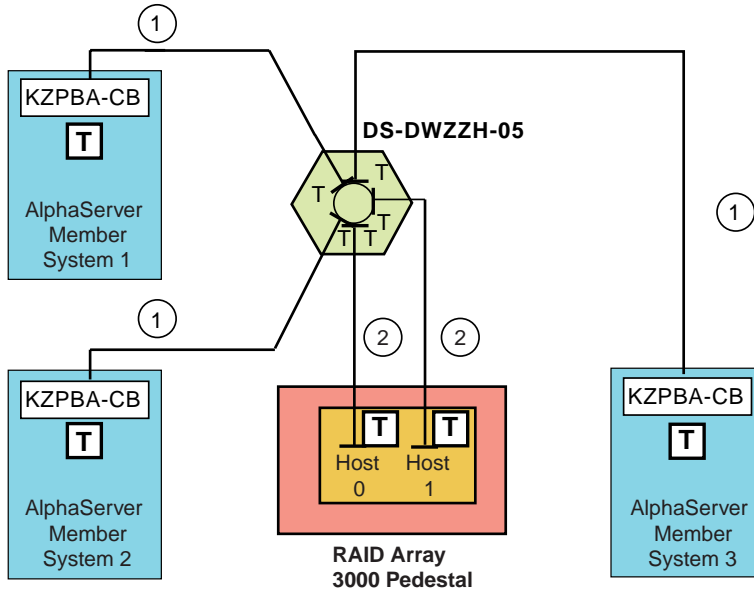
^bThe maximum length of the SCSI bus segment, including the BN37A cables and internal device length, must not exceed 25 meters.

Figure 2–8 shows a three-member TruCluster configuration and an RA3000 pedestal with active/active or active/passive failover radially connected to a DS-DWZZH-05 UltraSCSI hub. This configuration uses independent connections to the two pedestal host ports to increase the available bandwidth to the RA3000 controllers.

Note

If you connect a DWZZH-05 host port to an RA3000 pedestal host port to provide active/active failover, you must disable fair arbitration on the DWZZH-05 by placing the fair arbitration switch in the `DISABLE` position.

Figure 2–8: TruCluster Configuration with an RA3000 Pedestal with Active/Active or Active/Passive Failover and a DWZZH-05 UltraSCSI Hub



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Table 2–6 shows the components used to create the cluster shown in Figure 2–8.

Table 2–6: Hardware Components Used in the Configuration Shown in Figure 2–8

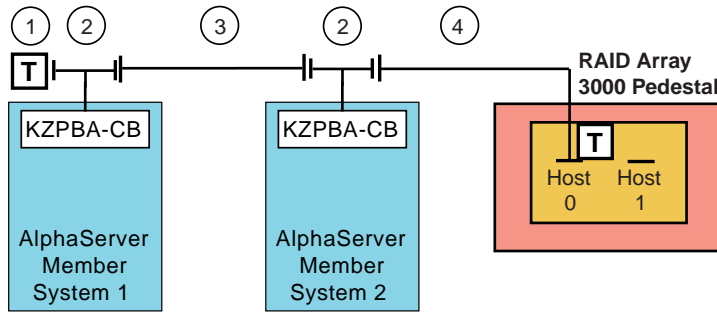
| Callout Number | Description |
|----------------|--|
| 1 | BN38C HD68 to VHDCI cable ^a |
| 2 | BN37A VHDCI cable ^b |

^aThe maximum length of the SCSI bus segment, including the combined length of BN38C cables and internal device length, must not exceed 25 meters.

^bThe maximum length of the SCSI bus segment, including the BN37A cables and internal device length, must not exceed 25 meters.

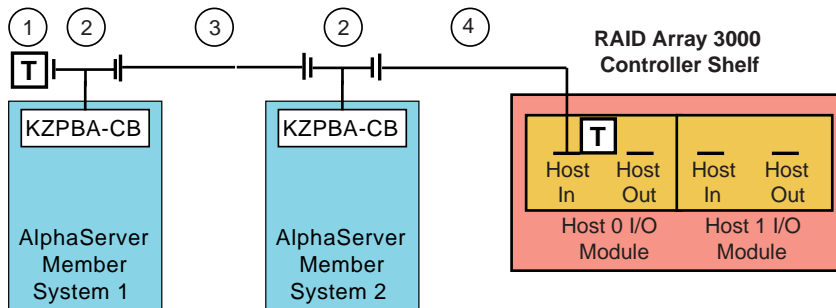
Figure 2–9 (pedestal) and Figure 2–10 (controller shelf) show an externally terminated TruCluster configuration using an RA3000. The RA3000 controller shelf and pedestal contains internal termination.

Figure 2–9: Externally Terminated TruCluster Configuration with an RA3000 Pedestal with Active/Passive Failover



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Figure 2–10: Externally Terminated TruCluster Configuration with an RA3000 Controller Shelf with Active/Passive Failover



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Table 2–7 shows the components used to create the clusters shown in Figure 2–9 and Figure 2–10.

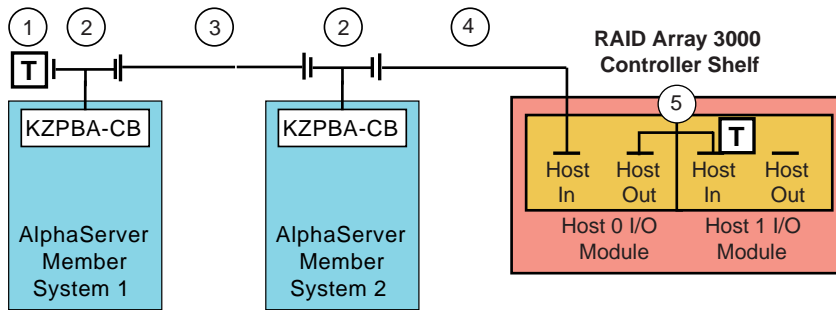
Table 2–7: Hardware Components Used in the Configurations Shown in Figure 2–9 and Figure 2–10

| Callout Number | Description |
|----------------|--|
| 1 | H879-AA terminator |
| 2 | BN21W-0B Y cable |
| 3 | BN21K (BN21L or BN31G) HD68 cable ^a |
| 4 | BN38C HD68 to VHDCI cable ^a |

^aThe maximum length of the SCSI bus segment, including the combined length of BN21K (BN21L or BN31G) and BN38C cables and internal device length, must not exceed 25 meters.

Figure 2–11 shows an externally terminated TruCluster configuration using an RA3000. In this configuration, because the Host 0 I/O module is daisy-chained to Host 1 I/O module, dual HSZ22 controllers could use active/active or active/passive failover.

Figure 2–11: Externally Terminated TruCluster Configuration with an RA3000 Controller Shelf with Active/Active or Active/Passive Failover



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Table 2–8 shows the components used to create the cluster shown in Figure 2–11.

Table 2–8: Hardware Components Used in the Configuration Shown in Figure 2–11

| Callout Number | Description |
|----------------|--|
| 1 | H879-AA terminator |
| 2 | BN21W-0B Y cable |
| 3 | BN21K (BN21L or BN31G) HD68 cable ^a |
| 4 | BN38C HD68 to VHDCI cable ^a |
| 5 | BN37A-0E 0.5-meter VHDCI cable |

^aThe maximum length of the SCSI bus segment, including the combined length of BN21K (BN21L or BN31G) and BN38C cables and internal device length, must not exceed 25 meters.

Figure 2–12 shows an externally terminated TruCluster configuration with a RA3000 in the middle of the bus. In this configuration, because Host 0 I/O module is daisy-chained to Host 1 I/O module, dual HSZ22 controllers could use active/active or active/passive failover.

Figure 2–12: Externally Terminated TruCluster Configuration with a Mid-bus RA3000 Controller Shelf with Active/Active or Active/Passive Failover

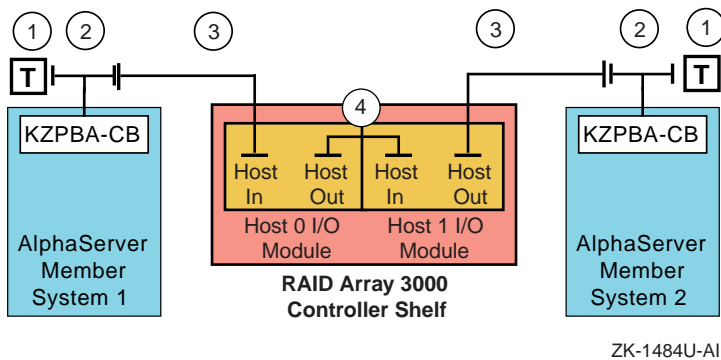


Table 2–9 shows the components used to create the cluster shown in Figure 2–12.

Table 2–9: Hardware Components Used in the Configuration Shown in Figure 2–12

| Callout Number | Description |
|----------------|--|
| 1 | H879-AA terminator |
| 2 | BN21W-0B Y cable |
| 3 | BN38C HD68 to VHDCI cable ^a |
| 4 | BN37A-0E 0.5 meter VHDCI cable |

^aThe maximum length of the SCSI bus segment, including the combined length of BN38C, BN37A-0E, and any BN21K (BN21L or BN31G) and internal device length, must not exceed 25 meters.

3

Reconfiguring the RA3000 Pedestal for the Expansion Pedestal Option

The following documentation covers installing the StorageWorks RAID Array 3000 expansion pedestal option:

- *RAID Array 3000 Storage Subsystem Expansion Pedestal Option Installation Guide* (EK-SM3KA-IG)
- *RAID Array 3000 Storage Subsystem Hardware User's Guide* Chapter 4 (EK-SMCPO-UG), which is basically a copy of EK-SM3KA-IG

Although most of the descriptive information in the Revision A01 version is correct, many of the illustrations accompanying the descriptions are incorrect.

Therefore, this chapter provides an abbreviated description, with corrected illustrations, on how to reconfigure the RA3000 pedestal for use with an expansion pedestal option.

It is expected that the previous documents will be revised shortly.

3.1 Overview

The StorageWorks RAID Array 3000 pedestal subsystem has the capacity for seven single-ended disks in a split-bus (two SCSI buses) configuration. The disks in base pedestal slots 0, 1, 2, and 3 (top four slots) use SCSI IDs 8, 9, 10, and 11, and form the first SCSI bus. The disks in base pedestal slots 4, 5, and 6 use SCSI IDs 8, 9, and 10, and form the second SCSI bus.

When the expansion pedestal option is added, the two RA3000 pedestal single-ended SCSI buses (split-bus) are reconfigured into a single SCSI bus. The expansion pedestal contains the second SCSI bus.

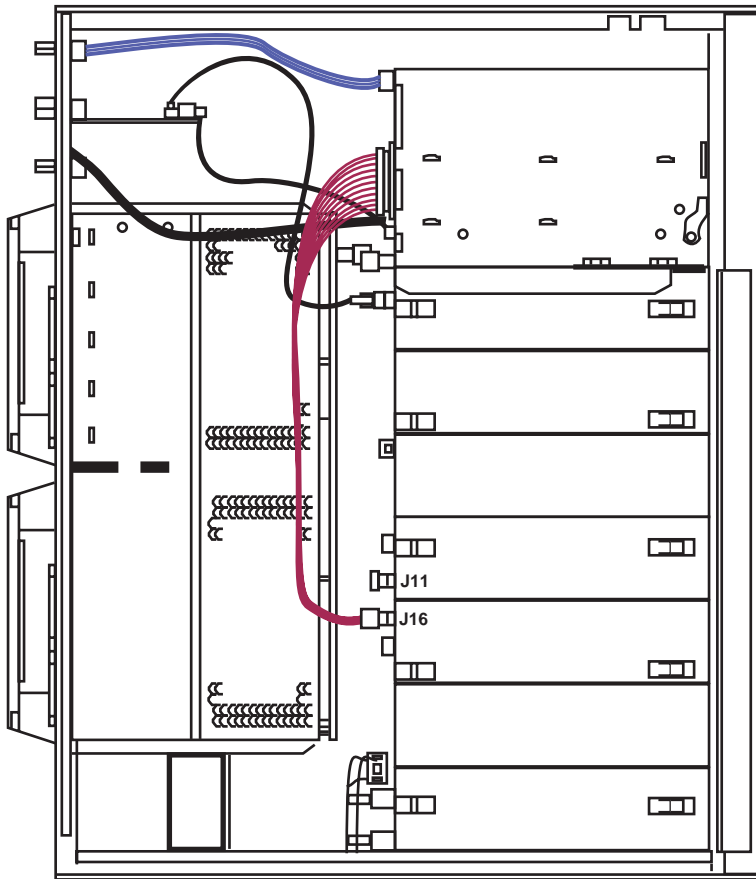
If you have seven disks installed in the RA3000 pedestal, and are upgrading with the expansion pedestal option, when the split-bus is reconfigured to a single bus, the disks in base pedestal slots 4, 5, and 6 will be assigned new SCSI IDs (12, 13, and 14). If you wish to retain the data on these three disks, the disks must be moved to the top three slots (0, 1, and 2) of the expansion pedestal option, where they retain the SCSI IDs of 8, 9, and 10.

3.2 Reconfiguring the RA3000 Base Pedestal UltraSCSI Bus

See the *RAID Array 3000 Storage Subsystem Expansion Pedestal Option Installation Guide* for more information about reconfiguring the StorageWorks RAID Array 3000 (RA3000) base pedestal UltraSCSI bus. Use the following procedure and the accompanying illustrations, in conjunction with the description in the manual to reconfigure the RA3000 base pedestal for use with an expansion pedestal option:

1. Ensure that the host shared SCSI bus attached to the RA3000 pedestal is inactive by stopping all services that utilize the shared SCSI bus.
2. Unplug the RA3000 pedestal from the power outlet, and then unplug the uninterruptible power supply (UPS) from the power outlet. The UPS signals the controller to flush the cache.
3. When the UPS shuts down (it may take several minutes), turn off the pedestal at the power switch and plug the UPS back in to the power outlet.
4. Remove the side cover from the RA3000 base pedestal.
5. Remove the SCSI bus terminator from the J11 backplane connector (see Figure 3-1).

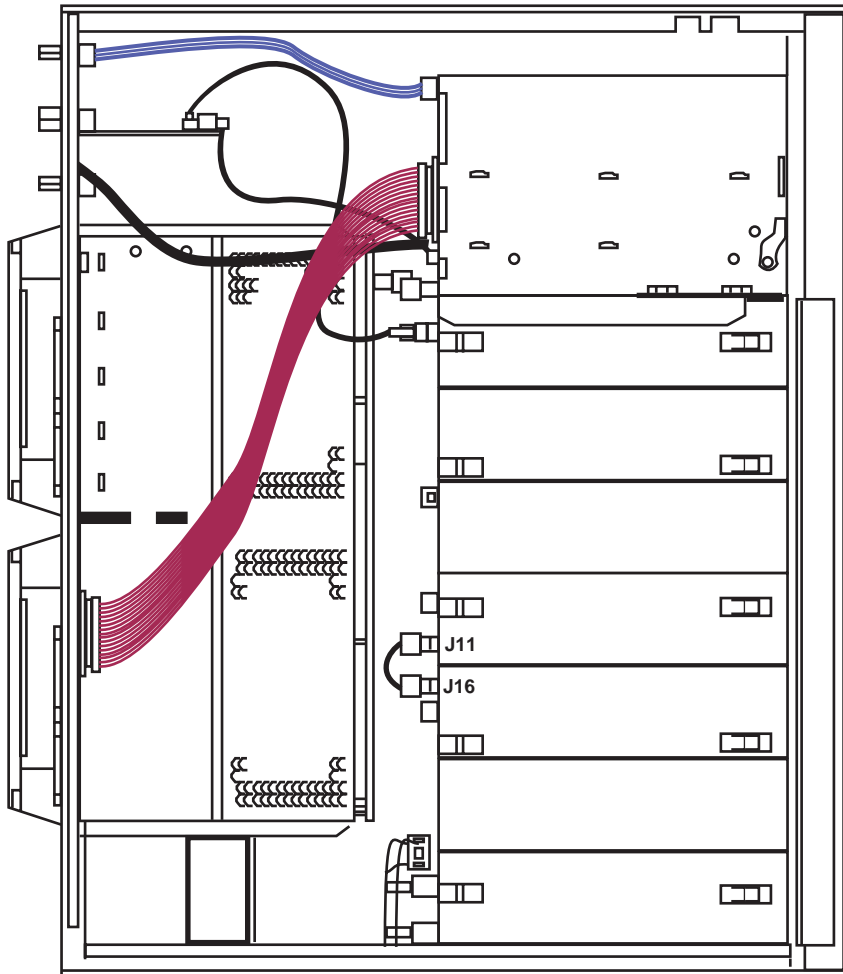
Figure 3–1: RA3000 Pedestal Cabled for Split-Bus Configuration



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6. Remove the SCSI bus cable from the J16 backplane connector and the device #1 backplane connector.
7. Connect SCSI bus jumper cable 17-04166-03 between backplane connectors J11 and J16 (see Figure 3–2). This forms a single SCSI bus within the base pedestal.

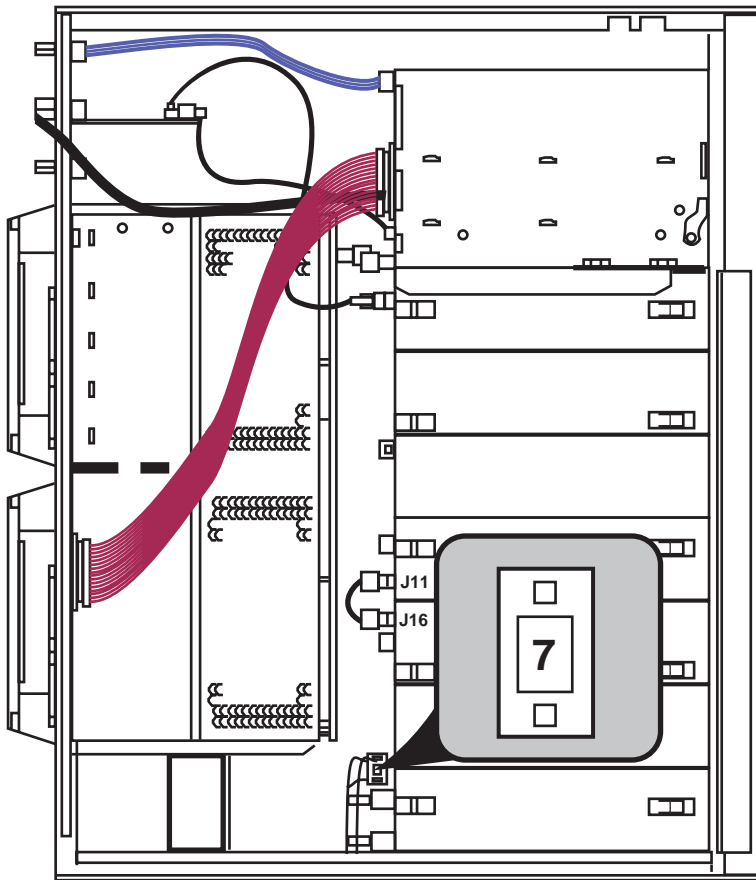
Figure 3–2: RA3000 Pedestal Cabled for Single-Bus Configuration



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8. Remove the knockout plate above the D1 OUT label on the rear panel of the base pedestal (see Figure 2–3).
9. Attach one end of cable assembly 17-04454-01 to the D1 OUT bulkhead opening. Connect the other end of the cable to the device #1 backplane connector (see Figure 3–2). This is the second SCSI bus, and it will be connected to the expansion pedestal option.
10. Set the bus configuration switch to 7 by depressing the increase or decrease buttons below and above the number display (see Figure 3–3).

Figure 3–3: RA3000 Pedestal SCSI ID Renumbering



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11. Connect a BN21K (BN21L or BN31G) HD68 cable between the base pedestal D1 OUT connector and the expansion pedestal option D1 IN connector.
12. Transfer the disks from slots 4, 5, and 6 of the base pedestal to slots 0, 1, and 2 of the expansion pedestal option if you want those disks to retain SCSI IDs 8, 9, and 10.
13. Reinstall the RA3000 base pedestal side cover and plug the power cord in to the power outlet.