

Dell Controlled Print



Dell™ PowerEdge™ Expandable RAID Controller 3/Di

## SOFTWARE INSTALLATION GUIDE





Dell™ PowerEdge™ Expandable RAID Controller 3/Di

## INSTALLATION GUIDE

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Last revised: 22 January 2002

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January 2002 P/N 6004T A04-00

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# 1

## Introduction

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The Dell™ PERC 3™ /Dual Channel Integrated RAID Controller provides powerful disk array support in PowerEdge servers.

This installation guide explains how to install the PERC 3/Di device driver and how to install the controller management software, enabling you to manage the controller and its attached storage devices.



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**Note:** Before beginning this software installation, you must first do the necessary hardware setup to enable PERC 3/Di. For information on setting up the hardware to enable PERC 3/Di, see the appropriate Dell hardware documentation for your system.

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## Installation Overview

To install the PERC 3/Di software:

- 1 Enable the PERC 3/Di.  
For more information, see the appropriate hardware documentation.
- 2 Optionally, create and configure containers using the PERC 3/Di BIOS.  
For more information, see Appendix A, *Using the BIOS Container Configuration Utility*.

**3** Install the PERC 3/Di device driver.

For more information, see Chapter 3, *Installing the Device Driver*.

**4** Install the controller management software.

For more information, see Chapter 4, *Installing the Controller Management Software*.



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**Note:** Version 2.7 is incompatible with earlier versions. If you are adding a version 2.7 controller to a system containing a controller at an earlier version, you must upgrade the firmware, drivers, and controller management software (as a complete set) for the controller at the earlier version. For information on how to perform the upgrade, see Chapter 2, *Performing an Upgrade Installation*.

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## Controller Management Utilities

The PERC 3/Di supports the following management utilities:

- **Dell OpenManage™ Array Manager (Array Manager)**—Array Manager software provides a comprehensive solution to storage management in an integrated graphical view. Through a common interface, Array Manager lets you configure and manage local and remote storage attached to a server while the server is online and continuing to process requests.

Array Manager obtains data from storage devices and the logical volumes contained on those devices. Array Manager displays storage configuration in both a physical and a logical view. The physical view shows the physical connections between the storage devices. The logical view shows a logical representation of your storage as logical volumes.

From the Array Manager console, you can do the following:

- Create and manage software and hardware RAID solutions
- Display all of your storage information in a graphical environment
- Customize the Array Manager interface to suit your individual needs

You can install Array Manager from your Dell OpenManage Application CD. For more information on using Array Manager to configure and manage your system, see the Array Manager documentation on the Dell Online Documentation CD.

- **Flexible Array Storage Tool (FAST)**—FAST software enables you to manage data, files, and storage devices in an easy-to-use graphical interface with wizard support.

In addition, you can integrate the FAST software with higher-level management platforms to unify systems and network management. FAST

can create a container consisting of partitions on different disks where each partition is less than the entire disk's capacity. FAST can be used to locally manage a PERC 3/Di on systems running the Microsoft™ Windows NT®/Windows 2000® operating system. Also from Microsoft Windows NT/Windows 2000, you can use FAST to remotely manage many controllers from the PERC 2 and PERC 3 family that are installed on another system running Microsoft Windows NT/Windows 2000 or NetWare.

For more information on FAST, see the *Flexible Array Storage Tool User's Guide*.



**Note:** Currently, the FAST and Array Manager utilities are not designed to coexist on the same system.

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- **Command Line Interface (CLI)**—CLI lets you perform most of the tasks that you can perform with the FAST utility and, in addition, lets you perform some tasks not available in FAST. CLI enables you to use CLI commands in command scripts. For more information on CLI, see the *Command Line Interface User's Guide* and the *Command Line Interface Reference Guide*, available on Dell's Web site, ([www.support.dell.com](http://www.support.dell.com)).
- **BIOS Utilities**— The built-in PERC 3/Di BIOS includes the following utilities that allow you to configure and manage your controller and attached storage devices:
  - **Container Configuration Utility (CCU)**—Allows you to create and manage containers.
  - **SCSISelect Utility (SSU)**—Allows you to configure your SCSI bus and devices.
  - **Disk Utilities (DU)**—Allows you to format and verify your attached storage devices.

## System Requirements

The following are the *minimum* system requirements for the PERC 3/Di:

- Dell PowerEdge server with the PERC 3/Di option. Refer to [www.dell.com](http://www.dell.com) for PowerEdge server and PERC 3/Di compatibility information.
- Minimum of 128 MBytes of main memory
- One 64 MByte PC-100 SDRAM DIMM (Dual-In Line Memory Module) with ECC for cache memory (included with controller)
- 32 MBytes of available hard disk space for the PERC 3/Di software

- One of the following:
  - Windows NT 4.0 Server, Small Business Server Edition
  - Windows NT 4.0 Server, Terminal Server Edition
  - Windows NT 4.0 Server, Enterprise Server Edition
  - Windows NT 4.0 Server, BackOffice Edition
  - Windows NT 4.0 Workstation (for installing the controller's GUI)



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**Note:** All Windows NT systems require Service Pack 6A or higher.

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- Windows 2000
  - NetWare 5.0 with Support Pack 6A or higher
  - NetWare 5.1 with Support Pack 3 or higher
  - NetWare 6.0
  - Red Hat Linux
- 3.5-inch, 1.44-MByte floppy disk drive
  - CD-ROM drive
  - SCSI cables to connect the internal or external PERC 3/Di 68-pin connectors to the SCSI devices. Depending on the configuration, from zero to four cables may be required. Internal cables are included with the controller.

## Software Version

This book supports Version 2.7.

## Conventions

This document uses the following typographic conventions:

**Enter**

Used for key names, screen elements, and for options you are told to select.

`nwconfig`

Used for file and program names and screen messages.

**A:\w2ksetup.bat**

Used for text that must be typed exactly as shown.

This document includes the following kinds of advisories:



**Note:** Notes are reminders, tips, or suggestions that might simplify the procedures included in this document.

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**Caution:** Cautions alert you to actions that might cause damage to your system or your data.

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**WARNING:** Warnings alert you to actions that might cause injury to you or someone else.

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To avoid injury to people or damage to equipment and data, be sure to follow the cautions and warnings in this document. Dell does not claim to have included in this document every condition or situation that might require a caution or warning notice. Be sure to consult the documentation for your computer and any connected equipment when you are installing the equipment or changing its configuration.



**WARNING:** *Always* use caution when handling electrical equipment!

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# 2

## Performing an Upgrade Installation

If you are migrating from an earlier release of firmware, drivers, and controller management software, you need to perform an upgrade installation. An upgrade installation requires that you do the following in the proper sequence:



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**Caution:** Failure to follow these steps exactly may make it impossible for your system to see the controller. Specifically, you do *not* want to upgrade the firmware before you install the new drivers, nor do you want to attempt to install the new controller management software until the new drivers have been installed and/or the firmware upgraded.

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- 1 Ensure that the controller is quiescent.
- 2 If you are using a pre-2.6 version of the controller management software, uninstall it. For instructions on how to uninstall the controller management software, see *Uninstalling the Controller Management Software on Windows* on page 4-3.
- 3 Install the new drivers. See Chapter 3, *Installing the Device Driver*.
- 4 Upgrade the firmware. See Appendix D, *Flashing the Firmware*.
- 5 Reboot your system.
- 6 If you uninstalled the controller management software in step 2, you will have to install the new controller management software at this point. Installation information exists for Windows, NetWare and Linux. For installation information, see the appropriate section in Chapter 4, *Installing the Controller Management Software*.





# 3

## Installing the Device Driver

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**Note:** You must install the Windows NT or NetWare driver for your controller before you install the controller management software. If you want to use a container as the boot container, first create the boot container as described in Appendix A, *Using the BIOS Container Configuration Utility*. Then, install the driver as you install the operating system. The operating system will then reside on the boot container and has the redundancy and performance features of that container.

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**Note:** If you are upgrading your controller's software and firmware from an earlier version, see Chapter 2, *Performing an Upgrade Installation* before installing the device drivers.

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## Windows Environment

To install the driver while installing Windows NT see *Installing the Driver During a Fresh Install of Windows NT*. To update or install the driver when Windows NT is already installed see *Installing the Driver When Windows NT is Already Installed* on page 3-4.

If you are installing the driver while upgrading from Windows NT to Windows 2000, see *Installing the Driver When Upgrading From NT to Windows 2000* on page 3-5. If you are installing the driver during a fresh installation of Windows 2000, see *Installing the Driver During a Fresh Install of Windows 2000* on page 3-6.

### Installing the Driver During a Fresh Install of Windows NT

Follow these instructions to install the Windows NT drivers while you are installing Windows NT. Windows NT will be installed on a boot container if you created a boot container with the Container Configuration Utility. (For information on creating a boot container, see Appendix A, *Using the BIOS Container Configuration Utility*.)



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**Note:** Microsoft has acknowledged that Windows NT 4.0 has a known 1 GByte maximum partition creation limitation when NT 4.0 is installed on a drive connected to a SCSI controller that contains two or more drives. We recommend, therefore, that prior to installing NT 4.0, you should create only one container using the BIOS Container Configuration Utility (refer to Appendix A, *Using the BIOS Container Configuration Utility* for information about container creation). Following the installation, you can then use the controller management software to create multiple containers.

For more information about the Windows NT partition size limitation, see the Microsoft Web site, [www.microsoft.com](http://www.microsoft.com).

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## Installing Windows NT from CD-ROM

- 1 Start your system with the Windows NT boot CD-ROM in the CD-ROM drive and proceed with the Windows NT installation.



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**Note:** To install Windows NT from a bootable CD-ROM, the CD-ROM drive must be connected to another SCSI controller or an IDE controller (*not* the PERC 3/Di).

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- 2 When the Windows NT CD-ROM starts to boot it will display the following message:  

```
Setup is inspecting your computer's hardware  
configuration...
```

Press **F6** immediately.
- 3 A few seconds later a screen will be displayed asking you to specify additional controllers.
- 4 Press **S** to select additional hardware.
- 5 A menu with several items will be displayed. Be sure that **Other** is highlighted and then press **Enter** to load the device driver.
- 6 You will be prompted to insert a disk into the diskette drive. Insert the diskette labeled **Dell PERC 2, 2/Si, 3/Si, 3Di NT Device Drivers Disk 1 of 1**.
- 7 Press **Enter** to start the load of the driver.
- 8 Select the following Dell driver: **PERC 2, 2/Si, 3/Si, 3Di**.
- 9 If you have no other drivers that you need to install, press **Enter** to continue with the installation. Follow the instructions on-screen and in the Windows NT documentation to complete the installation.

## Installing Windows NT from Diskette

- 1 Start your system with the Windows NT boot diskette in the diskette drive and proceed with the Windows NT installation.
- 2 At the message Setup has recognized the following mass storage devices, press **S**.
- 3 Insert the diskette labeled **Dell PERC 2, 2/Si, 3/Si, 3Di NT Device Drivers Disk 1 of 1** and press **Enter**.
- 4 Press **Enter** to select the following Dell driver:  
**PERC 2, 2/Si, 3/Si, 3Di**
- 5 Press **Enter** at the message Setup has recognized the following mass storage devices to continue with the Windows NT operating system setup. Follow the online instructions and in the Windows NT documentation to complete the installation.



**Note:** During the final phase of the Windows NT installation you will be prompted to reinsert the drivers diskette.

---

## Installing the Driver When Windows NT is Already Installed

To install the driver when Windows NT is already installed on your system:

- 1 Go to the **Control Panel** and double-click **SCSI Adapters**.
- 2 In the **SCSI Adapters** dialog box, select the **Drivers** tab and click **Add**.
- 3 Click **Have Disk**.  
Insert the diskette labeled **Dell PERC 2, 2/Si, 3/Si, 3Di NT Device Drivers Disk 1 of 1**.  
Click **OK**.
- 4 Select the listed driver — **PERC 2, 2/Si, 3/Si, 3Di** — and click **OK**.
- 5 At the message *Do you want to restart the computer now?*, remove the diskette from the diskette drive and click **Yes** to reboot the system.



**Note:** Instead of rebooting now, you may elect to install the controller management software first and then reboot. For instructions on how to install the controller management software, see Chapter 4, *Installing the Controller Management Software*.

---

## Installing the Driver When Upgrading From NT to Windows 2000

To install the PERC 3/Di driver during an upgrade to Windows 2000:

- 1 If appropriate, uninstall the controller management software. For instructions, see *Uninstalling the Controller Management Software on Windows* on page 4-3.
- 2 Insert the diskette labeled **PERC 2, 2/Si, 3/Si, 3Di Windows 2000 Drivers Diskette** into the diskette drive and *do not* remove it from the drive. The diskette contains the following:
  - A setup script, `w2ksetup.bat`, that prepares your system for the upgrade to Windows 2000
  - PERC 3/Di driver for Windows 2000
- 3 From the command prompt, change your working directory to the diskette drive, and execute the following command:

**A:** \w2ksetup.bat

The `w2ksetup.bat` script prepares your system for the upgrade to the new PERC 3/Di driver for Windows 2000.



**Caution:** During the upgrade to Windows 2000, the PERC 3/Di device driver for Windows NT that is currently installed on your system is replaced with PERC 3/Di driver for Windows 2000.

If, for whatever reason, you execute the script `w2ksetup.bat` but do not complete the upgrade to Windows 2000, you must re-install the PERC 3/Di device driver for Windows NT, because—among other things—`w2ksetup.bat` removes the PERC 3/Di driver for Windows NT from your system.

If you do not reinstall the PERC 3/Di driver for Windows NT, you will not be able to manage the controller, and if the operating system is on a boot container, the server will not boot.

To reinstall the PERC 3/Di driver for Windows NT, go to the **Control Panel** and double-click **SCSI Adapters**. Select the **Drivers** tab, then select the **Dell PowerEdge RAID Controller 3/Di** and press **Add**. Select **Have Disk**, then when prompted, insert the diskette that contains the PERC 3/Di driver for Windows NT.

After the original NT driver is installed, reboot and you will be able to manage your PERC 3/Di controller.

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- 4 Insert the Windows 2000 CD-ROM into your CD-ROM drive.

- 5 When the upgrade dialog box appears, select the option to **Upgrade to Windows 2000**.

Follow the on-screen instructions to begin the upgrade to Windows 2000.

A popup message is displayed, asking if you want to continue installing an unassigned driver. Select **Yes**.

The upgrade then continues to completion.

- 6 After the upgrade completes, reinstall the controller management software. For instructions on how to perform the installation, see *Installing the Controller Management Software on Windows* on page 4-2.

## Installing the Driver During a Fresh Install of Windows 2000

These instructions describe installing the Windows 2000 driver while you are installing Windows 2000. If you create a boot container with the Container Configuration Utility, Windows 2000 will be installed on a boot container. (For information on creating a boot container, see Appendix A, *Using the BIOS Container Configuration Utility*.)

To install the Windows 2000 driver while installing Windows 2000:

- 1 Start your system with the Windows 2000 boot CD-ROM in the CD-ROM drive and proceed with the Windows 2000 installation.



---

**Note:** To install Windows 2000 from a bootable CD-ROM, the CD-ROM drive must be connected to another SCSI controller or an IDE controller (*not* the PERC 3/Di).

---

- 2 When the Windows 2000 CD-ROM starts to boot, it will display the following message:  
  
Setup is inspecting your computer's hardware configuration....  
  
Press **F6** immediately.
- 3 A few seconds later, a screen will be displayed asking you to specify additional adapters.
- 4 Press **S** to select additional hardware.
- 5 A menu with several items will be displayed. Be sure that **Other** is highlighted and then press **Enter** to load the device driver.
- 6 You will be prompted to insert a diskette into the diskette drive. Insert the diskette labeled **PERC 2, 2/Si, 3/Si, 3Di Windows 2000 Drivers Diskette**.
- 7 Press **Enter** to start the load of the driver.

- 8 You will be shown a list with one item on it. Press **Enter** to select the driver — **PERC 2, 2/Si, 3/Si, 3Di**.
- 9 If you have no other drivers that you need to install, press **Enter** to continue with the installation. Follow the online instructions and in the Windows 2000 documentation to complete the installation.
- 10 When the installation completes, the **Found New Hardware** wizard automatically runs. Ensure that the **PERC 2, 2/Si, 3/Si, 3Di Windows 2000 Drivers Diskette** is inserted in the diskette drive and make the necessary selection to install the Windows 2000 driver from the diskette.
- 11 To load the Windows 2000 driver, remove the **PERC 2, 2/Si, 3/Si, 3Di Windows 2000 Drivers** diskette from the diskette drive and reboot the system.

## Installing the Driver When Windows 2000 is Already Installed

To install the driver when Windows 2000 is already installed on your system:

- 1 Ensure that the PERC 3/Di controller is installed in your system, then reboot your system so that the system can recognize the controller.

When the system is rebooted and the controller recognized, Windows 2000 automatically launches the **Found New Hardware** wizard, which you use to install the Windows 2000 driver for the PERC 3/Di controller.

- 2 The **Found New Hardware** wizard displays a **Files Needed** dialog box, which prompts for the location on the diskette drive for the driver files for the PERC 3/Di controller. Insert the diskette labeled **PERC 2, 2/Si, 3/Si, 3Di Windows 2000 Drivers Diskette** in the diskette drive and click **OK**.

The system then installs the driver.

- 3 When the driver finishes installing, click **Finish** to exit the **Found New Hardware** wizard.
- 4 At the message *Do you want to restart the computer now?*, remove the diskette from the diskette drive and click **Yes** to reboot the system.

## NetWare Environment

This section explains how to install the driver, `perc2.ham`, for Novell NetWare 5.0, 5.1, or 6.0. If you are performing a first time NetWare installation, see *Installing the Driver During a Fresh Install of NetWare* on page 3-8. If NetWare is already installed in your system, see *Installing the Driver when NetWare is Already Installed* on page 3-9.



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**Note:** We recommend that you install your NetWare operating system on a container to take advantage of the redundancy and performance features of the container.

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## Installing the Driver During a Fresh Install of NetWare

Follow these instructions only if you are installing NetWare for the first time. If you want NetWare to reside on a container, first create a boot container, then install the driver and software on that container.

For information on creating a boot container, see Appendix A, *Using the BIOS Container Configuration Utility*.

To install the `perc2.ham` driver when installing NetWare for the first time:

- 1 Begin installing NetWare on your server as instructed in your NetWare documentation.
- 2 When the **Detected Device Types** screen appears, select **Modify** and press **Enter**. Then select **Storage Adapters** and press **Enter**.
- 3 Select **I2OPCI.NLM** and press **Delete**.

If you choose to install **I2OPCI**, you can add the driver back after the `perc2.ham` driver is installed.

- 4 Check that the proper driver for any embedded SCSI controllers is installed.



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**Note:** If the embedded driver has not been installed, install it before installing the PERC 3/Di driver. Refer to your Dell server documentation for further information.

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- 5 Insert the PERC 3/Di driver diskette for NetWare into your diskette drive and press the **Insert** key.
- 6 An explanatory screen appears. Press **Enter** to have the system scan the diskette for the PERC 3/Di driver.
- 7 Select **PERC 2.HAM Dell PowerEdge RAID Controller** and press **Enter**. This will bring you to the **PERC 3/Di Parameters** screen.
- 8 Select **Return to driver list** to accept the default slot number and press **Enter**.
- 9 Press **Esc**.
- 10 Select **Return to driver summary** and press **Enter**.
- 11 If desired, select the **I2OPCI.NLM** driver and install it. You can enter the slot number as suggested in the **Slot Number Help** screen.

- 12 Press **Esc**.
- 13 To continue the NetWare installation, select **Continue** and press **Enter**.
- 14 If necessary, install the NetWare Support Pack 6a or higher for NetWare 5.0 or the NetWare Support Pack 3 for NetWare 5.1.



**Caution:** Novell recommends installing the Support Pack on your server from a client. If installing the Support Pack from a diskette, mount the diskette as a NetWare volume and then install the software.

---

## Installing the Driver when NetWare is Already Installed

To update or install the `perc2.ham` driver when NetWare is already installed, follow the instructions in this section. Before you begin, however, make a backup copy of the driver.

To install the `perc2.ham` driver:

- 1 At the NetWare console prompt, type **load nwconfig**.
- 2 Select **Driver Options** and press **Enter**.
- 3 Select **Configure disk and storage device drivers** and press **Enter**.
- 4 From the **Additional Driver Action** menu, choose **Select an additional driver** and press **Enter**.
- 5 Check that the proper driver for any embedded SCSI controllers is installed.



**Note:** If the embedded driver has not been installed, install it before installing the PERC 3/Di driver. Refer to your Dell server documentation for further information.

---

- 6 Insert the PERC 3/Di driver diskette for NetWare version 5.0 or version 5.1 into your diskette drive and press the **Insert** key.
- 7 An explanatory screen appears. Press **Enter** to have the system scan the diskette for the PERC 3/Di driver.
- 8 Select **PERC 2.HAM Dell PowerEdge RAID Controller** and press **Enter**. This will bring you to the **PERC 3/Di Parameters** screen.
- 9 Answer **Yes** to the prompt `Do you want to copy driver perc2.ham?`
- 10 Specify the path where you want the `perc2.ham` driver installed or press **Enter** to accept the default.
- 11 You will be prompted to save the existing driver and its attendant files. Answer **Yes** to these prompts.

- 12 Choose **Select/Modify driver Parameters** and press **Enter**.
- 13 Press **Ctrl-Esc**, and from the next menu choose the option to return to the **System Console**.
- 14 At the console prompt, type `load a:\v5.x\perc2.ham`.
- 15 Write down the HIN value displayed on the screen and select 0 to continue. Ignore the message regarding the `perc2.ham` not being loaded. Do *not* press **Enter**.
- 16 At the console prompt, press **Alt-Esc** to return to the `nwconfig` screen.
- 17 Enter the HIN value recorded in step 15, and press **Enter**.
- 18 Select **Save parameters and load driver** and press **Enter**.
- 19 Respond **No** to the prompt `Do you want to select an additional Disk driver?`
- 20 Press **Esc** until you return to the **Installation Options** menu. If necessary, modify the `load` command line in the `startup.ncf` file so that the proper path to the driver and all appropriate command line options are specified. See *Loading the NetWare Driver at Server Bootup* on page 3-10. Otherwise, exit the `nwconfig` program.
- 21 If necessary, install the Novell NetWare Support Pack 6a or higher for NetWare 5.0 or the Novell NetWare Support Pack 1 for NetWare 5.1.



**Caution:** Novell recommends installing the Support Pack on your server from a client. If installing the Support Pack from a diskette, mount the diskette as a NetWare volume and then install the software.

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## Loading the NetWare Driver at Server Bootup

To automatically load the `perc2.ham` driver at server bootup, the `startup.ncf` file (usually located in your server's startup directory) must contain a `load` command line that specifies the location of the driver and any appropriate command line options. For additional information on the `startup.ncf` file, refer to your NetWare documentation.

The correct syntax to load the driver is:

```
load [pathname]PERC 2 [options]
```

For example, the command line to load the driver from the `c:\nwserver` directory, with the `verbose` option *on* is:

```
load c:\nwserver\PERC 2 verbose=y
```

Command line options are *not* case sensitive. Placing commas between command line options is optional.

You can use the following procedure or a DOS text editor to modify the `startup.ncf` file.

To modify the `startup.ncf` file:

- 1 At the NetWare prompt, type `load nwconfig` and press **Enter**.
- 2 Select the appropriate menu option that allows you to edit the `startup.ncf` file.
- 3 Make the necessary changes. When done, press **Esc**.

## Linux Environment

The following sections explain how to install the Linux driver on a boot container during an operating system installation and after an installation, on a data container for all supported Linux operating systems.

The Linux driver for your controller may be delivered on a CD-ROM or on diskette or may be obtained from an Open Source provider.

### Installing the Linux Driver on a Boot Container



---

**Note:** The `percraid.img` driver is intended only for use with a boot container. It will not work correctly on a data container.

---

The Linux driver is now part of the standard Open Source distribution. Obtain the Linux operating system from an Open Source provider. For example, download the operating system from an Open Source Web site such as [www.redhat.com](http://www.redhat.com) and follow their instructions for loading the driver for the PERC 3/Di controller, which on the Open Source distribution is called the `aacraid` driver.

### Installing the Linux Driver on a Data Container

To install the Linux driver on a data container:

- 1 Log on as `root` or become superuser.
- 2 Check to see if the `percraid` driver already exists on your system, and if it does, remove it.

The Linux driver is now part of the standard Open Source distribution. Obtain the Linux operating system from an Open Source provider. For example, download the operating system from an Open Source Web site such as [www.redhat.com](http://www.redhat.com) and follow their instructions for removing the working driver for the PERC 3/Di controller, which on the Open Source distribution is called the `aacraid` driver.

- 3 Install the `percraid` driver on the data container.

The Linux driver is now part of the standard Open Source distribution. Obtain the Linux operating system from an Open Source provider. For example, download the operating system from an Open Source Web site such as **www.redhat.com** and follow their instructions for loading the driver for the controller, which on the Open Source distribution is called `aacraid`.

## **Additional Operating Systems**

If you are installing the driver on an operating system not listed in this chapter, please refer to the driver kit that shipped with your controller for instructions on how to perform the driver installation.



# 4

## Installing the Controller Management Software

For information about...	Turn to...
<i>Installing on Windows</i>	
<i>Installing the Controller Management Software on Windows</i>	page 4-2
<i>Uninstalling the Controller Management Software on Windows</i>	page 4-3
<i>Installing on NetWare</i>	page 4-3
<i>Installing on Linux</i>	page 4-5
<i>Installing on Additional Operating Systems</i>	page 4-6

This chapter explains how to install the controller management software on a Windows NT/Windows 2000 server, workstation, or client; a NetWare server or client; or a Linux system.



**Note:** If you want to install the controller management software on a boot container, you must first create a boot container and then install the PERC 3/Di driver as part of the operating system installation. For more information, see Chapter 3, *Installing the Device Driver*.

For information on creating a boot container, see Appendix A, *Using the BIOS Container Configuration Utility*.

See the documentation for the controller management software for instructions on using the software to manage storage.

## Installing on Windows

The following section explains how to install the controller management software on Windows. You can manage a controller using FAST or Array Manager; however, the following instructions assume you will be installing FAST. If you plan to install Array Manager, please consult the Array Manager documentation for installation instructions.

### Installing the Controller Management Software on Windows

You must first install the Dell PERC 2 API kit followed by the Dell PERC 2 Agent kit. If you install the Dell PERC 2 API kit on Windows 2000, you are required to reboot to complete the installation. Thus, at the end of the installation, you will be prompted to reboot the machine. You are not required to reboot when installing on Windows NT.

The Dell PERC 2 CLI kit has the same requirement to first install the Dell PERC 2 API kit followed by the Dell PERC 2 Agent kit.

Within the limitations described in this section, you can install any or all of the kits separately, depending on the functions you require.

You can install any of these kits on a system that does not have PERC 2 or ROMB hardware or drivers on it. This is sometimes appropriate. For example, if you want to use a workstation as a remote management station, you can install the Dell PERC 2 API and Dell PERC 2 FAST GUI kits. When you do this, you need to realize that any API or management functions that require local hardware will not work correctly.

The default target directory is `\Program Files\PERC2\`.

The Dell PERC 2 FAST GUI and the Dell PERC 2 CLI both add entries to the following menu:

```
Start>Programs>Dell PERC2
```

Each installation records a log file showing the steps and status of the installation. These logs are written to the AFA\Logs subdirectory under the target installation directory. By default, they appear in the following location:

```
\Program Files\PERC2\AFA\Logs
```

To begin the installation:

- 1 Start Windows and log on with administrative privileges.
- 2 Insert the CD-ROM.

For each kit that you are installing, beginning with the Dell PERC 2 API kit:

- 1 Click the **Start** button on the Windows task bar and click **Run**.
- 2 Browse to the CD-ROM drive and locate the appropriate kit.

- 3 For each kit, type `[drive] : \setup` and press **Enter**. Follow the instructions that appear on the screen.
- 4 If installing the software on a client that does not have a PERC 2 and PERC 3 family RAID controller, select the following option in the **Installation Type Selection** dialog box:  
**Remote Management Software Install, No PERC 2, 2/Si, 3/Si, 3Di Hardware**  
Otherwise, continue with the default selection.
- 5 When installation is complete, you are asked to reboot the system so your changes can take effect. You will be asked to reboot after installing the Dell PERC 2 API kit on a Windows 2000 machine. A reboot is required to rebuild the driver stack.

## Uninstalling the Controller Management Software on Windows

You must uninstall the Dell PERC 2 API kit last. If you try to uninstall the API kit while the other kits are still installed, the API uninstaller displays an error telling you to uninstall the other kits first.

If you have installed both the Dell PERC 2 Event Snap In kit and Dell PERC 2 Agent kit, you must uninstall the Event Snap In kit before the Agent kit. If you try to uninstall the Agent kit first, the uninstaller displays an error telling you to uninstall the Event Snap In kit first.

You must uninstall the Dell PERC 2 CLI kit and the Dell PERC 2 Event Snap In kit before you can uninstall the Dell PERC 2 Agent kit.

To perform the following procedure, you must be signed on as an administrator or have administrative privileges.

Follow these steps to uninstall the controller management software:

- 1 Click the **Start** button on the Windows task bar, and then point to **Settings**. Click **Control Panel** on the Settings menu.
- 2 Double-click the **Add/Remove Programs** icon.
- 3 Select the kit you wish to remove and click the **Add/Remove** button.
- 4 Follow the instructions (if any) that appear on the screen.
- 5 Reboot the system after removal is complete.

A reboot is required only after removing the Dell PERC 2 API kit from a Windows 2000 machine.

## Installing on NetWare

The following section explains how to install the controller management software on NetWare. Note that on NetWare, the controller can only be managed locally

with the CLI. However, you can manage a NetWare controller remotely using FAST or Array Manager, if you have FAST or Array Manager installed on a Windows NT or Windows 2000 system, and have established a network connection between the two systems.



**Note:** Before beginning this installation, ensure that the NetWare server is down and that you are at the DOS prompt.

---

To install the controller management software on NetWare:

- 1 When your NetWare server is at the DOS prompt, insert Diskette #1.
- 2 You can either execute the program directly from the floppy, or copy the `nwappd1.exe` executable to a local directory and execute it from there.
  - a To copy the file from the floppy disk to a local directory, type the following command:

```
copy a:\nwappd1.exe c:\[pathname]
```

where *pathname* is a directory on a local DOS partition.



**Caution:** Do not copy the `nwappd1.exe` file to the `nserver` directory, since when the file is uncompressed, you may overwrite files that should not be overwritten.

---

- b Type `cd \[pathname]` and press **Enter**.
- 3 Type `nwappd1.exe` and press **Enter**.  
Answer **Yes** to uncompress the files.
- 4 Start the NetWare server.
- 5 At the NetWare console, type the following and press **Enter**:

```
load \[pathname]\nwsetup
```

where *pathname* is the directory where you extracted the files.



**Note:** To get to the console on a NetWare system, when the server comes up, go to the Novell icon, select **Exit GUI**, and confirm your choice.

---

- 6 From the **NWSETUP Installation** menu, select **Start Installation**.
- 7 Follow the instructions that appear on the screen to complete the installation. (Press **F1** for help.)

- 8 After the installation of the controller management software is complete, you are prompted to update the `AUTOEXEC.NCF` file. Answer **Yes** to this prompt.

The contents of the file `sys:system\fsanw5.ncf` (for NetWare 5.0 or 5.1 systems), which load the `tcpip` and `spxs` modules, as well as the controller management software modules, are then appended to `AUTOEXEC.NCF`.

- 9 Press **Esc** to exit the installation.
- 10 To load the `tcpip`, `spxs`, and controller management software modules now without bringing down and restarting the server, type `sys:system\fsanw5.ncf`.



---

**Note:** Before you attempt to remotely manage the PERC 3/Di controller from a Windows system running FAST or Array Manager, be sure that communication with the server using the network is already established. (See the documentation provided with your TCP/IP software for instructions on establishing communications.)

---

## Installing on Linux

The controller management software for Linux consists of the command line interface (CLI) which allows you to manage the controller from a terminal emulator. On a Linux system, without the CLI, you can manage the controller only through the BIOS.

The Linux controller management software may be delivered on CD-ROM, diskette, or may be downloaded from the Dell Web site. The following instructions assume that the controller management software is delivered on CD-ROM.

To install the controller management software on Linux:

- 1 Log on as **root** or become superuser.
- 2 If you are upgrading from an earlier version, check to see if an `afaapps` kit already exists on your system. If it does exist, remove it.
  - a To determine if the `afaapps` kit is installed on your Linux system, enter the following command:  

```
rpm -q afaapps
```
  - b If the application software exists on your Linux system, the `rpm` command will return the following message, where `VERSION_NUMBER` is the actual version of the application software:  

```
afaapps-VERSION_NUMBER
```

- c** If the application software already exists on your Linux system, remove it by entering the following command, replacing *VERSION\_NUMBER* with the version number returned by the `rpm -q` command:

```
rpm -e afaapps-VERSION_NUMBER
```

- 3** Install the application software.

- a** Place the CD-ROM that contains the Linux controller management software in the CD-ROM drive.

The operating system may automount the diskette on `/mnt/cdrom`. If not:

- i** Create the mount point by entering the following command:

```
mkdir /mnt/cdrom
```

- ii** Mount the CD-ROM on `/mnt/cdrom` by entering a command like the following, replacing *cdrom\_LUN* with the logical unit number of your CD-ROM device. In most cases, the default LUN is `fd0`.

```
mount -t iso9660 /dev/cdrom_LUN /mnt/cdrom
```

- b** Change your working directory by entering the following command:

```
cd /mnt/cdrom
```

- c** Install the Linux controller management software on your Linux system by entering the following command, replacing *VERSION\_NUMBER* with the actual version of the software:

```
rpm -i afaapps-VERSION_NUMBER.rpm
```

- d** Enter the following command to unmount the CD-ROM:

```
umount /mnt/cdrom
```

- 4** Remove the controller management software CD-ROM from the drive.

## Installing on Additional Operating Systems

If you are installing the controller management software on an operating system not listed in this chapter, please refer to the software kit that shipped with your controller for instructions on how to install the controller management software.



# 5

## Installing and Configuring the SNMP Subagent

For information about...	Turn to...
<i>Installing the PERC 3/Di SNMP Subagent on Windows or NetWare</i>	page 5-2
<i>Setting up SNMP on NetWare</i>	page 5-3
<i>Installing and Configuring on Linux</i>	page 5-4
<i>Installing or Upgrading the PERC 3/Di SNMP Subagent</i>	page 5-4
<i>Configuring the PERC 3/Di SNMP Subagent</i>	page 5-5

This chapter explains how to install and configure the PERC 3/Di SNMP Subagent on the following platforms:

- Windows NT server or client
- Windows 2000 server or client
- Novell NetWare server
- Linux



---

**Note:** Before installing the PERC 3/Di SNMP Subagent on your system, you must first install and configure the SNMP service and master agent for your operating system. For more information, refer to the appropriate SNMP master agent documentation for your operating system.

---

## Installing the PERC 3/Di SNMP Subagent on Windows or NetWare

The kit containing the PERC 3/Di SNMP Subagent for your controller might be delivered on a CD-ROM, diskette, or can be down-loaded from the Dell Web site. These instructions assume that you will use the kit delivered on diskette.

To install the PERC 3/Di SNMP Subagent on a Windows NT or Windows 2000 system:

- 1 If FAST is installed on your system, from a command prompt window, stop the remote agent by entering the following command:

```
net stop afa_agent
```

- 2 Stop the SNMP service by entering the following command in a command prompt window:

```
net stop snmp
```

- 3 If FAST is installed on your system, rename the following dll files with a .nosnmp extension:

```
C:\Program Files\PERC2\AFA\afaapi.dll  
C:\Program Files\PERC2\AFA\afaappse.dll
```

- 4 Place the diskette that contains the PERC 3/Di SNMP Subagent software in the diskette drive.
- 5 Install the PERC 3/Di SNMP Subagent software by copying all the files from the NT\SNMP folder on the diskette to the C:\Program Files\PERC2\AFA folder.
- 6 Use the Windows NT Registry Editor (`regedt32`) to add an entry for the SNMP Subagent, as follows:

- a At the command prompt, run **regedt32**.

- b In the Registry Editor, locate the following key and select it:

```
HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services  
\SNMP\Parameters
```

- c Choose **Add Key** from the **Edit** menu.

- d In the **Key Name** field, type **ExtensionAgents**, and click **OK**.

- e In the Registry Editor window, select the newly added **ExtensionAgents** key, and choose **Add Value** from the **Edit** menu.

- f In the **Value Name** field, type **AFASNMP**. Set the **Data Type** to **REG\_SZ**, and click **OK**.

- g In the **String** field, enter the following:

```
SOFTWARE\Adaptec\RaidController\AFA\CurrentVersion
```

Click **OK**.

- 7 Use the Registry Editor to add an entry for the SNMP Subagent dll, as follows:
  - a In the Registry Editor, locate the following key and select it:  
`HKEY_LOCAL_MACHINE\Software\Adaptec\RaidController\AFA\CurrentVersion`
  - b Choose **Add Value** from the **Edit** menu.
  - c In the **Value Name** field, type **Pathname**. Set the **Data Type** to **REG\_EXPAND\_SZ**, and click **OK**.
  - d In the **String** field, enter the following:  
`%SystemDrive%\program files\PERC2\AFA\AFASNMPE.DLL`
  - e Click **OK** and exit the Registry Editor.
- 8 If FAST is installed on your system, from a command prompt window, enter the following command to restart the SNMP service:  

```
net start snmp
```
- 9 If FAST is installed on your system, enter the following command to restart the remote agent:  

```
net start afa_agent
```

## Setting up SNMP on NetWare

NetWare systems must be configured to send SNMP traps to a Windows NT or Windows 2000 system. For each client you want to receive traps, add an entry to the `traptarg.cfg` file in the `sys:etc` directory. Instructions for adding these entries are given in comments in the `traptarg.cfg` file.

Note that the Windows NT or Windows 2000 client system you select to receive the SNMP traps must be running SNMP.

To set up a NetWare system to generate SNMP traps:

- 1 Install the HP NetServer Agents and Desktop Management Interface (DMI) software on your NetWare system from the networked Windows NT or Windows 2000 system that will receive the NetWare traps. For information on how to perform this installation, see the appropriate HP NetServer documentation.
- 2 To activate the NetServer Agents and DMI software, reboot your NetWare system by entering the following command at the NetWare console (or if you have `rconsole` configured, on your Windows NT or Windows 2000 system):  

```
nsaload
```

# Installing and Configuring on Linux

The `afasmp` SNMP Subagent for your controller may be delivered on diskette, CD-ROM or may be downloaded from the Dell Web site. These instructions assume that the `afasmp` SNMP Subagent for your controller is being delivered on CD-ROM.

## Installing or Upgrading the PERC 3/Di SNMP Subagent

To install or upgrade the `afasmp` SNMP Subagent:

- 1 Install and configure the master SNMP agent for your Linux operating system. For more information, see the SNMP documentation for your Linux operating system.



---

**Note:** The UCD SNMP master agent that ships with RedHat Linux will not work with the `afasmp` SNMP Subagent. The `afasmp` SNMP Subagent requires UCD SNMP version 4.1.1 (and only this version). The UCD SNMP master agent must be built from source and configured using the `configure` command with the following two options:

```
--enable-reentrant --with-mib-modules="agentx"
```

---

- 2 Log on as `root` or become superuser.
- 3 If upgrading from an earlier release, check to see if the `afasmp` SNMP Subagent for your controller already exists on your system. If it does exist, remove it.
  - a To determine if the `afasmp` SNMP Subagent is installed on your Linux system, enter the following command:

```
rpm -q afasmp
```

If the `afasmp` SNMP Subagent exists on your Linux system, the `rpm` command will return the following message, where `VERSION_NUMBER` is the actual version of the SNMP software:

```
afasmp-VERSION_NUMBER
```
  - b If the `afasmp` SNMP Subagent already exists on your Linux system, remove it by entering the following command, replacing `VERSION_NUMBER` with the version number returned by the `rpm -q` command:

```
rpm -e afasmp-VERSION_NUMBER
```
- 4 Install the `afasmp` SNMP Subagent.
  - a Place the CD-ROM containing the `afasmp` SNMP Subagent in the CD-ROM drive.

- b** Mount the drive on `/mnt` by entering a command like the following, replacing `cdrom_LUN` with the logical unit number of your CD-ROM device (in most cases the default device is `fd0`):  

```
mount -f pcfs /dev/cdrom_LUN /mnt
```
- c** Change your working directory to `/mnt` by entering the following command:  

```
cd /mnt
```
- d** Install the `afasmp` SNMP Subagent by entering the following command, replacing `VERSION_NUMBER` with the actual version of the software:  

```
rpm -i afasmp-VERSION_NUMBER.rpm
```
- e** When the installation completes, unmount the diskette drive by entering the following command:  

```
umount /mnt
```
- f** Remove the `afasmp` SNMP Subagent CD-ROM from the drive.

## Configuring the PERC 3/Di SNMP Subagent

To configure the `afasmp` SNMP Subagent so that it can communicate with the SNMP master agent on your Linux operating system:

- 1** Log on as `root` or become superuser.
- 2** Create the following file, replacing `SNMP_CONFIGFILE_PATH` with the absolute path to the UCD SNMP master configuration file (the default absolute path is `/usr/local/etc/snmp`):

```
/SNMP_CONFIGFILE_PATH/afasmp.conf
```



**Note:** If you do not create this file, no traps will be sent by the `afasmp` SNMP Subagent.

---

- 3** Populate the file with the trap community and the trap designations for the `afasmp` SNMP Subagent, using the three following sample entries as a template (you can also use the trap destination syntax listed in UCD SNMP documentation):

```
trapcommunity "public"  
trapsink localhost  
trapsink monitor.company.com
```

Note that the values specified in `afasmp.conf` should be the same as those specified in the UCD SNMP master agent configuration file, unless you want the `afasmp` SNMP Subagent traps to go to another destination.

For more information on configuring UCD SNMP traps, see the appropriate UCD SNMP documentation.

- 4 If the UCD SNMP master agent is configured to start automatically at system boot-time, you can configure the `afasmp` SNMP Subagent to do the same by entering the following commands:

```
/sbin/chkconfig --add afasmpd
```

```
/sbin/chkconfig --level 35 afasmpd on
```

- 5 The UCD SNMP tools expect MIBs to be installed in the MIB directory, `/usr/local/share/snmp/mibs` by default. If you want to use the UCD SNMP tools with the `afasmp` MIB, copy the `afasmp` MIB file into the MIB directory by entering the following command, replacing `SNMP_MIB_DIR` with the absolute path to the MIB directory:

```
cp /usr/sbin/afa.mib /SNMP_MIB_DIR/afa.txt
```

- 6 To start the `afasmp` SNMP Subagent, enter the following commands:

```
/etc/rc.d/init.d/snmpd restart
```

```
/etc/rc.d/init.d/afasmpd start
```





# Using the BIOS Container Configuration Utility

The Container Configuration Utility (CCU) enables you to create, delete, and manage containers from the PERC 3/Di BIOS. A container is a logical disk created from freespace and made up of partitions on one or more physical disks. Refer to the *Flexible Array Storage Tool User's Guide* for more information on containers. You can use CCU to create a bootable container for the server. We recommend that you configure the server to boot from a container instead of from a single disk to take advantage of the redundancy and performance features of containers.

Note that the CCU is a BIOS utility. It does not have the same breadth of functionality as the controller management software because the operating system is not running and not accessible to the BIOS.

Dell also ships a version of CCU on a separate distribution that runs outside the BIOS as a stand-alone program. Note, however, that unlike the CCU in the BIOS, the stand-alone CCU utility does not contain *SCSISelect* or the Disk Utilities.



---

**Note:** If you are changing the configuration of a server that is already in use on a network, log all users off the system and shut it down in an orderly manner before you start the CCU.

---

To select a CCU menu option, move the cursor to the option with the ↑ and ↓ keys, then press **Enter**. In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing **Esc**.

## Creating a Container

Before creating containers, make sure the disks for the container are connected and installed in your server (or enclosure). To create a container you select the disks to be used in the container and then assign the container properties.

To select one or more disks to be used in the container:

- 1 Shut down and reboot the server.
- 2 At the BIOS prompt Press <Ctrl><A> for Configuration Utility! press **Ctrl-A**.
- 3 Select **Container Configuration Utility** from the menu.
- 4 Select **Create Container** from the CCU menu.
- 5 Use the **Left/Right** arrow keys to select a bus.
- 6 Select the disks for the new container and press **Insert**. CCU displays the largest usable freespace available for each disk. You can use available freespace from multiple disks for the new container. To deselect any disk, highlight the disk and press **Delete**.

Note that the number of drives used for each RAID level cannot exceed 32 drives. Note also that the CCU does not reliably find disks or enclosures that were powered up after system power-up.



**Note:** Any disks with DOS partitions, disks with no usable space, or uninitialized disks appear dimmed and cannot be used for creating a new container. See *Initializing a Disk Drive* on page A-6.

---

- 7 Press **Enter** when all disks for the new container are selected. The **Container Properties** menu displays.

If you install a controller into a system that has been powered down, on startup the BIOS will announce the detected configuration changes. If the system does not consider that these changes are risky, the system will present a confirmation prompt and will auto-confirm if there has been no operator input in 30 seconds. If the system considers that the changes are risky, you will be prompted for further action.

# Assigning Container Properties

Note that you cannot change container properties from the CCU once the container is created. You must instead use FAST or Array Manager.

To assign various properties to the new container:

- 1 In the **Container Properties** menu, select a container type and press **Enter**. Only container types available according to the number of disks selected displays. Your possible options are
  - **Volume:** A container made up of one or more partitions, linked together.
  - **RAID 0 (Stripe set):** Data is distributed across the partitions in a RAID 0 container in chunks, allowing for faster I/O performance than a single disk or volume. If one drive fails in a RAID 0 container, the container is marked *Dead*.



**Note:** Volume and RAID 0 containers do not store redundant data; if any disk in the container fails, all data is lost.

---

- **RAID 1 (Mirror set):** Data is mirrored on two equal-sized partitions that reside on two different disks. If one disk fails, data is available from the other disk. The actual data capacity of the container equals half the available disk space.
- **RAID 5:** The container contains redundant (parity) data distributed across all partitions in the container. If any one disk fails, the container is marked *Critical*, and data can be reconstructed from the parity information. If a second disk fails before the container has been reconstructed, all data is lost and the container is marked *Dead*. The actual usable data capacity of the container is equal to one less than the total number of partitions. (One partition's worth of capacity is needed to hold the parity information.)
- **RAID 0/1:** Data is distributed and mirrored on two or more pairs of partitions. If one disk in a pair fails, data remains available. The actual data capacity of the container equals half the total available partition space.

See the documentation for your controller management software for more information about selecting a RAID level.

- 2 Type in a label for the container and press **Enter**.
- 3 The CCU automatically displays the maximum size of the container that can be created from the selected partitions. To specify a different container size, type the size and select the unit of measure (MB or GB) from the drop-down list. If the aggregate size of the selected partitions is greater than the

container size you specify, the excess disk space is returned to the freespace pool for use in other containers.



---

**Note:** On a Windows 2000 system, a basic-disk container is usable only if its size is greater than 16 MBytes; otherwise, the container type must be dynamic disk. For information about modifying the container properties of an existing container, see the documentation for your controller management software.

---

- 4 Select the container chunk size. Chunk size is the amount of data written to one partition in a RAID 0 (stripe set), RAID 5, or RAID 0/1 container before the I/O data stream switches to the next partition.

The allowable chunk sizes are 8, 16, 32 (the default), and 64 KBytes. The default chunk size gives the best overall performance in most network server environments.

- 5 Specify if you want to enable read caching for the container.

This option should always be enabled to optimize performance, unless your application is doing completely random reads, which is unlikely.

- 6 Specify if you want to enable write caching for the container.



---

**Note:** Some controllers by design do not allow the use of write caching. In such cases the controller will not activate write caching, regardless of the container's write cache setting. If this is the case with your controller, you will see a message that tells you the settings have been recorded but have no effect.

---

Write caching options (if supported) consist of the following:

- **Enable When Protected** (default)

This means that the controller enables the container's write cache only if a battery is present and its status is OK.

- **Enable Always**

This means that the controller enables a container's write cache even if there is no battery or if the battery is bad.



---

**Caution:** If you select this option, you may experience data loss in the case of a power loss.

---

– **Disable**

This means that the controller disables a container's write cache.

7 When finished, select **Done**.

## Managing Containers

With the Manage Container option you can view information on containers, initialize containers, make a container the boot container, or delete containers.

CCU can display and manage a *maximum* of 24 containers.

### Viewing Container Information

To view information on an existing container:

- 1 At the BIOS prompt, press **Ctrl-A**.
- 2 From the menu, select **Container Configuration Utility**.
- 3 From the CCU menu, select **Manage Container**.
- 4 From the **List of Containers** dialog box, select the container you want to view information on and press **Enter**.

The **Container Properties** dialog box appears, showing detailed information on the container. The physical disks associated with the container will be displayed here.



**Note:** To identify the physical disks associated with a member of a RAID 0/1 container, highlight the displayed *member* in the **Container Properties** dialog box and press **Enter**.

---

- 5 Press **Esc** to return to the previous menu.

## Initializing a Disk Drive

If an installed disk does not appear in the disk selection list for creating a new container or if it appears grayed out, you may have to initialize it before being able to use it as part of a container.



**Caution:** Initializing a disk overwrites the partition table on the disk, and essentially makes all the previous data on the disk inaccessible. Since the partition table is overwritten, if the drive is used in a container, you may not be able to use the container again. Do *not* initialize a disk that is part of a boot container! The boot container is labelled as **00** in the **List of Containers** dialog box.

See *Viewing Container Information* on page A-5 for information on determining which disks are associated with a particular container.

---

To initialize a drive:

- 1 At the BIOS prompt press **Ctrl-A**.
- 2 Select **Container Configuration Utility** from the menu.
- 3 Select **Initialize Drives**.
- 4 Use the **Right/Left** arrow keys to select the bus with the disk you wish to initialize.
- 5 Select the disk you wish to initialize and press **Insert**.
- 6 Press **Enter**.
- 7 At the warning message, press **Y**.

## Making a Container Bootable

You can make a container bootable so that the server can boot from the container instead of from a stand-alone (single) disk.

To make a container bootable, the container number must be set to 00 in the boot order.



**Note:** The server will always attempt to boot from any installed non-SCSI disks (for example, any IDE disk drive at drive C). You must disable or remove all non-SCSI disks if you want the server to boot from a SCSI disk or container.

---

To make a container bootable:

- 1 At the BIOS prompt press **Ctrl-A**.
- 2 From the menu, select **Container Configuration Utility**.
- 3 From the CCU menu, select **Manage Container**.
- 4 Select the container you wish to make bootable and press **Ctrl-B**.



**Note:** You *cannot* make a non-00 container bootable if any container is in the process of scrubbing, clearing, or reconfiguring.

Refer to the *Flexible Array Storage Tool User's Guide* for information about scrubbing containers.

---

- 5 Reboot the system.



**Caution:** The controller always uses the lowest numbered container as its bootable container. If you delete container 00 for any reason, the next highest numbered container will become the bootable container. Use the *Ctrl B* option to mark the correct container as the bootable container (by making it container 00).

---

If you want to boot from a stand-alone (single) disk drive, first create a volume container on the desired disk.

The system BIOS provides additional tools to modify the search order for bootable controllers. For more information, refer to your system documentation.

## Deleting Containers



**Caution:** *Back up* the data on a container before you delete it. All data on the container is lost when you delete the container, and you cannot restore a deleted container.

---

To delete an existing container:

- 1 At the BIOS prompt, press **Ctrl-A**.
- 2 From the menu, select **Container Configuration Utility**.
- 3 From the CCU menu, select **Manage Container**.
- 4 Select the container you wish to delete and press **Delete**.
- 5 At the **Container Properties** screen, select **Delete** again and press **Enter**.
- 6 Press **Esc** to return to the previous menu.

## Repairing a RAID 5 Set

To repair a RAID 5 set:

- 1 At the BIOS prompt, press **Ctrl-A**.
- 2 From the menu, select **Container Configuration Utility**.
- 3 From the CCU menu, select **Manage Container**.
- 4 If the BIOS has detected a parity error in the selected RAID 5 set, the following help message is displayed at the bottom of the screen.  
<Ctrl+R> Restore/Enable RAID 5
- 5 To repair the selected RAID5 set, press **Ctrl-R** and follow the prompts.



**Caution:** Be careful when restoring RAID 5 data sets, since the containers went off-line as a result of some problem. Data on these sets should not be trusted until the data has been checked and verified.

---



# B

## Using the BIOS *SCSISelect* and Disk Utilities

The *SCSISelect* Utility enables you to change SCSI device and controller settings without opening the server chassis or handling the card. The Disk Utilities allow you to low-level format or verify the disk media of your SCSI hard disk drives. The *SCSISelect* settings are listed in Table B-1.

Table B-1. *SCSISelect* Options

<b>Controller Configuration Options</b>	<b>Default</b>
Drives Write Cache <sup>1</sup>	Disabled
Runtime BIOS	Enabled
Automatic Failover	Enabled
NVRAM State <sup>2</sup>	Clean
<b>SCSI Bus Interface Definitions</b>	<b>Default</b>
Controller SCSI Bus ID	7
SCSI Parity Checking	Enabled
Controller SCSI Bus Termination	Enabled

Additional Options	Default
SCSI Device Configuration	
Initiate Sync Negotiation	Yes
Maximum Transfer Rate	160 MBytes/sec
Enable Disconnection	Yes
Initiate Wide Negotiation <sup>3</sup>	Yes
Domain Validation	Enabled

<sup>1</sup> This option is used to control the cache on the drive, not the PERC 3/Di. We recommend that the drive write cache remain *disabled* for maximum data protection.

<sup>2</sup> This option is available only for controllers that have a battery.

<sup>3</sup> This option is available only if Wide SCSI is supported on the attached drives.

If you want to view or change the current settings, see *Starting the SCSISelect Utility* on page B-2. For detailed descriptions of each setting, see *Using the Controller Configuration Utility* on page B-3.

## Starting the SCSISelect Utility

To start *SCSISelect*:

- 1 Press **Ctrl-A** when the following prompt appears when you turn on or reboot your server:

Press <Ctrl><A> for Configuration Utility!

- 2 If multiple controllers are installed, select the controller you want to configure and press **Enter**.
- 3 Select **SCSISelect Utility** from the menu.

The menu **Controller Configuration** and **SCSI Configuration** options are displayed.

## Using SCSISelect Menus

To select a *SCSISelect* menu option, move the cursor to the option with the **↑** and **↓** keys, then press **Enter**. In some cases, selecting an option displays another menu. You can return to the previous menu at any time by pressing **Esc**.

To restore the original *SCSISelect* default values, press **F6** from the **Configure/View Host Adapter Settings** screen.

To toggle the display between color and monochrome modes, press **F5** from the main *SCSISelect* screen (note, however, that this feature does not work on some monitors).

## Exiting SCSISelect

To exit *SCSISelect*, press **Esc** until a message prompts you to exit (if you changed any host adapter settings, you are prompted to save the changes before you exit). Select **Yes** to exit and reboot the system. Any changes you made in *SCSISelect* take effect after the server boots.

## Using the Controller Configuration Utility

To access the Controller Configuration Utility, select the **Controller Configuration** option from the menu that appears after starting *SCSISelect*.

The following settings are the controller settings most likely to require any modification.

- **Drives Write Cache** — Enables or disables the write-back cache feature of all SCSI disk drives connected to the controller. If *Disabled*, the controller will disable the write-back cache of all attached drives. If *Enabled*, then the controller will enable the write-back cache of all attached drives. If *Drive Default*, then the controller will not change the write-back cache setting of any attached drives. The default is *Disabled*.



**Caution:** Disk drives with write-back cache enabled *do not* have the benefit of battery protection and could lose or corrupt data as a result of unexpected power loss or drive removal.

---

Certain controllers may not support drives write cache. In those cases where drives write cache is not supported, setting the option to *Enabled* has no effect.

- **Runtime BIOS** — Enables or disables the PERC 3/Di runtime BIOS. The BIOS must be enabled if you want to boot from a SCSI hard disk drive connected to the PERC 3/Di. The default is *Enabled*.
- **Automatic Failover** — If *Enabled*, this option lets you replace a failed drive in the same enclosure slot in a RAID-5, RAID 0/1, or Mirror set. The BIOS then recognizes that the failed drive has been replaced, initializes the new disk, and immediately initiates a failover. The default is *Enabled*. Note that this option is only supported for disks in SAF-TE enclosures or backplanes.
- **NVRAM State** — Displays the current status of the NVRAM cache. This option is available only for controllers that have a battery and is for display only. The user *cannot* set this option. The default is *Clean*.

## Using the SCSI Configuration Utility

To access the SCSI Configuration Utility, select the **SCSI Configuration** option from the menu that appears after starting *SCSISelect*. Select the bus you want to configure and press **Enter**.

## SCSI Bus Interface Options

The following settings are the SCSI*Select* settings most likely to require any modification.

- **Controller SCSI Bus ID** — Sets the PERC 3/Di's SCSI ID. We recommend that you leave the PERC 3/Di set to SCSI ID 7, which gives the PERC 3/Di the highest priority on the SCSI bus.
- **SCSI Parity Checking** — Determines whether the PERC 3/Di verifies the accuracy of data transfer on the SCSI bus. You should disable SCSI Parity Checking on the PERC 3/Di and all SCSI devices if any SCSI device supported by the PERC 3/Di does not support SCSI parity; otherwise, leave it enabled. Most SCSI devices do support SCSI parity. If you are not sure whether a device supports SCSI parity, consult the documentation for the device. All Dell server disks support parity.
- **Controller SCSI Bus Termination** — Sets termination on the controller card. We recommend that you leave the PERC 3/Di set to its default setting of *Enabled*.
- **SCSI Device Configuration** — For information about these options, see the section, *SCSI Device Configuration Options*.
- **Domain Validation** — Uses a sequence of I/O commands to determine the optimum transfer rate between the PERC 3/Di controller and the SCSI devices on initial boot. In the same way that a modem steps down the transfer rate based on a telephone line quality to ensure data integrity, Domain Validation limits the bandwidth to a device to guarantee reliable data transfers. The default is *Enabled*.

## SCSI Device Configuration Options

The SCSI device settings allow you to configure certain parameters for each device on the SCSI bus. To configure settings for a specific device, you must know the SCSI ID assigned to that device. If you are not sure of the SCSI ID, see *Using the Disk Utilities* on page B-5.

- **Initiate Sync Negotiation** — Determines whether the SCSI bus initiates synchronous data transfer negotiation (Sync Negotiation) between the device and SCSI bus. Normally, you should leave Initiate Sync Negotiation set to *Enabled*, because most SCSI devices support synchronous negotiation and because it allows for faster data transfer.
- **Maximum Transfer Rate** — Determines the maximum data transfer rate that the SCSI bus supports. The maximum effective data transfer rate is doubled when Initiate Wide Negotiation is set to *Yes* and 16-bit devices are attached (Initiate Wide Negotiation has no effect with 8-bit devices).
- **Enable Disconnection** — Determines whether the SCSI bus allows the SCSI device to disconnect from the SCSI bus (sometimes called

Disconnect/Reconnect or Reselection). This option should be enabled for maximum performance.

- **Initiate Wide Negotiation** — Determines whether the SCSI bus attempts 16-bit data transfer instead of 8-bit data transfer. The effective data transfer rate is doubled when 16-bit data transfer is used.

## Using the Disk Utilities

To access the disk utilities, select the **Disk Utilities** option from the main menu that appears after entering the Configuration Utility and selecting the desired PERC 3/Di controller. Select the desired bus and press **Enter**. Once the option is selected, a list of all SCSI IDs and the devices assigned to each ID is displayed.

When you select a specific ID and device, a small menu appears, displaying the options Format Disk and Verify Disk Media.

- **Format Disk**—Performs a low-level format on a hard disk drive. Each hard disk drive must be low-level formatted before you can use your operating system's partitioning and file preparation utilities, such as MS-DOS Fdisk and Format.

Most SCSI disk devices are preformatted at the factory and do not need to be formatted again. The Format Disk utility is compatible with the vast majority of SCSI disk drives.



**Caution:** A low-level format destroys all data on the drive. Be sure to back up your data before performing this operation. Once started, you *cannot* abort a low-level format.

---



**Note:** The controller should not be powered-off or rebooted during a disk format. Doing so may render the disk unusable until the format is manually restarted and completed.

---

- **Verify Disk Media** — Scans the media of a hard disk drive for defects. If the utility finds bad blocks on the media, it prompts you to reassign them. If you select **yes**, the utility remaps the recoverable defects and no longer uses those blocks. You can press **Esc** at any time to abort the utility.





# C

## Troubleshooting

If you have problems installing or using the PERC 3/Di controller and the SCSI devices attached to it, consult the following list of troubleshooting suggestions:

- Does the PERC 3/Di BIOS banner (similar to the following) appear during bootup?

```
Dell PowerEdge RAID Controller 3/Di, V2.7Build XXXX  
(c) 2002 Adaptec, Inc. All Rights Reserved
```

If the banner appears, it indicates that the system recognizes the PERC 3/Di as part of the hardware configuration. If it does not appear, check that you have enabled the PERC 3/Di. For information on how to enable your PERC 3/Di, see your Dell PowerEdge manual that covers *Activating the Dell PERC 3/Di*.

- Are the SCSI buses terminated properly and are all SCSI devices turned on?
- Are all SCSI bus cables and power cables connected securely? Be sure to carefully check the pins in the 68-pin cables.
- Does each device on the bus have a unique SCSI ID? If the controller will not boot, power off all disks and attempt to reboot. If the system boots and it is the first time the disks are connected, it is likely that the SCSI ID's are set incorrectly.
- Does the controller appear in the FAST or Array Manager open dialog? If not, check the System Event Log report for any errors reported by the controller. To do this from the Start menu, press **Start> Programs> Administrative Tools> Event Log**.
- If containers are not recognized as valid devices on a NetWare system, ensure that the `SCSIHD.CDM` custom device module is loaded before the `perc2.ham` driver in the `STARTUP.NCF` file. (The NetWare 5.1 installation procedure enforces the loading of CDM files before HAM files, whereas earlier versions did not.)
- Did the PERC 3/Di pass self-test? If not, a message similar to the following will appear on boot-up:

WARNING! The PERC 3/Di selftest has failed.

Contact your technical service representative to determine the cause of failure and to see if a replacement controller is required.

## Using the Controller Service Features

The PERC 3/Di BIOS provides a Controller Service utility that enables you to view a detailed log of BIOS events and change some advanced BIOS settings. This utility should be accessed in cases where your PERC 3/Di controller will not start because of a configuration problem.



**Caution:** The Controller Service utility is intended to assist technical support representatives in troubleshooting controller problems; it should *not* be used under normal operating conditions.

---

To access the Controller Service utility:

- 1 Press **Ctrl-A** when the following prompt appears when you turn on or reboot your server:  
  
Press <Ctrl><A> for Configuration Utility!
- 2 If multiple controllers are installed, select the controller you wish to configure and press **Enter**.
- 3 Press **Ctrl-P** to start the Controller Service Utility. A two-option menu appears.
- 4 Select **Additional Controller Configuration** to access advanced BIOS settings or select **Controller Log Information** to view detailed information on the current BIOS log and the previous BIOS log and press **Enter**.

### Controller Log Information

If you are experiencing system problems, your Dell technical service representative can access the controller log to gain detailed information on the internal operations of the PERC 3/Di during the current boot and the previous boot.

### Controller Configuration Options

The Controller Service utility provides the following options:

- **Force Single Container Configuration** — If *Enabled*, this option causes the PERC 3/Di to configure only the boot container to be able to boot; any other containers are ignored. The default is *Disabled*. Use this option if you encounter problems booting the controller because of problems with containers other than the boot container.

- **Boot Mode** — This option sets the mode for the next boot. If *Normal*, then all of the containers and files systems will be configured (if possible) during system boot. If *Maintenance*, then none of the containers or file systems will be configured. The default is *Normal*. Maintenance mode allows the system to be started in cases where you are experiencing PERC 3/Di problems and cannot otherwise boot your system.
- **Clear NVRAM** — This option is available only for controllers that have a battery. When *Enabled*, this option clears the PERC 3/Di NVRAM (nonvolatile DIMM) of its contents. The default is *Disabled*.



**Caution:** Clearing the NVRAM can have serious consequences! Loss of data occurs if the NVRAM is cleared when it contains valid data which has not been written to disk. Only an authorized individual should clear the NVRAM.

---

## Configuring the PERC 3/Di Remote Agent for NetWare

The NetWare PERC 3/Di remote agent allows you to disable remote access, permit read-only access and require a remote user to supply a password before allowing a remote connection. You can configure the PERC 3/Di remote agent by editing the `fsasrvnw.nlm` file. To edit the file, type **load edit fsasrvnw.ini** at the NetWare console prompt. Make the desired changes to the `.ini` file and exit the editor (see *Access* and *Communications* on page C-4 for settings). After the file has been edited, restart the `fsasrvnw.nlm` application so that the software recognizes that configuration changes have occurred. To do this, type **unload fsasrvnw** followed by **load fsasrvnw** at the console prompts.



**Note:** In Windows NT, the PERC 3/Di remote agent can be configured through a control panel application or through the Windows NT Registry. Refer to the *Flexible Array Storage Tool User's Guide* for more information.

---

## Access

The access section determines how or if a remote user is allowed to open a PERC 3/Di controller. The access section contains the following flags:

- **Read-write** — If this field is set to TRUE, remote read-write access will be allowed. If this field is set to false, no remote users will be allowed to open controllers in read-write mode.
- **Remote-access** — If this field is set to TRUE, remote access will be allowed. If this field is set to FALSE, no remote access will be allowed.



---

**Note:** The read-write password setting and read-only-password setting in `fsasrvnw.ini` are case sensitive.

---

- **Read-write-password** — If this field is set to TRUE then users opening controllers read-write remotely will be required to provide a password to gain access to the controller. The user will be prompted for a username and password. The user must supply a username and a password for an account on the NetWare server that has supervisor privileges. The setting is case sensitive.
- **Read-only-password** — If this field is set to TRUE then users opening controllers read-only remotely will be required to provide a password to gain access to the controller. The user will be prompted for a username and password. The user must supply a username and a password for an account on the NetWare server that has supervisor privileges. The setting is case sensitive.

## Communications

The communications section provides switches that control how communication will be configured. The communication section contains the following switches:

- **Use\_IP** — If this switch is set to TRUE, the PERC 3/Di Remote Agent will attempt to use IP as a communications protocol.
- **IP\_PORT** — This switch specifies (in decimal) the IP port that will be used for communications. This may be helpful if you are trying to access the controller through a firewall. The IP\_PORT is specified as a four-octet address, for example, `128.10.2.30`.
- **Use\_IPX** — If this switch is set to TRUE, the PERC 3/Di Remote Agent attempts to use IPX as a communications protocol.
- **IPX\_SOCKET** — This switch specifies (in decimal) the IPX socket that will be used for communications. This may be helpful if you are trying to access the controller through a firewall. The IPX\_SOCKET is specified as a hexadecimal address; for example, `4640E44D.000000000001`.
- **Client\_timeout** — This switch specifies (in seconds) the amount of time that the software will allow to expire before closing communications with the client.



# D

## Flashing the Firmware

When upgrading to a new version of the BIOS (for example, as part of an upgrade installation), you need to use the AFU utility to flash the firmware on your controller.

To flash the firmware using the AFU utility:

- 1 Shut down your system.
- 2 Insert the bootable diskette that contains the AFU utility.
- 3 Power on the system.

If the system has not been set up to boot from the diskette, please read your manufacturer's instructions on how to set this up.



---

**Note:** The following steps explain how to use the AFU utility from the command line. The AFU utility also supports a graphical interface, which you can access by typing **afu** with no arguments at the initial DOS command prompt.

The graphical interface allows you to **Select Controllers** and then **Update, Save, and Verify** the flash image, as well as **Display flash information**.

If you elect to use the AFU graphical interface to flash your firmware, select the controller(s) to be flashed from the **Select Controller(s)** menu, and then from the **Select an Operation** menu, **Update, Save, and Verify** the flash image, following the on-screen instructions.

---

- 4 At the DOS prompt, type the following command and press **Enter**:

```
afu list
```

This command displays a list of the controllers in your system. Take note of the controller(s) you would like to update and its number (or numbers if

there are more than one). Verify that the controller you wish to update is identified.



---

**Caution:** Each controller has a unique flash image. If you have more than one PERC 2 and PERC 3 family of controllers in your system, make sure that you select the correct controller to flash and that you use the appropriate flash image for that controller. Writing the wrong flash to a controller renders that controller inoperable.

---

- 5 If you want to flash the firmware on one controller, go to step a. If you want to flash the firmware on more than one controller, go to step b. If you want to flash the firmware on all controllers, go to step c.

- a Flashing the Firmware on a Single Controller

To flash the firmware on a single controller, type the following at the DOS prompt, replacing *CONTROLLER\_NUMBER* with the number of the controller whose firmware you are flashing.

```
afu update /c CONTROLLER_NUMBER
```

To upgrade controller 0, for example, you would type the following:

```
afu update /c 0
```

- b Flashing the Firmware on Multiple Controllers

To flash the firmware on multiple controllers, type the following at the DOS prompt, replacing the comma-separated list of *CONTROLLER\_NUMBER\_n* with the numbers of the controllers whose firmware you are updating:

```
afu update /c CONTROLLER_NUMBER_1,CONTROLLER_NUMBER_2
```

To upgrade controllers 0, 2, and 3 for example, you would type the following:

```
afu update /c 0, 2, 3
```

- c Flashing the Firmware on All Controllers

To flash the firmware on all controllers, type the following at the DOS prompt:

```
afu update /c all
```

- 6 The firmware image is contained on two diskettes.

The AFU prompts you to put in the first firmware diskette. When it detects that the diskette is in the drive, the AFU will read the part of the firmware image contained on the first diskette.

- 7 The AFU then tells you to remove the first firmware diskette and insert the second firmware diskette.

The AFU will read the second part of the flash image, and then perform a checksum operation to verify that all the data was read correctly.

- 8 After the AFU reads the new BIOS from both installation disks, it shuts down the controller and updates the firmware. A verification of the operation follows. The results of each operation are displayed on the screen as it happens.
- 9 After the firmware installation completes, the AFU exits. After the AFU exits, remove the firmware diskette and insert the bootable diskette that contains the AFU utility.
- 10 Type the following command, replacing *CONTROLLER\_NUMBER(S)* with either the controller number or a comma-separated list of controller numbers:  

```
afu version /c CONTROLLER_NUMBER(S)
```

If you updated the firmware on controllers 0, 2, and 3, for example, you would type the following:  

```
afu version /c 0, 2, 3
```
- 11 The AFU displays the version information for the selected controllers. Verify that the version displayed is correct.
- 12 Remove the diskette from the diskette drive and reboot the system.







# Specifications

## PERC 3/Di Controller Technical Specification

Component	Description
RAID support	Volume set, RAID 0, RAID 1, RAID 0/1, and RAID 5
Container (array) support	Up to 64 containers per controller; 64 partitions maximum per container
Device support	<ul style="list-style-type: none"><li>■ Up to 15 SCSI devices per channel</li><li>■ Supports RAID container as boot device</li><li>■ Integrated SAF-TE 1.0 enclosures</li></ul>
Operating system support	<ul style="list-style-type: none"><li>■ Windows NT 4.0 (Service Pack 6A or higher)</li><li>■ Windows 2000</li><li>■ NetWare 5.0 (Support Pack 6A or higher)</li><li>■ NetWare 5.1 (Support Pack 3 or higher)</li><li>■ NetWare 6.0</li><li>■ Red Hat Linux</li></ul>
Remote management	Windows NT 4.0 (Service Pack 6A or higher) and Windows 2000

## Minimum and Maximum Subsystem Values

RAID Element	Minimum	Maximum	Default
<i>Containers</i>			
Total containers per controller	—	64	—
On-disk partition slots available	—	—	30
In-memory partition slots available per controller	—	—	256
Mirror set (RAID 1) limits			
Partitions	2	2	2
RAID-5 set limits			
Partitions	3	16	—
Chunk size limits	8 KB	64 KB	32 KB
Stripe set (RAID 0) limits			
Partitions	1	48	—
Chunk size limits	8 KB	64 KB	32 KB
Stripe set of mirror sets (RAID 0/1) limits			
Partitions	2	48	—
Chunk size limits	8 KB	64 KB	32 KB
Volume set limits			
Partitions	1	32	—
Volume of mirror sets limits			
Partitions	2	48	—
Volume of stripe sets limits			
Partitions	2	—	—



# F

## Regulatory Notices

### **FCC Notices (U.S. Only)**

Most Dell computer systems are classified by the Federal Communications Commission (FCC) as Class B digital devices. However, the inclusion of certain options can change the rating of some configurations to Class A. To determine which classification applies to your computer system, examine all FCC registration labels located on the bottom or back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries a Class A rating, your entire system is considered to be a Class A digital device. If *all* labels carry either the Class B rating distinguished by either an FCC ID number or the FCC logo, (FCC), your system is considered to be a Class B digital device.

Once you have determined your system's FCC classification, read the appropriate FCC notice. Note that FCC regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

### **A Notice About Shielded Cables**

Use only shielded cables for connecting peripherals to any Dell device to reduce the possibility of interference with radio and television reception. Using shielded cables ensures that you maintain the appropriate FCC certification of this product. For parallel printers, a cable is available from Dell Computer Corporation.

### **Class B**

This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the manufacturer's instruction manual, may cause interference with radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, you are encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Increase the separation between the equipment and the receiver.
- Plug the computer into a different outlet so that the computer and the receiver are on different branch circuits.

If necessary, consult a representative of Dell Computer corporation or an experienced radio/television technician for additional suggestions. You may find the following booklet helpful: FCC Interference Handbook, 1998, available from the U.S. Government Printing Office, Washington, DC 20402, Stock No. 054-000-00450-7. This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

The following information is provided on the device or devices covered in this document in compliance with FCC regulations:

- Product name
- Model number
- Company name (Dell Computer Corporation)

Regulatory Department  
One Dell Way  
Round Rock, Texas 78682 USA  
512-338-4400

## **IC Notice (Canada Only)**

Most Dell computer systems (and other Dell digital apparatus) are classified by the Industry Canada (IC) Interference-Causing Equipment Standard #3 (ICES-003) as Class B digital devices. To determine which classification (Class A or B) applies to your computer system (or other Dell digital apparatus), examine all registration labels located on the bottom or the back panel of your computer (or other digital apparatus). A statement in the form of "IC Class A ICES-3" or "IC Class B ICES-3" will be located on one of these labels.

Note that Industry Canada regulations provide that changes or modifications not expressly approved by Dell Computer Corporation could void your authority to operate this equipment.

This Class B digital apparatus meets the requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la Classe B respecte toutes les exigences du Règlement sur le Matériel Brouilleur du Canada.

## EN 55022 Compliance (Czech Republic Only)

This device belongs to Class B devices as described in EN 55022, unless it is specifically stated that it is a Class A device on the specification label. The following applies to devices in Class A of EN 55022 (radius of protection up to 30 meters). The user of the device is obliged to take all steps necessary to remove sources of interference to telecommunication or other devices.

Pokud není na typovém štítku pořízeno uvedeno, že spadá do třídy A podle EN 55022, spadá automaticky do třídy B podle EN 55022. Pro zařízená zařazená do třídy A (ochranné pásmo 30m) podle EN 55022 platí následující. Dojde-li k rušení telekomunikačních nebo jiných zařízení, je uživatel povinen provést takové opatření, aby rušení odstranil.

## CE Notice

Marking by the symbol **CE** indicates compliance of this Dell system to the EMC (Electromagnetic Compatibility) directive of the European Community. Such marking is indicative that this Dell system meets or exceeds the following technical standards:

- EN 55022 — “Limits and Methods of Measurement of Radio Interference Characteristics of Information Technology Equipment.”
- EN 50082-1 — “Electromagnetic compatibility—Generic immunity standard Part 1: Residential, commercial, and light industry.”
- IEC 801-2 — “Electromagnetic compatibility for industrial-process measurement and control equipment Part 2: Electrostatic discharge requirements.” Severity level 3.
- IEC 801-3 — “Electromagnetic compatibility for industrial-process measurement and control equipment Part 3: Radiated electromagnetic field requirements.” Severity level 2.

- IEC 801-4: “Electromagnetic compatibility for industrial-process measurement and control equipment Part 4: Electrical fast transient/burst requirements.” Severity level 2.
- EN 60950: 1992 — Amd. 1:1993 + Amd. 2:1993 — “Safety of Information Technology Equipment including Electrical Business Equipment.”

A “Declaration of Conformity” in accordance with the preceding standards has been made and is on file at Dell Products Europe BV, Limerick, Ireland.

## **VCCI Notice (Japan Only)**

Most Dell computer systems are classified by the Voluntary Control Council for Interference (VCCI) as Class B information technology equipment (ITE). However, the inclusion of certain options can change the rating of some configurations to Class A.

To determine which classification applies to your computer system, examine the FCC classification on the registration labels located on the back panel of your computer, on card-mounting brackets, and on the cards themselves. If any one of the labels carries an FCC Class A designation, your entire system is considered to be VCCI Class A ITE. If all labels carry either an FCC Class B identification number or the FCC logo (FCC), your system is considered to be VCCI Class B ITE.

### **Class B ITE**

This is a Class B product based on the standard of the Voluntary Control Council for Interference (VCCI) for information technology equipment. If this equipment is used near a radio or television receiver in a domestic environment, it may cause radio interference. Install and use the equipment according to the instruction manual.



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