eXtremeRAID™ Clustering Quick Installation Guide

eXtremeRAID 1100 PCI to Ultra2 SCSI RAID Controller

P/N: 775025-00
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The eXtremeRAID complies with the following regulatory agencies:

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The FCC information statements are in Appendix C of the eXtremeRAID Installation Guide (P/N 775013-00).

**CE Community of Europe**
The CE information statements are in Appendix C of the eXtremeRAID Installation Guide (P/N 775013-00).

**Underwriters Laboratories**

![UL Listed Logo]

**WARNING**
This controller is furnished with a nonvolatile RAM (NVRAM) chip that uses a sealed lithium battery/crystal module. Replace the module only with the same or equivalent type recommended by the manufacturer. Dispose of the used battery/crystal module according to the manufacturer’s instructions. Never incinerate a battery as it could explode and cause serious injury.
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Introduction

The eXtremeRAID DAC1164P is an Ultra2 SCSI, LVD RAID controller that promotes additional data availability in addition to RAID fault-tolerance through controller redundancy. The redundant controllers share one or more SCSI bus(es) connected to two network-linked Windows NT® servers in a clustering configuration (Figure 1). (When using the clustering feature, a server may also be referred to as a server node.)

Figure 1. Two-server Cluster with Termination Switches

Restrictions

You must be aware of the following limitations in order to perform a successful clustered installation of the DAC1164P:

Controller Configuration Restrictions

- Only two-server clustering is supported.
- Write-back caching is not supported on clustered controllers and will automatically be disabled in a clustered installation.
- The clustering-enabled controllers can only be connected to the shared bus (which includes all connected channels of the controller).
- Both controllers must have the same number of channels, identical memory configuration, and the same version of firmware.
• DAC1164P clustering is supported only under Microsoft Windows NT 4.0 Enterprise Edition environment, using Microsoft Cluster Server (MSCS) version 1.0 with Service Pack 3 (SP3).

• Each clustered controller must have a unique SCSI ID (factory default ID is 7 for each channel). One controller must have the ID manually set (using RAID EzAssist) to another ID (all channels of a controller will automatically be assigned the new SCSI ID).

• Add Capacity (MORE – Mylex Online RAID Expansion) is not supported on an array on a clustered pair of controllers. However, see the note below to use Add Capacity before making a clustered configuration.

☛ Note
To run Add Capacity on a server, you must first disconnect the other server, then disable clustering in RAID EzAssist. Add new drives as required, then run Add Capacity and allow it to complete.

To restore the cluster: reconnect the server, enable clustering in RAID EzAssist, and reboot.
Add Capacity cannot be run once the clustered server is reconnected.

SCSI Bus Restrictions

• Each channel on the Server A controller must be connected to the same channel on the Server B controller (e.g., Channel 0 to Channel 0, Channel 1 to Channel 1, or Channel 2 to Channel 2).

• All devices connected to a clustered controller must reside on a shared bus. A SCSI channel must either be connected to both controllers or must not be connected at all.

• Only SCSI Disk Drives and SAF-TE devices can be on a shared bus. CD-ROMs, tape drives, and removable media drives must reside on a separate controller.

• A shared bus must contain only NTFS-formatted drives, as required by MSCS.
• The overall SCSI bus length from controller (server 1) to controller (server 2) must match the SCSI bus cable length requirement (the Terminator Switch is not a repeater).

• The Terminator Switch must be placed at least one foot from the drive box to improve distribution of SCSI bus loading.

**Device Restrictions**

• All drives in the cluster must support multi-initiator mode.

• Windows NT® operating system files must reside on a disk on a local bus such as another SCSI adapter, embedded SCSI channel, or IDE drive. **The operating system cannot reside on a device directly connected to a clustered controller.**
Required Materials

Hardware

- Two DAC1164P controllers with the same amount of SDRAM, (i.e., 32MB or 64MB pairs)
- Drive enclosure with built-in clustering-aware terminator control; or Mylex termination switches, two per channel.
- High quality cable (as required) for the following configurations:
  - Controller to drive enclosure, or
  - Controller to annex Terminator Switch, or
  - Terminator switch to drive enclosure

Software/Firmware

- Firmware version 5.07, turn 79, build 0, or later
- BIOS version 4.10–41, or later
- RAID EzAssist Configuration Utility version 1.00–16, or later
  - EZASSIST.EXE or BIOS version
- NT Device Driver, DAC960NT.SYS version 5.01–00 (without Macdisk.sys)
- Optional:
  - GAM Driver, GAMDRV.SYS version 2.21, or later
  - GAM Server, version 2.21, or later
  - GAM Client, version 2.21, or later
Installation

The following describes the procedure to install and configure operating system, software, and hardware to enable a two-server clustered system.

Install Windows NT 4.0

1. Install Windows NT 4.0 Enterprise Edition with Service Pack 3 on both servers (server nodes) that will be clustered. You can install to IDE drives or to drives connected to a SCSI or RAID controller as long as that controller will NOT BE USED FOR CLUSTERING.

☛ Note
If you have an existing eXtremeRAID controller board connected to the Windows NT bootable drive, you can not use this controller for clustering unless you remove the operating system drive and reinstall it elsewhere. **Clustering can only be installed to secondary (not primary) controllers.**

2. Shut down both servers before you continue with this installation.

☛ Note
If you have an existing eXtremeRAID controller board that does not meet the minimum requirements for Firmware version or BIOS version, and does not have RAID EzAssist v1.00 (or above) BIOS Configuration Utility installed, you must perform the procedure called “Upgrading Firmware/BIOS/Configuration Utility” on page 17 before continuing below.
Install the Controller Boards

3. Install DAC1164P controllers into appropriate PCI slots in BOTH servers according to the instructions in the eXtremeRAID 1100 Quick Installation Guide, P/N 775031.

☛ Note
DO NOT install clustering cabling or termination at this time!

Disable Controller BIOS

☛ Note
Since the controllers in a clustered configuration will not be used for booting the operating system, the BIOS on the clustered RAID controllers can be disabled. Even if the BIOS on an eXtremeRAID controller is disabled, RAID EzAssist will still run.

4. Boot a server and press Alt–M during the start-up to enter the eXtremeRAID’s BIOS Options menu.

5. Disable BIOS from the BIOS Options menu, then exit. The server will reboot automatically.

Start RAID EzAssist

6. During reboot, allow the Alt–M message to pass, but press Alt–R to request the RAID EzAssist Configuration Utility.

After the boot process finishes, RAID EzAssist will start by scanning all recognized controllers.
Enable PCI Controller Clustering

Use RAID EzAssist to enable clustering, which will allow redundancy (fault tolerance) among controllers.

7. Use the arrow key to select Advanced Options on the main menu, if necessary, then press Enter.

8. From the Advanced Options menu, use the arrow key to select Clustering, then press Enter.

**Note**
If clustering is not supported for the selected controller, or if the minimum required firmware version is not present, a message appears which reads: “Clustering Not Supported by Firmware.” You will not be able to use the clustering feature in this case without first performing the firmware upgrade procedure described on page 17.

If clustering is currently *disabled*, the Clustering Control notice shown in Figure 2 will be displayed:

![Figure 2. Enable Clustering?](image)

9. Use the arrow key to select Yes, then press Enter, to *enable* clustering.
However, if clustering is currently **enabled** when you select the Clustering option on the Advanced Options menu, the Clustering Control notice shown in Figure 3 will be displayed:

![Figure 3. Disable Clustering?](image)

10. Since you want to retain clustering, use the arrow key to select No, then press Enter.

**Change a Host ID for PCI Controller Clustering**

To change a controller’s Host ID to another ID for use with clustering (controllers are normally set at ID 7 by default), use the HostID Change option on the Advanced Options menu in RAID EzAssist.

This option allows PCI Controllers that are being “clustered” to have unique IDs on the bus.

**Note**

Change the ID of only one of the eXtremeRAID controllers from ID 7. It is not necessary to change both.
11. Use the arrow key to select Advanced Options on the main menu, if necessary, then press Enter.

12. From the Advanced Options menu, use the arrow key to select HostID Change, then press Enter.

The HostID Change screen is displayed (Figure 4).

![HostID Change Screen](image)

**Note**

It is recommended that the Host ID of one controller be reassigned to ID 6, leaving the other as ID 7. However, make sure no drives on the shared bus are set to ID 6 or ID 7!!

This screen uses the following navigation strategy:

- In the HostID field, the Spacebar brings up a list of valid options. Arrow keys move among the options and Enter selects an option.
- In the HostID field, the + and - keys cycle through the valid options. Stop when the desired option is visible.
- The Tab key shifts control to the buttons, or from the buttons back to the HostID field.
- When buttons are in focus, arrow keys select a button and Enter activates the highlighted button.
- At any time, you can press Enter to accept the currently visible settings and close the screen.
13. With the HostID field selected:
   • Press the + or - key to assign the desired ID setting to the controller, OR
   • Press Spacebar to display a box of available choices, use the arrow key
to select your desired ID setting, then press Enter.
14. Once you've selected the alternate ID setting, press Tab, then press
Enter with Ok selected.

Modify Controller Parameters (optional)

At this time, you may change some of your controller’s default parameters.
For detailed information, please refer to Chapter 3, Controller Configuration,
in the RAID EzAssist Configuration Utility User Reference Guide
(P/N 775029).

Exit RAID EzAssist and Shut Down the Server

15. Exit RAID EzAssist by pressing the Esc key until you see the Exit
screen, then select Yes and press Enter.
16. As the server starts to reboot, shut down the server.
Repeat Installation Steps for the Second Server

17. On your second server, repeat the instructions in the sections identified below:

- Disable Controller BIOS
- Start RAID EzAssist
- Enable PCI Controller Clustering
- Modify Controller Parameters (optional)
- Exit RAID EzAssist and Shut Down the Server

**Note**

You only need to change the Host ID on ONE of the servers. If you changed the Host ID for the controller in the first server, you don’t need to change the Host ID for the controller in the second server.
Install Cabling and Termination for Clustering

18. Set up the two-server cluster configuration as shown in Figure 5. Be sure that termination is disabled inside the Drive Enclosure shown in the figure.

![Figure 5. Two-server Cluster with Termination Switches](image)

Use two long cables to connect each controller to its termination switch, and two short cables (at least one foot) to connect each termination switch to a drive at each end of the drive stack. The overall SCSI bus length from controller (server 1) to controller (server 2) must comply with the SCSI bus cable length requirement, not to exceed 12 meters.

☛ Note

The Terminator Switch is not a repeater. The overall combined length of all cables on a channel includes the length of external and internal cables.
Set Up a RAID Configuration and Logical Drives on ONE Server ONLY

☛ Note
Even though you’re setting up the configuration on one controller, clustering allows the other controller to have access to the configuration.

19. Power on (boot) the drive enclosure and both servers.

20. On ONE SERVER ONLY, press Alt–R during start-up to enter the RAID EzAssist Configuration Utility again.

21. Refer to Chapter 1, First-Time Configuration, or Chapter 2, Drive Configuration, of the RAID EzAssist Configuration Utility User Reference Guide (P/N 775029) for details on how to set up a RAID Configuration and define logical drives.

☛ Note
Use Assisted or Custom Configuration only.
You must define AT LEAST TWO LOGICAL DRIVES for clustering.

22. Exit RAID EzAssist after setting up your configuration by pressing Esc until you see the Exit screen, then selecting Yes and pressing Enter to exit.
Install Windows NT 4.0 Device Driver to BOTH SERVERS

Windows NT 4.0 Enterprise Edition with Service Pack 3 or above must already be installed on the local disks. The clustered DAC1164Ps will be non-bootable. After installing the controller hardware and configuring a disk array, follow the procedure below to add the necessary controller driver, from the driver diskette, to each server.

23. Make sure Windows NT 4.0 Enterprise Edition with Service Pack 3 is running on BOTH SERVERS.

For both servers, use the Windows 4.0 NT device driver diskette to install or update the DAC1164P Mini-port Driver with Clustering Support, version 5.01 or later, using the SCSI adapter icon in the NT control panel.

☛ Note
Do not install any version of Macdisk.sys.

☛ Note
If you want to install GAM Server, it should be added after the NT driver installation. Please see the Disk Array Controller Software Kit Installation Guide and User Manual (P/N 771929) on the Mylex Solutions CD-ROM.

☛ Note
If you want to install GAM Client, it should be added after the NT driver installation. Please see the Global Array Manager Client Software Installation Guide and User Manual (P/N 771961) on the Mylex Solutions CD-ROM.

24. Click Start, and select Settings->Control Panel within the Start menu.

25. From the Control Panel window, double-click the SCSI Adapters icon.

26. In the SCSI Adapters box, click the Drivers tab to bring the Drivers page to the foreground.
27. With the Drivers page in the foreground, click **Add**.
    
    The Creating driver list progress bar is displayed briefly, and then the Install Driver box is displayed.

28. In the Install Driver box, click **Have Disk**.

29. Insert the device driver diskette into the floppy disk drive.

30. From the Install From Disk box, change the path to A:\NT, then click **OK**.

31. From the Install Driver box, be sure the Mylex Disk Array Controller is selected, then click **OK**.

32. If there is an existing Mylex driver in the system you will see a Windows NT Setup box. Click **New** to install the new driver from the diskette.

33. Again, be sure the path is A:\NT and click **Continue**.
    
    The driver is copied from the diskette. The System Settings Change box is displayed.

34. Remove the diskette and click **Yes** to restart Windows NT 4.0 for the new Mylex Disk Array Controller drivers to be available.

35. Repeat the above procedure on the second server.

☛ **Note**

The controllers will automatically detect each other’s presence and establish a cluster nexus (master/slave configuration). The configuration of Server A will be synchronized with Server B.
Install Microsoft Clustering (MSCS) and Service Pack Updates

Server A is now ready for MSCS installation.

36. On Server A, boot Windows NT 4.0. From the Disk Administrator, partition and format the shared drives using the NTFS type file system.

37. Install MSCS on Server A and select “Form a new cluster.” Assign a cluster name and configure the drive and network resources.

38. Reboot Server A after MSCS installation is completed.

Server B is now ready for MSCS installation.


40. After Server A boots up and the cluster service starts, install MSCS on Server B and select “Join an existing cluster.” Type in the cluster name and follow the prompts.

41. Reboot after the existing cluster has been joined.

42. Reapply any necessary updated NT Service Packs (e.g., SP4 or above) and/or Hot Fixes.

Clustering installation is completed.
Upgrading Firmware/BIOS/Configuration Utility

Use the Mylex Solutions CD-ROM containing Software Kit v2.01 and follow the steps below to upgrade firmware, BIOS, and configuration utility code to levels suitable for clustering.

Items Needed

- One Computer system with PCI bus
- One or more Mylex eXtremeRAID DAC1164P controller boards
- One Mylex Solutions CD-ROM containing the Software Kit v2.01
- One 1.44 floppy diskette

Creating a Bootable Diskette Containing all Files Required for Flashing

Follow the steps below to create your bootable diskette with the files needed to flash the updated software.

1. Format a bootable 1.44 diskette using MS-DOS 6.x or higher.
2. Under Windows NT or MS-DOS load the Mylex Solutions CD-ROM.
3. On the Mylex Solutions CD-ROM go to the `\flash\er1164` subdirectory.
4. Copy all files in the `\flash\er1164` to the root directory of the bootable diskette you created in step 1.

Files included are:

- bla41041.img - BIOS flash file - rev. 4.10-41
- ez10016.img - EzAssist flash file - rev. 1.00-16
- fla50779.000 - Firmware flash file - rev. 5.07-79
- kla50702.img - Boot Block flash file - rev. 5.07-02

5. Also, from the Mylex Solutions CD-ROM copy the following file to the root directory of the diskette.
   `\utility\ezassist\ezassist.exe`
6. The diskette is ready for flashing controllers.

1. Later versions may be on your Mylex Solutions CD-ROM.
Flashing an eXtremeRAID DAC1164P Controller Board

Use your newly created bootable disk (completed in the above section) to flash your eXtremeRAID DAC1164P controller board with the updated files. Follow the steps below.

7. With one or more eXtremeRAID DAC1164P controller boards in the system, power on the computer and boot from the diskette.
8. Run the file ezassist.exe from the diskette.
9. From the main menu, select Advanced Options, then select Update Flash Code.
10. From the A:\ prompt, you will be asked which file to flash. Type in bla41041.img, then press Enter.

After the system finds the file, a screen showing the flash code contents will be displayed.
11. If you have multiple eXtremeRAID controller cards in the system, select any or all controllers you wish to flash using the Enter key.
12. You will notice selected controllers have a check mark next to them. After all controllers are selected, press Tab to select/highlight Ok and press Enter.
13. A warning screen will come up. Press Tab to select/highlight YES and press Enter.
14. Next, a Notice screen appears prompting to “Program controller now?” Again, press Tab to select/highlight YES and press Enter.
15. Once done, a Flash Process Status window will display “Flashing done.” Press Enter to return back to the main screen.
16. To flash another file on all controllers, repeat the above procedure beginning with step 9.
17. Repeat the procedure until all four files identified earlier have been flashed.
18. Exit RAID EzAssist by pressing Esc until you see the Exit screen, then selecting Yes and pressing Enter.
19. Remove the bootable diskette from the drive. The server will reboot with Windows NT.
Appendix A

Terminator Switch

Functional Specification

Overview

Two-Server clustering (Microsoft Clustering Service, MSCS) is becoming more popular in a fault-tolerant server environment. MSCS clustering uses the SCSI bus as the back-end I/O interface to achieve system fault tolerance capability. The SCSI bus is not the ideal interface for powering ON/OFF or removing one server (may also be referred to as a server node) while the other server is still operating. However, in maintaining clustering, this function is a must. Therefore, the Terminator Switch is used to isolate the one server from the rest of the cluster so that it can be powered ON/OFF or removed for maintenance. Hence, the Terminator Switch improves the serviceability of the clustering environment.

Features

- Auto-detects SE or LVD
- No external Power Supply required
- Provides auto-termination when server is down
- Provides bus isolation when server is down
- Physically small footprint

Terminator Switch Application

Although the SCSI bus is not designed to support hot-plugging devices, it is used in system environments that demand zero down time. Therefore, in order to service the FRU (Field Replaceable unit), it is required that the devices are hot-plugged and un-plugged. If the FRU is connected to the SCSI bus, the chances are that hot-plugging the FRU will cause the overall system to crash or cause other problems due to perturbation on the SCSI bus. Therefore, isolating the FRU from the rest of the system will be beneficial to avoid system crashes or other undesirable effects.
The connection and usage of the Termination Switch is as follows:

*Note*

*Server connection requirement:* The server side of the SCSI connector will be connected to the server, and the drive side SCSI connector will be connected to the drives or drive box. Reversing the connection will cause the Terminator Switch not to operate as desired.

![Figure A-1. Connection of Terminator Switch for Mylex Clustering](image)

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**Terminator Switch Application**

The connection and usage of the Termination Switch is as follows:

*Note*

*Server connection requirement:* The server side of the SCSI connector will be connected to the server, and the drive side SCSI connector will be connected to the drives or drive box. Reversing the connection will cause the Terminator Switch not to operate as desired.

![Figure A-2. Terminator Switch Label](image)
Concept
The Terminator Switch automatically detects the power going down in a failed server and isolates the server from the rest of the clustering system. At the same time, the Terminator Switch replaces the termination needed to the SCSI bus in which the termination was previously provided by the now failed server.

When the failed server has been serviced and powered up, the Terminator Switch will again automatically detect the presence of the server and restore the connection between the newly activated server and the rest of the clustering system. Again, at that instant, the Terminator Switch disables its internal SCSI termination so that the newly connected server will provide the termination of the SCSI bus.

External Requirements for the Terminator Switch

**SCSI or RAID controller (resides in the server system) requirement.**
The controller shall provide Termpower to the SCSI bus and have the SCSI termination enabled.

**Drives or drive box requirement.** The drive box may supply Termpower to the SCSI bus, though it is not absolutely necessary. The SCSI termination shall be disabled unless a SCSI repeater is used, in which case the SCSI bus segment has to be terminated.

**Valid configuration.** The only valid configuration when using the Terminator Switch is to have the drives or drive box in the middle of the two server system as depicted in Figure A-1.

**Terminator Switch positioning requirement.** The Terminator Switch shall be positioned at least one foot from the server if it is installed near the server, or at least one foot from the drive box if it is installed near the drive box.

**Server connection requirement.** The server side of the SCSI connector shall be connected to the server, and the drive side SCSI connector shall be connected to the drives or drive box. Reversing the connection will cause the Terminator Switch not to operate as desired.
Guidelines for Using Terminator Switch

In order to meet SCSI cable length requirements defined in the SCSI specification, and to maintain system reliability, the following guidelines are provided:

- For SCSI SE connectivity, if the cable length from server (server node) to the drive box is more than 1.5 meter and Ultra speed is used with more than 4 drives, a SCSI SE repeater inside the drive box is recommended.
- For SCSI LVD connectivity, if the cable length from server (server node) to the drive box is more than 3 meters and Ultra2 speed is used with more than 14 drives, a SCSI LVD repeater inside the drive box is recommended.
- The SCSI Controller that resides on the server (server node) shall supply TermPower to the SCSI bus and the Terminator Switch closest to it.
- The Drive box or drives shall supply TermPower independently to the SCSI bus and each Terminator Switch.

Electrical Specification

- Termpower voltage operating range: 3.7 to 5.5 Volts
- Current consumption: 250mA max.
- Switch-over Speed: Less than 5ns
- Type of SCSI Interface supported: SE or LVD (auto-detect)

Mechanical Specification

- Dimension: 2.375 x 3.625 x 0.7 inches
- Connectors used: VHDIC (0.8mm) type SCSI connector on both ends
Environmental Specification

- Temperature:
  - Operating – 0 to 50 degree C
  - Non-operating – 0 to 80 degree C
- Relative Humidity:
  - Operating - 10 to 90% (non condensing)
  - Non-operating – 10 to 90% (non condensing)

Regulatory Agencies Compliance

- FCC Class B
- CE