



AcceleRAID™ Installation Guide

AcceleRAID 150
PCI to Ultra2 SCSI
RAID Controller





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AcceleRAID™ 150 (DAC960PRL-1) PCI to Ultra2 SCSI RAID Controller

Part Number 775020-01

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Thank you for purchasing the Mylex AcceleRAID™ 150 controller. This manual describes the installation of the Mylex AcceleRAID 150 controller. Requests for technical information about this and other Mylex Corporation products should be made to your Mylex authorized reseller or Mylex sales representative.

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About This Manual

This installation guide covers hardware set-up and configuration procedures necessary for the installation of the Mylex AcceleRAID 150 PCI to Ultra2 SCSI RAID controller.

Chapter 1 describes the controller, standard package contents, and user-supplied items necessary for installation.

Chapter 2 describes steps to be performed prior to controller installation and the physical installation of the controller.

Chapter 3 describes controller board start-up and the RAID EzAssist resident utilities.

Appendix A describes installation notes.

Appendix B describes hardware and environmental specifications.

Appendix C describes error messages and how to correct problems causing errors.

Appendix D describes enclosure management.

Appendix E provides regulatory information.

Conventions

Throughout the manual, the following conventions are used to describe user interaction with the product:

prompt This style of type indicates screen display messages.

Enter Press the key labeled “Enter” (or “Delete”, etc.).



Note

Supplementary information that can have an effect on system performance.



Caution

Notification that a proscribed action has the *potential* to adversely affect equipment operation, system performance, or data integrity.



WARNING

Notification that a proscribed action will *definitely* result in equipment damage, data loss, or personal injury.

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Chapter 1

Introduction

This chapter describes:

- Product description
- Standard package contents
- User supplied items

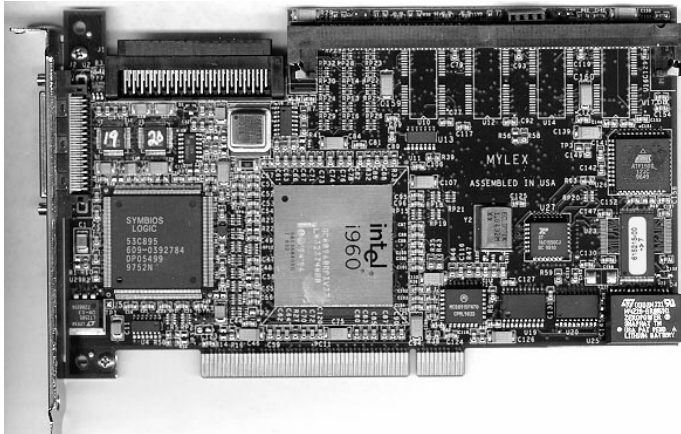


Figure 1-1. AcceleRAID 150 Disk Array Controller

Product Description

The AcceleRAID™ 150 (DAC960PRL-1) is a single-channel PCI-to-Ultra2 SCSI, LVD (Low Voltage Differential) RAID Controller. It has all the functions and performance characteristics of the Mylex line of RAID controllers for several popular network operating systems.

The Mylex AcceleRAID 150 offers the ultimate flexibility in a controller board, as a standard PCI configuration or as a SCSI Interrupt Steering Logic (SISL) configuration.

The AcceleRAID 150 controller board works on two different types of system boards: a standard system or PC board that has the standard PCI bus interface, or a system board with embedded SCSI that allows the AcceleRAID 150 controller to steer RAID features (the SISL feature) onto the embedded SCSI channel(s).

Mylex's AcceleRAID 150 can be used in either one of the following two situations:

1. A cost-effective, single-channel, standard PCI RAID controller board, which may reside in any PCI slot (to implement a standard RAID connection), or
2. A cost-effective PCI RAID controller board with SISL, which must reside in the prewired, SISL-dedicated slot on a system board (to implement a SISL connection). See your system board documentation to identify your board's specific PCI slot that supports SCSI Interrupt Steering Logic (SISL).

In addition to the choice of any system board for one of the above situations, note that some Intel® boards also give you the following flexibility:

1. Use the AcceleRAID 150 board plugged into a standard PCI slot as a single-channel board, or
2. Use the AcceleRAID 150 board plugged into a SISL enhanced PCI slot. The controller board takes control of the SCSI channels allowing RAID configurations to be extended from the controller board to the embedded SCSI channels on the system board.

The following Intel boards: N440BX, T440BX, NA440BX, NC440BX and SC450NX are examples of the server boards and systems that support the SISL feature of the AcceleRAID 150 controller.

A specially configured dedicated SISL slot is required to use SCSI Interrupt Steering Logic (SISL).

Mylex AcceleRAID controllers supply the necessary signals that enable SISL hardware to capture and control the embedded SCSI channel(s) on the system board. This feature implements RAID capabilities on the SCSI channels that reside on the system board.

AcceleRAID 150 Controller Features

Includes the following features:

- Ability to operate in an ordinary PCI slot as a single-channel RAID controller in any PCI system.
- Ability to add the functionality of an additional RAID SCSI channel which is a Wide Ultra2 SCSI RAID LVD channel (see the note below for further explanation).

Note

The AcceleRAID 150 will work as a single-channel, Wide Ultra2 SCSI LVD RAID controller with a system board that has an available PCI slot.

A specially configured, dedicated PCI slot is required to enable SISL, which allows the controller to add RAID capability to a system board's built-in SCSI channels.

See your system board documentation to identify your board's specific PCI slot that supports SCSI Interrupt Steering Logic (SISL).

Operating System Support

MS-DOS 5.x, 6.x, and above are supported using drivers that are included in the Disk Array Software Kit. Many other popular operating systems are supported using software drivers in the Disk Array Controller Software Kit that is included with the AcceleRAID controller (see the *Disk Array Controller Software Kit Installation Guide and User Manual – P/N 771929*)

Standard Package Contents

The following items are supplied with the standard shipping package:

Hardware

- AcceleRAID 150 Disk Array Controller with documentation

Software

- Disk Array Controller Configuration (RAID EzAssist™) utility with documentation on CD-ROM
- Disk Array Controller Software Kit with documentation on CD-ROM
- OS drivers (controller drivers) on diskette
- Global Array Manager (GAM client and GAM Server) with documentation on CD-ROM

AcceleRAID 150 Controller

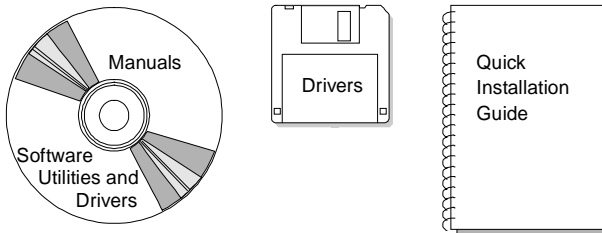
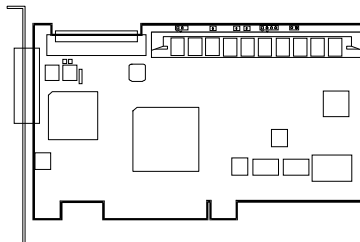


Figure 1-2. Standard Package Contents

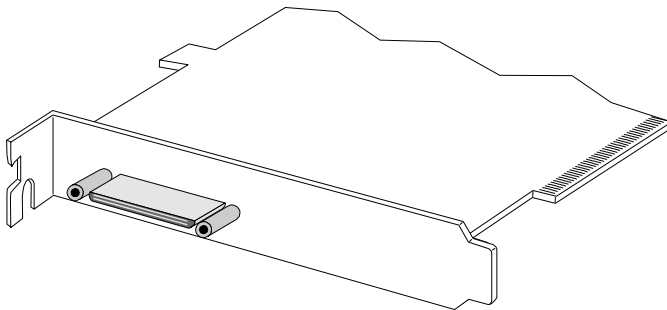
User-supplied Items

The following user-supplied items are required to perform this installation:

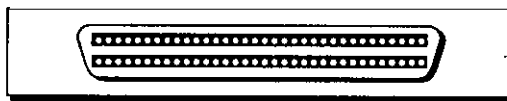
- Host system with a PCI slot, or
- Host system with a prewired SISL supported PCI slot in order to use the SISL feature
- SCSI cables to connect SCSI channels to disk drives
- Operating system software
- Static grounding strap or electrostatic discharge (ESD) safe work area
- Disk array enclosure (or equivalent) and SCSI disk drives

Note

The supported SCSI drive types include Ultra2 SCSI with LVD as well as the following single-ended SCSI types: SCSI-1, Fast SCSI, Wide Fast SCSI, Ultra SCSI, and Wide Ultra SCSI.



**Figure 1-3. AcceleRAID 150 External Connector (0.8mm UHD Centronics 68F):
68-Pin Very High Density Cable Interconnect (VHDCI)**



**Figure 1-4. AcceleRAID 150 Internal Connector (HD DB68F):
68-Pin High Density**

This chapter describes:

- **Before you begin**
- **Connectors, Jumpers, and LED's**
- **Safety considerations: *Caution and Warning notes***
- **Installing the AcceleRAID 150 board (controller)**

AcceleRAID 150 with Standard PCI Bus

 **Note**

If you will be installing the AcceleRAID 150 controller board with the SISL feature, please go to the section titled “AcceleRAID 150 with SISL (SCSI Interrupt Steering Logic)” on page 2-15.

 **Caution**

If an operating system or existing data resides on drives already installed on the system, a full backup should be performed on these drives prior to this installation.

Before You Begin (Standard)

Installing a standard AcceleRAID 150 PCI to Ultra2 SCSI RAID controller board is no more difficult than installing any PCI adapter board. Follow these steps and then follow the installation procedures in this chapter. Occasionally, you may need to refer to the instructions that came with your computer system.



WARNING

Power OFF the system and disconnect the power cord from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.



WARNING

This controller board 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.

1. Power OFF the system and any enclosures, such as a tower, and disconnect the power cord and cables before starting the installation. Refer to the instructions provided in your system documentation. Do not disconnect cables or power cords while system power is ON.
2. Read all of the instructions in this chapter completely before proceeding. Follow the Notes, Cautions, and Warnings described in this manual and marked on the equipment.
3. Safety check the installation before powering ON the system:
 - Make sure SCSI cables are properly connected.
 - Make sure all SCSI conventions (cable type, cable length, termination, and SCSI addresses) are followed. Examples of cable types are: flat, rounded, shielded, or non-shielded -- use like types together.
 - For information about cable lengths and formats, please refer to Table A-1 on page A-1.

Standard Installation Checklist

GET READY

 **Note**

It is recommended that you wear a grounded wrist strap when working with hardware installation procedures.

1. ____ Decide which available standard PCI slot will be used.
2. ____ Remove the plate from the I/O access port to the PCI slot.
3. ____ Remove the AcceleRAID 150 controller board from the anti-static bag.
4. ____ Check Jumper 10 (JP10). If it is installed on the jumper pins, remove it according to Figure 2-6.

GET SET

5. ____ Plug the AcceleRAID 150 board into a standard PCI slot.
6. ____ Tighten the AcceleRAID 150 board into the mounting bracket.
7. ____ Connect the SCSI cable(s) drives and/or devices to the board.
8. ____ Check termination - Only internal or external devices.
9. ____ Check termination - Both internal and external devices.
10. ____ Remove or set termination jumpers to the *disabled* position on the disk drive.
11. ____ Set SCSI ID on the disk drive.
12. ____ Enable termination power on disk drives.
13. ____ Safety check the installation.

 **Note**

Review Figure 2-1 and Table 2-1 to get familiar with the layout of the AcceleRAID 150 controller board and the Connectors, Jumpers, and LED descriptions.

GO

14. ____ Go to Chapter 3, Controller Board Start-up.

Connectors, Jumpers, and LED's (Standard)

Figure 2-1 is a diagram of the AcceleRAID 150 Low Profile board.

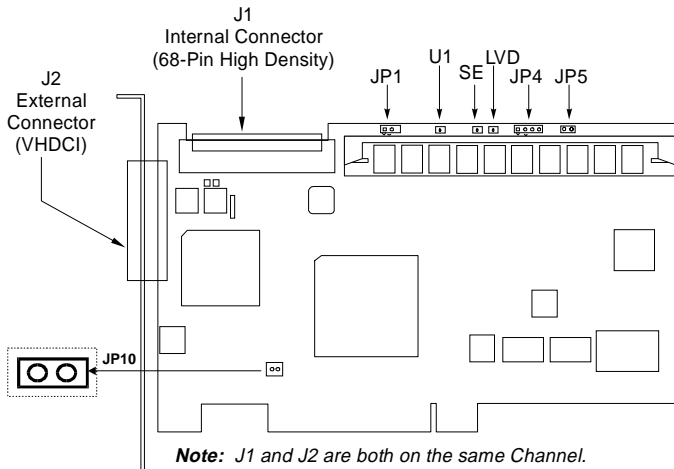


Figure 2-1. AcceleRAID Connectors, Jumpers, and LED's

Table 2-1. AcceleRAID Connectors, Jumpers, and LED Descriptions

Component	Description
JP1	Two-pin header available for connection to a front panel LED that indicates SCSI activity (user supplied).
JP4	Reserved
JP5	Not used / for maintenance only.
JP10	OFF = Disable SISL ON = Enable SISL
J1	Channel 0 Internal Ultra2 SCSI LVD Connector – 68-Pin High Density Cable
J2	Channel 0 External Ultra2 SCSI LVD Connector – 68-Pin Very High Density Cable Interconnect (VHDCI)
U1	LED, ON indicates the controller board failed internal diagnostics during start-up.
LVD (D3)	LED, ON = default; the light is always on unless a single-ended device is connected. The light will turn OFF when a single-ended device is detected*.
SE (D2)	LED, ON indicates a single-ended drive is detected.

* The LVD and SE lights will not be ON or OFF at the same time.

Controller Board Installation (Standard)

Caution

Anti-static handling procedures are required. Leave the controller board in its anti-static bag until it is time to plug it into the PCI slot.

Wearing a grounded wrist strap (see Figure 2-2), having the power cord plugged into an electric-ground wall outlet, having the computer power turned off, and following other ESD protective measures are highly recommended. See warning below about unplugging the power cord when the computer cover is removed.



Figure 2-2. Wear a grounded wrist strap.

WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.

Follow these installation steps:

1. Choose any available standard PCI slot as shown in Figure 2-3.

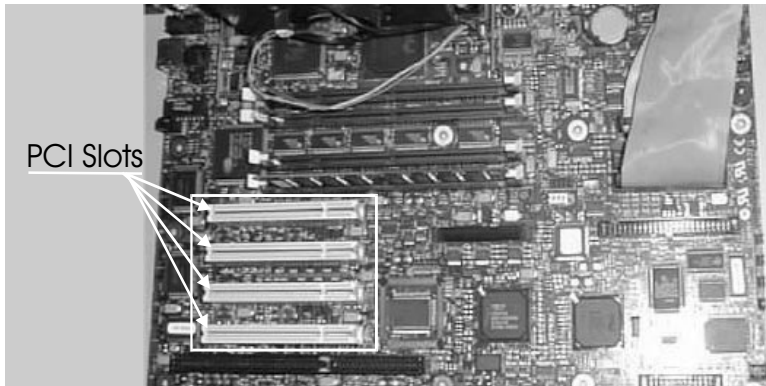


Figure 2-3. Choose an Available PCI Slot

2. Remove the metal cover plate from the slot's access port (usually at the back of the cabinet). Save the retaining screw as shown in Figure 2-4.

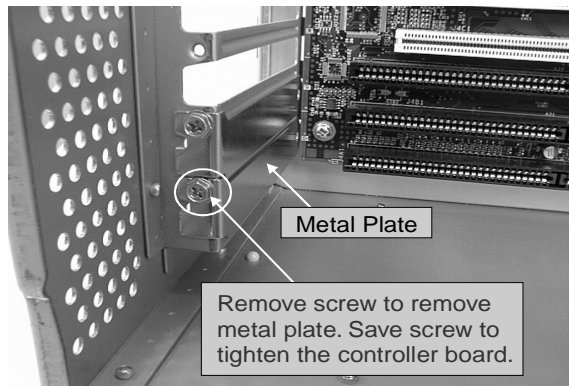


Figure 2-4. Remove the Metal Plate

3. Remove the AcceleRAID 150 controller board from the anti-static bag as shown in Figure 2-5.

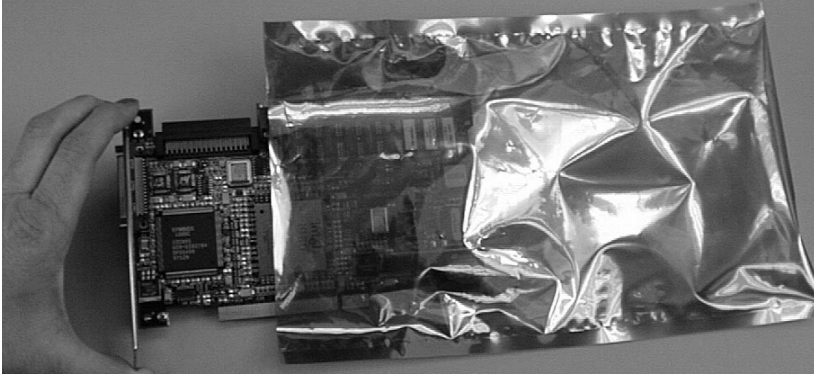


Figure 2-5. Remove the Anti-static Bag

4. If Jumper 10 (JP10) is installed, place it on only one peg to the OFF position, as shown in Figure 2-6, when using the standard AcceleRAID 150 configuration.

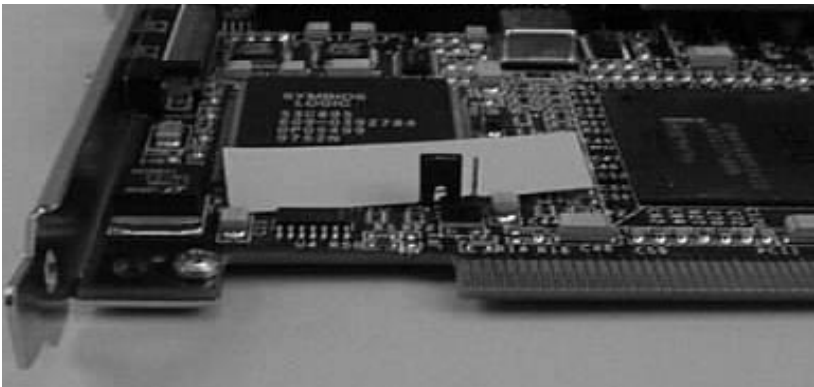


Figure 2-6. Jumper 10 (JP10) on one peg, OFF position

5. Plug the controller board firmly into the selected standard PCI slot as shown in Figure 2-7.

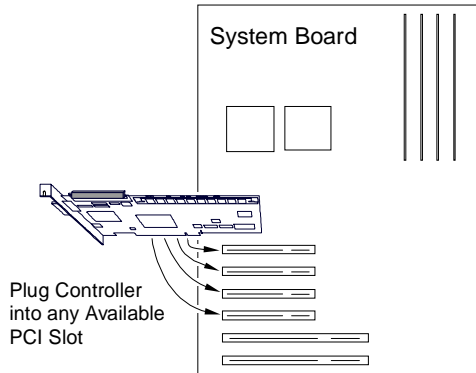


Figure 2-7. Plug Controller Board into any Standard PCI Slot

6. Use the retaining screw (see Figure 2-4) to tighten the controller board by its mounting bracket. The controller board will go into the space created when you removed the metal plate.

7. Connect the SCSI cables from the disk drives to a SCSI connector on the AcceleRAID 150 controller board, as shown in Figure 2-8. (The controller board is already connected to the system board.)
If necessary, refer to Table A-1 on page A-1 for SCSI formats and bus lengths.

 **Note**

In order to ensure an error free environment, the proper cable type designed for a certain SCSI speed must be used.

 **Note**

Wide and narrow SCSI disk **drives must not** be installed together (mixed) on any one channel, or the AcceleRAID controller board may not work properly. It is ok to mix wide and narrow connections for other devices, but **do not mix SCSI disk drives**.

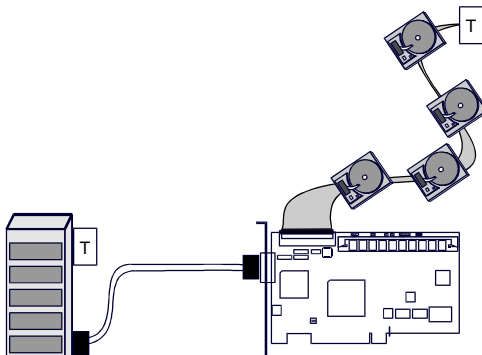


Figure 2-8. Connecting Disk Drives to the AcceleRAID 150

 **Note**

It is recommended that non-RAID SCSI devices be connected to a separate SCSI channel, either on the system board or furnished by a SCSI host bus adapter board, such as a Mylex FlashPoint board.

See Appendix A for information on LVD mode and single-ended mode.

8. Termination - Only Internal or External Devices (Standard)

Check that the drive channel is properly terminated according to drawings below. The AcceleRAID 150 is equipped with automatic SCSI termination circuitry which handles automatic enabling and disabling of on-board termination. For example, if the controller board is at the end of the SCSI bus, it automatically *enables* on-board termination.

If all the SCSI devices on a channel are **connected either to the internal connector or to the external connector**, the end of the SCSI bus farthest from the controller board must have a terminator installed; the controller board automatically *enables* on-board termination. See Figure 2-9 for an example of an internal drive configuration. See Figure 2-10 for an example of an external drive configuration.

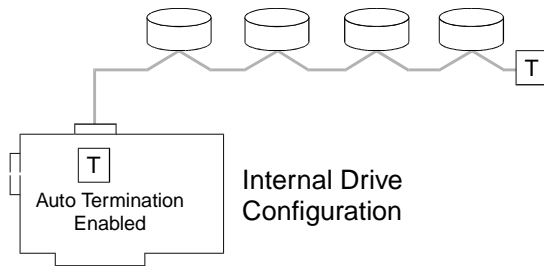


Figure 2-9. Termination with Internal Drive Configuration

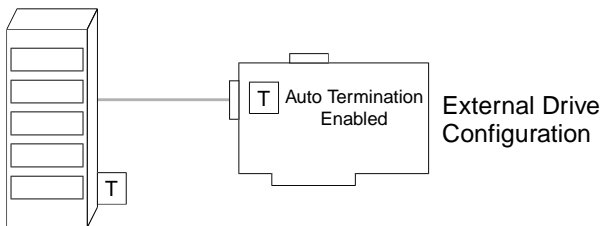


Figure 2-10. Termination with External Drive Configuration

9. **Termination - Both Internal and External Devices (Standard)**

Check that the drive channel is properly terminated according to drawing below. If the controller board is in the middle of the SCSI bus, it automatically *disables* on-board termination. If some SCSI devices on the channel are **connected to the internal connector, and some are connected to the external connector**, the two ends of the SCSI bus farthest from the controller board must each be terminated; this allows hot swap capability.

See Figure 2-11 for an example of a combined internal and external drive configuration. Notice that they are on the same channel.

 **Note**

It is better to terminate the ends of the SCSI bus itself than it is to terminate the end devices on the bus. This allows hot swap devices to be added or removed from the SCSI bus without affecting termination.

 **Note**

The only devices controlled by the RAID configuration are the ones physically connected to the AcceleRAID 150 card.

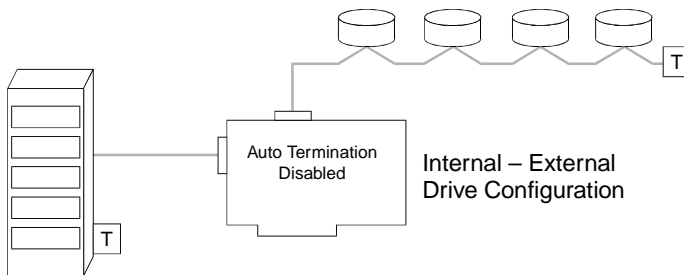


Figure 2-11. Termination with Internal and External Drive Configuration

10. Remove or set disk drive termination jumpers to the *disabled* position (if needed). Refer to your system documentation furnished with your disk drives to determine if your termination jumpers need to be adjusted.
11. Set the SCSI ID on the disk drives: ID 7 is reserved for the controller board.

 **Note**

Each drive must have a unique ID chosen from 0 through 6 or 8 through 15. Be careful not to duplicate a drive address on the same channel.

Remember: ID 7 is reserved for the controller board; therefore, it cannot be used as a disk drive ID.

ID's from 0 through 6 are usually for Narrow, 8-bit devices. However, the full range of SCSI ID addresses, 0 through 6 and 8 through 15 can be used for Wide, 16-bit devices.

See your device documentation for instructions on how to set your particular disk drive's SCSI address.

SCSI ID Numbers

7 is reserved for the controller

0 1 2 3 4 5 6 = used for narrow or wide devices

8 9 10 11 12 13 14 15 = used only for wide devices
--

Figure 2-12. SCSI ID Numbers

12. Enable termination power to all the disk drives (usually there is a jumper on the drive). See your device documentation for instructions on how to set your particular disk drive's termination power and configuration options.

 **Note**

The supported SCSI drive types include Ultra2 SCSI with LVD as well as the following single-ended SCSI types: SCSI-1, Fast SCSI, Wide Fast SCSI, Ultra SCSI, Wide Ultra SCSI, and Wide Ultra2 SCSI.

13. Safety check the installation by checking Pin 1 locations and cable types. For more details, see step 3 in the section titled "Before You Begin (Standard)" on page 2-2.
14. Replace the cover and connect the power cord.

The standard AcceleRAID 150 installation is complete.

Proceed to the next chapter for controller board start-up procedures and other setup options.

AcceleRAID 150 with SISL (SCSI Interrupt Steering Logic)

Note

If you will be installing the AcceleRAID 150 controller board as a standard unit without the SISL feature, please go to the section titled “AcceleRAID 150 with Standard PCI Bus” on page 2-1.

Caution

If an operating system or existing data resides on drives connected to the system board’s resident SCSI channels, a full backup must be performed on these drives prior to this installation.

Before You Begin (SISL)

Installing AcceleRAID PCI to Ultra2 SCSI RAID controller board is no more difficult than installing any PCI adapter board. Follow these steps and then follow the installation procedures in this chapter. Occasionally, you may need to refer to the instructions that came with your computer system.



WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.



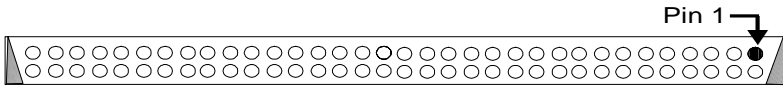
WARNING

This controller board 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.

1. Power OFF the system and any enclosures, then, disconnect the power cables before starting the installation. Refer to the instructions provided in your system documentation. Do not disconnect cables or power cords while system power is ON.
2. Read all of the instructions in this chapter completely before proceeding. Follow the Notes, Cautions, and Warnings described in this manual and marked on the equipment.

3. Safety check the installation before powering ON the system.
 - Make sure cables are properly oriented so that the colored stripe (Pin 1) on the edge of the ribbon cable aligns with Pin 1 on the connector (see Figure 2-13).



This is a connector on the system board, face up.
Align the colored stripe on the edge of the ribbon
SCSI cable to Pin 1 on the connector.
Note: the colored stripe is Pin 1 in the SCSI cable.

Figure 2-13. SCSI Cable Pin 1 Alignment to the Connector

- Make sure all SCSI conventions (cable type, cable length, termination, and SCSI addresses) are followed. Examples of cable types are: flat, rounded, shielded, or non-shielded -- use like types together.
- For information about cable lengths and formats, please refer to Table A-1 on page A-1.

SISL Installation Checklist

GET READY

 **Note**

It is recommended that you wear a grounded wrist strap when working with hardware installation procedures.

1. ___ Locate the prewired SISL slot, see your system documentation.
2. ___ Remove the plate from the I/O access port to the SISL PCI slot.
3. ___ Remove the AcceleRAID 150 controller board from the anti-static bag.
4. ___ Check Jumper 10 (JP10). If it is not on the jumper pins, install it to the ON position as shown in Figure 2-19.

GET SET

5. ___ Plug the AcceleRAID 150 board into the prewired SISL slot.
6. ___ Tighten the AcceleRAID 150 board into the mounting bracket.
7. ___ Connect the SCSI cable(s) drives and/or devices to the board.
8. ___ Check termination for both internal and external configuration.
9. ___ Check termination for embedded system board channels.
10. ___ Remove or set termination jumpers to the *disabled* position on the disk drive.
11. ___ Set SCSI ID on the disk drive.
12. ___ Enable termination power on the disk drive.
13. ___ Safety check the installation.

 **Note**

Review Figure 2-14 and Table 2-2 to get familiar with the layout of the AcceleRAID 150 board and the Connectors, Jumpers, and LED descriptions.

GO

14. ___ Go to Chapter 3, Controller Board Start-up.

Connectors, Jumpers, and LED's (SISL)

Figure 2-14 is a design example of the AcceleRAID 150 Low Profile board.

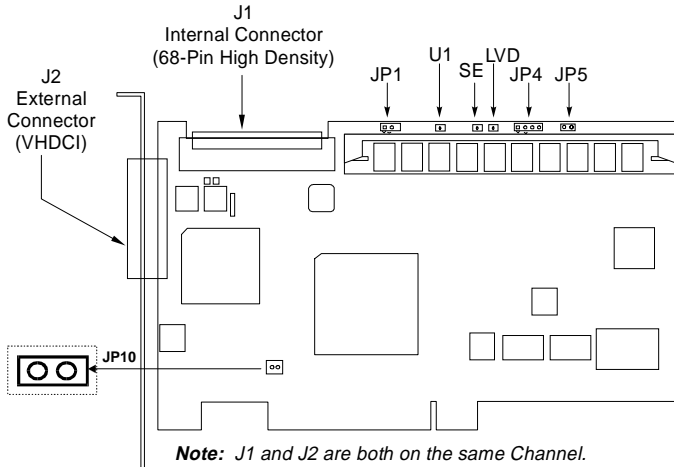


Figure 2-14. AcceleRAID Connectors, Jumpers, and LED's

Table 2-2. AcceleRAID Connectors, Jumpers, and LED Descriptions

Component	Description
JP1	Two-pin header available for connection to a front panel LED that indicates SCSI activity (user supplied).
JP4	Reserved
JP5	Not used / for maintenance only.
JP10	OFF = Disable SISL ON = Enable SISL
J1	Channel 0 Internal Ultra2 SCSI LVD Connector – 68-Pin High Density Cable
J2	Channel 0 External Ultra2 SCSI LVD Connector – 68-Pin Very High Density Cable Interconnect (VHDCI)
U1	LED, ON indicates the controller board failed internal diagnostics during start-up.
LVD (D3)	LED, ON = default; the light is always on unless a single-ended device is connected. The light will turn OFF when a single-ended device is detected*.
SE (D2)	LED, ON indicates a single-ended drive is detected.

* The LVD and SE lights will not be ON or OFF at the same time.

Controller Board Installation (SISL)

Caution

Anti-static handling procedures are required. Leave the controller board in its anti-static bag until it is time to plug it into the PCI slot.

Wearing a grounded wrist strap (see Figure 2-15), having the power cord plugged into an electric-ground wall outlet, having the computer power turned off, and following other ESD protective measures are highly recommended. See warning below about unplugging the power cord when the computer cover is removed.



Figure 2-15. Wear a grounded wrist strap.

WARNING

Disconnect the system from the electrical wall outlet before opening the system cabinet. Working with the system covers off and power applied to the system can result in shock and serious injury.

Follow these installation steps:

1. Choose the dedicated PCI slot that was prewired for SISL functionality, (see your system documentation to identify the position of the SISL slot on your system board) as shown in Figure 2-16.

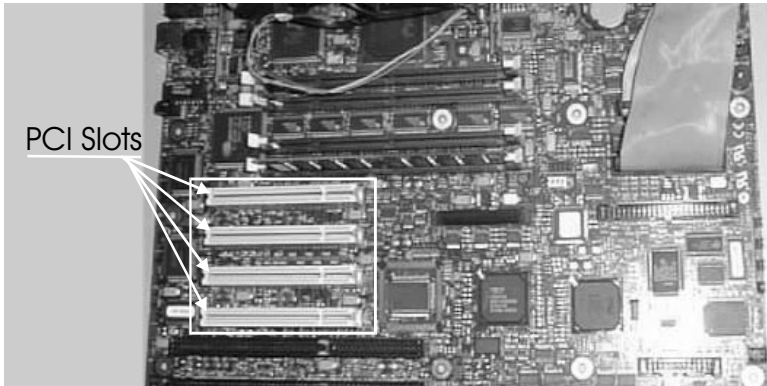


Figure 2-16. Identify SISL PCI Slot

2. Remove the metal cover plate from the slot's access port (usually at the back of the cabinet) as shown in Figure 2-17. Save the retaining screw.

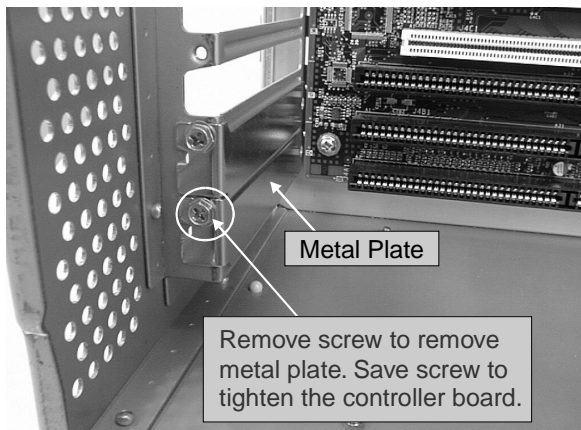


Figure 2-17. Remove the Metal Plate

3. Remove the AcceleRAID 150 controller board from the anti-static bag as shown in Figure 2-18.

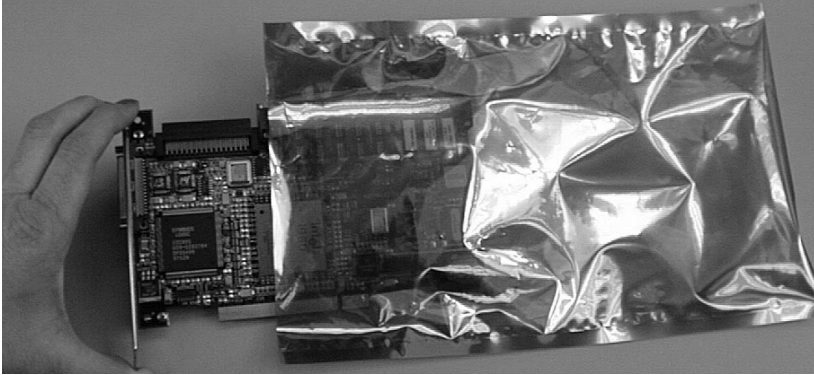


Figure 2-18. Remove Controller Board from the Anti-Static Bag

4. If Jumper 10 (JP10) is not in place, install it (ON position), as shown in Figure 2-19, when using the AcceleRAID 150 with the SISL feature.

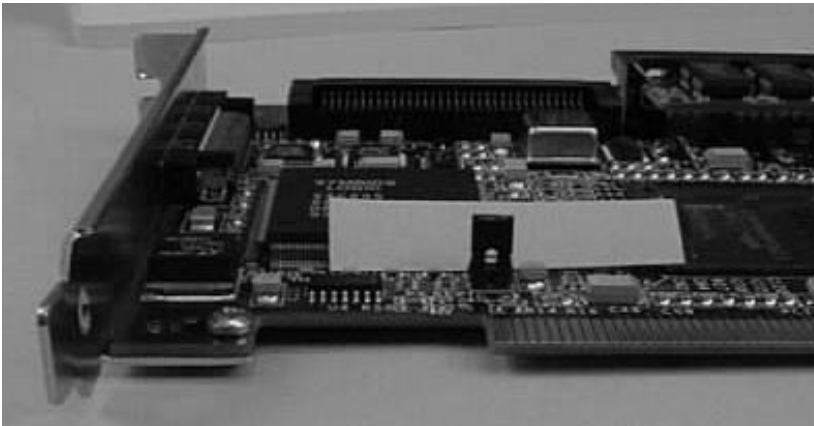


Figure 2-19. Install Jumper 10 (JP10) on two pins, ON position

5. Plug the AcceleRAID 150 controller board firmly into the dedicated, prewired SISL PCI slot as shown in Figure 2-20.

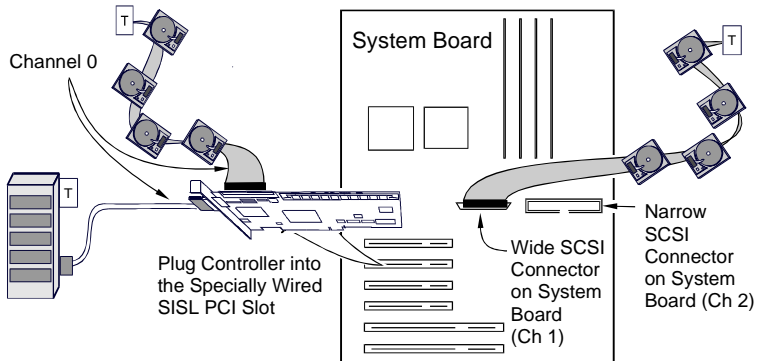


Figure 2-20. AcceleRAID 150 in a Typical SISL Installation

6. Use the retaining screw (see Figure 2-17) to secure the controller board by its mounting bracket. The controller board will go into the space created when you removed the metal plate.

7. Connect the SCSI cables from the disk drives to the drive channels, as required, according to the example shown in Figure 2-21.
(The controller board is already connected to the system board.)
If necessary, refer to Table A-1 on page A-1 for SCSI formats and bus lengths.

Note

In order to ensure an error free environment, the proper cable type designed for a certain SCSI speed must be used.

Note

Wide and narrow SCSI disk **drives** must not be installed together (mixed) on any one channel, or the AcceleRAID controller board may not work properly. It is ok to mix wide and narrow connections for other devices, but **do not mix SCSI disk drives**.

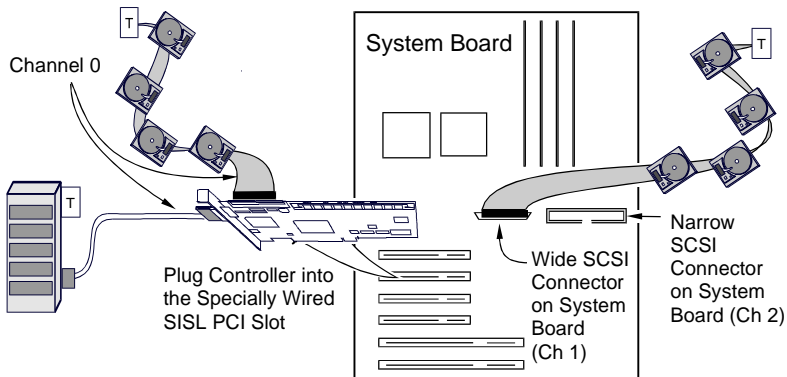


Figure 2-21. AcceleRAID 150 Typical SISL Installation showing channels

Note

It is recommended that non-RAID SCSI devices be connected to a separate SCSI channel, either on the system board or furnished by a SCSI host bus adapter board, such as a Mylex FlashPoint board.

See Appendix A for information on LVD mode and single-ended mode.

8. AcceleRAID 150 Termination (SISL)

Check to confirm that all drive channels are properly terminated as shown in Figure 2-22. The AcceleRAID 150 is equipped with automatic SCSI termination circuitry for the SCSI channel that resides on the AcceleRAID board. If the controller board is at the end of the SCSI bus, it automatically enables on-board termination.

If all the SCSI devices on a channel are connected either to the internal connector or to the external connector, the end of the SCSI bus farthest from the controller board must have a terminator installed. In this case, the controller board automatically *enables* on-board termination.

If some SCSI devices on the channel are connected to the **internal connector, and some are connected to the external connector**, the two ends of the SCSI bus farthest from the controller board must each be terminated. In this case, the controller board automatically *disables* on-board termination. See Figure 2-22 for an example of an internal – external drive configuration. Notice the terminator “T” symbol indicating termination at the farthest bus ends. External drive cabinets usually have termination built into the end of the SCSI bus.

Note

The illustrated internal and external connectors are both on the same channel.

It is better to terminate the ends of the SCSI bus itself than it is to terminate the end devices on the bus. This allows hot swap devices to be added or removed from the SCSI bus without affecting termination.

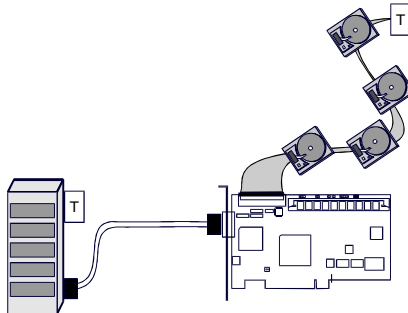


Figure 2-22. Termination with Internal - External Drive Configuration

9. SCSI Termination for Embedded System Board Channels (SISL)

Correct termination is critical for the SCSI channels. Termination on the end of the bus connecting the disk drives (or other SCSI devices) is required.

SCSI termination for the SCSI channels that reside on the system board need to be properly controlled (notice the terminator “T” symbol) as shown in Figure 2-23. You may also want to refer to documentation that was provided with your system.

Note

It is better to terminate the end of the SCSI bus itself than it is to terminate the end device on the bus. This allows hot swap devices to be added or removed from the SCSI bus without affecting termination.

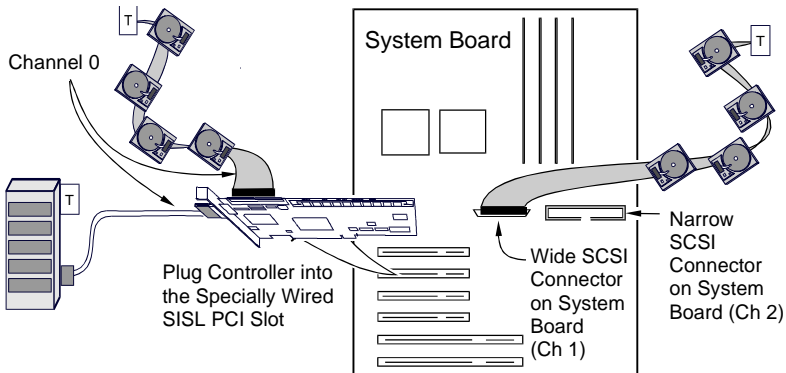


Figure 2-23. System Board SCSI Termination

10. Remove or set disk drive termination jumpers to the *disabled* position (if needed). Refer to your system documentation furnished with your disk drives to decide if your termination jumpers need to be adjusted.
11. Set the SCSI ID on the disk drives: ID 7 is reserved for the controller board, as shown in Figure 2-24.

 **Note**

Each drive must have a unique ID chosen from 0 through 6 or 8 through 15. Be careful not to duplicate a drive address on the same channel.

Remember: ID 7 is reserved for the controller board; therefore, it cannot be used as a disk drive ID.

ID's from 0 through 6 are usually for Narrow, 8-bit devices. However, the full range of SCSI ID addresses, 0 through 6 and 8 through 15 can be used for Wide, 16-bit devices.

See your device documentation for instructions on how to set your particular disk drive's SCSI address.

SCSI ID Numbers

7 is reserved for the controller

0 1 2 3 4 5 6 = used for narrow or wide devices

8 9 10 11 12 13 14 15 = used only for wide devices

Figure 2-24. SCSI ID Numbers

12. Enable termination power to all the disk drives (usually there is a jumper on the drive). See your device documentation for instructions on how to set your particular disk drive's termination power and configuration options.

 **Note**

The supported SCSI drive types include Ultra2 SCSI with LVD as well as the following single-ended SCSI types: SCSI-1, Fast SCSI, Wide Fast SCSI, Ultra SCSI, Wide Ultra SCSI, and Wide Ultra2 SCSI.

 **Caution**

If wide drives are to be connected to an on-board narrow SCSI connector (by a 68-pin to 50-pin adapter), the 8-bit bus width parameter must be set first, using the RAID EzAssist Configuration Utility.

Instructions on how to force the 8-bit bus width are in the *RAID EzAssist Configuration Utility User Reference Guide* (P/N 775029) under “Advanced Parameters.”

13. Safety check the installation by checking Pin 1 locations and cable types. For more details, see step 3 in the section titled “Before You Begin (SISL)” on page 2-16.
14. Replace the cover and connect the power cord.

 *Caution*

If the SCSI channels embedded on the system board are controlled by a Symbios Logic® chipset, the Symbios BIOS must be disabled in the system BIOS before proceeding with RAID configuration, or with operating system or driver installation. This is to allow the AcceleRAID 150 to take over control of the system board's embedded channels without any conflicts.

The Symbios BIOS can be disabled by running the CMOS setup routine when powering on your system (see the documentation that is furnished with your system).

The SISL AcceleRAID 150 installation is complete.

Proceed to the next chapter for controller board start-up procedures and other setup options.

Chapter 3

Controller Board Start-up

This chapter describes:

- **Start-up procedures**
- **BIOS options**
- **RAID EzAssist Configuration Utility**
- **Driver Installation**
- **What to check in case of problems**

This chapter describes the AcceleRAID 150 controller start-up procedures and messages produced by the BIOS during start-up or reboot. This chapter also explains three BIOS options that are available for configuring the controller operation.

Procedural Overview

The steps covered in this chapter include:

1. Setting BIOS options
2. RAID EzAssist configuration utility– refer to the *RAID EzAssist Configuration Utility User Reference Guide* (P/N 775029) for configuration instructions and default controller parameter definitions.
3. Loading the operating system and operating system drivers – refer to the *Disk Array Controller Software Kit Installation Guide and User Manual* (P/N 771929) for installation instructions for operating system drivers and the GAM server module.
4. Installing Global Array Manager – refer to the *Global Array Manager Client Software Installation Guide and User Manual* (P/N 771961) for installation instructions for the GAM client.

Controller Board Start-up

The start-up procedure should be performed prior to any software configuration. There are two start-up sequences: the BIOS Options sequence and the BIOS Configuration Utility sequence. Either start-up sequence can be skipped by ignoring the <ALT-M> and/or the <ALT-R> prompt when the computer is started up.

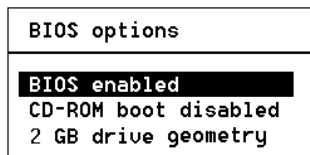
BIOS Options Sequence

After physically installing the controller and connecting the cabling, do the following if you need to change any BIOS option settings. (See “Setting BIOS Options” on page 3-3 for details.)

1. Before turning power on to the computer, power ON any external enclosures connected to the controller.
2. Power ON the computer.
3. Watch the messages on the screen for the following prompt to be displayed:

Press <ALT-M> for BIOS options

4. Press **Alt-M** to get into the *BIOS Options* menu.
5. The *BIOS Options* menu provides the following items to choose from:



6. To select any of the items in the menu, highlight the selection with the **Up Arrow** or **Down Arrow**. Press **Enter** to toggle any of the three items.

 **Note**

BIOS must be enabled to toggle the CD-ROM boot and the Drive geometry parameters.

Setting BIOS Options

The available BIOS options are:

- BIOS disabled / enabled
- CD-ROM boot disabled / enabled
- 2 GB / 8 GB drive geometry

BIOS Disable or Enable

This option must be enabled in order to toggle the CD-ROM boot and the drive geometry parameters shown in the BIOS Options menu. The CD-ROM BIOS must also be enabled in order to boot from any device (e.g., CD-ROM, tape drive) or system drive configured on the controller, or to access any DOS partition on any drive configured on the controller.

When BIOS Disable or Enable is selected, the following message will be displayed. Pressing any key will restart the system.

```
BIOS options
-----
BIOS enabled
CD-ROM boot disabled
2 GB drive geometry
```

```
The system will restart
Press any key to continue
```

CD-ROM Boot Disable or Enable

The default for this option is for the CD-ROM boot to be disabled (e.g., the system will boot from a hard drive, even if there is a bootable CD installed). If the CD-ROM boot option is enabled, and if a bootable CD is installed in the CD-ROM drive, the system will boot from the CD.

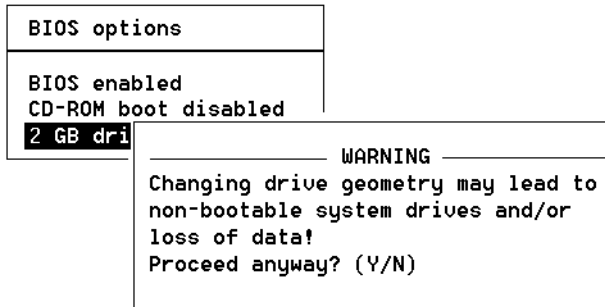
If the CD-ROM boot option is enabled, the CD-ROM will take priority over the disk drives. For example, under MS-DOS, the disk drive that is normally *Drive C* will become *Drive D*. All subsequent drive IDs will similarly be moved forward.

Enable 2 GByte or 8 GByte Drives

This setting affects how the BIOS reads the disk drives. Drive geometries can be toggled between 2 GB and 8 GB. The default is 2 GB. When the drive geometry setting is changed, the drive must be low level formatted.

⚠ Caution

Changing this setting after data has been stored will make the data unreadable. If you have already configured your array and have stored data, you should *not* change this setting.



The default BIOS geometry of the controller is set to 2 GB. This means that the operating system through the BIOS can access only the first 2 GB of any drive that has been configured on the controller. This is adequate in most applications, since BIOS is used only to boot the operating system. However, it does mean the operating system must be installed in the first 2 GB of the capacity of the configured drive. Some operating systems are limited to a 2 GB boot partition.

If this is not adequate, the BIOS geometry can be changed to 8 GB, allowing the operating system through the BIOS to access the first 8 GB of capacity.

As a rule of thumb, select 8 GB geometry if the following three cases apply:

1. You have a system (RAID) drive that is greater than 2.145 GB in capacity.
2. The DOS/Windows compatible partitions could be located in an area above the first 2.145 GB.

Otherwise the 2 GB option is fine.

 **Note**

In the event that the RAID controller needs to be replaced, the current drive geometry will be restored from the configuration on disk (COD).

RAID EzAssist Configuration Utility Sequence

After the BIOS options have been set as desired, do the following:

1. Power ON the computer (or allow the computer to restart normally after the BIOS options have been set).
2. Watch the messages on the screen for the following prompt to be displayed:

Press <ALT-M> for BIOS options

3. Wait approximately 5 seconds. Do *not* press any keys at this time.
4. Watch the messages on the screen for the following prompt to be displayed:

Press <ALT-R> for RAID Configuration options

5. Press **Alt-R** to get into the BIOS Configuration Utility.

Note

For detailed information on how to run the RAID EzAssist Configuration Utility, refer to the *RAID EzAssist Configuration Utility User Reference Guide* (P/N 775029).

Operating System

If an operating system is not already installed on the system, it can be installed on a system disk on the controller. The operating system is installed along with the operating system device drivers.

Installing the AcceleRAID as the Primary Controller

Follow the procedures indicated in the appropriate operating system chapter of the *Disk Array Controller Software Kit User's Manual* when installing AcceleRAID along with the operating system software.

- Do NOT install the driver for the on-board Symbios Logic SCSI adapter at any time during the operating system installation.

Installing the AcceleRAID into an Existing System with a SCSI Boot Device



WARNING

If an existing operating system is running on a SCSI boot drive using the Symbios Logic SCSI adapter embedded on the system board, the AcceleRAID controller must be installed as the primary (boot) controller.¹ You must do the following BEFORE installing the AcceleRAID controller:

1. **Back up all data on all SCSI devices** (including the boot device) that are controlled by an on-board Symbios Logic 810 SCSI device driver.
2. Shut down or exit from the operating system and run the *system* BIOS setup utility when prompted by pressing F2.
3. Switch to Advanced Settings.
4. Open PCI Configuration.
5. Open PCI Device, Embedded SCSI Devices.

-
1. This warning does not apply if the operating system is installed on an IDE device.

6. Change the Option ROM Scan to **DISABLED**. Enable Master should be set to **ENABLED**, and Latency Timer should be at least 0040h.
7. Save the settings and exit by pressing F10.
8. At the memory check, power down the server.

Install the AcceleRAID as the primary controller as documented:

1. Install the AcceleRAID controller hardware and disk drives, and cable and terminate properly as described in Chapter 2.
2. Run RAID EzAssist according to the instructions in “RAID EzAssist Configuration Utility Sequence” on page 3-6.
3. Use the configuration utility to set up one or more disk arrays and save the configuration (*RAID EzAssist Configuration Utility User Reference Guide P/N 775029*).
4. Install the DAC driver for your operating system at the same time you install the operating system itself onto the array, referring to the appropriate chapter of the *Disk Array Controller Software Kit Installation Guide and User Manual (P/N 771929)*.
5. Reboot and restore your previously backed up data to the array.

Operating System Device Drivers

Device drivers that are compatible with the controller can be found in the Software Kit. For details on how to install and load drivers, refer to the *Disk Array Controller Software Kit Installation Guide and User Manual (P/N 771929)* and the *AcceleRAID 150 Quick Installation Guide (P/N 775024)* for Windows NT and NetWare operating systems.

Global Array Manager (GAM)

The controller can be configured using GAM. GAM can also be used from the server or a system client to monitor status and verify data integrity of disks connected to the controller while the system and disks are running.

For details on how to install and run GAM, refer to the *Global Array Manager Client Software Installation Guide and User Manual (P/N 771961)*. This manual can be downloaded at no cost from the Mylex web site (www.mylex.com).

In Case of Problems

If problems are encountered during start-up, check the following:

- Check SCSI cabling for loose connections, pin mismatches (make sure pin 1 on the cable matches pin 1 on the connector), bent pins, and damaged or crossed cables.
- Check cable length. This includes internal bus lengths in enclosures.
- Check termination.
- Check SCSI IDs on all drives.
- Remove the system cover, power ON the system and observe the LEDs (see Figure 3-1).
 - Be sure the U1 light goes out after system is booted.
 - Be sure the SE or LVD is lighted appropriately, see the table excerpt following Figure 3-1 on the next page.

- Check the LED lights when controller is installed. (See the LED section of Table 2-1, “AcceleRAID Connectors, Jumpers, and LED Descriptions,” or see the excerpt below for details.)

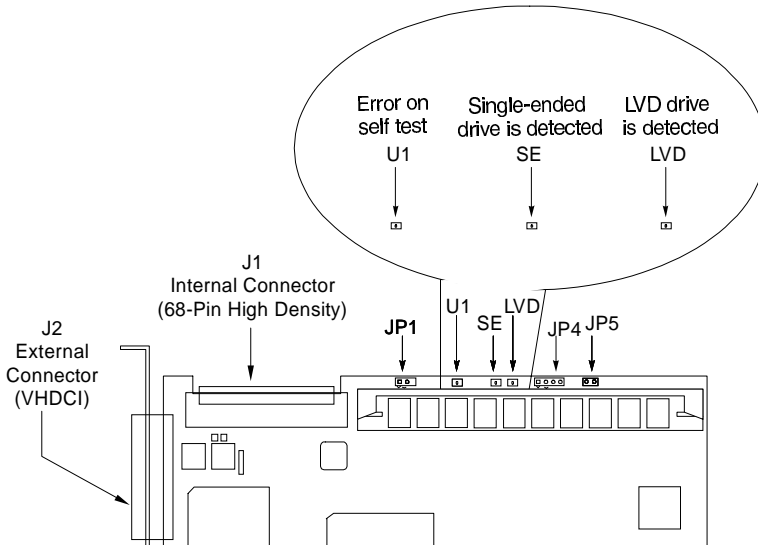


Figure 3-1. LED Descriptions

U1	LED, ON indicates the controller card failed internal diagnostics during start-up.	–
LVD (D3)	LED, ON = default; the light is always ON unless a single-ended device is connected. The light will turn OFF when a single-ended device is detected*.	–
SE (D2)	LED, ON indicates a single-ended drive is detected.	–

* The LVD and SE lights will not be ON or OFF at the same time.

Appendix A

Installation Notes

Helpful AcceleRAID Installation Notes

The purpose of this appendix is to provide additional information about your AcceleRAID 150 installation of either the Standard or SISL configuration. There are cross references to direct you to the appropriate topic in the main installation section of this manual.

SCSI Formats and Bus Lengths

Table A-1. Supported SCSI Formats and Bus Lengths

SCSI Drive Type*	Bus Speed, MB/Sec, Max.	Bus Width, Bits	Max. Bus Length, Meters*		Max. Device Support (Including Controller)
			Single-ended	Low-Voltage Differential	
SCSI-1	5	8	6	-	8
Fast SCSI	10	8	3	-	8
Fast Wide SCSI	20	16	3	-	16
Ultra SCSI	20	8	1.5	-	8
Ultra SCSI	20	8	3	-	4
Wide Ultra SCSI	40	16	-	-	16†
Wide Ultra SCSI	40	16	1.5	-	8
Wide Ultra SCSI	40	16	3	-	4
Ultra2 SCSI	40	8	Not Defined	12	8
Wide Ultra2 SCSI	80	16	Not Defined	12	16

* SCSI Trade Association (STA) Terms

† The maximum number of devices allowed on a Wide Ultra SCSI bus is 8 unless bus extender technology is used

Note

In order to ensure an error free environment, the proper cable designed for a certain SCSI speed must be used.

SCSI Cabling for AcceleRAID 150 (Standard and SISL)

An Ultra SCSI or an Ultra2 SCSI channel supports up to 15 SCSI devices. Examples of SCSI devices include hard disk, tape, and CD-ROM.

Caution

Wide and narrow SCSI cables must not be installed together on any one channel, or the AcceleRAID controller may not work properly.

LVD Mode

The controller supports Ultra2 SCSI with LVD. If all drives attached to a controller drive channel support Ultra2 SCSI with LVD, then that channel will operate at 80 MB/sec per bandwidth with Wide Ultra2 SCSI. This setup allows a maximum SCSI bus length of up to 12 meters. See the topic about connecting the SCSI cables, on page 2-10 and on page 2-25.

Note

The SCSI bus length can be extended to 25 meters if only the controller and one drive are on the bus.

Note

Definition: The SCSI bus length is defined as the total physical distance between the terminators, including space needed for cables, connectors, and devices. (See the illustrations under the termination sections and notice the placement of the terminator “ T ” symbol indicating termination at the farthest ends of the configuration.)

Single-ended Mode

If any device on the channel is *not* Ultra2 SCSI capable, the channel will revert to single-ended mode. The SCSI bus lengths will then be limited to the single-ended bus lengths shown in Table A-1

Appendix B

AcceleRAID Specifications

General Hardware Specifications

AcceleRAID

Controller	DAC960PRL
CPU	Intel i960 RP® RISC 32-bit microprocessor, 33MHz
Memory	EDO parity memory 60ns 4 MB or 16 MB
Cache	Write: Selectable, Write Through or Write Back Error Protection: Parity
Firmware	ROM Type, Flash EEPROM, 512K x 8
PCI	I/O Processor: Embedded in Intel i960 RP microprocessor Transfer Rate: 132 MB/second (burst)
SCSI	I/O Processor: Symbios 53C895 on AcceleRAID 150. AcceleRAID supports 53C875, 53C876, 53C895, and 53C896 on system board Number of Controller Channels DAC960PRL-1 – one Ultra2 LVD channel on controller

Environmental Specifications

Controller	DAC960PRL	
Temperature	Operating	0°C to +50°C (+32°F to 122°F) <i>[was +55°C, 131°F]</i>
	Storage	-20°C to +60°C (-4°F to +140°F) <i>[was +70°C, 158°F]</i>
Humidity	Operating	10% to 90% relative humidity (non-condensing)
	Storage	10% to 90% relative humidity (non-condensing)
Altitude	Operating	Up to 3,048m (10,000 ft)
	Storage	Up to 15,240m (50,000 ft)
Form Factor	Length:	7.225 inches
	Width:	4.2 inches
	Maximum.	
	Component	0.105 inches solder side
	Height:	0.570 component side.
	Board	Not to exceed the width of one PCI slot
Mean Time Between Failure	MTBF	350,000 hours at 55° C

DAC960PRL Block Diagram (Standard)

Figure B-1 (example of a system board block diagram) shows a standard configuration to use the Mylex AcceleRAID 150 Controller with any available PCI Bus Slot on a capable system board.

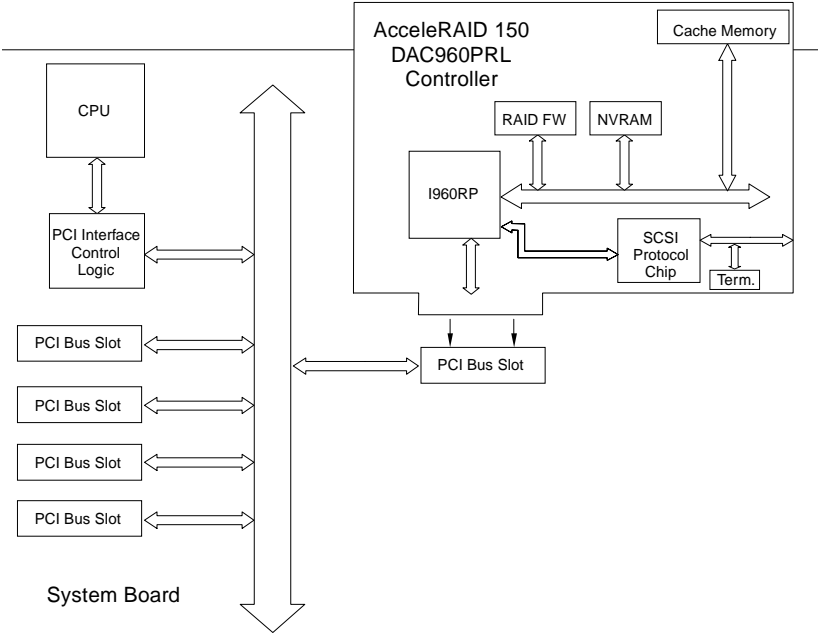


Figure B-1. AcceleRAID Standard System Board

DAC960PRL Block Diagram (SISL)

Figure B-2 (example of a system board block diagram) shows the functional relationship between the Mylex AcceleRAID 150 Controller and the SCSI-capable system board. The SCSI chip interrupt line(s) are routed to a PCI bus slot (shaded to indicate SISL availability) specifically preconfigured to accept the controller.

The non-shaded PCI bus slots indicate an example of available SCSI connections that are not intended for SISL activity.

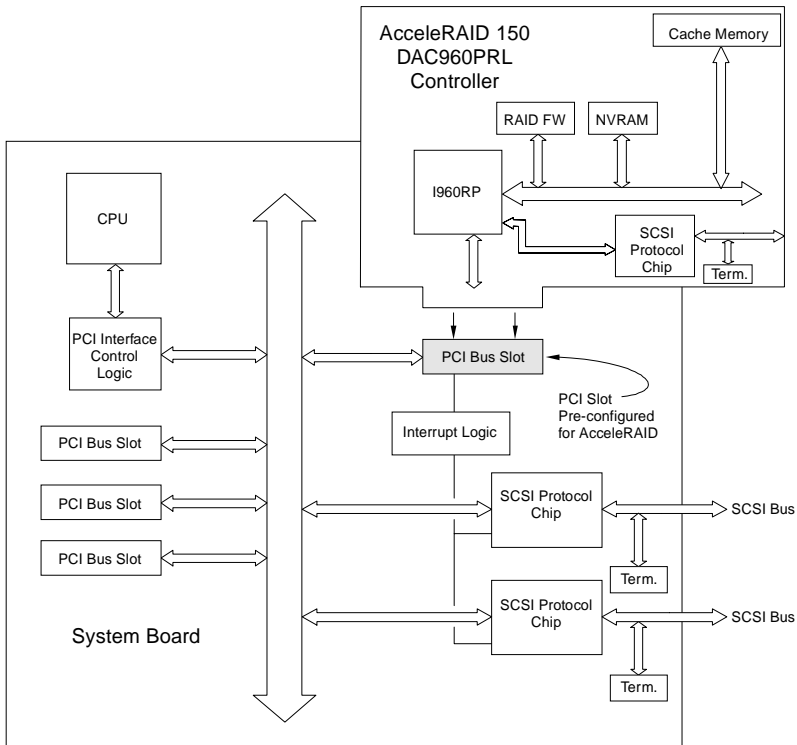


Figure B-2. AcceleRAID and SCSI-Capable System Board (SISL)

Appendix C

AcceleRAID Error Messages

Error Messages

Start-up: Error Messages

The BIOS looks for any initialization message posted by the firmware during the start-up sequence. If a message is found, one of the following errors displays on screen and the installation process aborts.

```
DAC960Pn fatal error--memory test failed
DAC960Pn fatal error--command interface test failed
DAC960Pn hardware error--run diagnostics to pinpoint error
DAC960Pn firmware checksum error--reload firmware
```

Drive Check: Error Messages

If the firmware finds a valid controller configuration, but it doesn't match the SCSI drives currently installed, one or more of the following messages display:

```
Unidentified device found at channel x...
Device identified for chn x, tgt y found at chn x', tgt y'
SCSI device at chn x, tgt y not responding
```

If any of the above messages are displayed, the firmware will not proceed any further in the initialization process, except to find other mismatches. Then, the BIOS prints out the following:

```
DAC960Pn Configuration Checksum error--run configuration
utility
```

If the firmware detects that during the last power cycle the system was turned off abruptly leaving some incomplete write operations, the following message appears:

```
Recovery from mirror race in progress
```

The following messages may also appear:

```
Adapter cannot recover from mirror race!
Some system drives are inconsistent!
```

During the initialization, if the firmware fails to respond to the BIOS inquiry within two minutes, the following message displays:

```
DAC960Pn not responding--no drives installed.
```

The BIOS then inquires the firmware for its version number and other information, and prints out the following message:

```
DAC960Pn firmware version x.xx
```

One or more of the following messages will be displayed if the firmware reports the following conditions:

```
Warning: X system drives are offline
```

```
Warning: X system drives are critical
```

```
Warning: The following SCSI devices are dead--chn  
x, tgt y...
```

```
No system drives found: None installed
```

```
X system drives installed
```

The BIOS repeats the same process for additional RAID controllers present in the system. Then it proceeds to boot, if possible, from the first system drive on the first controller.

Aborted Installation

With Firmware 4.x, the installation aborted message is displayed when the BIOS finds that the configuration of the disk drives, as stored in the NVRAM and configuration on disk, is different from what it senses at boot time. When this happens, (and a brand new installation is not being attempted) the cause is often a faulty cable or drive, or a loose connection. Check all of the connectors, cables, drives, and try to boot. If the error persists, it most likely indicates a genuine failure and needs to be corrected. To correct it, run the RAID EzAssist (previously BIOS) Configuration Utility (see “RAID EzAssist Configuration Utility Sequence” on page 3-6). For more information, refer to the *RAID EzAssist Configuration Utility User Reference Guide* (P/N 775029).

NVRAM Error

With Firmware 4.x, if the BIOS displays a mismatch between the NVRAM and the COD, no drives will be installed. Normally this error will not be displayed. If it is, boot and run the RAID EzAssist (previously BIOS) Configuration Utility (see “RAID EzAssist Configuration Utility Sequence” on page 3-6) to recover from the error. For more information, refer to the *RAID EzAssist Configuration Utility User Reference Guide* (P/N 775029).

System Reboot or Power Down

Before you power-down or reboot the system, it is *very important* to make sure that all data is written to the disk by waiting a minimum of 15 seconds before resetting or rebooting the system.

The AcceleRAID is a caching controller with write back capability. Data may still be in the cache waiting to be written to the disk drives when the system reports that a write command was completed.

Appendix D

Enclosure Management

Introduction

Mylex's AcceleRAID controllers support the industry standard enclosure management protocol *SCSI Accessed Fault-Tolerant Enclosures* (SAF-TE). This feature allows the host to monitor drive enclosures and detect certain faults or operating environment conditions. The host can make a decision to shut down the system or issue a warning based on the type of fault detected.

SAF-TE

The SAF-TE protocol follows a specification jointly worked out by nStor Corporation and Intel Corporation. Enclosures that are compliant with this protocol are known as SCSI Accessed Fault-Tolerant Enclosures (SAF-TE). The protocol is compatible with standard SCSI buses and cabling.

The SAF-TE interface standard's objective is to provide a non-proprietary means of allowing third-party disks and controllers to be automatically integrated with peripheral enclosures that support:

- Status Signals (LEDs, audible alarms, LCDs, etc.)
- Hot swapping of drives
- Monitoring of fans, power supplies, and enclosure temperature

SCSI is the underlying transport mechanism for communicating enclosure information. All standard SCSI host adapters will work. There is no need to consider reserved signals or special cabling.

The SAF-TE interface can be implemented as a SCSI target that uses a SCSI port and an 8-bit micro controller.

All communication is initiated by the host. The SAF-TE processor acts only in target mode. The SAF-TE processor should be periodically polled by the host approximately every 2 to 10 seconds.

Appendix E

Regulatory Information

FC Class B Compliance

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

1. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
2. THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRE OPERATION.

All external connections should be made using shielded cables.

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 residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna.
2. Move the equipment away from the receiver.
3. Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions.

Caution

Only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment.

Any changes or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the user's authority to operate such equipment.

FC Declaration of Conformity

Per FCC Part 2, Section 2.1077(a)

Manufacturer's Name: Mylex Corporation
Manufacturer's Address: 34551 Ardenwood Blvd.
Fremont, CA 94555-3607
USA

Declares that the product:

Product Name: AcceleRAID 150 Ultra2 SCSI RAID Controller

Model Number(s): DAC960PRL-1

Year of Manufacture: 1998

Conforms to the following Product Specification(s):

FCC: CFR 47 Part 15, Subpart B, Section 15.107(e)
and Section 15.109(g) Class B Digital Device
tested per ANSI C63.4-1992 procedures

Supplementary Information:

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

CE Declaration of Conformity
Per 89\336\EEC

Responsible Party

Name: Mylex Corporation
Address: 34551 Ardenwood Boulevard
Fremont, CA 94555-3607 USA

hereby declares that the product

Trade Name: AcceleRAID 150 Ultra2 SCSI RAID Controller
Model Number: DAC960PRL-1

conforms to the following specifications

Standards: EN 50081-1:1992, EMI
EN 55022 Class B (Radiated), Class B (Conducted)
EN 50082-1:1992, Immunity
EN 61000-4-2:1995 Electrostatic Discharge
EN 61000-4-3:1996 Radiated Susceptibility
EN 61000-4-4:1995 Electrical Fast Transients/Burst

CE Community of Europe

CE mark is rated for the AcceleRAID 150 Ultra2 SCSI RAID Controller as follows:

CISPR 22 Radiated Emission

EN55022, EN5082-1 Generic immunity standard for the following:

IEC 801-2 ESD, IEC 801-3 Radiated, and IEC 801-4 EFT/Burst

Warning!

This is a Class B product. In a residential environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Achtung!

Dieses ist ein Gerät der Funkstörgrenzwertklasse B. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen auftreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!

Cet appareil est un appareil de Classe B. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre des mesures appropriées.

Underwriters Laboratories



Cache

Controller memory used to speed up data transfer to and from a disk.

Cache Flush

Refers to an operation where all unwritten blocks in a Write-Back Cache are written to the target disk. This operation is necessary before powering down the system.

Cache Line Size

The Cache Line Size function is set in conjunction with stripe size and represents the size of the data “chunk” that will be read or written at one time.

Channel

Refers to one SCSI bus on a disk array controller. Each disk array controller provides at least one channel.

Consistency Check

Refers to a process where the integrity of redundant data is verified. For example, a consistency check of a mirrored drive will make sure that the data on both drives of the mirrored pair is exactly the same.

Disk Failure Detection

The controller automatically detects SCSI disk failures. A monitoring process running on the controller checks, among other things, elapsed time on all commands issued to disks. A time-out causes the disk to be “reset” and the command to be retried. If the command times out again, the disk could be “killed” (taken “offline”) by the controller (its state changed to “dead”). DAC960 controllers also monitor SCSI bus parity errors and other potential problems. Any disk with too many errors will also be ‘killed’.

Disk Media Error Management

When a disk reports a media error during a read, the controller reads the data from the mirror (RAID 1 or 0+1), or computes the data from the other blocks (RAID 3, RAID 5), and writes the data back to the disk that encountered the error. If the write fails (media error on write), the controller issues a “reassign” command to the disk, and then writes the data to a new location. Since the problem has been resolved, no error is reported to the system.

When a disk reports a media error during a write, the controller issues a “reassign” command to the disk, and writes the data out to a new location on the disk.

Drive Groups (or Drive Packs)

A group of individual disk drives (preferably identical) that are logically tied to each other and are addressed as a single unit. In some cases this may be called a drive “pack” when referring to just the physical devices. Up to eight (8) drives can be configured together as one drive group.

All the physical devices in a drive group should have the same size, otherwise each of the disks in the group will effectively have the capacity of the smallest member. The total size of the drive group will be the size of the smallest disk in the group multiplied by the number of disks in the group. For example, if you have five disks of 400MB plus one disk of 200 MB they are equal to six disk of 200MB of total storage. With RAID 3 or RAID 5, one disk’s worth of storage is dedicated to parity. Therefore, the equivalent data capacity of the array would be five disks of 200MB or 1000MB (5*200).

Hot Replacement of Disks (Hot Swap)

The design of the DAC960 Series controllers allows for the replacement of failed hard disk drives without interruption of system service. In the event of a SCSI drive failure on a properly configured system (where the data redundancy features of the controller are used), system service continues without interruption.

When a replacement drive becomes available, the system operator can remove the failed disk drive, install a new disk drive, and instruct the controller to “rebuild” the data on the new drive, all without interrupting system operations.

Once the rebuild is complete, the controller will be brought back into a fault tolerant state.

Logical Drive States

The state of a logical (system) drive can be either ONLINE, CRITICAL, or OFFLINE. Notice that the same term “online” is used for both physical and logical drives.

Online: A Logical Drive is in an “online” state if...

All of its participating SCSI drives are “online.”

Critical: A Logical Drive is in a “critical” state if...

It has been configured at RAID level 1, 3, 5, or 0+1; and

One (and only one) of its SCSI drives is not “online.”

A logical drive is considered “critical” because any failure of another of its SCSI drives may result in a loss of data.

Note

I/O operation can only be performed with system drives that are online or critical.

Offline: A Logical Drive is in an “offline” state if...

No data can be read from it or written to it.

System commands issued to offline logical drives are returned with an error status: no operations can be performed on offline logical drives. A logical drive can be “offline” under one of two situations described below:

- It is configured with a redundant RAID level (1, 3, 5, or 0+1), and two or more of its SCSI drives are not “online”; or
- It is configured at RAID level 0, JBOD, or in a spanned set, and one or more of its SCSI drives are not “online.”

Logical Drives

See “System Drives.”

LVD – Low Voltage Differential

Low Voltage Differential is a form of SCSI signalling that was introduced with Ultra2 SCSI. Low Voltage Differential allows cable lengths of up to 12 meters (approximately 39 feet) with up to 15 devices. The devices need to be Ultra2 SCSI LVD devices in order to take advantage of the LVD signalling.

LVD uses data high and data low signal lines to increase transmission distances over those of single-ended (conventional SCSI signalling). LVD differs from conventional differential signalling. LVDs advantages are that it consumes less power and it can sense single-ended devices on the bus and revert to single-ended signalling.

Mirroring

Refers to the 100 percent duplication of data on one disk drive to another disk drive. Each disk will be the mirror image of the other.

Pack

See “Drive Groups (or Drive Packs).”

Parity

See “Rotated XOR Redundancy.”

PCI

Peripheral Component Interconnect – This is a high-performance, backplane interface, expansion slot architecture that is found on PCs, Macintoshes, and UNIX workstations. PCI is a standardized architecture that provides a high-speed data path between peripherals and the CPU. PCI cards are portable across hardware platforms with the help of various software drivers.

RAID

RAID stands for Redundant Array of Independent Disks. The DAC960 controllers implement this technology to connect up to 15 SCSI devices per channel. Several different forms of RAID implementation have been defined. Each form is usually referred to as a “RAID level.” All the RAID levels supported by DAC960 Series controllers are shown below.

The appropriate RAID level for a system is selected by the system manager or integrator. This decision will be based on which of the following are to be emphasized:

Disk Capacity

Data Availability (redundancy or fault tolerance)

Disk Performance

RAID Levels

The disk array controllers monitored by this utility support four RAID Advisory Board-approved (RAID 0, RAID 1, RAID 3, RAID 5) and two special RAID levels (RAID 0+1, and JBOD).

Level 0. Block “striping” across multiple drives is provided, yielding higher performance than is possible with individual drives. This level does not provide any redundancy.

Level 1. Drives are paired and mirrored. All data is 100 percent duplicated on a drive of equivalent size.

Level 3. Data is “striped” across several physical drives. Maintains parity information which can be used for data recovery.

Level 5. Data is “striped” across several physical drives. For data redundancy, drives are encoded with rotated XOR redundancy.

Level 0+1. Combines RAID 0 striping and RAID 1 mirroring. This level provides redundancy through mirroring. (Mylex RAID 6)

JBOD. Sometimes referred to as “Just a Bunch of Drives.” Each drive is operated independently like a normal disk controller, or drives may be spanned and seen as a single drive. This level does not provide data redundancy. (Mylex RAID 7)

Level 10. Combines RAID 0 striping and RAID 1 mirroring spanned across multiple drive groups (super drive group). This level provides redundancy through mirroring.

Level 30. Data is “striped” across multiple drive groups (super drive group). Maintains parity information which can be used for data recovery.

Level 50. Data is “striped” across multiple drive groups (super drive group). For data redundancy, drives are encoded with rotated XOR redundancy.

 **Note**

The host operating system drivers and software utilities remain unchanged regardless of the level of RAID installed. The controller makes the physical configuration and RAID level implementation.

Replacement Table

A replacement table contains information regarding which SCSI devices have been replaced by other SCSI devices through standby replacement.

Rotated XOR Redundancy

This term (also known as “parity”) refers to a method of providing complete data redundancy while requiring only a fraction of the storage capacity of mirroring. In a system configured under RAID 5 (which require at least three SCSI drives), all data and parity blocks are divided between the drives in such a way that if any single drive is removed (or fails), the data on it can be reconstructed using the data on the remaining drives. (XOR refers to the Boolean “Exclusive-OR” operator.) In any RAID 5 array, the capacity allocated to redundancy is the equivalent of one drive.

SCSI

SCSI is an acronym for “Small Computer Systems Interface,” although it is often used in large systems. The SCSI interface supports disk drives, tape drives, and CD-ROM drives. Narrow SCSI supports up to seven (7) devices on a channel, and Wide SCSI, Ultra SCSI, and Ultra2 SCSI support up to 15 devices on a channel.

SCSI Drive

A disk drive equipped with a SCSI interface (sometimes referred to as a SCSI Disk). Each disk drive will be assigned a SCSI address (or SCSI ID), which is a number from 0 to 7 (0 to 15 under wide or Ultra SCSI). The SCSI address uniquely identifies the drive on the SCSI bus or channel.

SCSI Drive States

Refers to a SCSI drive's current operational status. At any given time, a SCSI drive can be in one of five states: READY, ONLINE, STANDBY, DEAD, or REBUILD.

The controller stores the state of the attached SCSI drives in its non-volatile memory. This information is retained even after power-off. Hence, if a SCSI disk is labeled DEAD in one session, it will stay in the DEAD state until a change is made either by using a system level utility or after a rebuild. Each of the states is described below:

Ready: A SCSI disk drive is in a "ready" state if it...

Is powered on, and

Is available to be configured during the current session but remains unconfigured.

Online: A SCSI disk drive is in an "online" state if it...

Is powered on, and

Has been defined as a member of a drive group, and

Is operating properly.

Standby: A SCSI disk drive is in a "standby" state if it...

Is powered on, and

Is able to operate properly, and

Was NOT defined as part of any drive group.

Dead: A SCSI disk drive is in a "dead" state if it...

Is not present, or

If it is present but not powered on, or

If it failed to operate properly and was ‘killed’ by the controller.

When the controller detects a failure on a disk, it “kills” that disk by changing its state to “dead.” A SCSI drive in a dead state does not participate in any I/O activity. No commands are issued to dead drives.

Rebuild: A SCSI disk drive is in a “rebuild” state...

While it is in the process of being rebuilt. During this process, data is regenerated and written to the disk drive. This state is also referred to as ‘Write-Only’ (WRO).

SCSI Interrupt Steering Logic

This is the architecture that allows a RAID controller, such as AcceleRAID to implement RAID on a system board embedded SCSI bus or a set of SCSI busses.

Segment Size

See “Cache Line Size”.

Session

Refers to the period of time between any two consecutive system shutdowns. System shutdown may be either a power OFF/ON, or a hardware reset.

SISL

See “SCSI Interrupt Steering Logic.”

Standard Disk Drive

This term refers to a hard disk drive with SCSI, IDE, or other interface, that is attached to the host system through a standard disk controller.

Standby Replacement of Disks (“Hot Spare”)

The “Standby Replacement” (or “Hot Spare”) is one of the most important features the controller provides to achieve automatic, non-stop service with a

high degree of fault-tolerance. The rebuild operation will be carried out by the controller automatically when a SCSI disk drive fails and both of the following conditions are true:

- A “standby” SCSI disk drive of identical size is found attached to the same controller.
- All of the system drives that are dependent on the failed disk are redundant system drives, e.g., RAID 1, RAID 3, RAID 5, RAID 0+1.

 **Note**

The standby rebuild will only happen on the SAME DAC960 controller, never across DAC960 controllers.

A Standby or Spare disk can be created by using RAID EzAssist or Global Array Manager Client software.

During the automatic rebuild process, system activity continues as normal. System performance may degrade slightly during the rebuild process.

To use the standby rebuild feature, you should always maintain a standby (spare) disk in your system. When a disk fails, the standby disk will automatically replace the failed drive and the data will be rebuilt. The system administrator can disconnect and remove the bad disk and replace it with a new disk. The administrator can then make this new disk a standby.

Stripe Order

The order in which SCSI disk drives appear within a drive group. This order must be maintained, and is critical to the controller’s ability to ‘Rebuild’ failed drives.

Stripe Size

The stripe size is defined as the size, in kilobytes (1024 bytes) of a single I/O operation. A stripe of data (data residing in actual physical disk sectors, which are logically ordered first to last) is divided over all disks in the drive group.

Stripe Width

The number of striped SCSI drives within a drive group.

Striping

Refers to the storing of a sequential block of incoming data across multiple SCSI drives in a group. For example, if there are 3 SCSI drives in a group, the data will be separated into blocks and block 1 of the data will be stored on SCSI drive 1, block 2 on SCSI drive 2, block 3 on SCSI drive 3, block 4 on SCSI drive 1, block 5 on SCSI drive 2 and so on. This storage method increases the disk system throughput by ensuring a balanced load among all drives.

System Drives

A system drive is equivalent to a “logical” drive. System drives are presented to the operating system as available disk drives, each with a capacity specified by the DAC960 Series controller.

Target ID

A target ID is the SCSI ID of a device attached to a DAC960 controller. Each SCSI channel can have up to 15 attached SCSI devices (target ID from 0 to 6, and 8 to 15).

Ultra SCSI

Ultra SCSI, or Fast 20 SCSI is a high performance SCSI protocol that has a bus speed of 20 MegaBytes per second in the Narrow SCSI configuration and 40 MegaBytes in the Wide SCSI (Fast 20 Wide SCSI) configuration.

Ultra2 SCSI

Ultra2 SCSI, or Fast 40 SCSI is a higher performance SCSI protocol than Ultra SCSI. Ultra2 SCSI has a bus speed of 40 MegaBytes per second in the Narrow SCSI configuration and 80 MegaBytes in the Wide SCSI (Wide Ultra2 SCSI) configuration.

Write-Back Cache

Refers to a caching strategy whereby write operations result in a completion signal being sent to the host operating system as soon as the cache (not the disk drive) receives the data to be written. The target SCSI drive will receive the data at a more appropriate time, in order to increase controller performance.

Write Through Cache

Refers to a caching strategy whereby data is written to the SCSI drive before a completion status is returned to the host operating system. This caching strategy is considered more secure, since a power failure will be less likely to cause loss of data. However, a write through cache results in a slightly lower performance.



MYLEX DAC960 Problem Report

Customer Identification DACPRL-1														DACPRL-1 Identification							
Name: _____														Date: _____		Purchase Date: _____					
Company: _____														Model _____							
Address: _____														Invoice Number: _____							
_____														Serial Number: _____							
_____														# Chnls: _____		Cache: _____					
Country: _____														Firmware Ver: _____		BIOS Ver: _____					
Phone Number: _____														Make/Model/Size/Type of _____							
Fax Number: _____														Drives: _____		Disk: _____					
														Non-Disk: _____							
System Information																					
Motherboard: _____										CPU Speed: _____				BIOS Ver: _____							
Video Adapter: _____										Network Card: _____				MB Memory: _____							
Operating Sys: _____										Other Disk Ctrl: _____				Other Cards: _____							
Pack Configuration														System Drive Configuration							
Indicate in matrix below 1, 2... for member of pack 1, pack 2... respectively. Indicate S, T, C, or O for Standby, Tape, CDROM and other drives.														System Drive	Size	RAID Level	Write Back/Thru				
Chan- nel	SCSI ID														0						
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	1				
0																	2				
1																	3				
2																	4				
																	5				
																	6				
																	7				
Problem Description																					

This DPR form has been included with your Mylex product as a convenience to both you and our Technical Services Department. If filled out completely, this will greatly assist Mylex personnel in quickly resolving any technical problems or questions you may have. Use the Mylex fax number (510) 745-7715 to transmit this form to the Technical Services Department, or mail to Mylex Corporation, Technical Services Department, 34551 Ardenwood Blvd., Fremont, CA 94555-3607

Mylex Warranty - Customer Policy

Thank you for purchasing this Mylex product for your computer system. In addition to this high-quality product, your purchase entitles you to the warranty coverage set forth herein. In order to provide this warranty coverage, and to indicate your acceptance of this warranty, we must have the attached Warranty Registration Card completed and returned to us within 15 days of your purchase. Also, in order for us to provide you the highest level of service, we must know where you purchased your MYLEX product.

Three Year Limited Warranty

If at any time during the thirty six month period immediately following the date of original purchase of the MYLEX product enclosed herewith (the "PRODUCT") you discover one or more defects in the material or workmanship, MYLEX will repair, or at MYLEX's sole option, replace the PRODUCT. If the PRODUCT fails to operate at any time within seven days after the date of its original purchase, it will be replaced by MYLEX. Such repair or replacement will be your sole remedy against MYLEX, and MYLEX's only liability to you, for any failure or malfunction of the PRODUCT. The warranty set forth in this paragraph will be void if:

1. The PRODUCT has been installed in an improper manner or in an improper operating environment.
2. The PRODUCT has been modified or repaired by any party other than MYLEX or a MYLEX factory authorized service center.
3. The PRODUCT has been damaged.

Some MYLEX products will have a Warranty Expiration Date label affixed to the product itself. When present, the warranty period will extend through the last day of the month indicated.

This warranty will not apply to, and MYLEX provides no warranty for, any BIOS, software, ROM-based firmware, or any other PRODUCT developed or manufactured by any third party, whether included with this PRODUCT or not. Such warranty or warranties as are provided by third parties, to the extent permitted thereby, shall be made available, and are hereby assigned, by MYLEX to the purchaser of this PRODUCT.

If MYLEX issues a revision to the BIOS, firmware or software included with this PRODUCT within 30 days of your purchase, MYLEX will replace such firmware at no charge except handling fees.

Out of Warranty Service

Mylex products which are ineligible for warranty service may be serviced by MYLEX according to our standard price list, as modified from time to time. A current copy of the standard price list is available from the Technical Support Department.

Limitation of MYLEX Liability

MYLEX's liability arising from the sale, use and disposition of this PRODUCT shall in no event exceed the amount paid to MYLEX for this PRODUCT. MYLEX assumes no liability for damages arising from the use or failure of any MYLEX product. The WARRANTY DESCRIBED ABOVE CONSTITUTES THE ONLY WARRANTY MADE BY MYLEX. MYLEX EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT WILL MYLEX BE LIABLE FOR INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OF DATA, USE, OR INCOME), EVEN IF ADVISED OF SUCH DAMAGES IN ADVANCE. Your sole remedies shall be as provided herein.

Returned Merchandise Procedures

If you suspect that there is a defect in the material or workmanship of this PRODUCT, you should contact the person or company from which you purchased it. That person or company may be able to solve the problem and if not, will be able to contact us for technical assistance or repair.

If it is determined that the PRODUCT must be returned to MYLEX for repair or replacement, contact MYLEX's Technical Support Department at 510-608-2400 before it is returned. Each returned item must have a separate Return Merchandise Authorization (RMA) number, provided by MYLEX.

The following rules apply to all returned items:

1. The PRODUCT must be returned either in its original packaging or in other packaging which is appropriate for the PRODUCT and the manner of shipment, and the RMA number must be displayed prominently on the outside of each such package.
2. If a PRODUCT is determined to be ineligible for warranty service, the customer will be notified before any further action is taken with the PRODUCT.
3. MYLEX will not be responsible for any loss or damage to property shipped with the RMA PRODUCT not originally sold by MYLEX (e.g., coprocessor chips, peripheral boards, memory modules, enclosures, power supplies, or any other accessories or attached items).
4. Any item returned to MYLEX without a valid RMA number will be returned to the shipper.

Products shipped to MYLEX must be shipped or mailed at the shipper's risk, freight prepaid, to the address below.

Mylex Corporation
34551 Ardenwood Blvd.
Fremont, California U.S.A.
94555-3607

Mylex will pay for return freight via such carrier as MYLEX shall deem appropriate.

Technical Support

MYLEX's Technical Support Department, to assist you in resolving problems with MYLEX products, is available through the world wide web. Contact the Technical Support web site through the Mylex Internet home page at www.mylex.com, or by e-mail at support@mylex.com. In the U.S.A., the Technical Support Department can be reached by telephone at (510) 608-2400 or by FAX at (510) 745-7715. Current hours of operation, which are subject to change, are from 6:00 a.m. to 6:00 p.m. Pacific Time, Mondays through Fridays, **excluding U.S.A. national holidays**.

Included with the shipment of most MYLEX products is a System Problem Report (SPR) form. When contacting the Technical Support Department for assistance with an installation or compatibility problem, we recommend that this form be completed and sent by facsimile or mail to MYLEX. Completion of this form will allow our Technical Support Department to solve most technical problems expeditiously.

Mylex will make reasonable efforts to address compatibility problems which may arise with respect to third party products, but shall not be responsible for the compatibility of its products with the products of any third party. Customers are advised to verify each products compatibility with their installation before committing to any particular procurement plan.



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