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AcceleRAID™
Installation Guide

AcceleRAID 170
PCI to Ultra 160 SCSI
RAID Controller

P/N: 775064-00

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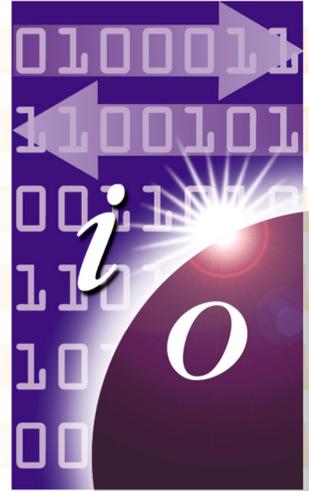
AcceleRAID™ 170 PCI to Ultra 160 SCSI RAID Controller Installation Guide

Part Number 775064-00

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About This Manual

This installation guide covers hardware set-up and configuration procedures necessary for the installation of a Mylex AcceleRAID 170 single channel RAID controller.

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

Chapter 2 describes the steps to be performed prior to controller installation and the physical installation of the AcceleRAID 170 single channel RAID controller.

Chapter 3 describes controller start-up and the BIOS resident utilities.

Appendix A provides hardware and environmental specifications.

Appendix B describes error messages and problem correction.

Appendix C describes the PCI Hot Plug feature.

Appendix D provides enclosure management information.

Appendix E provides regulatory agency 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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AcceleRAID 170 Installation Guide

Chapter 1
Introduction

This chapter describes:

- **The AcceleRAID™ 170 controller**
- **Standard package contents**
- **User supplied items**

Figure 1-1. AcceleRAID 170 Controller

Product Description

The Mylex AcceleRAID 170 controller is a PCI to Ultra 160 SCSI single channel RAID controller with 32-bit, 33MHz PCI capability. The AcceleRAID 170 supports one external connector and one internal Ultra 160 SCSI connector. The AcceleRAID 170 controller provides the speed and functionality required by high demand server platforms. AcceleRAID 170 achieves performance breakthroughs in PCI technology, eliminates storage bottlenecks, and delivers scalable performance. PCI Hot Plug is a standard feature.

Controller Features

Features of the AcceleRAID 170 controller include:

- One QLogic ISP 10160A chip to support one Ultra 160 SCSI LVD channel
- Intel i960RM RISC processor operating at 100MHz
- 32MB, 64MB, and 128MB ECC cache DIMM module
- PCI 2.2 compliant
- 1MB, 8-bit flash EEPROM for BIOS and code
- Built-in configuration utilities (in BIOS)
- Write-through and write-back cache support
- PCI Hotplug capability allows the AcceleRAID 170 to be swapped with a replacement without powering down the system

⚠ *Caution*

Be sure the motherboard you are using supports PCI Hotplug before attempting to use this feature, or serious damage to the controller and/or the motherboard could result. (The motherboard must be PCI 2.2 compliant if using PCI Hot Plug.)

Channel Capabilities

15 Ultra 160 SCSI devices per channel

Controller Capabilities

- 15 physical drives in the drive group (array)
- 32 total logical drives on the controller
- Supports RAID levels 0, 1, 0+1, 3, 5, 10, 30, 50, and JBOD

Operating System Support

MS-DOS 5.x, 6.x, and above are supported using drivers that reside in the AcceleRAID BIOS. Many drivers in the Disk Array Controller Software Kit, included with the AcceleRAID 170 controller, support many other popular operating systems. (See the appropriate *Disk Array Controller Software Kit Installation Guide and User Manual*.)

Standard Package Contents

The following items are supplied with the standard shipping package:

Hardware

- AcceleRAID 170 Disk Array Controller with documentation included on the CD-ROM and a printed Quick Installation Guide

- Standard DIMM Module: 32MB, 64MB, or 128MB (ECC)

Software

- On-board RAID EzAssist disk array controller configuration utility with documentation on CD-ROM and a printed Quick Configuration Guide

- Software Driver Kit diskettes with documentation on CD-ROM

- Global Array Manager (GAM) Server and Client software and documentation on CD-ROM

AcceleRAID 170 PCI to Ultra 160 SCSI RAID Controller
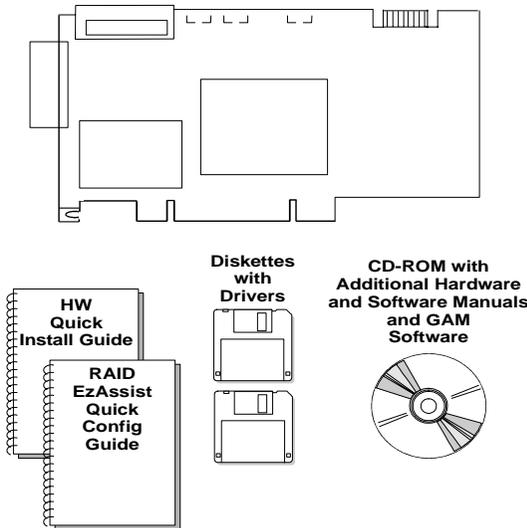
Figure 1-2. Standard Package Contents

User-supplied Items

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

- IBM-PC™ compatible host system with PCI slot (PCI 2.2 compliant)

- Network operating system software (as required)

- SCSI cables to connect the controller and disk arrays

- Static grounding strap or electrostatic discharge (ESD) safe work area

- Disk array enclosure (or equivalent) with SCSI disk drives

Chapter 2
Installation

This chapter describes:

- **Before You Begin**
- **Safety Considerations**
- **Installation Checklist**
- **Connectors, LEDs, Jumpers**
- **Installation Process (controller)**
- **SCSI Termination**
- **SCSI IDs**
- **SCSI Cabling**
- **Limitations on Mixing SCSI Drives**

Mylex disk array controllers are designed to work in a variety of SCSI RAID application environments. Certain configuration steps need to be performed prior to installing the controller into a RAID environment. Each of the steps described in this chapter are part of the installation process.

Before You Begin

Installing the AcceleRAID 170 single channel RAID controller is no more difficult than installing any 32-bit PCI adapter card. The AcceleRAID 170 single channel controller connects into any PCI 2.2 compliant slot on the motherboard. Follow these steps and the installation procedures in this chapter.

☞ **Note**

> Recommended: Connect the AcceleRAID 170 into a 32-bit PCI slot to reserve the 64-bit PCI slot for 64-bit controllers (although the AcceleRAID 170 will work in a 64-bit slot).

🛑 **WARNING**

> **Working with the system covers off and power applied to the system can result in shock and serious injury.**

1. Power off the system and 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. Follow electrostatic discharge (ESD) safety procedures. Use a grounded wrist strap or ESD safe footwear, and work in an ESD safe area.

4. Perform a safety check of the installation before powering on the system.
   - Make sure that the cabling Pin 1 location is correct and that all cables are firmly seated in the connectors.
   - Make sure all SCSI conventions (cable type, cable length, termination, etc.) are correct, see Table 2-3 on page 2-15.

Safety Considerations

Be sure to observe the following precautions before beginning the controller installation procedure:

⚠ *Caution*

> Anti-static handling procedures are required. Leave the controller in its anti-static bag until it is time to plug the controller into the PCI slot. The use of a grounded wrist strap and other ESD protective measures are highly recommended.

🛑 **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.

Installation Checklist

GET READY

☞ **Note**

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

1. ____ Power off your computer system.

2. ____ Decide which available PCI slot will be used.

3. ____ Remove the plate from the I/O access port to the PCI slot.

4. ____ Remove the AcceleRAID 170 board from the anti-static bag.

GET SET

☞ **Note**

Review Figure 2-1, Figure 2-2, and Figure 2-3; Table 2-1 and Table 2-2 to get familiar with the layout of the AcceleRAID 170 controller board and the Connectors, Jumpers, and LED descriptions.

5. ____ Plug the AcceleRAID 170 board into a standard PCI 2.2 compliant slot.

6. ____ Secure the AcceleRAID 170 board's mounting bracket with a screw or retainer.

7. ____ Connect the SCSI cable(s) from your drive(s) and/or device(s) to the SCSI channel.

8. ____ Check SCSI termination for internal and/or external devices.

9. ____ Check disk drives. Be sure termination is set to the *disabled* position on any disk drive(s) that will not be terminated. For more information, see the documentation that accompanied the disk drives.

10. ____ Set SCSI ID on the disk drive(s).

11. ____ Enable termination power on disk drive(s).

12. ____ Safety check the installation.

GO

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

Connectors, LEDs, and Jumpers

There is one external and one internal Ultra 160 SCSI connector supported on the AcceleRAID 170 controller as shown in Figure 2-1, and labeled as CH 0.

The AcceleRAID 170 controller has three LEDs on the front side as shown in Figure 2-2 and described in Table 2-1. The LEDs indicate SE (single ended), LVD, and FAIL modes.

SCSI jumpers should normally be set to their default settings, no adjustments are needed. Default jumper locations are shown in Figure 2-3 and are described in Table 2-2.

When you have checked the termination requirements, completed the connections of your desired SCSI devices, and other possible devices such as a CD-ROM drive or a tape drive, close your system with the cover.

PCI Hotplug

☛ **Note**

Please see Appendix C for information on how to implement the Hotplug feature for your system's requirements.
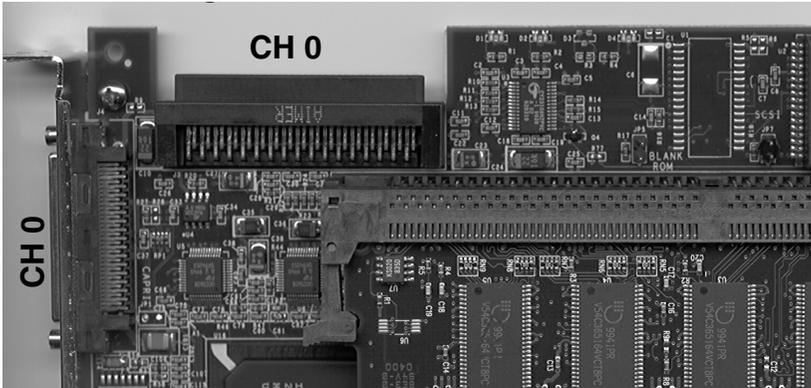
Figure 2-1. AcceleRAID 170 Controller Channel Connectors
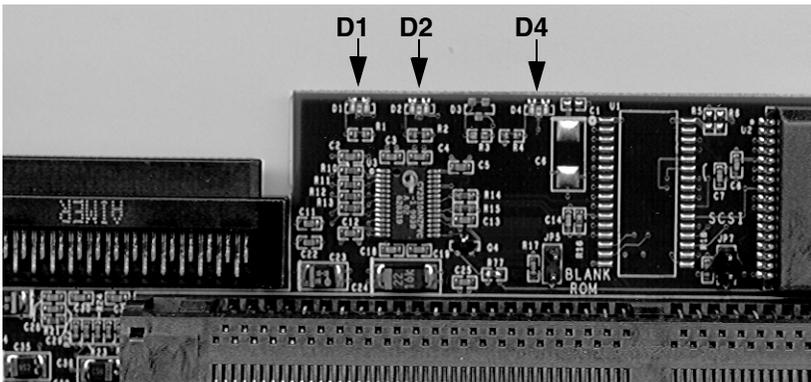
Figure 2-2. AcceleRAID 170 LEDs

Table 2-1. LED Descriptions

D1	SE (Single Ended)
D2	LVD (Low Voltage Differential)
D4	Fail (Processor Self Test)
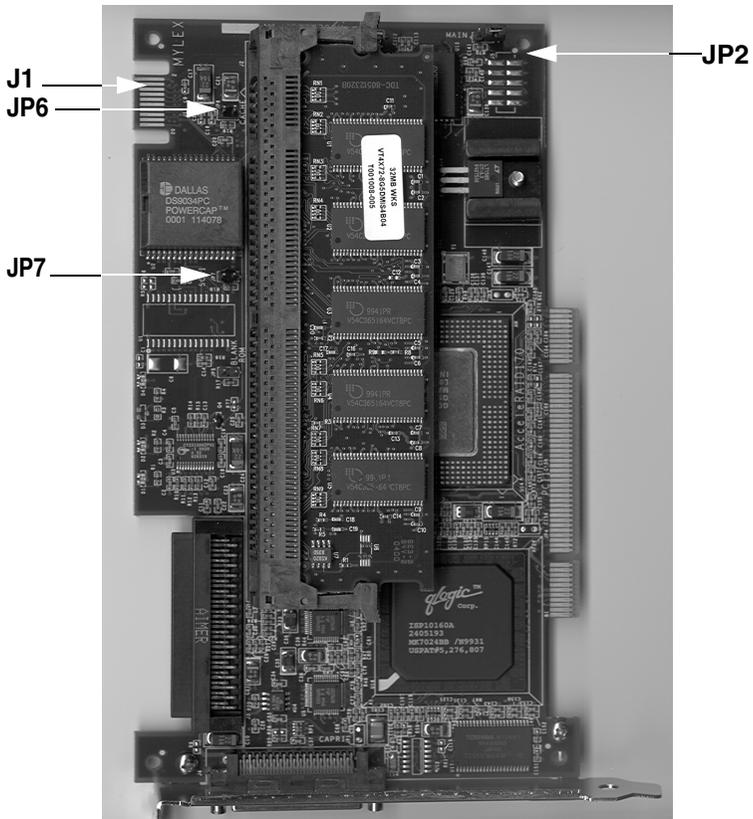
Figure 2-3. AcceleRAID 170 Jumper Locations

Table 2-2. AcceleRAID 170 Jumper Descriptions

J1	Manufacturing test point
JP2	Maintenance mode
JP6	Cache dirty (monitor cache write back) — LED header
JP7	BSY (SCSI activity) — LED header

Installation Process

Installing the Controller

Follow these installation steps:

1. Choose any available 32-bit or 64-bit PCI slot as shown in Figure 2-4.
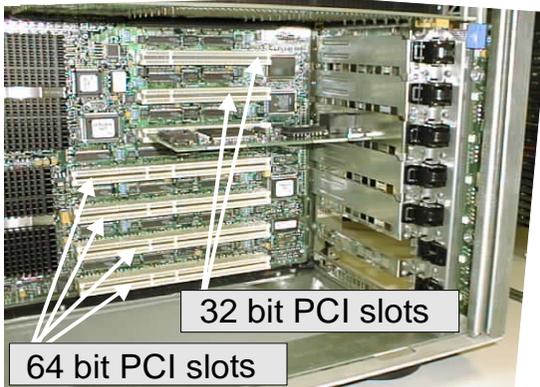
Figure 2-4. Choose an Available PCI Slot

2. Remove the metal cover plate from the slot's access port (at the back of the cabinet), usually by releasing the black clip as shown in Figure 2-5.
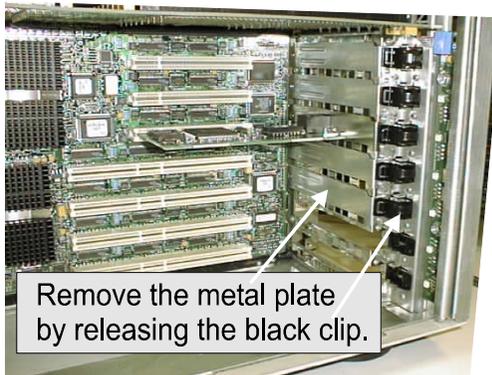
Figure 2-5. Remove the Metal Plate

⚠ *Caution*

Be sure to wear a ground wrist strap at all times.

3. Handling the AcceleRAID 170 controller by the edges, remove it from the anti-static bag as shown in Figure 2-6.

Ground wrist strap
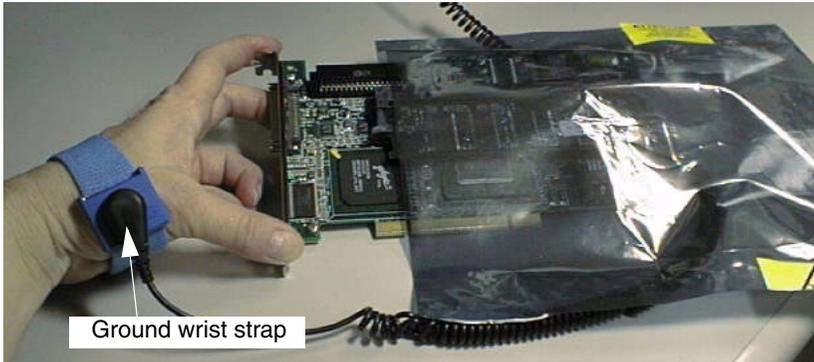
Figure 2-6. Remove the Controller from the Anti-static Bag

4. Plug (install) the controller board firmly into any 32-bit or 64-bit PCI slot as shown in Figure 2-7.

32-bit PCI slot

AcceleRAID 170

Ground wrist strap
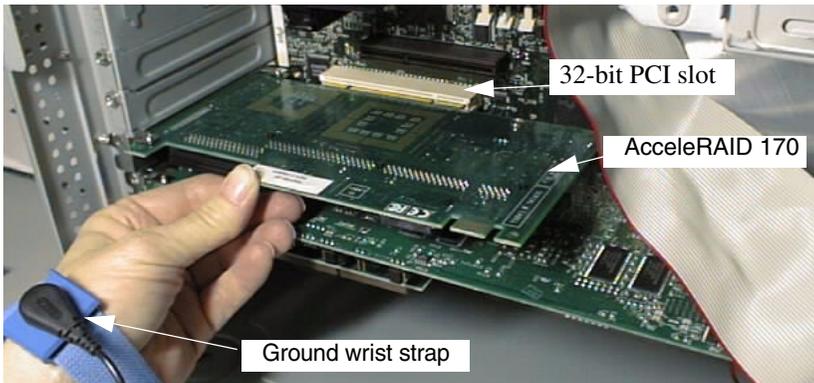
Figure 2-7. Plug the Controller Board into any 32-bit or 64-bit PCI Slot

Preparing the SCSI Drives

To prepare the drives for installation, follow these steps:

1. Remove any terminators attached to the drive or set any drive termination jumpers to the *disabled* position.

2. Set the SCSI IDs on the drives.

3. Enable term power on the drives.

Refer to the drive manual for specific information about drive configuration settings.

Installing Cables and Setting Termination

Please refer to Table 2-3 on page 2-15 for SCSI Formats and Bus Length requirements.

4. Connect the SCSI cable from the internal disk drive to the SCSI connector on the AcceleRAID 170 controller as shown in Figure 2-8. (The controller is already connected to the system board.)
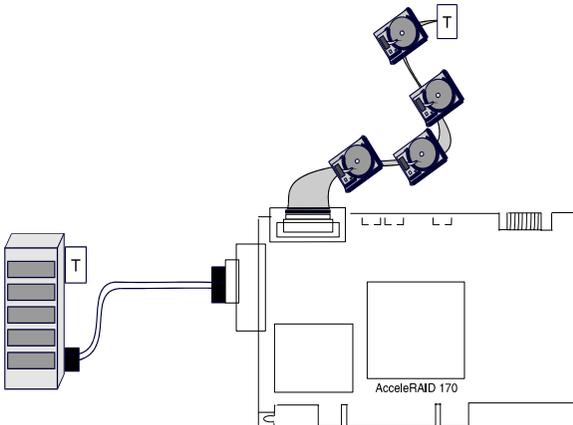
Figure 2-8. Connecting Disk Drives to the AcceleRAID 170

☞ **Note**

> In order to ensure an error free environment, the proper cable type designed for a certain SCSI speed must be used, please refer to Table 2-3 on page 2-15.

☞ **Note**

> To avoid problems caused by mixing drive types, please refer to "Limitations on Mixing SCSI Drives" on page 2-16.

SCSI Termination

Each end of a SCSI bus must be terminated to maintain proper voltage levels for SCSI control and data signals. The device used for this purpose is called a terminator. Termination devices can be built into a controller, a SCSI device, or attached to the end of a SCSI bus.

The AcceleRAID 170 controller is equipped with automatic SCSI bus termination circuitry. If the controller is at the end of a SCSI bus, it automatically enables on-board termination. The controller can also detect whether single-ended (SE) or low-voltage differential (LVD) termination is required, and can automatically configure the appropriate termination type.

The end of the SCSI bus farthest from the controller must be terminated if SCSI devices are connected to the SCSI channel. See Figure 2-9 for an example of a SCSI device configuration connected to the internal SCSI channel.

☞ **Note**

> When connecting SCSI devices, it is better to terminate the ends of the SCSI bus itself, rather than 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.

1. **Termination - Only Internal or Only External Devices**
   Check that the drive channel is properly terminated according to
   drawings below, or skip to Step 2 if using both internal and external
   devices.

   The AcceleRAID 170 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.

Internal Drive Configuration
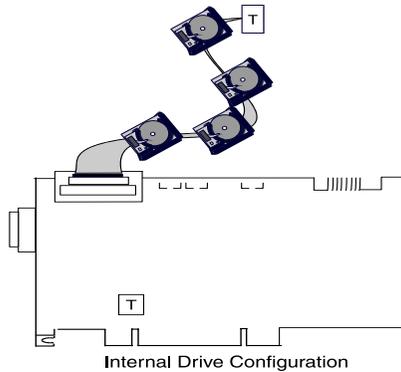
Figure 2-9. Termination with Internal Drive Configuration

External Drive Configuration
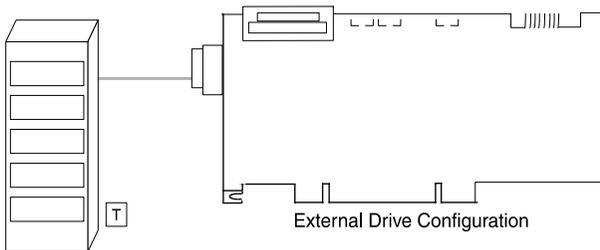
Figure 2-10. Termination with External Drive Configuration

2. **Termination - Both Internal and External Devices**
   Check that the drive channel is properly terminated according to the 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,** on the same channel, the two ends of the SCSI bus farthest from the controller board must each be terminated.

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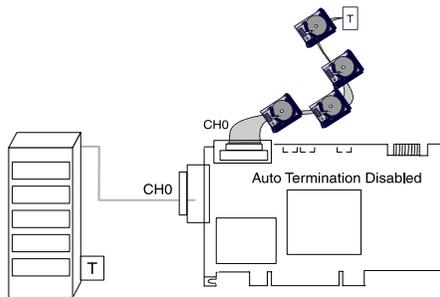
Figure 2-11. Termination with Internal and External Drive Configuration

3. Remove or set disk drive termination jumpers to the *disabled* position (if needed). Refer to the documentation furnished with your disk drives to determine if your termination jumpers need to be adjusted.

Setting SCSI Device IDs

4. Set the SCSI ID on the disk drives; ID 7 is reserved for the controller board. See Figure 2-12.

   ☛ **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.

   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

SCSI Cabling

The controller supports one Ultra 160 SCSI channel which can support up to 15 SCSI devices (plus the controller itself).

LVD Mode

The controller supports Ultra 160 SCSI with LVD. If all drives attached to a controller drive channel support Ultra 160 SCSI with LVD, then that channel will operate at a maximum of 160MB/s burst speed. This setup allows a maximum SCSI bus length of up to 12 meters.

☛ **Note**

> The SCSI bus length can be extended up to 25 meters if only the controller and one drive are on the bus in a point-to-point configuration.

Single-ended Mode

If any device on the channel does *not* have LVD electrical characteristics, the channel will revert to single-ended operation mode. The SCSI bus lengths will then be limited to the single-ended bus lengths shown in Table 2-3.

Table 2-3. SCSI Formats and Bus Lengths

SCSI Trade Association (STA) Terms	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
Ultra 160 SCSI	160	16	Not Defined	12	16

* The Maximum number of devices allowed on a Wide Ultra SCSI bus is 8, unless bus extender technology is used.

† This length can be extended to 25 meters if there are only 2 devices (e.g., the controller and one drive) on the bus in a point-to-point configuration.

Limitations on Mixing SCSI Drives

Narrow with Wide SCSI Drives

If you mix narrow and wide SCSI devices on the controller, use a terminator that does not terminate the upper eight bits, and be sure to properly terminate the end of the bus with either a 16-bit terminator or a 16-bit device that has termination enabled.

LVD with Single-ended Drives

If LVD capable drives are installed on a channel with single-ended devices, all drives on the channel will operate as if they were single-ended devices. This will also limit the bus length to the single-ended bus length specified in Table 2-3.

Controller Start-up

This chapter describes:

- **Controller Start-up Procedures**
- **BIOS Options Sequence**
- **BIOS Configuration Utility (RAID EzAssist)**
- **Operating System, Device Drivers, GAM, WAM**
- **What to Check in Case of Problems**

This chapter describes the AcceleRAID 170 RAID controller start-up procedures and messages produced by the BIOS during start-up or re-boot. This chapter also explains three BIOS options that are available for configuring controller operation.

Procedural Overview

The steps covered in this chapter include:

- Setting BIOS options
- Using RAID EzAssist (the BIOS configuration utility) – see the *RAID EzAssist Configuration Utility User Reference Guide* or *Quick Configuration Guide* for configuration instructions and default controller parameter definitions.
- Loading the operating system and operating system drivers – see the appropriate *Disk Array Controller Software Kit Installation Guide and User Manual* for installation instructions on operating system drivers and the GAM server module.
- Installing Global Array Manager (GAM) client or Web Array Manager (WAM) client – refer to the *Global Array Manager Client Software Installation Guide and User Manual* or the *Web Array Manager Client Software Installation Guide and User Manual*.

Controller Start-up

The controller start-up procedure is the first step in confirming that the controller is correctly installed and working properly. The start-up procedure should be performed prior to any software configuration. There are two start-up sequences:

- BIOS Options sequence, and
- 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 powered on.

BIOS Options Sequence

After physically installing the controller and connecting the cabling, do the following steps if you need to set or modify a BIOS option, see "Setting BIOS Options" on page 3-3 for details:

1. Power on the computer.

2. Watch the messages on the screen for the following prompt to be displayed:

   ```
   Press <ALT-M> for BIOS options
   ```

3. Press **Alt–M** to get into the *BIOS Options* menu.

4. The *BIOS Options* menu provides the following items to choose from:

   ```
   BIOS options

   BIOS enabled
   CD-ROM boot disabled
   2 GB drive geometry
   ```
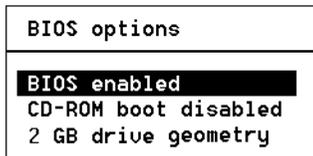
5. To select any of the items in the menu, highlight the selection with the **Up Arrow** or **Down Arrow**. Press **Enter** to toggle any of the three items.

   ☛ **Note**

   BIOS must be enabled to toggle the CD-ROM boot option.

Setting BIOS Options

The available BIOS options are:

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

BIOS Disable or Enable

This option must be enabled in order to toggle the CD-ROM boot parameter shown in the BIOS Options menu. The BIOS must also be enabled in order to boot from any device (e.g., CD-ROM) 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. Press the **Esc** key to restart the system and then watch the screen for the following messages.

```
BIOS options

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

```
The system will restart
Press any key to continue
```
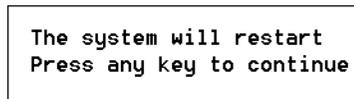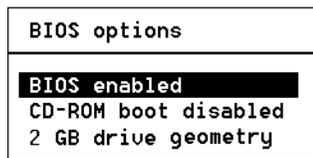
CD-ROM Boot Disable or Enable

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-ROM installed–attached to the AcceleRAID 170). If the CD-ROM boot option is enabled, and if a bootable CD is installed in the CD-ROM drive, the system can boot from the CD, you will also get an option to bypass the CD-ROM boot feature.
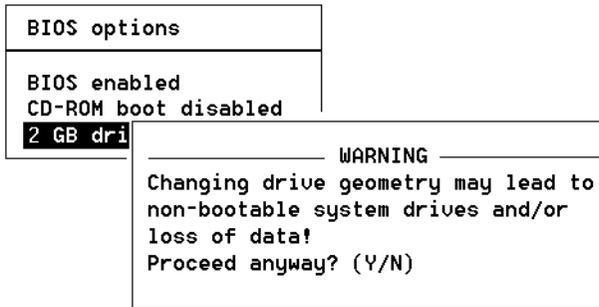
If the CD-ROM boot option is enabled, the CD-ROM attached to the AcceleRAID 170 will take priority over the disk drives. For example, under MS-DOS, the disk drive that is normally *Drive C* will become *Drive D*. All subsequent drive IDs will similarly be moved down.

Enable 8 GByte or 2 GByte Drives

This setting affects how the BIOS reads the disk drives for the boot partition. Drive geometries can be toggled between 8 GB and 2 GB. The default is 2 GB. When the drive geometry is changed, the drive should be formatted at the operating system level.

> ⚠ *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.

```
 BIOS options

 BIOS enabled
 CD-ROM boot disabled
 2 GB dri┌──────────── WARNING ────────────┐
          Changing drive geometry may lead to
          non-bootable system drives and/or
          loss of data!
          Proceed anyway? (Y/N)
         └──────────────────────────────────┘
```

The default BIOS geometry of the controller is set to 2 GB. This means that the BIOS can only access the first 2 GB of any drive that has been configured on the controller. This is adequate in most applications, since BIOS is only used 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. If this is not adequate, the BIOS geometry can be changed to 8 GB, allowing the BIOS to access the first 8 GB of capacity.

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

- You have a system (RAID) drive that is greater than 2.145 GB in capacity.
- 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).

BIOS Configuration Utility (RAID EzAssist)

RAID EzAssist, the on-board BIOS Configuration Utility, is used to build several types of RAID configurations.

The following limitations apply to Automatic Configuration:

- Only one array will be configured using the Automatic Configuration option.

- All drives controlled by the AcceleRAID 170 board can be different sizes, but all drives will be configured to the size of the smallest disk controlled by the AcceleRAID 170 board if in the same array.

- A maximum of 16 drives can be configured into an array using Automatic Configuration. Any additional drives will become hot spares. The drives with the largest capacity (if mixed drive sizes are used) will be the drives selected to become hot spares.

☛ **Note**

> If you want to do anything other than an Automatic Configuration, refer to the *RAID EzAssist Configuration Utility User Reference Guide* or the *Quick Configuration Guide*.

To perform a RAID configuration with the Automatic Configuration option using RAID EzAssist, do the following:

1. Power on the computer. The AcceleRAID 170 controller is furnished with the BIOS enabled by default.

2. Watch the messages on the screen for the following prompt to be displayed:

   ```
   Press <ALT-M> for BIOS options
   ```

   Wait approximately 5 seconds. Do *not* press any keys at this time.

3. Watch the messages on the screen for the following prompt to be displayed:

```
Press <ALT-R> for RAID Configuration options
```

4. Press **Alt–R** to get into RAID EzAssist (the configuration utility).

   ☛ **Note**

   For more detailed information on how to run RAID EzAssist, refer to the *RAID EzAssist Configuration Utility User Reference Guide* or the *Quick Configuration Guide*.

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.

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 appropriate *Disk Array Controller Software Kit Installation Guide and User Manual*.

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 client, refer to the *Global Array Manager Client Software Installation Guide and User Manual*.

Web Array Manager (WAM)

The controller can be configured using WAM. WAM 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 WAM client, refer to the *Web Array Manager Client Software Installation Guide and User Manual*.

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.

Appendix A
AcceleRAID 170
Specifications

General Hardware Specifications

AcceleRAID 170

Controller	AcceleRAID 170
CPU	i960RM microprocessor, 100MHz
Cache Memory	32MB, 64MB, and 128MB installed on a DIMM module
	Write: Selectable, Write-Through or Write-Back
	Error Protection: ECC (Error Correction Code)
Firmware	ROM Type, Flash EEPROM, 1MB x 8
PCI	32 bit, 33MHz - Host 32 bit, 33MHz - Internal PCI
SCSI	Supports a single channel Ultra 160 SCSI LVD 10160A

Environmental Specifications

Controller	**AcceleRAID 170**	
Temperature	Operating	0°C to +50°C (+32°F to 131°F)
	Storage	-20°C to +70°C (-4°F to +158°F)
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:	7.575 inches
	Width:	4.200 inches
	Maximum. Component Height:	0.105 inches on the solder side of the board 0.570 inches on the component side of the board
Typical Power Consumption	at 5.25v	below 3.0A (15W) with 128MBytes SDRAM
	at 4.75v	below 3.25A (11.25W) with 128MBytes SDRAM
MTBF		above 250,000 hours at 55°C

AcceleRAID 170
Error Messages

☛ **Note**

The firmware you are using may have these messages turned off. However, they are listed here for your reference.

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.

```
AcceleRAID 170 fatal error--Memory test failed!

AcceleRAID 170 fatal error--Command interface test failed!

AcceleRAID 170 hardware error--Run Diagnostics to pinpoint
error

AcceleRAID 170 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. Then, the BIOS prints out the following:

```
AcceleRAID 170 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

WARNING: Dead SCSI devices (Channel Target) : x:y
```

The following messages may also appear:

```
AcceleRAID 170 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:

```
AcceleRAID 170 not responding--no drives installed!
```

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

```
AcceleRAID 170 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 offline

Warning: X system drives critical

WARNING: Dead SCSI devices (Channel : Target) : x:y

No system drives 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.

Installation Abort

With Firmware 6.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 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, boot and run the on-board BIOS Configuration Utility, RAID EzAssist (see Chapter 3). For more information, refer to the *RAID EzAssist Configuration Utility User Reference Guide* or the *Quick Configuration Guide*.

With Firmware 6.x, if the BIOS displays a mismatch in the Configuration on Disk (COD) on all drives, then the following message will be displayed, "install abort"-- no drives will be installed message. If you get this message, boot and run RAID EzAssist, the on-board Mylex Disk Array Configuration Utility. See Chapter 3 to recover from the error. For more information, refer to the *RAID EzAssist Installation Guide and User Manual*.

System Reboot or Power Down

Status messages may also be available from LED indicators connected to the controller. The Cache Dirty indicator is especially important when preparing to power-down the system.

⚠ *Caution*

> It is *very important* to make sure that all data is written to the disk before rebooting or powering down the system, or you may lose data. It is always a good idea to wait for 60 seconds or until all activity stops before resetting or rebooting the system.

The AcceleRAID 170 controller is a caching controller with 32MB, 64MB, or 128MB of cache memory when the system reports that a write command was completed, data may still be in the cache waiting to be written to the disk drives.

AcceleRAID 170 Installation Guide

PCI Hot Plug

Introduction

PCI Hot Plug is a feature that allows a PCI card to be replaced while the host system is still running. The term "Hot Plug" is somewhat misleading; the PCI card cannot simply be pulled out of the host system while the card is operating without risk to the card, the system, and the data on the system.

In order to replace a Hot Plug PCI card, a software command must be invoked to power off the card slot before the card can be removed. After the software indicates that the card is unloaded and the slot is powered off, a physical card retainer/switch must be released to allow the card to be removed from the PCI bus. At this point, the card can be replaced.

At this time, Mylex only supports Hot Replacement of PCI Hot Plug cards. Future releases are planned to support Hot Upgrade or Hot Expansion (adding a card).

Implementation

Aside from the general terms previously mentioned, PCI Hot Plug implementation is specific to the host hardware platform and the operating system running on it. Refer to your host system's documentation for specific details on how to implement PCI Hot Plug.

NetWare

When NetWare is installed on a system capable of PCI Hot Plug, the following four modules are installed:

- cpqsbd.nlm - This is the Compaq system bus driver (a different driver will be needed for a platform other than Compaq).

- ncm.nlm - This is the Novell Configuration Manager, which manages the PCI Hot Plug system.

- ncmcon.nlm - This is the Hot Plug user interface called the Novell Configuration Manager Console.

- odineb.nlm - This is a module combining the Open Data-link interface and the Novell Event Bus (NEB). The NEB controls the device drivers through the Open Data-link.

If the NetWare installation process determines that the server supports PCI Hot Plug and detects the appropriate driver, the installation process adds the following two LOAD commands to the autoexec.ncf file:

- LOAD sys:\system*driver_name*

  This command loads the bus driver (for Compaq, this is ***cpqsbd.nlm***). After this command is executed, NetWare autoloads ncm.nlm.

- #LOAD sys:\system\ncmcon.nlm

  This command loads the Novell Configuration Manager Console, which then loads odineb.nlm. These commands can also be executed at the server console prompt.

  ☞ **Note**

  This command is commented out. If you want the Configuration Manager Console to be loaded every time the system is started, remove the pound sign (#) at the beginning of the line.

Perform the following steps:

1. Install NetWare 5 Service Patch 1.

2. Install the Mylex GAM DMI driver.

3. Restart the server. The autoexec.ncf will execute and load the drivers and start *ncmcon.nlm* (the PCI Hot Plug user interface).

   ☞ **Note**

   If any LOAD line is commented out in *autoexec.ncf*, the corresponding driver can be loaded manually by executing the LOAD command (as listed in *autoexec.ncf*) at the server console prompt.

Windows NT

Windows NT requires additional software from the vendor who makes the system. Since this software is not a part of NT, the software needs to be installed after the operating system is loaded. Refer to your vendor's PCI Hot Plug documentation.

⚠ *Caution*

GAM drivers can stop PCI Hot Plug Boards from unloading. If this problem occurs, stop GAM and unload the GAM drivers before attempting to unload the PCI Hot Plug controller.

Known Windows NT Issues

• Mylex Software Kit 2.1 or greater is required to support your system vendor's PCI Hot Plug utility.

• The *macdisk.sys* driver should not be loaded with a Mylex PCI Hot Plug board; if *macdisk.sys* is loaded, the system will hang upon shutdown.

• When you install a Mylex card as a boot device and a Mylex Driver has been installed prior to the installation of the Windows NT OS, NT will not recognize the Mylex card as a PCI Hot Plug device. To fix this, the driver must be reinstalled, and the system rebooted.

This problem occurs because PCI Hot Plug information does not get loaded into the Windows NT registry for the Mylex controller upon installation of Windows NT.

Windows 2000

Windows 2000 supports the PCI Hot Plug capability. No additional software is required.

Please refer to the Windows 2000 documentation for instructions on how to use the PCI Hot Plug feature.

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 Conner 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 microcontroller.

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

SES

The AcceleRAID 170 supports SES (SCSI Enclosure System) cabinets. Please refer to the documentation supplied with your SES enclosure cabinet for details on how to take advantage of this feature.

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 UNDESIRED 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 not 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 170 Ultra 160 SCSI RAID Controller

Model Number(s): A170-1-32NB

A170-1-64NB

A170-1-128NB

Year of Manufacture: 2000

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.

$C \in$ Declaration of Conformity
Per 89\336\EEC

Responsible Party

Name: Mylex Corporation

Address: 34551 Ardenwood Boulevard

Fremont, CA 94555-3607

U.S.A.

hereby declares that the product

Trade Name: AcceleRAID 170 Ultra 160 SCSI RAID Controller
Fab 550166-00 Rev A

Model Number(s): A170-1-32NB

A170-1-64NB

A170-1-128NB

conforms to the following specifications

Standards: EN 50081-1:1992, Emissions
EN 55022:1998 Class B ITE radiated and conducted emissions

EN 50024:1998, Immunity
EN 61000-4-2:1998 Electrostatic Discharge
EN 61000-4-3:1998 Radiated Immunity
EN 61000-4-4:1995 Electrical Fast Transients/Burst
EN 61000-4-5:1995 Surges
EN 61000-4-6:1996 Conducted Immunity
EN 61000-4-11:1994 Supply Dips and Variations

$\mathsf{C}\,\mathsf{E}$ Community of Europe

CE mark is rated for the AcceleRAID™ 170
PCI to Ultra 160 SCSI
RAID Controller
Installation Guide as follows:

CISPR 22 Radiated Emission

EN55022, 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 aufreten, 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 mésures appropriées.

Underwriters Laboratories Statement and Warning

```
  C (UL) US     MYLEX CORP.
     ®          I. T. E. : 32JK    File: E178007
  LISTED
```

Glossary
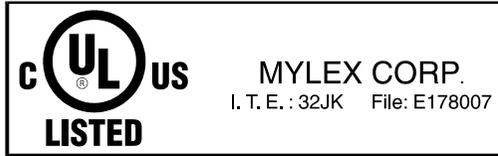
Cache

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. Under RAID EzAssist, the cache line size (also known as "segment size") should be based on the stripe size you selected. The default cache line size for Mylex eXtremeRAID controllers is 8K.

Channel

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

Consistency Check

The process where the integrity of redundant data is verified. A consistency check on a RAID 1 (mirroring) or RAID 0+1 (mirroring with striping) configuration checks if the data on drives and their mirrored pair are exactly the same. When using RAID 3 or RAID 5, a Consistency Check calculates the parity from the data written on the disk drive and compares it to the written parity. A Consistency Check using Mylex utilities such as Global Array Manager (GAM) or RAID EzAssist gives the user the ability to have a discrepancy reported, or additionally to have the discrepancy corrected.

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 controller (its state changed to "offline") could take the disk offline. Mylex RAID controllers also monitor SCSI bus parity errors and other potential problems. Any disk with too many errors will also be 'offline'.

Disk Media Error Management

Mylex RAID controllers transparently manage SCSI disk media errors. Disks are programmed to report errors, even ECC-recoverable errors.

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.

☛ **Note**

> The soft error counter is incremented in this case. The soft error count can be viewed using the Mylex disk array configuration utilities.

When a disk reports a media error during a write, the controller issues a rewrite and then, if it fails, 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 16 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 4 disks of 400MB each, and 1 disk of 200MB in a pack, the effective capacity available for use is only 1000MB (5*200), not 1800MB.

Hot Replacement of Disks (Hot Swap)

The design of the Mylex RAID 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. A message is generated by the system to alert the system operator.

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."

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."

RAID

RAID stands for Redundant Array of Independent Disks. The Mylex RAID 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 Mylex RAID 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 parity.

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 parity.

☛ **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 3 or 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 3 or RAID 5 array,
the capacity allocated to redundancy is the equivalent of one drive.

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, OFFLINE,
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 OFFLINE in one session, it will stay in the OFFLINE 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

Is defined as part of a group, as a standby device; and

Is NOT part of a logical drive.

OFFLINE: A SCSI disk drive is in an "offline" state if it...

Is not present; or

If it is present but not powered on; or

If it failed to operate properly and was taken offline by the controller.

When the controller detects a failure on a disk, it takes that disk offline by changing its state to "offline." A SCSI drive in an offline state does not participate in any I/O activity. No commands are issued to offline 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).

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.

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.

A "Standby" disk can be created in one of two ways:

- When a user runs RAID EzAssist, all disks attached to the controller that are NOT configured into any drive group will be automatically labeled as "standby" drives.

- A disk may also be added (attached at a later time) to a running system and labeled as standby by using the "Software Kit" (see appropriate chapters for utilities for a particular operating system).

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

☛ **Note**

> The standby rebuild will only happen on the SAME
> Mylex RAID controller, never across Mylex RAID
> controllers.

To use the standby rebuild feature, you should always maintain a standby
SCSI 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 Mylex RAID controller.

Target ID

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

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. An optional cache battery backup can be used to protect against data loss as a result of a power failure or system crash.

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.

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MYLEX AcceleRAID 170 Problem Report

Customer Identification	AcceleRAID 170 Identification
Name: _____	Date: Purchase Date:
Company: _____	Model:
Address: _____	Invoice Number:
_____	Serial Number:
_____	# Chnls: Cache:
Country: _____	Firmware Ver: BIOS Ver:
	Make/Model/Size/Type of Drives:
Phone Number:_____	Disk:
Fax Number:_____	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.

Chan-nel	SCSI ID																System Drive	Size	RAID Level	Write Back/ Thru
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	0			
																	1			
0																	2			
1																	3			
2																	4			
																	5			
																	6			
																	7			

Problem Description

_____
_____
_____
_____
_____
_____
_____

772014-DAC1164

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 (18 months for BBM/BDIMM) 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 WARRANY DESCRIBED ABOVE CONSTITUTES THE ONLY WARRANY MADE BY MYLEX. MYLEX EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANT-ABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT WILL MYLEX BE LIABLE FOR INCIDENTAL, SPECIAL OR CONSEQUEN-TIAL 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

Technical support, to assist you in resolving problems with MYLEX products, is available through MYLEX's Technical Support Department. In the U.S.A., the Technical Support Department can be reached by telephone at (510) 608-2400, by FAX at (510) 745-7715, or by e-mail at support@mylex.com. 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.** Many problems can also be solved using the Mylex Web site (http://www.mylex.com), which has a support area available 24 hours a day for interactive technical support.

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 product's compatibility with their installation before committing to any particular procurement plan.

MYLEX

MOVING DATA ▶ SMARTER