L440GX+ Server Board

**Installation and Operating Summary of the
Mylex* AcceleRAID* 250 (DAC960PTL-1*)
RAID Controller**

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CONTENTS

Introduction

This document is intended to serve as a "quick start guide" to the integration of the Mylex AcceleRAID 250 RAID Controller into an Intel® L440GX+ server board, and subsequent configuration of a RAID array. It is not intended to replace the Mylex AcceleRAID 250 Hardware and Software manuals that ship with that product. Specifically, the **Mylex AcceleRAID Installation Guide** contains a wealth of valuable information and the user is strongly encouraged to read it in it's entirety.

As a brief review, the following definitions apply to RAID (Redundant Array of Independent Disks):
- **RAID 0** = data striping with no parity, it is used for performance but provides no fault tolerance.
- **RAID 1** = mirroring, used for maximum fault tolerance but has the disadvantage of paying for twice the storage space you have available for actual data.
- **RAID 3** = data striping with a dedicated parity drive, fault tolerant as one disk can fail and all of the data is still available. RAID 3 has relatively high read performance but lower write performance due to the bottleneck of the dedicated parity drive.
- **RAID 5** = data striping with parity distributed across all drives, optimized for true fault tolerance while still retaining high read/write data rate transfer capability. Yields a total available drive storage area of (n-1)x(capacity of the smallest drive) where n= the total number of drives.

Mylex AcceleRAID 250

AcceleRAID 250 controller is a microprocessor-based half-length PCI to Ultra2 SCSI RAID controller. It is designed to operate in one of two basic modes. The first is as a single channel microprocessor-based RAID controller using a Symbios* 53C895 Ultra2 SCSI controller, and is how it is employed with the Intel® L440GX+ server board in this document. The second is as a SISL (SCSI Interrupt Steering Logic) "zero-channel" RAID controller. SISL enables a RAID controller in a specific slot on a server board to use the SCSI channels embedded on the server board for RAID control. The Intel® N440BX and T440BX server boards, and the SC450NX server platform have this SISL capability and are compatible with the AcceleRAID 250. The AcceleRAID is different from the AcceleRAID 200 (DAC960PTL-0) in that it has the single channel SCSI on board for use with server boards that do not support SISL while the AcceleRAID 200 is a true "zero-channel" controller and has no SCSI channels of it's own. AcceleRAID adapters bring the performance and fault tolerance of RAID to entry level and mid-range server applications at the lowest overall price.

The AcceleRAID's performance is made possible by the use of the Intel i960®RD 66MHz processor and the Mylex 86238 RAID controller chip. AcceleRAID 250 also provides full RAID 0, 1, 0+1, 3, 5, 10, 30, 50 and JBOD (Just a Bunch of Disks) level configuration capabilities. ECC cache, supporting 4MB to 128 MB SIMM cache memory, provides error detection and correction for maximum data protection.

Assumptions

It is assumed that the integrator has a basic familiarity with RAID, and SCSI (Small Computer System Interface). If not, RAID and SCSI primers can be found on the Intel Corporation site
http://www.intel.com/business/ibp/servers/encyc.htm

It is further assumed that the integrator has configured an Intel L440GX+ server board with the following minimum components. A minimum of one Intel Pentium® II processor or Penitum lll processor, and a processor terminator card in the remaining empty processor connector. At one 32MB 100MHz SDRAM DIMM module, a floppy disk drive, and a minimum of three identical SCSI hard disk drives. If RAID 1 (mirroring) is the intended application, a minimum of two identical SCSI hard disk drives is required. Refer to the L440GX+ tested memory document, and the supported Hardware and Operating System document for Intel tested components. These documents can be found at the Intel Corporation site http://support.intel.com/support/motherboards/server/L440GX

Example: Configuring and initializing a RAID array using a Mylex AcceleRAID 250 and DACCF utility

Summary

1. Install the Hardware.
2. Boot the system and then run the System Setup Utility (SSU).
3. Reboot the server and run the Disk Array Controller Configuration (DACCF) utility out of the RAID controller card's BIOS or from the provided diskette. If you choose to run the utility from the diskette, you will need to first boot the system to DOS*.
4. Using the Mylex DACCF utility define and configure one or more logical drives using "Automatic Configuration" for a RAID5 array with 3 or more identical drives or "New Configuration" to create a custom RAID array.
5. Save (Backup) the configuration to a floppy.
6. Initialize the system drives.
7. Install the Network Operating system.

Installing the Mylex AcceleRAID 250 hardware & starting the DACCF utility

Hardware configuration used for this example:

Intel L440GX+ server board integrated with an Intel® Astor II server chassis, two Intel Pentium lll processors with 100MHz System Bus, operating at 500MHz, 512MB tested 100MHz SDRAM, 5 Quantum* Viking II 4.3GB Ultra2 SCSI Hard Disk Drives, a Mylex AcceleRAID 250 RAID controller, a Western Digital* Caviar* 2.025GB EIDE Hard Disk Drive (boot drive), Hitachi* IDE CD-ROM, and Teac* Floppy diskette drive.

1. The Mylex AcceleRAID 250 should come with one EDO ECC SIMM cache memory installed. The card used in this example had 16MB of cache, possible cache sizes include 4, 8, 16, 32, 64, and 128MB. Important: the SIMM slot must be populated with one EDO DRAM SIMM, a minimum of 4MB of cache memory is required and must be installed before AcceleRAID 250 will be operational. Ensure system is powered off and **unplugged**.

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Warning: Unplug the power cord!

The Intel L440GX+ has an 800mA +5V Standby power requirement that powers the server board full time. Simply "turning off" the system does not disconnect all power from the system. Unplug the power cord!

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2. Place the AcceleRAID 250 on an anti-static work space and configure jumper JP10 to disable SISL.

> **Note: The default condition for jumper JP10 enables SISL and will prevent the controller from functioning when integrated with the L440GX+ server board.**

3. Open the chassis and insert the Mylex AcceleRAID 250 into any available PCI slot.
   Note: Consideration should be given to the overall intended system configuration and the interrupt routing scheme of the L440GX+ server board when selecting a slot for the AcceleRAID 250. The L440GX+ server board's interrupt routing scheme is described in the L440GX+ server board Technical Product Specification (TPS) that can be found on the L440GX+ support website: http://support.intel.com/support/motherboards/server/l440gx.

PCI slot four should be avoided if the onboard Adaptec* AIC-7896* Ultra2 SCSI controller is also intended to be used in the system. This is because PCI slot four shares the primary PCI interrupt (PCI_Int_A) with the AIC-7896. Because the L440GX+ has two peer PCI busses, one implemented via the Intel® 21150 AGP-PCI bridge, it is possible to place the RAID controller on what could be configured as a dedicated bus, ideal for optimal PCI RAID to Ultra2 SCSI performance. PCI slot five is the best choice for this implementation as it is the slot on the secondary PCI bus (PCI Slots 5 & 6) that retains a dedicated primary interrupt, i.e. unshared.

4. Connect the two – connector Wide SCSI cable that ships with the Astor II server chassis from the internal 68 pin connector on the upper edge of the AcceleRAID 250 (connector J1) to the 68 pin connector on the managed Hot-Swap SCSI Backplane (HSBP).

   Note: The SCSI backplane in the L440GX+ chassis is designed so that the SCA (Single Connector Attachment) drive inserted in the bottom drive bay. If not installing the Operating System to an IDE drive or on a logical drive connected to the RAID Controller, it is important to install the Operating System or "boot drive" on the physical drive in this location.   The (HSBP) assigns SCSI device IDs and ensures proper termination.

   If you are not using the Astor II server chassis, connect the multi-connector 68 pin Wide SCSI cable that ships with the L440GX+ server board from the AcceleRAID 250 to each individual SCSI drive to be used in the array. Ensure that the drive connected furthest from the SCSI controller is properly terminated.

5. Power on the system and boot to the L440GX+ server board Resource CD-ROM that ships with the server board. During the server's Power On Self Test (POST) note that the Mylex Option-ROM loads and then the appropriate SCSI devices are displayed as well.
6. The ROM-DOS* operating system will load and display a set of basic menus. Using the cursor arrows select **<Run Utilities>** and then **<System Setup Utility>**. Run the Resource Configuration Add-in (RCA) and it will ask you if you want to restore the system configuration from a backup. Select **<No>** and the SSU will probe the server's hardware. You should see the RAID controller displayed and can view the system resources it has allocated to it at this time. Select **<Save>** and the configuration will be saved to the server's Non-Volatile Flash memory. You will then also be asked if you desire to backup the configuration to a file. Exit the SSU.
7. Restart the server and remove the L440GX+ Resource CD-ROM from the server.
8. During the server's Power On Self Test (POST), select **<ALT-M>** to access the AcceleRAID BIOS set-up options menu. Ensure that the AcceleRAID BIOS is enabled and change any other options you desire. For purposes of this example, default values will be used. Please refer to the AcceleRAID Installation Guide for further details.
9. During POST, select **<ALT-R>** to run the Mylex DACCF utility from the BIOS of the RAID controller. To run the DACCF utility from diskette, boot the server to DOS* and change the directory to **a:\.** Run the DACCF utility from the floppy by typing **<a:\daccfg\daccf.exe>.**
10. The DACCF utility will search for and spin up the SCSI drives in the system. This may take a few minutes.
11. To perform an "Automatic Configuration" creating a RAID5 array using 3 or more identical drives proceed to the next section: "Using "Automatic Configuration" to create a RAID5 array with 3 or more drives" – this is the easiest method to configure a RAID array. For other RAID configurations skip to the section titled: "Using "New Configuration" to create a custom RAID array"

Using "Automatic Configuration" to create a RAID5 array with 3 or more drives

1. To create a RAID5 array using 3 or more identical drives choose "Automatic Configuration" from the Main Menu of the DACCF utility.
2. The program will prompt "Do you wish to have a standby drive".   A standby drive is also known as a "Hot Spare". A standby drive is an installed, unused drive that automatically replaces a drive that fails. It must be in addition to the drives required for the RAID (i.e. at least 3 drives + 1 for the standby.) The standby drive should be an identical drive to the drives in the RAID but a larger drive may be used. If a Standby drive is available and desired choose **<Yes>**. "Do you want to have Write Cache enabled?" Select **<NO>** to set the write policy of the system drive to "write through". Select **<YES>** to set the write policy to "write back". The system will show: "Saving Configuration, please wait."

Write back or Write Through?
A write back policy results in better performance under light to medium loads at the expense of fault tolerance. In a power failure/system crash, any data in the cache will be lost, unless an optional cache battery backup is used. A write through policy will result in somewhat lower performance, but no data can be lost in a power failure/system crash.

3. A screen will appear which details the number of system drives, RAID level, cache settings, number of physical drives, and capacity of the drives. It should also display "Automatic Configuration successfully done. Created system drive is available for immediate use."
4. Select <**Enter**> to go to the main menu.
5. Proceed to the section titled **"Backing up the configuration information to a floppy**"

Using "New Configuration" to create a custom RAID array

1. At the Main Menu of the DACCF utility choose "New Configuration".
2. Under the "New Configuration" menu choose <**1. Define Pack**>
3. The table on the left shows boxes for each possible drive location. A status will appear in each box for which a drive is installed under the appropriate channel and drive ID. Drives that are installed and ready will have "RDY" displayed. "ONL" represents drives that are currently online. A "RDY" drive can be assigned to a RAID pack (or array).
4. Use the arrow keys to move around on the drive table, select <**Enter**> on each drive that you wish to be included in the RAID. Each selected drive will change from "RDY" to "ONL". Note: Drives with higher ID's (above 6) will be off the screen – you will have to move the cursor arrow down to see and subsequently select them.
5. When the desired number of drives has been selected select <**ESC**> to return to the "Pack Definition" menu. Note: if all available drives are selected it will automatically return to the "Pack Definition" menu.
6. Choose <**Arrange Pack**>.
7. Using the arrow keys, move the cursor over to one of the drives you have selected and select<**Enter**>.
8. The program will return you to the "New Configuration" Menu – choose <**2. Define System Drive**>.
9. At "System Drive Definition" choose <**1. Create System Drive**>
10. Choose the "RAID Level" you desire (depends on the performance / redundancy tradeoff required for your application). Refer to the introduction of this document for more information on RAID levels.
11. "Enter Size (MB):" Type a value in the window less than or equal to the default value. This default value is the amount of space which is yet unassigned on the RAID array. You can create multiple "System drives," or "logical drives" until the RAID array space is fully used.
12. When finished creating system drives, select <**ESC**> twice to exit the Configuration section of DACCF utility.
13. At the "Save Configuration?" prompt choose <**YES**>.
14. Proceed to the next section: Backing up the configuration information to a floppy

Backing up the configuration to floppy

Backing up the configuration to floppy is strongly recommended as it allows the configuration to be restored if it is lost. This is useful if for some reason the RAID card fails. A new card can be installed and the configuration loaded. Without the configuration, the exact configuration must be re-created with the DACCF utility or the data on the RAID array will be unreadable.

1. From the main menu of DACCF utility, choose <**07. Tools**>. The program will respond: "Starting drive(s) Please wait."
2. From the Tools menu choose <**Backup**/**Restore configuration**>.
3. At the caution prompt press any key to continue.
4. At the "Backup/Restore Configuration" prompt, choose <**Backup Configuration**>.
5. Insert a blank formatted floppy and enter the filename at the prompt: **a:\filename**. Where "filename" is the name of the configuration file. Example: `a:\RaidConf` to save to the "A" drive with the filename "Raidconf"

6. At the warning: "Existing File, if any will be overwritten!" choose <**YES**>. The program will respond with "Saving Configuration to a file." And then "Configuration saved to a file. Press any key to continue."
7. Press any key, then <**ESC**>
8. It is advisable to make a second copy of the configuration information also. One copy can be taken off site and the other taped into the server chassis to ensure it will be available if needed.
9. Proceed to the next section: Initializing the RAID array to prepare the drives for use.

Initializing the RAID array

1. From the main menu of the DACCF utility choose <**05. Initialize System Drive**>
2. From the "Initialize System Drive" menu choose <**1. Select System Drive**>
3. Using the arrow keys move the cursor over one of the created system drives and select <**ENTER**> on it. A check will appear to it. If there are additional system drives that have been created which you would like to initialize select them also.
4. Select <**ESC**> to return to the "Initialize System Drive" menu.
5. Select <**2. Start Initialization**>
6. At the prompt: "Do you want to proceed with initialization?" select <**YES**>
7. The initialization process will take awhile, dependent on the capacity of the drives in use. After the initialization is complete, select any key (as prompted) to save the configuration.

Exiting the DACCF utility software.

1. At the main menu select <**ESC**> to exit the software.
2. The program will prompt you to make sure that you have made a backup of the configuration and ask you if you really want to exit. Choose <**YES**>.
3. Remove the floppy from the "A" drive.
4. The system is now ready to have the operating system installed either on a boot drive or on the RAID system drive.

Installing an Operating System

Microsoft* Windows NT* 4.0 is used as an example of a Network Operating System installation. Please refer to Appendix A for further details on drivers supported by Mylex for the AcceleRAID 250.

Microsoft Windows NT 4.0 Server Installation:

The installation requires using the three install floppy diskettes in addition to the CD – this allows the user to perform a "Custom" installation which allows separate installation the Mylex drivers. Below is a summary of the Windows NT4.0 install process with the Mylex AcceleRAID 250. For more detailed information refer to instructions on installing NT 4.0 found in the Mylex "Disk Array Controller Software Kit Installation Guide and User Manual."

1. Boot the system with the Windows NT 4.x setup diskette #1.
2. Insert setup diskette #2 when prompted and press <**ENTER**>.
3. Press <**ENTER**> again when prompted.
4. Select Custom Setup in the Windows NT Setup screen.
5. Next, choose **S** to skip the automatic detection scan.
6. Choose **S** to specify an additional device.
7. Choose **Other** in the list of supported adapters displayed and press <**ENTER**>.
8. When prompted for the Manufacturer's supplied hardware support disk, insert the Mylex AcceleRAID Software Kit diskette #1 into the floppy disk drive and press <**ENTER**>.
9. Select the **DAC960 NT SCSI Driver** in the list and press <**ENTER**>.

10. Repeat Steps 6 and 7 above, if you have drivers to install for other controllers. When prompted, insert the manufacturer's supplied hardware. To install the IDE/ATAPI CD-ROM drivers use the cursor arrows to scroll up until the driver is observed as available for selection. When you have no other drivers to install, or when you have finished press <ENTER> to continue installation.
11. Insert Windows NT 4.x setup diskette #3 when prompted.
12. Follow the rest of the on screen instructions to complete the NT installation.

Global Array Manager (GAM)

The Global Array Manager is a software package that resides "on top" of the operating system also ships with the AcceleRAID 250. GAM can be used to configure the RAID array from the server or a system client in the LAN to monitor status and verify data integrity of the disks connected to the controller while the server is running. For further details on GAM, refer to the *Global Array Manager Client Software Installation Guide and User's Manual*.

Troubleshooting

This section is not intended to be a tutorial on repair and system troubleshooting. It is intended to provide hints for the system integrator.

Trouble Shooting Information	
Problem	**Possible Solution**
System fails to boot	General: Check power. Check that cables, connectors and socketed components are properly seated. Remove all components except minimal memory and a processor and processor termination card and reboot. If possible check individual components (especially processors and memory) in a known good system. 1. Check for processor termination cards being fully seated. 2. Check for tested memory DIMM's on the L440GX+ memory module. http://support.intel.com/support/motherboards/server/L440GX/compat.htm 3. Ensure correct (EDO) cache memory installed in the Mylex AcceleRAID 250.
System will not boot from the L440GX+ CDROM	1. Incorrect BIOS Boot priority order. Press **<F2>** during the server's POST and configure in BIOS set-up. 2. In the AcceleRAID BIOS settings (accessed by "Alt-M" during boot), "BIOS" must be enabled and "CD-ROM boot" enabled.
AcceleRAID 250 or SCSI devices attached to it not properly recognized during POST	1. Ensure SISL is disabled by moving Jumper JP10 on AcceleRAID 250 Card.
Other	For further support information, check **http://support.intel.com/support/motherboards/server/L440GX**

Appendix A: Mylex AcceleRAID 250 Driver Support

Operating System Driver Support
- Windows NT 3.51, 4.0 & Advanced Server
- NetWare 3.x, 4.x (non NWPA) & SMP
- SCO UnixWare 2.1, 7.0, UNIX OSR 5.x
- OS/2.x,3.x &SMP
- DOS 5.x, 6.x and above

Mylex web site: www.mylex.com