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Purpose-Built
N440BX & T440BX Server Boards
Installation and Operating Summary of the
AMI MegaRAID* Express 762

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intel.

Revision History		
Date	**Rev**	**Modifications**
5/5/98	1.0	Initial Release
5/18/98	1.1	Font and grammatical changes

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Introduction

This document is intended to serve as a "quick start guide" to the integration of the AMI MegaRAID Express* RAID Controller into an Intel® N440BX or T440BX based server system, and subsequent configuration of a RAID array. It is not intended to replace the AMI MegaRAID* Express 762 Hardware and Software manuals that ship with the product. There is a wealth of usable information in those publications and the user is strongly encouraged to read them in their 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, some fault tolerance but optimized for high data transfer rates. RAID 5 = data striping with parity distributed across all drives, optimized for true fault tolerance while still retaining high data rate transfer capability.

A "Zero-channel" RAID adapter is designed to use the on-board SCSI channels of the Server Board so that the manufacturer of the RAID solution can reduce cost by eliminating the SCSI interface from their product.

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 N440BX or T440BX based Server system with the following minimum components. An Intel N440BX or T440BX Server Board integrated in an approved chassis, a minimum of one Intel Pentium® II Processor, a processor terminator card in the secondary slot 1 connector, at least one 32MB 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 are required. Refer to the N440BX or T440BX tested chassis and power supply document, tested memory document, and the supported Hardware and Operating System document for Intel approved components. These documents can be found at the Intel Corporation sites **http://support.intel.com/support/motherboards/server/n440bx** for the Intel N440BX Server Board or **http://support.intel.com/support/motherboards/server/t440bx** for the Intel T440BX Server Board.

Zero channel RAID Overview

On Intel N440BX and T440BX Server Boards, control of the on-board SCSI channels is given to the zero-channel RAID controller by routing the interrupts from the on-board SCSI channels directly to the RAID adapter when a zero-channel RAID product is detected in the system. Thus, the RAID adapter can effectively control the behavior of the SCSI channels using the PCI bus and mask the SCSI interrupts from the system. The system interrupt controller will never see interrupts from the SCSI controller directly, it will only see interrupts from the RAID adapter.

In the case where the on-board SCSI controller supports two channels, such as the Symbios* 53C876 on the Intel N440BX Server Board, some of these zero-channel solutions are designed to support a single and dual channel mode. In the single channel mode, the interrupt from the second SCSI channel is passed directly through the RAID adapter to the system interrupt controller. **For each channel that is under RAID control the SCSI BIOS must be disabled in the Server BIOS SetUp so that the N440BX does not see the same devices attached to the RAID adapter and the SCSI controller.**

Unique Features of the AMI MegaRAID Express 762

AMI MegaRAID Express provides three new RAID levels that involve disk spanning, RAID 10, 30, and 50. Disk spanning allows multiple disk drives to function like one big drive. Spanning overcomes lack of disk space and simplifies storage management by combining existing resources or adding relatively inexpensive resources. For example, four 2 GB disk drives can be combined to appear to the operating system as one single 8 GB drive. Spanning alone does not provide reliability or performance enhancements. Spanned logical drives must have the same stripe size and must be contiguous. In the following graphic, a RAID 1 array is turned into a RAID 10 array.
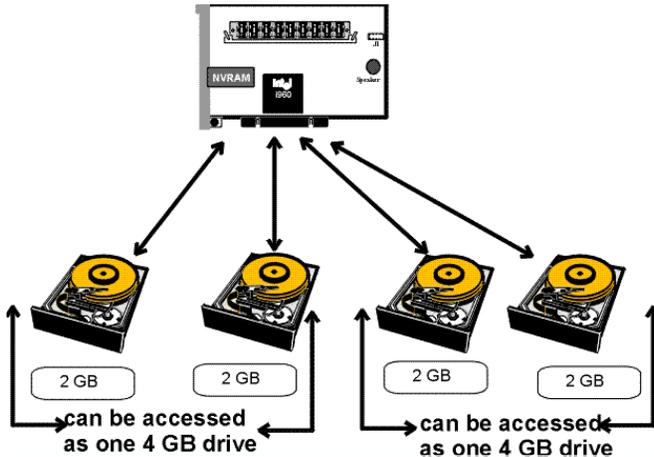
Spanning for RAID 10, RAID 30, or RAID 50

Level	Description
10	Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.
30	Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.
50	Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.
Note:	Spanning two contiguous RAID 0 logical drives does not produce a new RAID level or add fault tolerance. It does increase the size of the logical volume and improves performance by doubling the number of spindles.

Configuring and initializing a RAID array using the AMI utilities

Summary:

1. Optimize the MegaRAID Express controller options for your system. Refer to the *MegaRAID Express Software Guide* for a detailed explanation of the all the options available with the AMI configuration utility.
2. Perform a low level format of the SCSI hard disk drives that will be included in the array and the drives to be used for hot spares.
3. Run the *MegaRAID Express BIOS Configuration Utility* by pressing **<Cntl + M>** during server POST (Power On Self Test).

4. Define and configure one or more logical drives. Select Easy Configuration in the *MegaRAID Express BIOS Configuration Utility* or select New Configuration to customize the RAID array.
5. Create and configure one or more system drives (logical drives). Select the RAID level, cache policy, read policy, and write policy.
6. Save the configuration.
7. Initialize the system drives.
8. Install the Network Operating system.

Example configuration of a RAID 5 array

Hardware configuration used:
Intel N440BX Server Board, Intel Astor chassis, two Intel Pentium II Processors with 100MHz System Bus, operating at 350MHz, 128MB Micron* PC/100-compliant 100MHz SDRAM (four 32MB 168pin Gold DIMMS), 5 Seagate* ST32550WC "Barracuda" Hard Disk Drives, AMI MegaRAID Express RAID controller, Hitachi* 24xIDE CD-ROM, Teac* Floppy diskette drive.

1. Set jumpers J3 and J4 on the AMI MegaRAID Express card to configure the card for single or dual channel mode. For purposes of this example, use pins 1-2 to configure for dual channel operation.
2. Install cache memory. The SIMM socket accepts a 72-pin SIMM ($\times$ 36-type) Fast Page Mode SIMM. See Appendix A for a list of approved SIMMs.

Important

A minimum of 4 MB of cache memory is required. The cache memory must be installed before MegaRAID Express is operational. The SIMM slot *must be populated with one Fast Page Mode DRAM SIMM.* ***EDO DRAM is not supported.***

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1. Ensure system is powered off and unplugged.

Warning

The Intel N440BX and T440BX Server Boards have an 800mA +5V Standby power requirement that powers the Server Board full time.

Insert the AMI MegaRAID Express into PCI Slot #3. This is the "RAID-upgradeable" PCI slot with IRQ routing to accept a zero-channel RAID controller card.
1. Connect wide SCSI cable to J5A1 (wide connector) on the hot-swap backplane of the Intel Astor chassis.

    Note: The SCSI backplane in the Astor chassis is designed so that the SCA drive inserted in the BOTTOM drive bay is assigned SCSI ID 0. It is important to install the Operating System or "boot drive" on the physical drive in this location unless installing the O/S on a logical drive.

2. Power on the system and enter the BIOS Setup by pressing **<F2>**.
3. Select the **<Advanced>** menu, **…<PCI Configuration>…<PCI Device, Embedded SCSI Devices>…<Option ROM Scan>** and set to disable. This is required to allow the AMI MegaRAID Express controller to take control of the SCSI channels embedded in the Server Board without conflicts.
4. Select **<F10>** to save and exit the BIOS Setup program.

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5. Upon completion of POST you should see a message indicating: "Press <Ctrl><M> to run configuration utility or any other key to continue"
6. Press **<Ctrl-M>** to enter the *MegaRAID Express BIOS Configuration Utility*.
7. After the Main Menu appears, use the cursor to select **<Configure>** and **<Enter>** to access the Configuration Menu.
8. Using the cursor, select **<New Configuration>** and press **<Enter>.**
9. Select **<Yes>** and press **<Enter>** when prompted to proceed.
10. The SCSI channels will be scanned and a list of SCSI devices on channel 1 and 2 should be displayed as "READY." Note: If there are no SCSI devices on channel 2 then channel 2 information will not be displayed.
11. Place the cursor over each hard drive ID and press the **<space>** bar to change the drive status from "READY"' to "ONLIN." The logical drive array to which each physical disk drive is expected to belong is also displayed, flashing (example: A1-1 for the first physical disk in the first logical drive, A2-1 for the first physical disk in the second logical drive). Note: The SCSI channel, SCSI ID, drive capacity, drive make and model are also displayed at the bottom of the screen as each individual drive is selected.
12. Press **<Enter>** to end selection of drives for this drive array. You should observe that the channel/drive identifiers cease blinking. To select drives for a different logical drive, repeat the previous procedure for the desired drives
13. Press **<F10>** to configure the drive array.
14. Verify the following in the 'Logical Drive 1' dialog box, all of which are adjustable:
    (a) RAID = 5
    (b) Size (based on RAID level), for RAID5 = (capacity of smallest drive)*(#drives –1)
            example: (2.55GB)*(5-1)=10.2GB
    (c) Span = No, related to RAID levels 10, 30, 50
    (d) Advanced
    Note: The Advanced menu contains the following components and options (default is bold):
        Stripe Size: 2, 4, **8**, 126, 32, 64, 128KB
        Write Policy: **Write Thru** (most fault tolerant), Write Back (higher performance)
        Read Policy: Normal, **Read Ahead**, Adaptive
        Cache Policy: **Cached I/O**, Direct I/O
1. Highlight **<Accept>** and press **<Enter>**. The text color of the configuration data for the Logical Drive being configured in the "Logical Drives Configured" box should now change. If configuring more than one Logical drive, after accepting the configuration of the first logical drive, the second logical drive appears in the "Logical Drives Configured" box. Repeat steps 17 and 18.
2. Verify the following in Logical Drive Dialog box
    (a) LD = 1
    (b) RAID = 5
    (c) Size = 10200MB (This will vary based on disk drive capacity)
    (d) #Stripes = 5
    (e) StrpSz = 8KB
    (f) Drive_State Optimal
18. Press **<Esc>**
19. Select **"Yes"** for Save Configuration. A message box displaying **"Configuration is Saved. Press Any Key To Continue."** should be displayed.
20. Press any key.
21. Press **<Esc>** to return to the Management Menu.
22. Highlight **"Initialize"** and press **<Enter>** to return to the Management Menu. A "Logical Drives Configured" box should be displayed. Move the cursor to select the logical drive to be initialized.
23. Press **<space>** to highlight "Logical Drive 1". Repeat steps 22 & 23 for any other logical drives.
24. Press **<F10>** to begin simultaneous initialization of all logical drives.
25. Select **"Yes"** and press **<Enter>.** A status bar indicating progress should be displayed.
26. After initialization is completed press any key to continue.
27. Press **<ESC>** to return to main menu.
28. Press **<ESC>** to bring up exit menu.

29. Select **"Yes"** and press **<Enter>.** Message stating "Configuration has changed. Press Ctrl-Alt-Del to Reboot" should be displayed.
30. Upon reboot a message stating "1 logical drive found on the Host Adapter" should be displayed, or however many logical drives were configured. You are now ready to begin installing your operating system.

> *Important*
>
> **Do not install the Symbios Logic drivers for the NOS being installed. Instead, use the AMI MegaRAID Express drivers for that particular NOS.**

Troubleshooting

This section is not intended to be a tutorial on repair and system troubleshooting. It is intended to provide hints for the technician. If the problem system has just been assembled, a first step should be to check the system against the assembly procedures in the printed Intel N440BX Server Board "Quick Start Guide," and the electronic Intel N440BX Server Board Product Guide. Both guides are provided on the Resource CD in the Server Board kit, and on the Intel Corporation's support website, listed below.

Trouble Shooting Information	
Problem	**Possible Solution**
System fails to boot	General: Check power. Check cabling, connectors and socketed components are properly seated. Remove all components except minimal memory and a processor and reboot. If possible check individual components (especially processors and memory) in a known good system. 1. Check for processor termination card in empty slot 1. 2. Check for approved memory DIMM modules. 3. Check to assure that the power supply is attached to correct connectors (two along the edge of the board for the two Intel chassis, one closer to the center of the board for 20-pin ATX standard power supply). 4. Ensure the Power Supply is providing at least 800mA of +5V standby current to support WOL*, if not, disable WOL via Server Board jumper. 5. Ensure correct cache memory installed in the AMI MegaRAID Express; refer the approved list in the AMI hardware guide.
System will not boot from the N440BX Server Board Resource CDROM	Incorrect BIOS Boot priority order. Press <F2> during the server's POST and configure in BIOS set-up.
AMI MegaRAID Express card Tone Generator "squeals"	Incorrect cache memory installed.
RAID Express not properly recognized during POST	1. Ensure Card inserted into PCI Slot 3 2. Ensure <SCSI Option ROM> disabled in server BIOS setup
NOS "hangs" during install	Ensure Symbios drivers are not installed, use AMI MegaRAID Express drivers. If not, both devices will attempt to take control of the SCSI channels on board the Server Board
Other	For further support information, check **http://support.intel.com/support/motherboards/server/n440bx**

Appendix A: Drivers for MegaRAID Express

AMI Driver Support:

Novell® NetWare® 3.1x and 4.x HAM, DDFS, and ASPI Driver,
Windows ® NT 3.1, 3.5/3.51, and 4.0 Miniport Driver,
SCO® UNIX® SVR 4.2 and ODT® 3.0 & 5.0MSCSI Driver,
UnixWare® 2.0 / 2.01PDI Driver,
MS DOS 5.0 and Above,
ASPI Support

Appendix B: Cache Memory for MegaRAID Express

Approved Cache memory SIMMs**

Manufacturer	Part Number	Size	Configuration
PNY	361006-S51T03JE	4 MB	1M x 36
PNY	Y361006-S51T03JE	4 MB	1M x 36
PNY	361007-S51T03JE	4 MB	1M x 36
PNY	361006-S51T02JF	4 MB	1M x 36
Samsung	KMM5361203AW-6	4 MB	1M x 36
Samsung	KMM5361203BW-6	4 MB	1M x 36
Centon	CTOS1MX36NQ6	4 MB	1M x 36
Micron Technology	MB12D436DM-7	16 MB	4M x 36
Unigen	UG9M43602KBT-6	16 MB	4M x 36
Advantage	A436-4X4-66T	16 MB	4M x 36

SIMM Specifications You can use either one 70 ns 1 MB, 4 MB, 16 MB x 36, or 32 MB $\times$ 36 Fast Page Mode 72-pin SIMM.

Supported Cache Memory Configurations

SIMM Socket	Total Cache Memory
1 MB $\times$ 36	4 MB
4 MB $\times$ 36	16 MB
16 MB $\times$ 36	64 MB
32 MB $\times$ 36	128 MB

**This list was is the AMI* approved memory list and was current as the initial release of this document. Please refer to the *AMI MegaRAID Express Hardware Guide*, that ships with the AMI MegaRAID Express 762, for the most recent list of approved cache memory.

Appendix C: Graphic of MegaRAID Express