RPX Module AMI MegaRAID User's Guide

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1 Introduction to RAID

MegaRAID provides reliability, high performance, and fault-tolerant disk subsystem management. MegaRAID has two or three Fast and Wide SCSI channels, supporting data transfer rates up to 40 Megabytes per second (MBs) per channel.

RAID (Redundant Array of Independent Disks) is an array of multiple small independent hard disk drives that provide high performance and fault tolerance. A RAID disk subsystem improves I/O performance over a computer using only a single drive. The RAID array appears to the host computer as a single storage unit. I/O is expedited because several disks can be accessed simultaneously. RAID systems improve data storage reliability and fault tolerance compared to single-drive computers. Data loss because of a disk drive failure can be reconstructed from the data on other disk drives, including drives in the same redundant array. RAID has six official disk array models (RAID levels). Each RAID level provides disk fault-tolerance and offers trade-offs in features and performance.

MegaRAID includes a configuration utility and drivers for:

- MS-DOS[†] 3.2 or later
- Microsoft Windows[†] NT[†] Version 4.x
- Novell[†] NetWare[†] Version 4.x
- SCO[†] UnixWare[†] Version 2.x

RAID provides data security through fault tolerance and redundant data storage. The MegaRAID management software configures and monitors RAID disk arrays.

Documentation Overview

Table 1. RPX Module Documentation Sources

Documentation	Description	Where Found
RPX Module Setup Guide	Quick install instructions for the RPX module.	Inside RPX Module CD-ROM jewel case.
RPX Module AMI MegaRAID User's Guide	User's guide for AMI MegaRAID applications, including setup and management utilities.	.PDF file on the RPX Module CD-ROM
RPX MegaRAID Drivers User's Guide	Operating system specific driver installation instructions for RPX MegaRAID.	.PDF file on the RPX Module CD-ROM
M440LX Server System Product Guide	Overall product user's guide including RPX module installation and removal instructions	.PDF file on the country kit CD-ROM

RAID Overview

RAID (Redundant Array of Independent Disks) is a collection of specifications that describe a system for ensuring the reliability and stability of data stored on large disk subsystems. A RAID system can be implemented in a number of different versions (or RAID Levels). The standard RAID levels or RAID 0, RAID 1, RAID 3, and RAID 5. MegaRAID supports all standard RAID levels and RAID levels 10, 30, and 50, which are special RAID versions supported only by MegaRAID.

Host-Based RAID

The RPX MegaRAID application is a host-based RAID solution.

A host-based RAID product puts all of the RAID intelligence on an adapter card that is installed in a network server. A host-based RAID product provides the best performance. MegaRAID is part of the file server, so it can transmit data directly across the computer's buses at data transfer speeds up to 132 MBs. The actual data transfer speed is determined by the number and type of SCSI channels and is usually between 20 and 60 MBs.

Host-based solutions must provide operating system-specific drivers.

Consistency Check

In RAID, checking consistency verifies the correctness of redundant data in an array. For example, in a system with dedicated parity, checking consistency means computing the parity of the two data drives and comparing the results to the contents of the dedicated parity drive.

Fault Tolerance

Fault tolerance is achieved through cooling fans, power supplies, and the ability to hot swap drives. MegaRAID provides hot swapping through the hot spare feature. A hot spare drive is an unused online available drive that MegaRAID instantly plugs into the system when an active drive fails.

After the hot spare is automatically moved into the RAID subsystem, the failed drive is automatically rebuilt. The RAID disk array continues to handle request while the rebuild occurs.

Disk Striping

Disk striping writes data across multiple disk drives instead of just one disk drive. Disk striping involves partitioning each drive storage space into stripes that can vary in size from one sector (512 bytes) to 128 KB. These stripes are interleaved in a repeated sequential manner. The combined storage space is composed of stripes from each drive.

For example, in a four-disk system using only disk striping (as in RAID level 0), segment 1 is written to disk 1, segment 2 is written to disk 2, and so on. Disk striping enhances performance because multiple drives are accessed simultaneously; but disk striping does not provide data redundancy.

Segment 1
Segment 5
Segment 9

Segment 2
Segment 6
Segment 10

Segment 3
Segment 7
Segment 11

Segment 4
Segment 8
Segment 12

OM06989
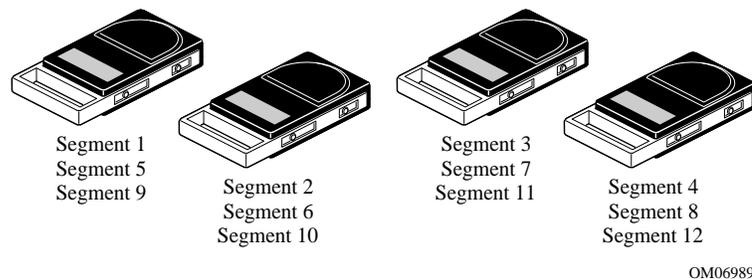
Disk Spanning

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 400 MB disk drives can be combined to appear to the operating system as one single 1600 MB drive.

Spanning alone does not provide reliability or performance enhancements. Spanned logical drives must have the same stripe size and must be contiguous. For example logical drives 1 and 2 can be spanned; logical drives 1 and 3 cannot. In the following graphics, spanning turns a RAID 0 array into a RAID 10 array.

2 GB   2 GB   2 GB   2 GB

Can be accessed   Can be accessed
as one 4 GB drive   as one 4 GB drive

OM06990
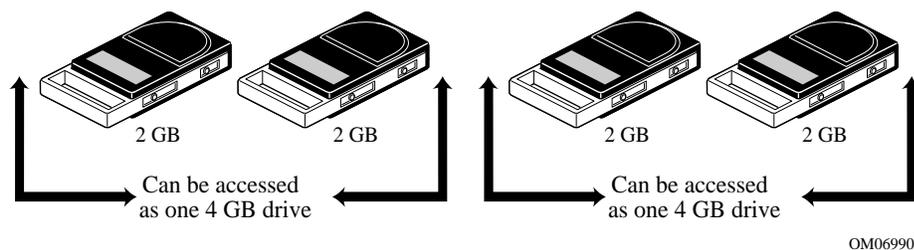
Spanning for RAID 10, RAID 30, or RAID 50

Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.

Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.

Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.

Disk Mirroring

With mirroring, data written to one disk drive is simultaneously written to another disk drive. If one disk drive fails, the contents of the other disk drive can be used to run the system and reconstruct the failed drive. The primary advantage of disk mirroring is that it provides 100% data redundancy. Since the contents of the disk drive are completely written to a second drive, it does not matter if one of the drives fails. Both drives contain the same data at all times. Either drive can act as the operational drive. If RAID 1 is used, the main data source is the original drive.

Disk mirroring provides 100% redundancy, but is expensive because each drive in the system must be duplicated.

Segment 1   Segment 1 Duplicate
Segment 2   Segment 2 Duplicate
Segment 3   Segment 3 Duplicate
Segment 4   Segment 4 Duplicate

OM06991
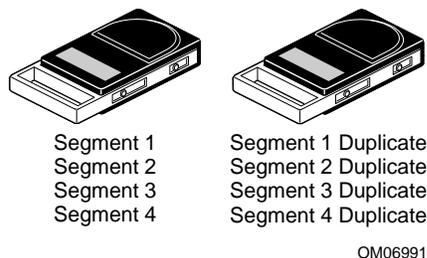
Parity

Parity generates a set of redundancy data from two or more parent data sets. The redundancy data can be used to reconstruct one of the parent data sets. Parity data does not fully duplicate the parent data sets. In RAID, this method is applied to entire drives or stripes across all disk drives in an array. The types of parity are:

- Dedicated Parity: the parity of the data on two or more disk drives is stored on an additional disk.

- Distributed Parity: the parity data are distributed among all the disk drives in the system.

If a single disk drive fails, it can be rebuilt from the parity of the respective data on the remaining drives.

RAID level 3 combines dedicated parity with disk striping. The parity disk in RAID 3 is the third drive on the first channel in the logical array.

RAID level 5 combines distributed parity with disk striping. Parity provides redundancy for one drive failure without duplicating the contents of entire disk drives, but parity generation can slow the write process. A dedicated parity scheme during normal read/write operations is shown below:

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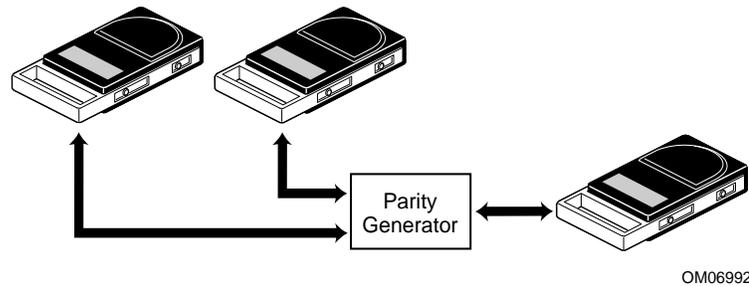
Hot Spares

A hot spare is an extra, unused disk drive that is part of the disk subsystem. It is usually in standby mode, ready for service if a drive fails. Hot spares permit you to replace failed drives without system shutdown or user intervention.

MegaRAID implements automatic and transparent rebuilds using hot spare drives, providing a high degree of fault tolerance and zero downtime. The MegaRAID RAID Management software allows you to specify physical drives as hot spares. When a hot spare is needed, the MegaRAID controller assigns the hot spare that has a capacity closest to and at least as great as that of the failed drive to take the place of the failed drive.

⟹ **NOTE**

Hot spares are only employed in arrays with redundancy, for example, RAID levels 1, 3, 5, 10, 30, and 50.

Disk Rebuild

You rebuild a disk drive by reconstructing the data that had been stored on the drive before the drive failed.

Rebuilding can be done only in arrays with data redundancy such as RAID level 1, 3, 5, 10, 30, and 50.

Standby rebuild (warm spare) is employed in a mirrored (RAID 1) system. If a disk drive fails, an identical drive is immediately available. The primary data source disk drive is the original disk drive.

A hot spare can be used to rebuild disk drives in RAID 3, 5, 10, 30 and 50 systems. If a hot spare is not available, the failed disk drive must be replaced with a new disk drive so that the data on the failed drive can be rebuilt.

The MegaRAID controller automatically and transparently rebuilds failed drives with user-definable rebuild rates. If a hot spare is available, the rebuild starts automatically when a drive fails.

Rebuild Rate

The rebuild rate is the fraction of the compute cycles dedicated to rebuilding failed drives. A rebuild rate of 100 percent means the system is totally dedicated to rebuilding the failed drive.

The MegaRAID rebuild rate can be configured between 0% and 100%. At 0%, the rebuild is only done if the system is not doing anything else. At 100%, the rebuild has a higher priority than any other system activity.

Physical Array

A physical array is a collection of physical disks governed by the RAID management software. A physical array appears to the host computer as one or more logical drives.

Logical Drive

A logical drive is a partition in a physical array of disks that is made up of contiguous data segments on the physical disks. A logical drive can consist of any of the following:

- an entire physical array,
- more than one entire array,
- a part of an array,
- parts of more than one array, or
- a combination of any two of the above conditions.

Hot Swap

A hot swap is the manual replacement of a defective physical disk unit while the computer is still running. When a new drive has been installed, you must issue a command to rebuild the drive. MegaRAID can be configured to detect the new disks via fault bus signals and to rebuild the contents of the disk drive automatically.

Stripe Width

Stripe width is the number of disks involved in an array. For example, a four-disk array with disk striping has a stripe width of four.

Physical Drive States

A SCSI disk drive can be in one of these states:

- Online: the drive is functioning normally and is a part of a configured logical drive.
- Ready: the drive is functioning normally but is not part of a configured logical drive and is not designated as a hot spare.
- Hot Spare: the drive is powered up and ready for use as a spare in case an online drive fails.
- Fail: a fault has occurred in the drive placing it out of service.
- Rebuild: the drive is being rebuilt with data from a failed drive.

Logical Drive States

The logical drive states can be:

- Optimal: the drive operating state is as good as it can be.
- Degraded: the drive operating state is as not as good as it can be.
- Failed: the drive has failed.
- Offline: the drive is not available to MegaRAID.

Enclosure Management

Enclosure management is the intelligent monitoring of the disk subsystem by software and/or hardware.

The disk subsystem can be part of the host computer or separate from it. Enclosure management helps you stay informed of events in the disk subsystem, such as a drive or power supply failure. Enclosure management increases the fault tolerance of the disk subsystem.

RAID Levels

There are six official RAID levels (RAID 0 through RAID 5). MegaRAID supports RAID levels 0, 1, 3, and 5. American Megatrends has designed three additional RAID levels (10, 30, and 50) that provide additional benefits. The RAID levels that MegaRAID supports are:

Table 2. Supported RAID Levels

RAID Level	Type	turn to
0	Standard	page 15
1	Standard	page 15
3	Standard	page 16
5	Standard	page 17
10	MegaRAID only	page 18
30	MegaRAID only	page 19
50	MegaRAID only	page 20

To ensure the best performance, you should select the optimal RAID level when you create a system drive. The optimal RAID level for your disk array depends on a number of factors:

- the number of drives in the disk array
- the capacity of the drives in the array
- the need for data redundancy
- the disk performance requirements

Selecting a RAID Level

Table 3. Selecting a RAID Level

RAID Level	Description and Use	Pros	Cons	Drives	Fault Tolerant
0	Data divided in blocks and distributed sequentially (pure striping). Use for non-critical data that requires high performance.	High data throughput for large files	No fault tolerance. All data lost if any drive fails	Two or more	No
1	Data duplicated on another disk (mirroring). Use for read-intensive fault-tolerant systems.	100% data redundancy	Doubles disk space. Reduced performance during rebuilds	Even number	Yes
3	Disk striping with a dedicated parity drive. Use for non-interactive apps that process large files sequentially.	Achieves data redundancy at low cost	Performance not as good as RAID 1	Three or more	Yes
5	Disk striping and parity data across all drives. Use for high read volume but low write volume, such as transaction processing.	Achieves data redundancy at low cost	Performance not as good as RAID 1	Three or more	Yes
10	Data striping and mirrored drives.	High data transfers, complete redundancy	More complicated	Even number	Yes
30	Disk striping with a dedicated parity drive.	High data transfers, redundancy	More complicated	Six	Yes
50	Disk striping and parity data across all drives.	High data transfers, redundancy	More complicated	Six	Yes

RAID 0

RAID 0 provides disk striping across all drives in the RAID subsystem. RAID 0 does not provide any data redundancy, but does offer the best performance of any RAID level.

- Provides high data throughput, especially for large files
- Provides increased data throughput for large files
- Does not provide fault tolerance; all data will be lost if any drive fails
- Requires one or more drives

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.
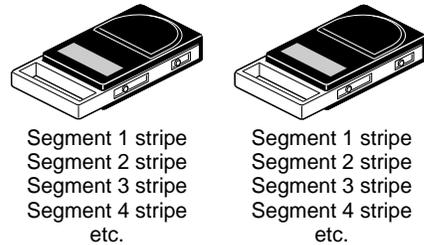
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RAID 1

RAID 1 duplicates all data from one drive to a second drive. RAID 1 provides complete data redundancy, but at the cost of doubling the required data storage capacity.

- Select if disk drive availability is of paramount importance
- Provides complete data redundancy
- Performance is impaired during drive rebuilds
- Requires an even number of drives

Segment 1
Segment 2
Segment 3
Segment 4
etc.

Segment 1 duplicate
Segment 2 duplicate
Segment 3 duplicate
Segment 4 duplicate
etc.

Segment 1
Segment 2
Segment 3
Segment 4
etc.

Segment 1 duplicate
Segment 2 duplicate
Segment 3 duplicate
Segment 4 duplicate
etc.
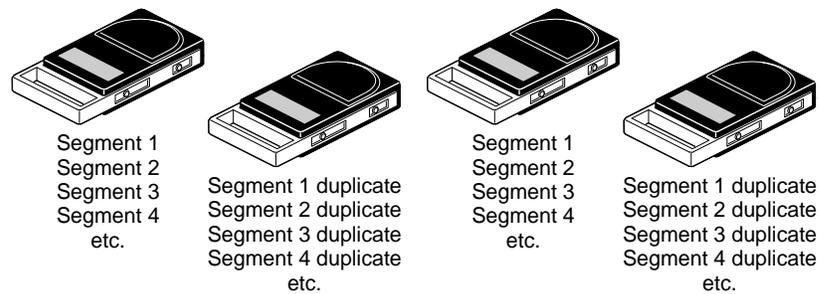
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RAID 3

Raid 3 provides disk striping and complete data redundancy though a dedicated parity drive. The disk stripes must be 64 KB in RAID 3. RAID 3 handles data at the block level, not the byte level, so it is ideal for networks that often handle very large files, such as graphic images.

- Provides high data throughput, especially for large files
- Provides data redundancy and high data transfer rates
- Requires three or more drives

Parity Drive

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.

Segment 1 stripe
Segment 2 stripe
Segment 3 stripe
Segment 4 stripe
etc.
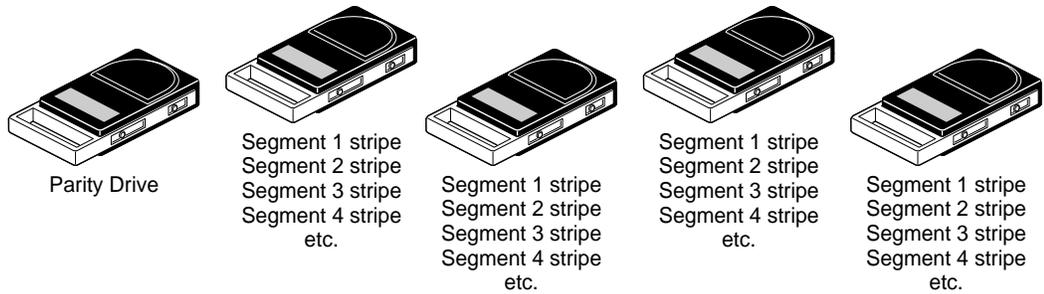
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RAID 5

Raid 5 includes disk striping at the byte level and parity. In RAID 5, the parity information is written to several drives. RAID 5 is best suited for networks that perform a lot of small I/O transactions simultaneously. Use RAID 5 for transaction processing applications because each drive can read and write independently. If a drive fails, MegaRAID uses the parity drive to reconstruct all missing information. Use also for office automation and online customer service that requires fault tolerance. Use for any application that has high read request rates but low write request rates.

- Provides high data throughput, especially for large files
- Provides the same level of data redundancy as RAID 1 using only half as much disk capacity
- Does not provide the best throughput performance; disk drive performance will be reduced if a drive is being rebuilt
- Requires three or more drives

Disk 1

Disk 2

Disk 3

Disk 4

Disk 5

Disk 6

Segment 1
Segment 7
Parity (9-12)

Segment 2
Segment 8

Segment 3
Segment 9
Parity (5-8)

Segment 4
Segment 10

Segment 5
Segment 11
Parity (1-4)

Segment 6
Segment 12
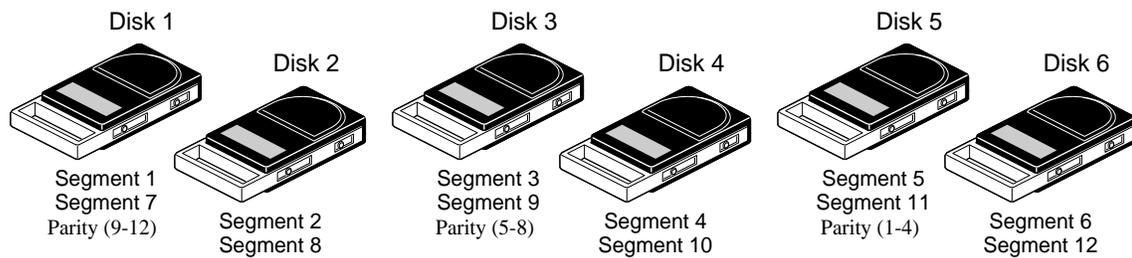
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RAID 10

Raid 10 is a combination of RAID 0 and RAID 1. RAID 10 has mirrored drives. RAID 10 works best for data storage that must have the 100% redundancy of mirrored arrays and that also needs the enhanced I/O performance of RAID 0 (striped arrays).

- Provides both high data transfer rates and complete data redundancy

- Requires twice as many drives as RAID 0

- Requires an even number of drives
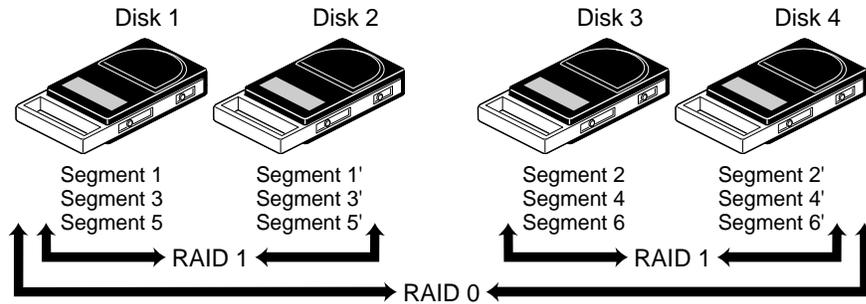
OM06997

RAID 30

Raid 30 is a combination of RAID 0 and RAID 3. RAID 30 provides high data transfer speeds and high data reliability. RAID 30 is best implemented on two RAID 3 disk arrays with data striped across both disk arrays. RAID 30 works best when used with non-interactive applications that process large files sequentially, require fault tolerance, and also require high data transfer rates.

- Provides data reliability and high data transfer rates
- Is more complex than lower RAID levels and requires more drives
- Requires six drives

Disk 3   Disk 6

Disk 1   Disk 4

Parity 1, 2
Parity 5, 6
Parity 9, 10

Parity 3, 4
Parity 7, 8
Parity 11, 12

Disk 2   Disk 5

Segment 1
Segment 5
Segment 9

Segment 3
Segment 7
Segment 11

Segment 2
Segment 6
Segment 10

Segment 4
Segment 8
Segment 12

RAID 3   RAID 3
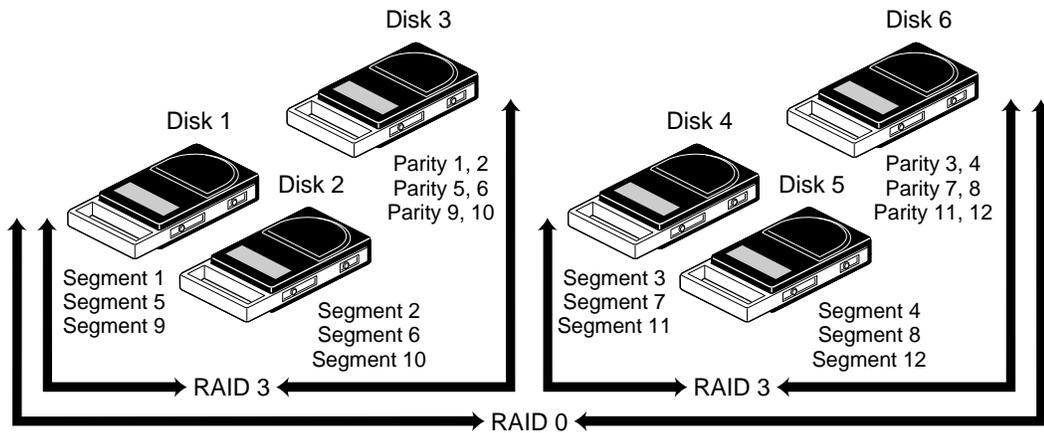
RAID 0

OM06998

RAID 50

Raid 50 provides the features of both RAID 0 and RAID 5. RAID 50 includes both parity and disk striping across multiple drives. RAID 50 is best implemented on two RAID 5 disk arrays with data striped across both disk arrays. Works best when used with data that requires high reliability, high request rates, and high data transfer performance requirements.

- Provides high data throughput and data reliability
- Is more complex than other RAID levels and requires more drives
- Requires six drives

Disk 3

Disk 1

Parity (1, 2)
Segment 5
Segment 10

Disk 2

Segment 1
Segment 6
Parity (9, 10)

Segment 2
Parity (5, 6)
Segment 9

RAID 5

Disk 6

Disk 4

Parity (3, 4)
Segment 7
Segment 12

Disk 5

Segment 3
Segment 8
Parity (11, 12)

Segment 4
Parity (7, 8)
Segment 11

RAID 5

RAID 0
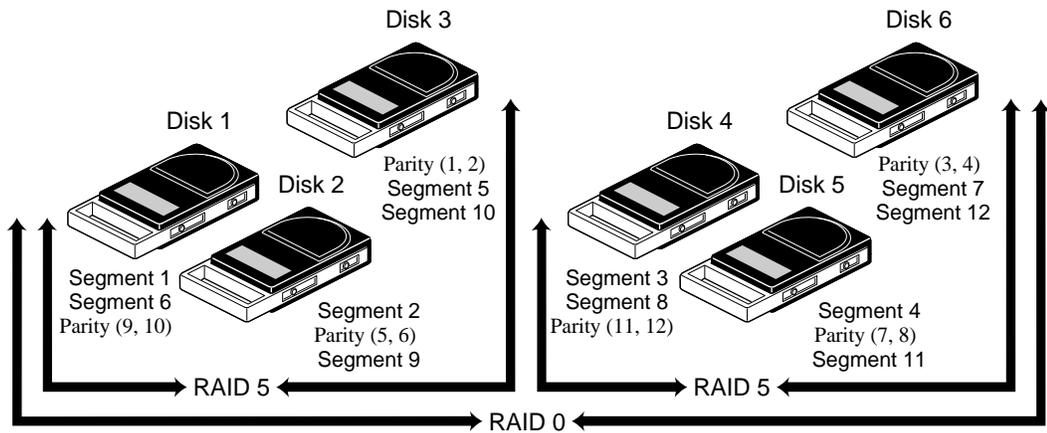
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2 MegaRAID Features

Up to three SCSI channels are available. Each channel supports Fast/Wide SCSI, with data transfer rates of up to 20 MBs per channel, and Fast/Ultra Wide SCSI, with data transfer rates up to 40 MBs per SCSI channel. Each SCSI channel supports up to 8 Ultra Wide devices, up to 15 Wide (non-Ultra) devices and up to seven non-Wide devices.

SMART Technology

The MegaRAID Self Monitoring Analysis and Reporting Technology (SMART) detects up to 70% of all predictable drive failures. SMART monitors internal performance of all motors, heads, and drive electronics. You can recover from drive failures through FlexRAID remapping and online physical drive migration.

Configuration Features

The MegaRAID configuration features include:

- Support for RAID levels 0, 1, 3, 5, 10, 30, and 50
- Online capacity expansion
- Online RAID level migration
- Flashable firmware
- Support for hot swap devices
- Support for Non-disk devices
- Support for Mixed capacity hard disk drives
- Support for hard disk drives with capacities of more than 8 GB
- Support for Clustering (Failover control)
- Online RAID level migration
- Power failure control in OCE and RLM
- No reboot necessary after expansion
- More than 200 Qtags per physical drive
- User-specified programmable rebuild rate

Array Performance Features

The MegaRAID array performance features include:

- Host data transfer rate of 132 MBs
- Drive data transfer rate of 40 MBs
- Up to 26 Scatter/Gathers
- Maximum size of 6.4 MB in 64 KB stripes for I/O requests
- Up to 211 Queue Tags per drive
- Stripe Size of 4 KB, 8 KB, 16 KB, 64 KB, or 128 KB
- Up to 255 concurrent commands
- Support for multiple initiators

RAID Management Features

The MegaRAID RAID management features include:

- Support for SNMP
- Performance Monitor provided
- Remote control and monitoring
- Event broadcast and event alert
- Drive roaming
- Support for concurrent multiple stripe sizes
- Windows NT and NetWare server support via GUI client utility

Fault Tolerance Features

The MegaRAID fault tolerance features include:

- SAF-TE compliant enclosure management
- Automatic drive failure detection
- Automatic drive rebuild using hot spares
- Monitoring temperature and voltage in battery backup module
- Software and hardware parity generation and checking
- Hot swap manual replacement without bringing the system down
- Battery-backed cache memory that provides backup power for the cache in case of a power failure

Software Utilities

The MegaRAID software utility features include:

- Graphical user interface
- Diagnostic utility
- Management utility
- Automatic advanced RAID wizard configuration
- Bootup configuration via MegaRAID Manager
- Online Read, Write, and cache policy switching
- Internet and intranet support through TCP/IP
- works in heterogeneous environments

RAID Management Features

These utilities manage and configure the RAID system and MegaRAID, create and manage multiple disk arrays, control and monitor multiple RAID servers, provide error statistics logging, and provide online maintenance facilities. These utilities include:

- FlexRAID - The optional FlexRAID utility allows you to reconfigure RAID systems by adding drives or changing RAID levels on-the-fly without bringing the system down.
- MegaRAID BIOS Setup - BIOS Setup configures and maintains RAID arrays, formats disk drives, and manages the RAID system. BIOS Setup is independent of any operating system. See Chapter 4 for additional information.
- Power Console - Power Console runs in Windows NT. It configures, monitors, and maintains multiple RAID servers from any network node or a remote location. See Chapter 6 for additional information.
- MegaRAID Manager - MegaRAID Manager is a character-based utility that works in SCO UnixWare 2.x and Novell NetWare 4.x.

Operating System Software Drivers

The MegaRAID Controller runs under the following operating systems:

- MS-DOS version 3.2 or later (or the PC-DOS equivalent)
- Windows NT version v3.1, 3.5, 3.51, and 4.x
- Novell NetWare 3.1x and 4.x
- SCO UnixWare v2.x

The DOS drivers for MegaRAID are contained in the firmware on MegaRAID except the DOS ASPI and CD-ROM drivers. In UnixWare, you must use BIOS Setup to configure drives. Contact your Intel service representative for information about drivers for other operating systems.

MegaRAID BIOS

The BIOS resides on a 256 KB × 8 flash ROM for easy upgrade. The MegaRAID BIOS supports INT 13h calls to boot DOS without special software or device drivers.

The MegaRAID BIOS provides an extensive setup utility that can be accessed by pressing <Ctrl> <M> at BIOS initialization. MegaRAID BIOS Setup is described in Chapter 4.

SCSI Firmware

The MegaRAID firmware handles all RAID and SCSI command processing and also supports:

- Disconnect/Reconnect that optimizes SCSI Bus seek

- Multiple tags to improve random access

- Scatter/Gather multiple address/count pairs

- Up to 255 simultaneous commands with elevator sorting and concatenation of requests per SCSI channel

- Variable stripe size for all logical drives: 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB

- Multiple rebuilds and consistency checks with user-definable priority

Compatibility

MegaRAID compatibility issues include:

- server management - as an SNMP agent, MegaRAID supports all SNMP managers and RedAlert from Storage Dimensions

- SCSI device compatibility - MegaRAID supports SCSI hard disk drives, CD-ROMs, tape drives, optical drives, DAT drives and other SCSI peripheral devices

- software compatibility - All SCSI backup and utility software should work with MegaRAID. Software that has been tested and approved for use with MegaRAID includes Cheyenne[†], CorelSCSI[†], Arcserve[†], and Novaback[†].

3 Configuring MegaRAID

Configuring SCSI Physical Drives

Physical SCSI drives must be organized into logical drives. The drive groups and logical drives that you construct must be able to support the RAID level that you select. Distribute the disk drives among all available channels for optimal performance.

MegaRAID supports SCSI CD-ROM drives, SCSI tape drives, and other SCSI devices as well as SCSI hard disk drives. For optimal performance, all non-disk SCSI devices should be attached to one SCSI channel.

Basic Configuration Rules

You should observe the following guidelines when connecting and configuring SCSI devices in a RAID array:

- attach non-disk SCSI devices to a single SCSI channel that does not have any disk drives
- distribute the SCSI hard disk drives equally among all available SCSI channels except any SCSI channel that is being reserved for non-disk drives
- you can place up to seven physical disk drives in a drive group
- a drive group can contain SCSI devices that are assigned to any channel
- include all drives that have the same capacity to the same drive group
- make sure any hot spare has a capacity that is at least as large as the largest drive that may be replaced by the hot spare
- when replacing a failed drive, make sure that the replacement drive has a capacity that is at least as large as the drive being replaced

Configuration Plan

Write down the SCSI hard disk drive and SCSI device configuration on the following chart before you begin the hardware installation process:

Table 4. Device Description Worksheet

SCSI ID	Device Description
SCSI Channel 0	
0	
1	
2	
3	
4	
5	
6	
7	
SCSI Channel 1	
0	
1	
2	
3	
4	
5	
6	
7	
SCSI Channel 2	
0	
1	
2	
3	
4	
5	
6	
7	

Plan the System Configuration

Complete the following tables before you install the MegaRAID controller.

Table 5. Logical Drive Configuration Worksheet

Logical Drive	RAID Level	Stripe Size	Logical Drive Size	Cache Policy	Read Policy	Write Policy	# of Physical Drives
LD1							
LD2							
LD3							
LD4							
LD5							
LD6							
LD7							
LD8							

Table 6. Physical Device Layout Worksheet

Item	Channel 1	Channel 2	Channel 3
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware Level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			
Target ID			
Device Type			
Logical Drive Number/ Drive Number			
Manufacturer/Model Number			
Firmware level			

Configuring Drive Groups

Organize the physical disk drives in drive groups after the drives are installed, formatted, and initialized. Each drive group can consist of one to seven physical disk drives.

MegaRAID supports up to 8 drive groups. The number of drives in a drive group determines the RAID levels that can be supported.

Arranging Drive Groups

You must arrange the drive groups to provide additional organization for the drive array. You must arrange drive groups so you can create system drives that can function as boot devices.

You can sequentially arrange drive groups with an identical number of drives so that the drives in the group are spanned. Spanned drives can be treated as one large drive. Data can be striped across the entire drive group in this way.

You can create spanned drives by using the MegaRAID BIOS Setup utility (see Chapter 4) or the MegaRAID Manager (see Chapter 5).

Creating Hot Spares

Any drive that is present, formatted, and initialized but is not included in a drive group or logical drive is automatically designated as a hot spare. You can also designate drives as hot spares via MegaRAID BIOS Setup (see Chapter 4), the MegaRAID Manager (see Chapter 5), or Power Console (see Chapter 6).

Creating System Drives

System drives are the logical drives that are presented to the operating system. You must create one or more logical drives. The logical drive capacity can include all or any portion of a drive group. The logical drive capacity can also be larger than a drive group. MegaRAID supports up to 8 logical drives.

Configuration Strategies

The most important factors in RAID array configuration are: drive capacity, drive availability (fault tolerance), and drive performance.

Unfortunately, you cannot configure a logical drive that optimizes drive capacity, drive availability (fault tolerance), and drive performance. It is relatively easy to choose a logical drive configuration that maximizes one factor at the expense of the other two factors, but your needs are seldom that simple.

Maximize Capacity

You can achieve maximum disk drive capacity with RAID 0, but RAID 0 does not provide data redundancy. The drive capacity for each RAID level is shown below. D is the number of drives. N is the drive capacity.

Table 7. RAID Level Drive Capacity

RAID Level	Effective Total Drive Capacity	Example
0	D*N	Two 5 GB drives would provide 10 GB.
1	(D*N)/2	Two 5 GB drives would provide 5 GB.
3	(D-1)*N	Three 5 GB drives would provide 10 GB.
5	(D-1)*N	Three 5 GB drives would provide 10 GB.
10	(D*N)/2	Two 5 GB drives would provide 5 GB.
30	(D-1)*N	Six 5 GB drives would provide 20 GB.
50	(D-1)*N	Six 5 GB drives would provide 20 GB.

Maximizing Drive Availability

You can maximize the availability of data on the physical disk drive in the logical array by maximizing the level of fault tolerance. The levels of fault tolerance provided by the RAID levels are:

Table 8. RAID Level Fault Tolerance

RAID Level	Fault Tolerance Protection
0	No fault tolerance.
1	Disk mirroring, which provides 100% data redundancy.
3	100% protection through a dedicated parity drive.
5	100% protection through striping and parity. The data is striped and parity data is written across a number of physical disk drives.
10	100% protection through data mirroring.
30	100% protection through data striping. All data is striped across all drives in two or more arrays.
50	100% protection through data striping and parity. All data is striped and parity data is written across all drives in two or more arrays.

Maximizing Drive Performance

You can configure an array for optimal performance. But optimal drive configuration for one type of application will probably not be optimal for any other application. A basic guideline of the performance characteristics for RAID drive arrays at each RAID level is:

Table 9. RAID Level Drive Performance

RAID Level	Performance Characteristics
0	Excellent for all types of I/O activity, but provides no data security.
1	Excellent for write-intensive applications.
3	Excellent for write-intensive applications.
5	Excellent for sequential read operations and sequential write operations. Also good for random read operations.
10	Excellent for all types of I/O activity and RAID 10 provides data security.
30	Good for write-intensive applications and RAID 30 provides excellent data security.
50	Good for write-intensive applications and RAID 50 provides excellent data security.

Drive Summary

The following table lists the possible RAID levels, fault tolerance, and effective capacity for all possible drive configurations for an array consisting of one to seven drives. It does not take into account any hot spare (standby) drives. You should always have a hot spare drive in case of drive failure.

RAID 1 and RAID 10 require a multiple of 2 drives. RAID 30 and RAID 50 require at least 6 drives.

Table 10. Drive Summary

Number of Drives	Possible RAID Levels	Relative Performance	Fault Tolerance	Effective Capacity
1	None	Excellent	No	100%
1	RAID 0	Excellent	No	100%
2	None	Excellent	No	100%
2	RAID 0	Excellent	No	100%
2	RAID 1	Good	Yes	50%
2	RAID 10	Good	Yes	50%
3	None	Excellent	No	100%
3	RAID 0	Excellent	No	100%
3	RAID 1	Good	Yes	50%
3	RAID 3	Good	Yes	50% - 80%
3	RAID 5	Good	Yes	50% - 80%
4	None	Excellent	No	100%
4	RAID 0	Excellent	No	100%

Continued

Table 10. Drive Summary (continued)

Number of Drives	Possible RAID Levels	Relative Performance	Fault Tolerance	Effective Capacity
4	RAID 1	Good	Yes	50%
4	RAID 3	Good	Yes	50% - 80%
4	RAID 5	Good	Yes	50% - 80%
4	RAID 10	Good	Yes	50%
5	None	Excellent	No	100%
5	RAID 0	Excellent	No	100%
5	RAID 3	Good	Yes	50% - 80%
5	RAID 5	Good	Yes	50% - 80%
6	None	Excellent	No	100%
6	RAID 0	Excellent	No	100%
6	RAID 1	Good	Yes	50%
6	RAID 3	Good	Yes	50% - 80%
6	RAID 5	Good	Yes	50% - 80%
6	RAID 10	Good	Yes	50% - 80%
6	RAID 30	Good	Yes	50% - 80%
6	RAID 50	Good	Yes	50% - 80%
7	None	Excellent	No	100%
7	RAID 0	Excellent	No	100%
7	RAID 3	Good	Yes	50% - 80%
7	RAID 5	Good	Yes	50% - 80%
7	RAID 30	Good	Yes	50% - 80%
7	RAID 50	Good	Yes	50% - 80%

Configuring Logical Drives

After you have installed all physical disk drives, perform the following actions to prepare a RAID disk array:

1. Optimize the MegaRAID controller options for your system.

2. Perform a low-level format of the SCSI drives that will be included in the array and the drives to be used for hot spares.

3. Press <Ctrl> <M> to run the MegaRAID Manager.

4. Define and configure one or more logical drives. Select Easy Configuration in MegaRAID Manager 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. After initialization, you can install the operating system.

4 MegaRAID BIOS Setup

Overview

The MegaRAID BIOS Setup utility configures disk arrays and logical drives. Since the utility resides in the MegaRAID BIOS, its operation is independent of the operating systems on your computer.

Table 11. BIOS Setup Tasks

To...	Use this menu	turn to...
Configure arrays and logical drives	Configure	page 41
Initialize logical drives	Initialize	page 53
Rebuild a disk drive	Rebuild	page 56
Format a disk drive	Format	page 54
Use a pre-loaded SCSI drive as-is	Configure	page 58

For information about other functions, see the following menu tree and menu descriptions.

Starting MegaRAID BIOS Setup

When the host computer boots, hold the <Ctrl> key and press the <M>key when the following appears:

```
Host Adapter-1 Firmware Version x.xx DRAM Size 4 MB

0 Logical Drives found on the Host Adapter

0 Logical Drives handled by BIOS

Press <Ctrl><M> to run MegaRAID BIOS Configuration Utility
```

For each MegaRAID adapter in the host system, the firmware version, DRAM size, and the status of logical drives on that adapter is displayed.

If you do not press <Ctrl> <M> within a few seconds of the prompt, the computer continues the normal boot procedure.

When you press <Ctrl> <M>, the following will be displayed:


```
┌──────────────────────────────────────────────────────────────────────┐
│   MegaRAID  BIOS Configuration Utility Ver 1.37  Feb 22, 1996  Adapter-1   │
│                                                                        │
│   ┌─Management Menu─┐                                                  │
│   │ Configure        │                                                 │
│   │ Initialize        │                                                │
│   │ Objects           │                                                │
│   │ Format            │                                                │
│   │ Rebuild           │                                                │
│   │ Check Consistency │                                                │
│   │ Select Adapter    │                                                │
│   └───────────────────┘                                               │
│                                                                        │
│                          ┌──────────────────────┐                      │
│                          │ Configure the Logical Drives │              │
│                          └──────────────────────┘                      │
│  Use cursor keys to navigate between items and Press ENTER to select an option │
└──────────────────────────────────────────────────────────────────────┘
```
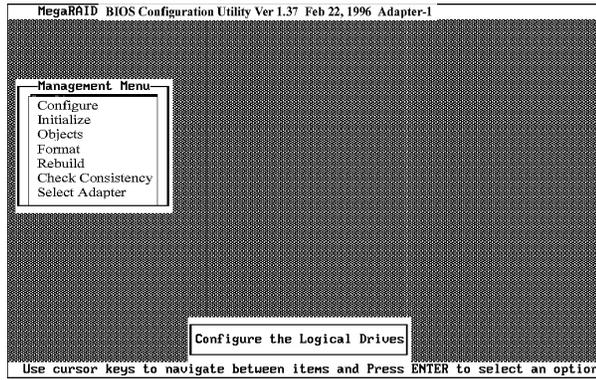
BIOS Setup Menu

Table 12. BIOS Setup Menus

Menu	Description
Configure	Choose this option to configure physical arrays and logical drives.
Initialize	Choose this option to initialize one or more logical drives.
Objects	Choose this option to individually access controllers, logical drives, and physical drives.
Format	Choose this option to low-level format hard disk drives.
Rebuild	Choose this option to rebuild failed disk drives.
Check Consistency	Choose this option to verify that the redundancy data in logical drives using RAID level 1, 3, or 5 is correct.
Select Adapter	Choose this option to select a MegaRAID host adapter to work on.

MegaRAID BIOS Setup Menu Tree

The following is an expansion of the menus in the MegaRAID BIOS Setup.

Configure ─────── Easy Configuration
          ─────── New Configuration
          ─────── View/Add Configuration
          ─────── Clear Configuration

Initialize

Objects ─────── Adapter ─────── Clear Configuration
                        ─────── FlexRAID PowerFail
                        ─────── Disk Spin up Timings
                        ─────── Cache Flush Timings
                        ─────── Rebuild Rate

        ─────── Logical Drive ─────── Initialize
                              ─────── Check Consistency
                              ─────── View/Update Properties

        ─────── Physical Drive ─────── Rebuild
                               ─────── Format
                               ─────── Make Online
                               ─────── Fail Drive
                               ─────── Make HotSpare
                               ─────── View Drive Information
                               ─────── Synchronous Negotiation
                               ─────── SCSI-2 Command Tagging

        ─────── SCSI Channel ─────── Terminate High 8 Bits
                             ─────── Terminate Wide Channel
                             ─────── Disable Termination
                             ─────── Set PowerOn Defaults

        ─────── Battery Backup ─────── Backup Module
                               ─────── Fast Charging
                               ─────── No of Cycles

Format

Rebuild

Check Consistency

BIOS Setup Configure Menu

Choose the Configure option to select a method for configuring arrays and logical drives.
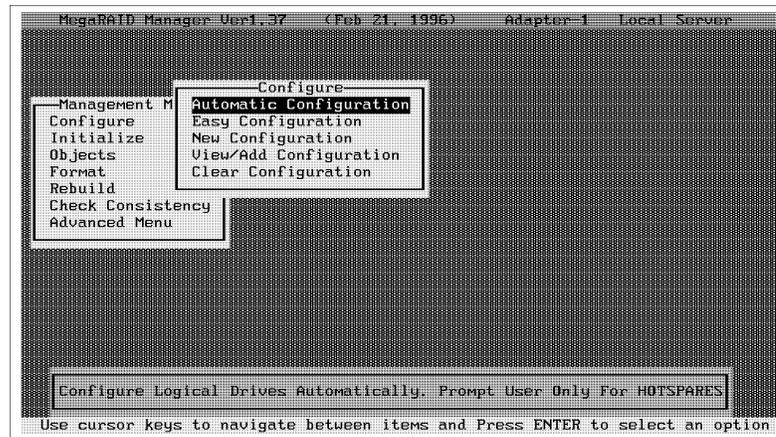
Table 13. Configure Menu Options

Option	Description
Easy Configuration	Select this method to perform a basic logical drive configuration where every physical array you define is automatically associated with exactly one logical drive. See page 41 for additional information.
New Configuration	Select this method to discard the existing configuration information and to configure new arrays and logical drives. In addition to providing the basic logical drive configuration functions, New Configuration allows you to associate logical drives with multiple or partial arrays. See page 41 for additional information.
View/Add Configuration	Select this method to examine the existing configuration and/or to specify additional arrays and logical drives. View/Add Configuration provides the same functions available in New Configuration. See page 41 for additional information.
Clear Configuration	Select this option to erase the current configuration information from the MegaRAID controller non-volatile memory.

BIOS Setup Initialize Menu

Choose this option from the BIOS Setup main menu to initialize one or more logical drives. This action typically follows the configuration of a new logical drive. See page 53 for additional information.

⚠ WARNING

Initializing a logical drive destroys all data on the logical drive.

BIOS Setup Objects Menu

Choose the Objects option from the BIOS Setup main menu to access the controllers, logical drives, physical drives, and SCSI channels individually. You can also change settings for each object. The Objects menu options are:

Adapter

Choose *Adapter* from the Objects menu to select a MegaRAID controller (if the computer has more than one) and to modify parameters.

Table 14. Adapter Menu Options

Option	Description
Clear Configuration	Choose this option to erase the current configuration from the controller non-volatile memory.
FlexRAID PowerFail	Choose this option to allow drive reconstruction to continue when the system restarts if a power failure occurs.
Disk Spin-Up Timings	Choose this option to set the method and timing for spinning up the hard disk drives in the computer.
Cache Flush Timings	Choose this option to set the cache flush interval to once every 2, 4, 6, 8, or 10 seconds.
Rebuild Rate	Choose this option to display the firmware version number. You can also change the rebuild rate for the adapter.

Logical Drive

Choose this option from the BIOS Setup Objects menu to select a logical drive and to perform the actions.
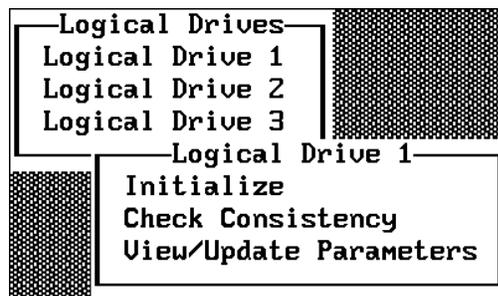
Table 15. Logical Drive Menu Options

Option	Description
Initialize	Initializes the selected logical drive. Do this for every logical drive that is configured.
Check Consistency	Verifies the correctness of the redundancy data in the selected logical drive. This option is only available if RAID level 1, 3, or 5 is used.
View/Update Parameters	Displays the properties of the selected logical drive. You can modify the cache write policy, the Read policy, and the I/O policy from this menu.

Physical Drive

Choose this option from the BIOS Setup Objects menu to select a physical device and to perform the operations listed in the table below. The physical hard disk drives in the computer are listed. Move the cursor to the desired device and press <Enter> to display the following:

```
┌─────────────Objects – PHYSICAL DRIVE SELECTION MENU─────────────┐
│                                                                 │
│       Channel-1              Channel-2              Channel-3    │
│  ID ┌───────────┐      ID ┌───────────┐      ID ┌───────────┐   │
│  0  │■ READY    │      0  │■ READY    │      0  │           │   │
│     ├───────────┤         ├───────────┤         ├───────────┤   │
│  1  │■ READY    │      1  │■ READY    │      1  │           │   │
│     ┌─Channel 2, Target 3─┐         ├───────────┤         ├───────────┤   │
│  2  │ Rebuild            │  READY    │      2  │■ TAPE     │   │
│     │ Format             ├───────────┤         ├───────────┤   │
│  3  │ Make Online        │  READY    │      3  │           │   │
│     │ Fail Drive         ├───────────┤         ├───────────┤   │
│  4  │ Make HotSpare      │           │      4  │           │   │
│     │ View Drive Information        ├───────────┤         ├───────────┤   │
│  5  │ Synchronous Negotiation  READY │      5  │           │   │
│     │ SCSI-2 Command Tagging ├───────────┤         ├───────────┤   │
│  6  └───────────┘         └───────────┘      6  │■ CDROM    │   │
│                                                 └───────────┘   │
└─────────────────────────────────────────────────────────────────┘
```
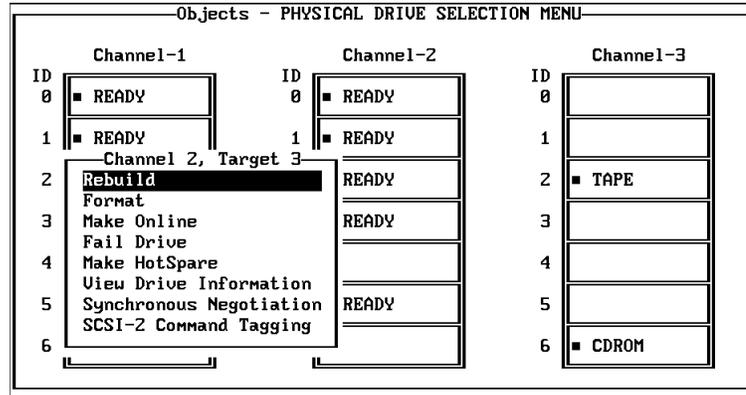
Table 16. Physical Drive Menu Options

Option	Description
Rebuild	Choose this option to rebuild the selected disk drive.
Format	Choose this option to low-level format the selected disk drive.
Make Online	Choose this option to change the state of the selected disk drive to Online.
Fail Drive	Choose this option to change the state of the selected disk drive to Fail.
Make HotSpare	Choose this option to designate the selected disk drive as a hot spare.
View Drive Information	Choose this option to display the manufacturer data for the selected physical device.
Synchronous Negotiation	Choose this option to enable or disable synchronous negotiation for the selected physical device. The default is Enabled.
SCSI-2 Command Tagging	Choose this option to set the number of queue tags per command to 2, 3, or 4, or to disable command tagging. The default setting is 4 queue tags.

SCSI Channel

Choose this option from the BIOS Setup Objects menu to select a SCSI channel on the currently selected controller. You can perform the following operations on the selected channel.

```
┌──────Channel 1──────┐
│ Terminate High 8 Bits │
│ Terminate Wide Channel │
│ Disable Termination   │
│ Set PowerOn Defaults  │
└───────────────────────┘
```
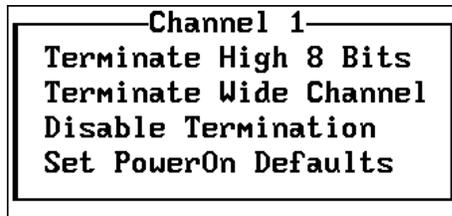
Table 17. Channel Menu Options

Option	Description
Terminate High 8 Bits	Choose this option to enable termination on the selected channel for the upper eight bits and disable termination on the controller for the lower eight bits. This setting is required if the selected SCSI channel is terminated with 8-bit devices at both ends.
Terminate Wide Channel	Choose this option to enable Wide termination for the selected channel. This is required if the MegaRAID controller is at one end of the SCSI bus for the selected channel.
Disable Termination	Choose this option to disable termination on the MegaRAID controller for the selected channel. This option should be used if the selected SCSI channel is terminated with Wide devices at both ends.
Set PowerOn Defaults	Choose this option to have the MegaRAID controller examine its SCSI channels and to set its termination automatically.

Battery Backup

Choose this option from the BIOS Setup Objects menu to configure the battery backup. You can perform the following operations.

Table 18. Battery Backup Options

Option	Description
Backup Module	This is a read only field that tells you if the backup battery is connected to the RPX module.
Fast Charging	This is a read only field that tells you if the battery is charging or not.
No of Cycles	Choose this option to reset the number of clock cycles.

BIOS Setup Format Menu

⚠️ **WARNING**

Formatting a hard drive destroys all data on the drive.

Choose the Format option from the BIOS Setup main menu to low-level format one or more physical drives.

Since most SCSI disk drives are low-level formatted at the factory, this step is usually not necessary. You must format a disk only if:

- the disk drive was not low-level formatted at the factory, or

- an excessive number of media errors have been detected on the disk drive.

You do not have to choose Format to erase existing information on your SCSI disks, such as a DOS partition. That information is erased when you initialize the logical drive(s).

See page 54 for additional information.

BIOS Setup Rebuild Menu

Choose the Rebuild option from the BIOS Setup main menu to rebuild one or more failed disk drives. See page 57 for additional information.

BIOS Setup Check Consistency Menu

Choose this option to verify the redundancy data in logical drives that use RAID levels 1, 3, or 5.

When you choose Check Consistency, the parameters of the existing logical drives on the current controller and a selection menu listing the logical drives by number appear. If a discrepancy is found, it is automatically corrected, assuming always that the data is correct. However, if the failure is a read error on a data drive, the bad data block is reassigned with the generated data (to a corresponding data block on another data drive or to a corresponding parity block).

```
┌Management Menu─┐        ┌─────────────Logical Drives Configured────────────┐
│ Configure      │   LD   RAID    Size    #Stripes   StrpSz   Drive-State
│ Initialize     │    1     5     984MB       4        8KB       OPTIMAL
│ Objects        │    2     5     516MB       3        8KB       OPTIMAL
│ Format         │    3     1     507MB       2        8KB       OPTIMAL
│ Rebuild        │
│┌Logical Drives┐│
││Logical Drive 1││
││Logical Drive 2││
││Logical Drive 3││
│└──────────────┘│
└────────────────┘        └──────────────────────────────────────────────────┘
```

Press the arrow keys to choose the desired logical drives. Press the spacebar to select or deselect a drive for consistency checking. Press <F2> to select or deselect all the logical drives.

Press <F10> to begin the consistency check. A progress indicator for each selected logical drive is displayed.

```
┌─────────────────────Check Consistency Progress─────────────────────┐
│ ┌─────────────────────Check Consistency 1─────────────────────┐ │
│ │████████        12%                                          │ │
│ └─────────────────────────────────────────────────────────────┘ │
│ ┌─────────────────────Check Consistency 2─────────────────────┐ │
│ │██████          8%                                           │ │
│ └─────────────────────────────────────────────────────────────┘ │
└─────────────────────────────────────────────────────────────────┘
```

When the consistency check is finished, press any key to clear the progress display and press <Esc> to display the main menu.

Configuring Arrays and Logical Drives

You can configure physical arrays and logical drives with MegaRAID BIOS Setup using:

- Easy Configuration
- New Configuration
- View/Add Configuration

Each configuration method requires a different level of user input. The general flow of operations for array and logical drive configuration is:

1. Choose a configuration method.
2. Designate hot spares (optional).
3. Create arrays using the available physical drives.
4. Define logical drives using the space in the arrays.
5. Save the configuration information.
6. Initialize the new logical drives.

Choosing the Configuration Method

Easy Configuration

In Easy Configuration, each physical array you create is associated with exactly one logical drive, and you can modify the following parameters:

- RAID level
- stripe size
- cache write policy
- Read policy
- I/O policy

If logical drives have already been configured when you select Easy Configuration, the configuration information is not disturbed. See page 44 for instructions on Easy Configuration.

New Configuration

In New Configuration, you can modify the following logical drive parameters:

- RAID level
- stripe size
- cache write policy
- Read policy
- I/O policy
- logical drive size
- spanning of arrays

If you select New Configuration, the existing configuration information on the selected controller is *destroyed when the new configuration is saved*. See page 46 for instructions on New Configuration.

View/Add Configuration

View/Add Configuration allows you to control the same logical drive parameters as New Configuration *without disturbing* the existing configuration information

See page 50 for additional information.

Designating Drives as Hot Spares

Hot spares are physical drives that are powered up along with the RAID drives and usually stay in a standby state. If a disk drive used in a RAID logical drive fails, a hot spare will automatically take its place and the data on the failed drive is reconstructed on the hot spare. Hot spares can be used for level 1, 3 and 5 RAID. Each MegaRAID controller supports up to eight hot spares. See Hot Spares on page 11 for additional information.

The methods for designating physical drives as hot spares are:

- press <F4> while creating arrays in Easy, New or View/Add Configuration mode, or
- From the Objects/Physical Drive menu, select a physical drive and press <Enter.> Select Make HotSpare.

Press <F4>

When you choose any configuration option, a list of all physical devices connected to the current controller appears, as shown below:

```
┌────────────Configuration - ARRAY SELECTION MENU────────────┐
│                                                            │
│      Channel-1              Channel-2              Channel-3│
│  ID┌─────────────┐     ID┌─────────────┐     ID┌─────────────┐│
│  0 │ ◆ READY     │     0 │ ◆ READY     │     0 │             ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  1 │ ◆ READY     │     1 │ ◆ READY     │     1 │             ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  2 │ ◆ READY     │     2 │ ◆ READY     │     2 │ ◆ TAPE      ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  3 │ ◆ READY     │     3 │ ◆ READY     │     3 │             ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  4 │ ◆ READY     │     4 │             │     4 │             ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  5 │ ◆ READY     │     5 │ ◆ READY     │     5 │             ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
│  6 │             │     6 │             │     6 │ ◆ CDROM     ││
│    └─────────────┘       └─────────────┘       └─────────────┘│
└────────────────────────────────────────────────────────────┘
```

Press the arrow keys to choose a disk drive that has a READY indicator and press <F4> to designate the drive as a hot spare. The indicator will change to HOTSP.

Objects Menu

Select Objects from the Management menu, then select Physical Drive. A physical drive selection screen will appear. Select a disk drive and press <Enter> to display the action menu for the drive.

```
┌────────────Objects - PHYSICAL DRIVE SELECTION MENU────────────┐
│                                                               │
│      Channel-1               Channel-2              Channel-3 │
│  ID┌─────────────┐      ID┌─────────────┐     ID┌─────────────┐│
│  0 │ ■ READY     │      0 │ ■ READY     │     0 │             ││
│    └─────────────┘        └─────────────┘       └─────────────┘│
│  1 │ ■ READY     │      1 │ ■ READY     │     1 │             ││
│    ┌─Channel 2, Target 3─┐ └─────────────┘       └─────────────┘│
│  2 │ Rebuild             │  │ READY     │     2 │ ■ TAPE      ││
│    │ Format              │  └─────────────┘       └─────────────┘│
│  3 │ Make Online         │  │ READY     │     3 │             ││
│    │ Fail Drive          │  └─────────────┘       └─────────────┘│
│  4 │ Make HotSpare       │  │           │     4 │             ││
│    │ View Drive Information│ └─────────────┘       └─────────────┘│
│  5 │ Synchronous Negotiation│ READY     │     5 │             ││
│    │ SCSI-2 Command Tagging│ └─────────────┘       └─────────────┘│
│  6 └─────────────────────┘  │           │     6 │ ■ CDROM     ││
│    └─────────────┘        └─────────────┘       └─────────────┘│
└───────────────────────────────────────────────────────────────┘
```

Press the arrow keys to select Make HotSpare and press <Enter>. The indicator for the selected drive changes to HOTSP.

Using Easy Configuration

In Easy Configuration, each array is associated with exactly one logical drive. Follow the steps below to create arrays using Easy Configuration:

1. Choose Configure from the MegaRAID BIOS Setup main menu.

2. Choose Easy Configuration from the Configure menu. The array selection menu appears:

```
        MegaRAID BIOS Configuration Utility   Ver1.20  Oct 10, 1995  Adapter-1
┌──────────────────Easy Configuration - ARRAY SELECTION MENU──────────────────┐
│                                                                              │
│           Channel-1              Channel-2              Channel-3            │
│       ID                     ID                     ID                      │
│  C    0  ┌──────────┐        0  ┌──────────┐        0  ┌──────────┐         │
│  I       │■ READY   │           │■ READY   │           │          │         │
│  O    1  ├──────────┤        1  ├──────────┤        1  ├──────────┤         │
│  F       │■ READY   │           │■ READY   │           │          │         │
│  R    2  ├──────────┤        2  ├──────────┤        2  ├──────────┤         │
│  C       │■ READY   │           │■ READY   │           │■ TAPE    │         │
│  S    3  ├──────────┤        3  ├──────────┤        3  ├──────────┤         │
│          │■ READY   │           │■ READY   │           │          │         │
│       4  ├──────────┤        4  ├──────────┤        4  ├──────────┤         │
│          │■ READY   │           │          │           │          │         │
│       5  ├──────────┤        5  ├──────────┤        5  ├──────────┤         │
│          │■ READY   │           │■ READY   │           │          │         │
│       6  ├──────────┤        6  ├──────────┤        6  ├──────────┤         │
│          │          │           │          │           │■ CDROM   │         │
│          └──────────┘           └──────────┘           └──────────┘         │
│                                                                              │
│          ┌──────────────────────────────────────────────────────┐          │
│          │ Ch-1 ID-0  DISK    328MB    SEAGATE  ST3390N    9546  │          │
│          └──────────────────────────────────────────────────────┘          │
└──────────────────────────────────────────────────────────────────────────────┘
    SPACE-Array,ENTER-Configure,F2-Drive Information,F3-Logical Drives,F4-HotSpare
```

3. Press the arrow keys to choose specific physical drives. Press the spacebar to associate the selected physical drive with the current array. The indicator for the selected drive changes from READY to ONLIN A[*array number*]-[*drive number*]. For example, ONLIN A2-3 means disk drive 3 in array 2.

   Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the array are treated as if they have the capacity of the *smallest* drive in the array.

   The number of physical drives in a specific array determine the RAID levels that can be implemented with the array.

4. Press <Enter> when you are finished creating the current array. The logical drive configuration screen appears.

```
        MegaRAID BIOS Configuration Utility   Ver1.20  Oct 10, 1995  Adapter-1
┌───────────────────────────Logical Drives Configured──────────────────────┐
│                                                                            │
│        LD    RAID      Size     #Stripes    StrpSz   Drive-State      3    │
│         1     5       516MB        3          8KB      OPTIMAL             │
│   ID                                                                       │
│  C   0  ■                                                                  │
│  I                                                                         │
│  O   1  ■                                                                  │
│  F                                                                         │
│  R   2  ■                                                                  │
│  C                                                                         │
│  S   3  ■                                                                  │
│              ┌──Logical Drive 1──┐                                         │
│      4  ■ ONLI│ RAID = 5         │             4  ┌──────────┐            │
│               │ Size = 516MB     │                │          │            │
│      5  ■ READ│ Advanced Menu    │  READY        5  ├──────────┤            │
│               │ Accept           │                │          │            │
│      6        └──────────────────┘             6  │■ CDROM   │            │
│                                                    └──────────┘            │
│                  ┌──────────────────────────────────────────┐             │
│                  │ Choose RAID Level For This Logical Drive  │             │
│                  └──────────────────────────────────────────┘             │
└────────────────────────────────────────────────────────────────────────────┘
     Use cursor keys to navigate, ENTER to select an option and ESC to go back
```

The window at the top of the screen shows the logical drive that is currently being configured as well as any existing logical drives. The column headings are:

- LD - The logical drive number

- RAID - The RAID level

- Size - The logical drive size

- #Stripes - The number of stripes (physical drives) in the associated physical array

- StrpSz - The stripe size

- DriveState - The state of the logical drive

5. Set the RAID level for the logical drive. Highlight RAID and press <Enter>. The available RAID levels for the current logical drive are displayed. Select a RAID level and press <Enter> to confirm. See page 13 for an explanation of the RAID levels.

6. Set the stripe size, cache write policy, Read policy, and I/O (cache) policy from the Advanced Menu.

Press <Esc> to exit the Advanced Menu.

```
┌─Logical Drive 1─┐ ┌──────Advanced──────┐
│ RAID = 5        │ │ StripeSize = 8KB   │
│ Size = 984MB    │ │ Write Policy = WRTHRU │
│ Advanced Menu   │ │ Read Policy = READAHEAD │
│ Accept          │ │ Cache Policy = CachedIO │
└─────────────────┘ └────────────────────┘
```

Table 19. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through.
	In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
	In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting. Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*

Continued

Table 19. Advanced Menu Options (continued)

Option	Description
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. You can set this parameter to *Normal*, *Read-ahead,* or *Adaptive.*
	Normal specifies that the controller does not use read-ahead for the current logical drive.
	Read-ahead specifies that the controller uses read-ahead for the current logical drive. This is the default setting.
	Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive.
	Cached I/O specifies that the controller cache is used. This is the default setting.
	Direct I/O specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

7. When you have defined the current logical drive, choose Accept and press <Enter>. The array selection screen appears if any unconfigured disk drives remain.

8. Repeat steps 3 through 7 to configure another array and logical drive. MegaRAID supports up to eight logical drives per controller. If you are finished configuring logical drives, press <Esc> to exit Easy Configuration. A list of the currently configured logical drives appears:

```
                                 ┌Save Configuration?─┐
                                 │      YES           │
                                 │      NO            │
                                 └────────────────────┘
                    ┌Logical Drives Configured─────────────┐
                    │                                       │
         LD    RAID      Size     #Stripes    StrpSz   Drive-State
         1      5       516MB        3          8KB      OPTIMAL
         2      1       507MB        2          8KB      OPTIMAL
         3      5       984MB        4          8KB      OPTIMAL
                    │                                       │
                    │                                       │
                    │                                       │
                    │                                       │
                    └───────────────────────────────────────┘
```

After you respond to the Save prompt, the Configure menu appears.

9. Initialize the logical drives you have just configured. See Initializing Logical Drives on page 53.

Using New Configuration

The New Configuration option allows you to associate logical drives with partial and/or multiple physical arrays (the latter is called spanning of arrays).

⚠ **CAUTION**

Erases Configuration - Choosing the New Configuration option *erases* the existing configuration information on the selected controller.

To use the spanning feature and keep the existing configuration, use View/Add Configuration (see page 50).

1. Choose Configure from the MegaRAID BIOS Setup main menu.

2. Choose New Configuration from the Configure menu. An array selection window is displayed showing the devices connected to the current controller.

```
        MegaRAID BIOS Configuration Utility   Ver1.20  Oct 10, 1995    Adapter-1
    ┌──────────────────New Configuration - ARRAY SELECTION MENU──────────────────┐
    │          Channel-1            Channel-2            Channel-3               │
    │       ID                   ID                   ID                        │
    │  C    0 │■ READY│           0 │■ READY│           0 │       │             │
    │  I                                                                        │
    │  O    1 │■ READY│           1 │■ READY│           1 │       │             │
    │  F                                                                        │
    │  R    2 │■ READY│           2 │■ READY│           2 │■ TAPE │             │
    │  C                                                                        │
    │  S    3 │■ READY│           3 │■ READY│           3 │       │             │
    │       4 │■ READY│           4 │       │           4 │       │             │
    │       5 │■ READY│           5 │■ READY│           5 │       │             │
    │       6 │       │           6 │       │           6 │■ CDROM│             │
    │                                                                           │
    │    │ Ch-1 ID-0  DISK      328MB     SEAGATE  ST3390N       9546│          │
    └───────────────────────────────────────────────────────────────────────────┘
      SPACE-Sel,ENTER-EndArray,F10-Configure,F2-Drv. Info,F3-Logical Drives,F4-HSP
```

3. Press the arrow keys to choose specific physical drives. Press the spacebar to associate the selected physical drive with the current array. The indicator for the selected drive changes from READY to ONLIN A[*array number*]-[*drive number*]. For example, ONLIN A2-3 means disk drive 3 in array 2.

   Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

   The number of physical drives in a specific array determines the RAID levels that can be implemented with the array.

4. Press <Enter> when you are finished creating the current array. To continue defining arrays, repeat step 3. To begin logical drive configuration, go to step 5.

5. Press <F10> to configure logical drives. The logical drive configuration screen appears, as shown below:

```
┌─────────────────Logical Drives Configured─────────────────┐
│                                                            │
│   LD    RAID     Size     #Stripes    StrpSz   Drive-State │
│    1     5       984MB        4          8KB     OPTIMAL    3
│ ID                                                         │
│  0 ■                                                       │
│                                                            │
│  1 ■                                                       │
│                                                            │
│  2 ■                                                       │
│                                                            │
│  3 ■                                                       │
│      ┌────Logical Drive 1────┐                             │
│  4 ■ ONLI │RAID = 5         │                        4     │
│           │Size = 984MB     │                              │
│  5 ■ READ │Advanced Menu    │ READY                  5     │
│           │Accept           │                              │
│  6        │Span = NO        │                        6 ■ CDROM │
│      └──────────────────────┘                             │
│                                                            │
│            ┌─Choose RAID Level For This Logical Drive─┐    │
└────────────────────────────────────────────────────────────┘
```

The window at the top of the screen shows the logical drive that is currently being configured as well as any existing logical drives. The column headings are:

- LD - The logical drive number
- RAID - The RAID level
- Size - The logical drive size
- #Stripes - The number of stripes (physical drives) in the associated physical array
- StrpSz - The stripe size
- Drive-State - The state of the logical drive

6. Set the RAID level for the logical drive. Highlight *RAID* and press <Enter>. A list of the available RAID levels for the current logical drive appears. Select a RAID level and press <Enter> to confirm. See page 13 for an explanation of the RAID levels.

7. Set the spanning mode for the current logical drive. Highlight *Span* and press <Enter>. The choices are:

- CanSpan - Array spanning is enabled for the current logical drive. The logical drive can occupy space in more than one array.
- NoSpan - Array spanning is disabled for the current logical drive. The logical drive can occupy space in only one array.

For two arrays to be spannable, they must have the same stripe width (they must contain the same number of physical drives) and must be consecutively numbered. For example, assuming Array 2 contains four disk drives, it can be spanned only with Array 1 and/or Array 3, and only if Arrays 1 and 3 also contain four disk drives. If the two criteria for spanning are met, MegaRAID automatically allows spanning. If the criteria are not met, the *Span* setting makes no difference for the current logical drive. Highlight a spanning option and press <Enter>.

8. Set the logical drive size. Move the cursor to *Size* and press <Enter>. By default, the logical drive size is set to all available space in the array(s) being associated with the current logical drive, accounting for the *Span* setting and for partially used array space. For example, if the previous logical drive used only a part of the space in an array, the current logical drive size is set to the remaining space by default.

9. Open the Advanced menu to set the remaining options.

   Press <Esc> to exit the Advanced Menu.

```
┌─Logical Drive 1─┐ ┌───────Advanced───────┐
│ RAID = 5        │ │ StripeSize = 8KB      │
│ Size = 984MB    │ │ Write Policy = WRTHRU │
│ Advanced Menu   │ │ Read Policy = READAHEAD│
│ Accept          │ │ Cache Policy = CachedIO│
│ Span = NO       │ └───────────────────────┘
└─────────────────┘
```

Table 20. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through. In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction. In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting. Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. *Normal* specifies that the controller does not use read-ahead for the current logical drive. *Read-ahead* specifies that the controller uses read-ahead for the current logical drive. This is the default setting. *Adaptive* specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive. *Cached I/O* specifies that the controller cache is used. This is the default setting. *Direct I/O* specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

10. After you define the current logical drive, choose *Accept* and press <Enter>. If space remains in the arrays, the next logical drive to be configured appears. Repeat steps 6 to 9 to configure another logical drive. If the array space has been used, a list of the existing logical drives appears. Press any key to continue and respond to the Save prompt.

11. Initialize the logical drives you have just configured. See Initializing Logical Drives on page 53.

Using View/Add Configuration

View/Add Configuration allows you to associate logical drives with partial and/or multiple physical arrays (this is called spanning of arrays). The existing configuration is left intact, so you can also use View/Add Configuration simply to look at the current configuration.

1. Choose Configure from the MegaRAID BIOS Setup main menu.

2. Choose View/Add Configuration from the Configure menu. An array selection window is displayed showing the devices connected to the current controller.

```
┌─────────View/Add Configuration - ARRAY SELECTION MENU─────────┐
│                                                                 │
│        Channel-1           Channel-2           Channel-3        │
│    ┌ID┌──────────┐     ┌ID┌──────────┐     ┌ID┌──────────┐      │
│ C  │0 │■ ONLIN A1-1│    │0 │■ ONLIN A1-3│    │0 │          │     │
│ I  │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│ O  │1 │■ ONLIN A1-2│    │1 │■ ONLIN A1-4│    │1 │          │     │
│ F  │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│ R  │2 │■ ONLIN A2-1│    │2 │■ READY    │    │2 │■ TAPE    │     │
│ C  │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│ S  │3 │■ ONLIN A2-2│    │3 │■ READY    │    │3 │          │     │
│    │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│    │4 │■ ONLIN A2-3│    │4 │          │    │4 │          │      │
│    │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│    │5 │■ READY    │    │5 │■ READY    │    │5 │          │      │
│    │  └──────────┘     │  └──────────┘     │  └──────────┘      │
│    │6 │          │    │6 │          │    │6 │■ CDROM   │        │
│    └  └──────────┘     └  └──────────┘     └  └──────────┘      │
│                                                                 │
│    │ Ch-1 ID-5  DISK     507MB    FUJITSU  M2684S-512    2036│  │
└─────────────────────────────────────────────────────────────────┘
 SPACE-Sel,ENTER-EndArray,F10-Configure,F2-Drv. Info,F3-Logical Drives,F4-HSP
```

3. Press the arrow keys to choose specific physical drives. Press the spacebar to associate the selected physical drive with the current array. The indicator for the selected drive changes from READY to ONLIN A[array number]-[drive number]. For example, ONLIN A2-3 means disk drive 3 in array 2.

   Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as if they have the capacity of the smallest drive in the array.

   The number of physical drives in a specific array determine the RAID levels that can be implemented with the array.

4. Press <Enter> when you are finished creating the current array. To continue defining arrays, repeat step 3. To begin logical drive configuration, go to step 5.

5. Press <F10> to configure logical drives. The logical drive configuration screen appears, as shown below:

```
┌─────────────────Logical Drives Configured─────────────────┐
│                                                            │
│     LD   RAID    Size    #Stripes   StrpSz   Drive-State   │
│      1    5      984MB       4        8KB       OPTIMAL    │3
│ ID   2    5      516MB       3        8KB       OPTIMAL     │
│  0 ▪ 3    1      507MB       2        8KB       OPTIMAL     │
│                                                            │
│  1 ▪                                                       │
│                                                            │
│  2 ▪                                                       │
│                                                            │
│  3 ▪                                                       │
│         ┌─Logical Drive 3─┐                                │
│  4 ▪ ONLI│RAID = 1        │              4                 │
│         │Size = 507MB     │                                │
│  5 ▪ ONLI│Advanced Menu   │ ONLIN A3-2   5                 │
│         │Accept           │                                │
│  6      │Span = NO        │              6 ▪ CDROM         │
└──────────┴─────────────────┴───────────────────────────────┘
         ┌──────────────────────────────────────┐
         │Choose RAID Level For This Logical Drive│
         └──────────────────────────────────────┘
```
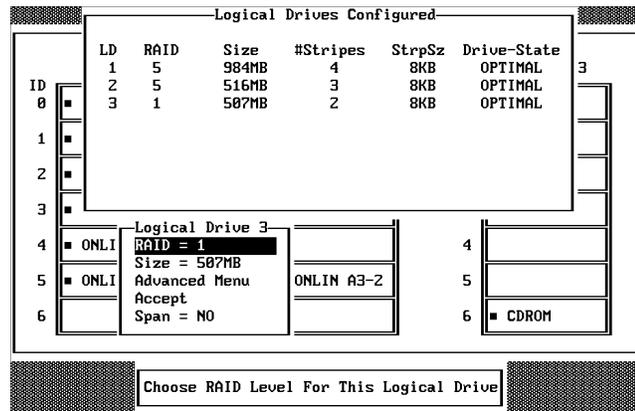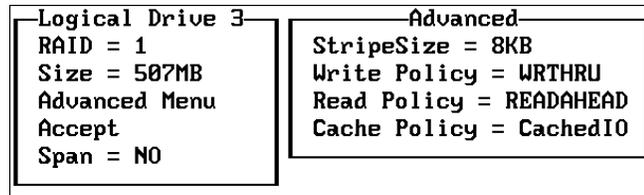
The logical drive that is currently being configured and any existing logical drives are displayed. The column headings are:

- LD - The logical drive number

- RAID - The RAID level

- Size - The logical drive size

- #Stripes - The number of stripes (physical drives) in the associated physical array

- StrpSz - The stripe size

- Drive-State - The state of the logical drive

6. Set the RAID level for the logical drive. Highlight RAID and press <Enter>. The available RAID levels for the current logical drive appear. Select a RAID level and press <Enter> to confirm. See page 13 for an explanation of the RAID levels.

7. Set the spanning mode for the current logical drive. Highlight Span and press <Enter>. The choices are:

- CanSpan - Array spanning is enabled for the current logical drive. The logical drive can occupy space in more than one array.

- NoSpan - Array spanning is disabled for the current logical drive. The logical drive can occupy space in only one array.

For two arrays to be spannable, they must have the same stripe width (they must contain the same number of physical drives) and they must be consecutively numbered. For example, assuming Array 2 contains four disk drives, it can be spanned only with Array 1 and/or Array 3, and only if Arrays 1 and 3 also contain four disk drives. If the two criteria for spanning are met, MegaRAID automatically activates spanning. If the criteria are not met, the Span setting makes no difference for the current logical drive. Highlight a spanning option and press <Enter>.

- Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.

- Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.

- Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.

8. Set the logical drive size. Move the cursor to Size and press <Enter>. By default, the logical drive size is set to all available space in the array(s) being associated with the current logical drive, accounting for the Span setting and for partially used array space. For example, if the previous logical drive used only a part of the space in an array, the current logical drive size is set to the remaining space by default.

9. Open the Advanced menu to set the remaining options.

Press <Esc> to exit the Advanced Menu.

```
┌─Logical Drive 3─┐    ┌──────Advanced──────┐
│ RAID = 1        │    │ StripeSize = 8KB         │
│ Size = 507MB    │    │ Write Policy = WRTHRU    │
│ Advanced Menu   │    │ Read Policy = READAHEAD  │
│ Accept          │    │ Cache Policy = CachedIO  │
│ Span = NO       │    └──────────────────────────┘
└─────────────────┘
```

Table 21. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through.
	In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
	In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting. Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. You can set this parameter to *Normal*, *Read-ahead,* or *Adaptive.*
	Normal specifies that the controller does not use read-ahead for the current logical drive.
	Read-ahead specifies that the controller uses read-ahead for the current logical drive. This is the default setting.
	Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive.
	Cached I/O specifies that the controller cache is used. This is the default setting.
	Direct I/O specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

10. After you define the current logical drive, choose Accept and press <Enter>. If space remains in the arrays, the next logical drive to be configured appears. Repeat steps 6 to 9 to configure another logical drive. If all array space is used, a list of the existing logical drives appears. Press any key to continue. Respond to the Save prompt.

11. Initialize the logical drives you have just configured. See Initializing Logical Drives on page 53.

Initializing Logical Drives

Initialize each new logical drive you configure. You can initialize the logical drives using:

- Batch Initialization - The Initialize option in the main menu lets you initialize up to eight logical drives simultaneously.

- Individual Initialization - The Objects/Logical Drive action menu for an individual logical drive has an Initialize option.

Batch Initialization

To initialize logical drives using the batch initialization procedure:

1. Choose Initialize from the BIOS Setup main menu. A list of the current logical drives appears, as shown below:

2. Press the arrow keys to select all drives. Press the spacebar to select the selected logical drive for initialization. Press <F2> to select/deselect all logical drives.

3. When you are done selecting logical drives, press <F10> and choose *Yes* at the confirmation prompt. The progress of the initialization for each drive is shown in bar graph format.

4. When initialization is complete, press any key to continue.

5. Press <Esc> to display the main menu.

Individual Initialization

1. Choose the Objects option from the MegaRAID BIOS Setup main menu. Choose the Logical Drive option from the Objects menu.

```
                    ┌─────Objects──────┐
        ┌─Managemen│ Adapter           │
        │ Configure │ Logical Drive     │
        │ Initialize│ Physical    ┌──Logical Drives──┐
        │ Objects   │ SCSI Chan│ Logical Drive 1 │
        │ Format    │          └─│ Logical Drive 2 │
        │ Rebuild   │            │ Logical Drive 3 │
        │ Check Consistency      └──────────────────┘
        │ Select Adapter │
        └────────────────┘
```

2. Select the logical drive to be initialized. The following appears:
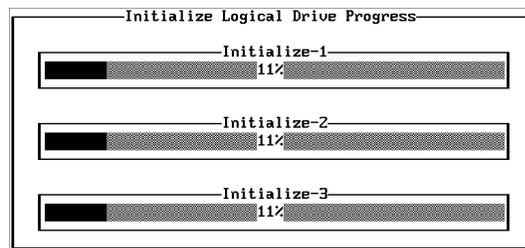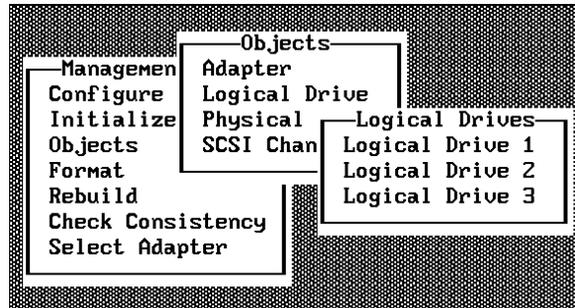
```
        ┌─Logical Drives─┐
        │ Logical Drive 1 │
        │ Logical Drive 2 │
        │ Logical Drive 3 │
        └──────┬──────────┘
          ┌────┴─Logical Drive 1─┐
          │ Initialize            │
          │ Check Consistency     │
          │ View/Update Parameters│
          └───────────────────────┘
```

3. Choose the Initialize option from the action menu. Initialization progress appears as a bar graph on the screen.

4. When initialization completes, press any key to display the previous menu.

Using Logical Drives in the Operating System

For information on an operating system other than DOS, see the software manual for that operating system. To use the logical drive(s) in DOS:

1. Exit MegaRAID BIOS Setup and reboot the computer.

2. Run DOS FDISK and configure one or more partitions using the logical drives.

3. Format the partitions with the FORMAT command.

Formatting Physical Drives

You can do low-level formatting of SCSI drives using BIOS Setup.

Since most SCSI disk drives are low-level formatted at the factory, this step is usually not necessary. Usually, you must format a disk if:

- the disk drive was not low-level formatted at the factory, or

- an excessive number of media errors have been detected on the disk drive.

Check the View Drive Information screen for the drive to be formatted. You can view this screen by choosing Objects from the Management menu. Select the Physical Drives option, and choose a device. Press <F2>.

The error count is displayed at the bottom of the properties screen. If you feel that the number of errors is excessive, you should probably format the disk drive. If more than 32 media errors were detected, MegaRAID automatically puts the drive in FAIL state. This occurs even in a degraded RAID set. The errors are displayed as they occur. In cases such as this, formatting the drive can clear up the problem.

You do not have to choose Format to erase existing information on your SCSI disks, such as a DOS partition. That information is erased when you initialize logical drives.

You can format the physical drives using:

- Batch Formatting - The Format option in the MegaRAID Manager main menu lets you format up to eight disk drives simultaneously.

- Individual Formatting - Choose the Format option from Objects on the Physical Drive action menu for an disk physical drive.

Batch Formatting

1. Choose Format from the BIOS Setup management menu. A device selection window is displayed showing the devices connected to the current controller, as shown below:

```
┌─────────────Format - PHYSICAL DRIVES SELECTION MENU─────────────┐
│                                                                  │
│          Channel-1            Channel-2            Channel-3      │
│      ID                   ID                   ID                │
│   C  0 ┌─────────┐        0 ┌─────────┐        0 ┌─────────┐     │
│   I    │■ READY  │          │■ READY  │          │         │     │
│   O  1 │■ READY  │        1 │■ READY  │        1 │         │     │
│   F    │         │          │         │          │         │     │
│   R  2 │■ READY  │        2 │■ READY  │        2 │■ TAPE   │     │
│   C  3 │■ READY  │        3 │■ READY  │        3 │         │     │
│   S    │         │          │         │          │         │     │
│      4 │■ READY  │        4 │         │        4 │         │     │
│      5 │■ READY  │        5 │■ READY  │        5 │         │     │
│      6 │         │        6 │         │        6 │■ CDROM  │     │
│        └─────────┘          └─────────┘          └─────────┘     │
│                                                                  │
│   ┌──────────────────────────────────────────────────────────┐  │
│   │ Ch-1 ID-0  DISK     328MB     SEAGATE  ST3390N      9546│  │
│   └──────────────────────────────────────────────────────────┘  │
└──────────────────────────────────────────────────────────────────┘
 SPACE-(De)Sel, F10-Start Format, F2-Drive Information, F3-View Logical Drives
```

2. Press the arrow keys to select all drives. Press the spacebar to select the selected physical drive for formatting. The indicators for selected drives flashes.

3. When you are done selecting physical drives, press <F10> and choose *Yes* at the confirmation prompt. The indicators for the selected drives changes to FRMT[*number*], where *number* reflects the order of drive selection. Formatting may take some time, depending on the number of drives you have selected and the drive capacities.
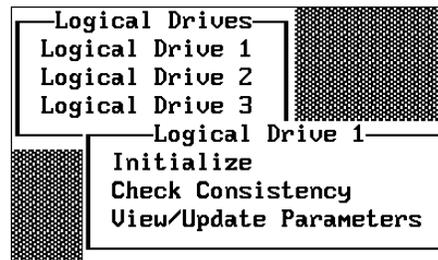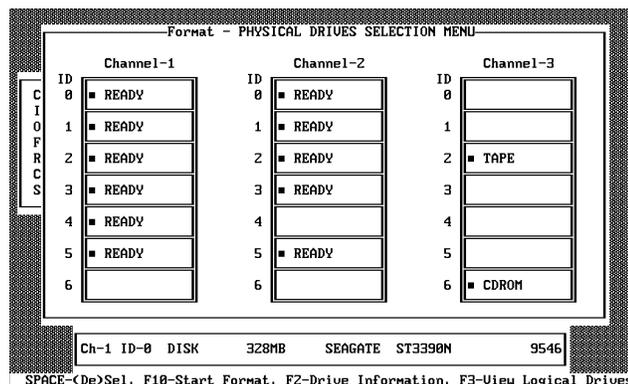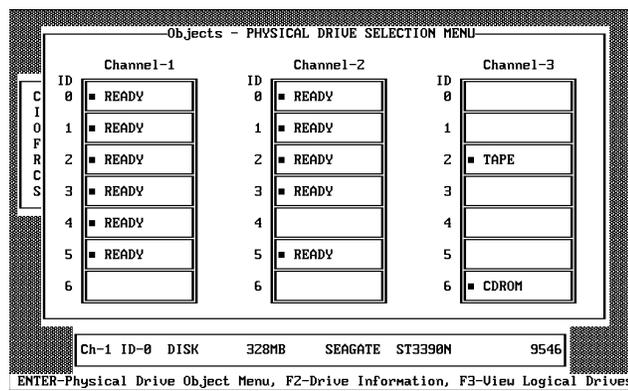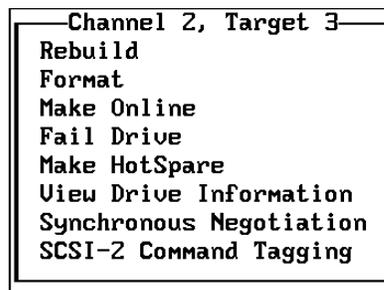
4. When formatting is complete, press any key to continue.

5. Press <Esc> to display the main menu.

Individual Formatting

1. Choose the Objects option from the MegaRAID BIOS Setup main menu. Choose the Physical Drive option from the Objects menu. A device selection window is displayed showing the devices connected to the current controller, as shown below:

2. Press the arrow keys to select the physical drive to be formatted and press <Enter>. The following action menu appears:

3. Choose the Format option from the action menu and respond to the confirmation prompt. Formatting can take some time, depending on the drive capacity.

4. When formatting completes, press any key to display the previous menu.

Rebuilding Failed Disk Drives

If a disk drive fails in an array that is configured as a RAID 1, 3, or 5 logical drive, you can recover the lost data by rebuilding the drive. If a spare that is rebuilding fails, MegaRAID starts a new rebuild using a second spare, if available. The capacity of the second spare must be equal to or greater than the failed drive.

Automatic Rebuild

If you have configured hot spares, MegaRAID automatically tries to use them to rebuild failed disks. Display the Objects/Physical Drive screen while a rebuild is in progress. The drive indicator for the hot spare disk drive has changed to REBLD A[array number]-[drive number], indicating the disk drive being replaced by the hot spare.

Manual Rebuild

Manual rebuild is necessary if no hot spares with enough capacity to rebuild the failed drives are available. Select the MegaRAID Manager main menu Rebuild option or the Rebuild option on the Objects/Physical Drive menu.

Manual Rebuild – Rebuilding an Individual Drive

1. Choose the Objects option from the MegaRAID Manager main menu. Choose Physical Drive from the Objects menu. A window is displayed that shows the devices connected to the current controller:

2. Press the arrow keys to select the physical drive to be rebuilt and press <Enter>. The following action menu appears:

```
┌─Channel-2, Target-3─┐
│ Rebuild             │
│ Format              │
│ Make Online         │
│ Fail Drive          │
│ Make HotSpare       │
│ View Drive Information │
│ View Rebuild Progress │
└─────────────────────┘
```

3. Choose the Rebuild option from the action menu and respond to the confirmation prompt. Rebuilding can take some time, depending on the drive capacity.

4. When rebuild completes, press any key to display the previous menu.

Manual Rebuild – Batch Mode

1. Choose Rebuild from the MegaRAID Manager main menu. A device selection window is displayed showing the devices connected to the current controller. The failed drives have FAIL indicators.

2. Press the arrow keys to select all drives to be rebuilt. Press the spacebar to select the selected physical drive for rebuild.

3. After selecting the physical drives, press <F10> and select Yes at the confirmation prompt. The indicators for the selected drives changes to *REBLD*. Rebuilding can take some time, depending on the number of drives you have selected and the drive capacities.

4. When rebuild is complete, press any key to continue.

5. Press <Esc> to display the main menu.

Using a Pre-loaded SCSI Drive "As-is"

⟹ **NOTE**

To use a pre-loaded drive in the manner described here, you must make it the first logical drive defined (for example: LD1) on the controller it is connected to.

You may have a SCSI disk drive that is already loaded with software. The drive may be a boot disk containing an operating system. You can use the MegaRAID controller as a SCSI adapter for such a drive by performing the following steps:

1. Connect the SCSI drive to one of the channels on the MegaRAID controller, with proper termination and TID settings.

2. Boot the computer and start BIOS Setup by pressing <Ctrl> <M>.

3. Choose *Easy Configuration* from the Configure menu.

4. Press the cursor keys to select the pre-loaded drive.

5. Press the spacebar. The pre-loaded drive should now become an array element.

6. Press <Enter>. You have now declared the pre-loaded drive as a one-disk array. Display the logical drive configuration screen.

7. Set the read policy and cache option on the Advanced menu.

8. Exit the Advanced menu. Highlight *Accept* and press <Enter>.

9. Press <Esc> and choose *Yes* at the Save prompt.

10. Exit BIOS Setup and reboot.

11. Set the host system to boot from SCSI, if such a setting is available.

Exiting MegaRAID BIOS Setup

Press <Esc> when the MegaRAID BIOS Setup management menu is displayed to exit MegaRAID BIOS Setup. Choose Yes at the prompt. You must then reboot the computer. The MegaRAID BIOS message appears again. Press <Esc> when the BIOS Configuration Utility prompt appears.

5 MegaRAID Manager

Overview

MegaRAID Manager is a character-based, non-GUI utility that configures and monitors RAID systems. MegaRAID Manager runs under MS-DOS 3.2 or later and MS-DOS-compatible operating systems, including: Novell NetWare 3.x, Novell NetWare 4.x, and SCO UNIX† 3.2.4.

Table 22. MegaRAID Manager Tasks

To...	Use this menu	Turn to...
Configure arrays and logical drives	Configure	page 62
Initialize logical drives	Initialize	page 84
Rebuild a disk drive	Rebuild	page 87
Format a disk drive	Format	page 85

Starting MegaRAID Manager

To start MegaRAID Manager in NetWare, make sure the program file is in your file path and type:

```
load megamgr
```

To start MegaRAID Manager in SCO UnixWare, make sure the program file is in your file path and type:

```
megamgr
```

The following appears when MegaRAID Manager is started:

```
   MegaRAID Manager Ver1.30    (Oct 12, 1995)    Adapter-1  Local Server

         ┌Management Menu─┐
         │Configure       │
         │Initialize      │
         │Objects         │
         │Format          │
         │Rebuild         │
         │Check Consistency│
         │Advanced Menu   │
         │Select Adapter  │
         └────────────────┘




                        ┌Configure Logical Drive(s)┐
                        └──────────────────────────┘
   Use cursor keys to navigate between items and Press ENTER to select an option
```
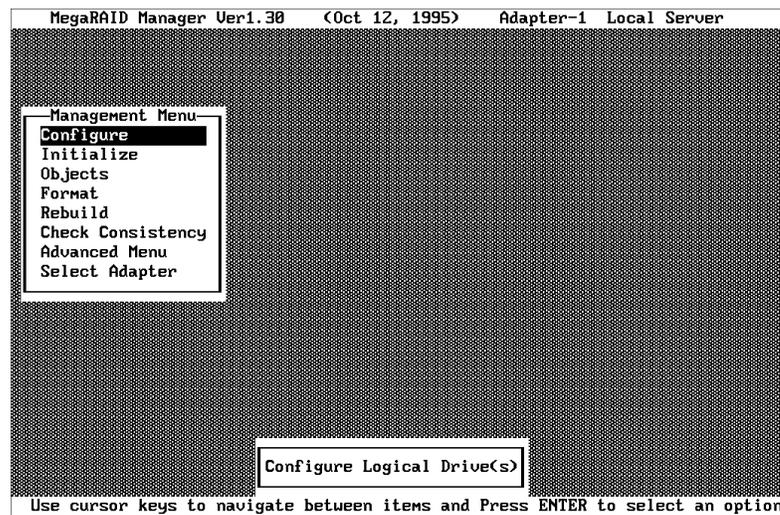
MegaRAID Manager Menu Options

Table 23. MegaRAID Manager Menus

Menu	Description
Configure	Choose this option to configure arrays and logical drives.
Initialize	Choose this option to initialize one or more logical drives.
Objects	Choose this option to individually access controllers, logical drives, and physical drives.
Format	Choose this option to low-level format hard disk drives.
Rebuild	Choose this option to rebuild failed disk drives.
Check Consistency	Choose this option to verify that the redundancy data in logical drives using RAID level 1, 3, or 5 is correct.
Advanced Menu	Choose this option to run the Enclosure Management and Diagnostics functions.

MegaRAID Manager Menu Tree

The following is an expansion of the menus in MegaRAID Manager.

Configure —— Automatic Configuration
—— Easy Configuration
—— New Configuration
—— View/Add Configuration
—— Clear Configuration

Initialize
Objects —— Adapter —— Clear Configuration
—— FlexRAID PowerFail
—— FlexRAID Virtual Sizing
—— Disk Spin-up Timings
—— Alarm Control
—— View/Update Parameters

Logical Drive —— Initialize
—— Check Consistency
—— View/Update Parameters
—— View Performance

Physical Drive —— Rebuild
—— Format
—— Make Online
—— View Drive Information
—— Fail Drive
—— Make Hotspare
—— View Rebuild Progress

SCSI Channel —— Deactivate Channel
—— Activate Channel
—— Terminate High 8 bits
—— Terminate Wide Channel
—— Disable Termination
—— View Parameters

Format
Rebuild
Check Consistency
Advanced —— Reconstruct Logical Drive
—— Enclosure Management
—— Diagnostics
Select Adapter

The menu items are explained on the following pages.

MegaRAID Manager Configure Menu

Choose the Configure option to select a method for configuring arrays and logical drives.
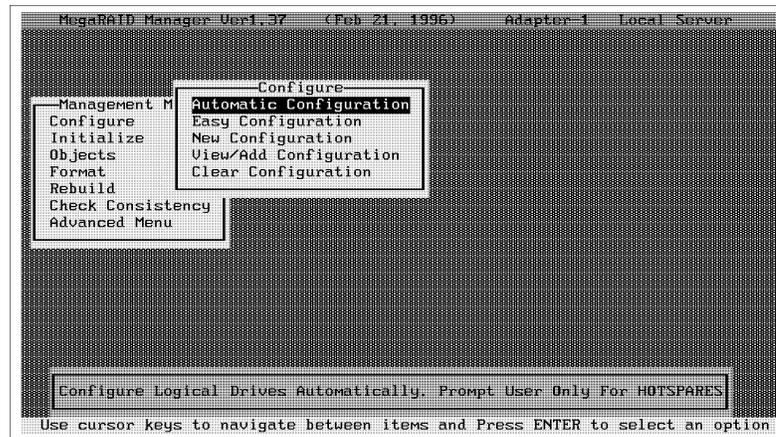
**Table 24. MegaRAID Manager Configure Menu Options**

Option	Description
Auto Configuration	Select this method to have the MegaRAID controller automatically configure arrays and logical drives for you. See page 71 for additional information.
Easy Configuration	Select this method to perform a basic logical drive configuration where every physical array you define is automatically associated with exactly one logical drive. See page 74 for additional information.
New Configuration	Select this method to discard the existing configuration information and to configure new arrays and logical drives. In addition to providing the basic logical drive configuration functions, New Configuration allows you to associate logical drives with multiple or partial arrays. See page 77 for additional information.
View/Add Configuration	Select this method to examine the existing configuration and/or to specify additional arrays and logical drives. View/Add Configuration provides the same functions as New Configuration. See page 81 for additional information.
Clear Configuration	Select this option to erase the current configuration information from the MegaRAID controller non-volatile memory.

MegaRAID Manager Initialize Menu

Choose this option from the MegaRAID Manager main menu to initialize one or more logical drives. This action typically follows the configuration of a new logical drive. See page 84 for additional information.

MegaRAID Manager Objects Menu

Choose the Objects option from the MegaRAID Manager main menu to access the controllers, logical drives, physical drives, and SCSI channels individually. You can also change certain settings for each object. The Objects menu options are described below.
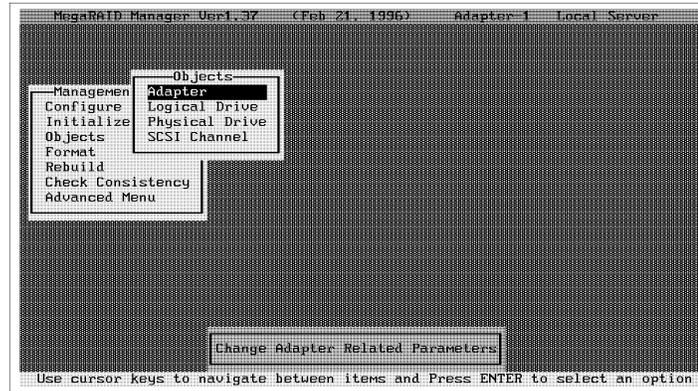
Adapter

Choose the Adapter option from the Objects menu to select a MegaRAID controller (if your computer has more than one) and to modify parameters.
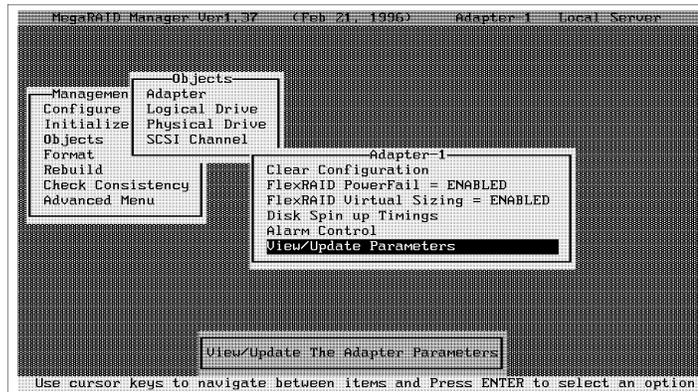
Table 25. Adapter Menu Options

Option	Description
Clear Configuration	Choose this option to erase the current configuration from the controller non-volatile memory.
FlexRAID PowerFail	Choose this option to allow drive reconstruction to continue when the system restarts if a power failure occurs.
FlexRAID Virtual Sizing	Set this option to *Enabled* before adding a physical drive to a logical drive. After you have created a logical drive set, the partition of the drive should be as large as the virtual size of the logical drive.
Disk Spin-Up Timings	Choose this option to set the method and timing for spinning up the hard disk drives in the computer.
Alarm Control	Choose this option to enable, disable, or silence the onboard alarm tone generator.
View/Update Parameters	Choose this option to display the firmware version number and the cache memory size. You can also change the rebuild rate for the adapter through this option.

Logical Drive

Choose this option from the MegaRAID Manager Objects menu to select a logical drive and to perform the listed actions.
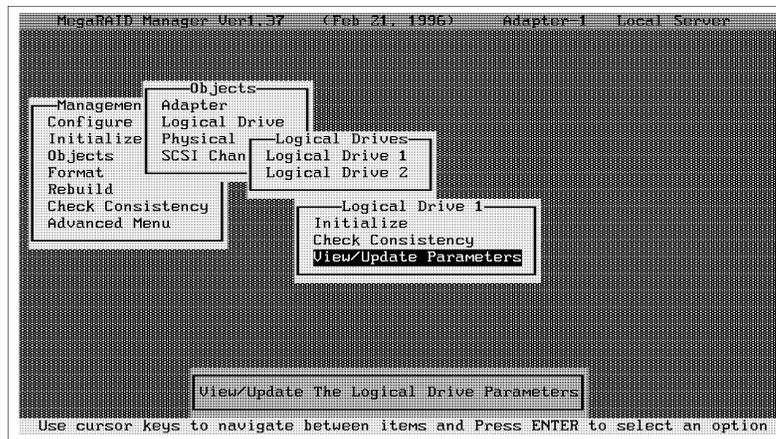
Table 26. Logical Drive Menu Options

Option	Description
Initialize	Choose this option to initialize the selected logical drive. This should be done for every logical drive you configure.
Check Consistency	Choose this option to verify the correctness of the redundancy data in the selected logical drive. This option is only available if RAID level 1, 3, or 5 is used.
View/Update Parameters	Choose this option to display the properties of the selected logical drive; you can modify the cache write policy, the Read policy, and the I/O policy from this menu.

Physical Drive

Choose this option from the MegaRAID Manager Objects menu to select a physical device and to perform the operations listed in the table below. When you choose this option, a selection menu is displayed showing the physical drives in the computer. Move the cursor to the desired device and press <Enter>. The following appears:
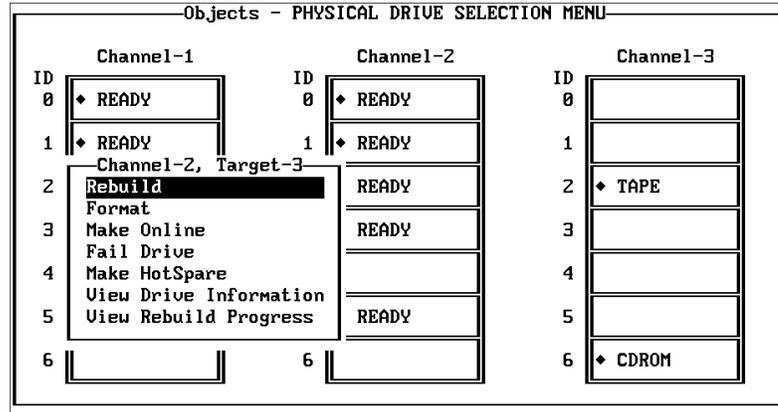
```
┌─────────────────Objects - PHYSICAL DRIVE SELECTION MENU─────────────────┐
│                                                                          │
│         Channel-1              Channel-2                 Channel-3        │
│    ID                     ID                        ID                   │
│    0  ┌─────────────┐     0  ┌─────────────┐        0  ┌─────────────┐    │
│       │ ◆ READY     │        │ ◆ READY     │           │             │    │
│       └─────────────┘        └─────────────┘           └─────────────┘    │
│    1  ┌─────────────┐     1  ┌─────────────┐        1  ┌─────────────┐    │
│       │ ◆ READY     │        │ ◆ READY     │           │             │    │
│       ┌─Channel-2, Target-3─┐└─────────────┘           └─────────────┘    │
│    2  │ Rebuild           │     │ READY   │        2  ┌─────────────┐    │
│       │ Format            │     └─────────┘           │ ◆ TAPE      │    │
│    3  │ Make Online       │     │ READY   │        3  └─────────────┘    │
│       │ Fail Drive        │     └─────────┘           ┌─────────────┐    │
│    4  │ Make HotSpare     │                        4  │             │    │
│       │ View Drive Information │                      └─────────────┘    │
│    5  │ View Rebuild Progress │  │ READY   │        5  ┌─────────────┐    │
│       └───────────────────┘     └─────────┘           │             │    │
│    6  ┌─────────────┐     6  ┌─────────────┐        6  ┌─────────────┐    │
│       │             │        │             │           │ ◆ CDROM     │    │
│       └─────────────┘        └─────────────┘           └─────────────┘    │
│                                                                          │
└──────────────────────────────────────────────────────────────────────────┘
```

Table 27. Physical Drive Menu Options

Option	Description
Rebuild	Choose this option to rebuild the selected disk drive.
Format	Choose this option to low-level format the selected hard disk drive.
Make Online	Choose this option to change the state of the selected hard disk drive to Online.
Fail Drive	Choose this option to change the state of the selected disk drive to Fail.
Make HotSpare	Choose this option to designate the selected disk drive as a hot spare.
View Drive Information	Choose this option to see the manufacturer data for the selected physical device.
View Rebuild Progress	Choose this option to see the progress of the rebuild process for the selected disk drive.

SCSI Channel

Choose this option from the MegaRAID Manager Objects menu to select a SCSI channel on the currently selected controller. You can perform the following operations on the selected channel.

```
┌──────────Channel-1──────────┐
│ Deactivate Channel          │
│ Activate Channel            │
│ Terminate High 8 Bits       │
│ Terminate Wide Channel      │
│ Disable Termination         │
│ View Parameters             │
└─────────────────────────────┘
```
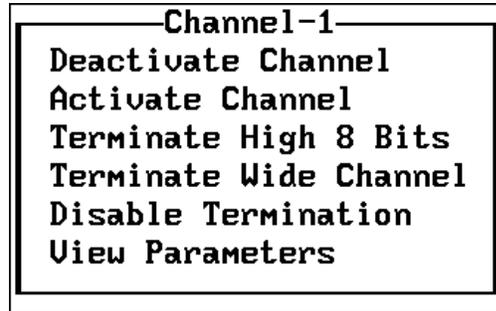
Table 28. SCSI Channel Menu Options

Option	Description
Deactivate Channel	Choose this option to deactivate the selected channel.
Activate Channel	Choose this option to activate the selected channel. Be sure that TermPWR is provided for all active channels.
Terminate High 8 Bits	Choose this option to enable termination on the selected channel for the upper eight bits and disable termination on the controller for the lower eight bits. This setting is required if the selected SCSI channel is terminated with 8-bit devices at both ends.
Terminate Wide Channel	Choose this option to enable Wide termination for the selected channel. This is required if the MegaRAID controller is at one end of the SCSI bus for the selected channel.
Disable Termination	Choose this option to disable termination on the MegaRAID controller for the selected channel. This option should be used if the selected SCSI channel is terminated with Wide devices at both ends.
View Parameters	Choose this option to view the termination and active status of the selected channel.

MegaRAID Manager Format Menu

Choose the Format option from the MegaRAID Manager main menu to low-level format one or more physical drives.

Since most SCSI disk drives are low-level formatted at the factory, this step is usually not necessary. You typically must format a disk if:

- the disk drive was not low-level formatted at the factory, or

- an excessive number of media errors have been detected on the disk drive.

You do not need to use the Format option if you simply want to erase existing information on your SCSI disks, such as a DOS partition. That information is erased when you initialize the logical drive(s).
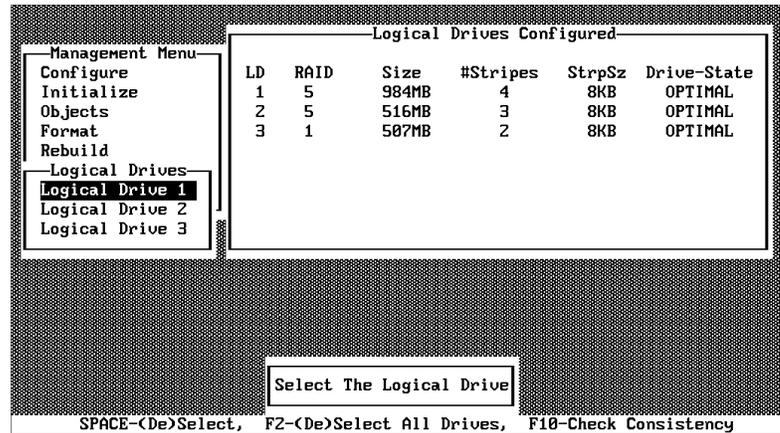
MegaRAID Manager Rebuild Menu

Choose the Rebuild option from the MegaRAID Manager main menu to rebuild one or more failed disk drives. See page 87 for additional information.
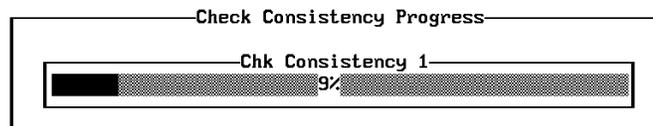
MegaRAID Manager Check Consistency Menu

Choose this option to verify the redundancy data in logical drives using RAID levels 1, 3, or 5. When you choose Check Consistency, the parameters of the existing logical drives on the current controller appear. The logical drives are listed by number.

```
┌─────────────────────────┬─Logical Drives Configured─────────┐
│─Management Menu─         │                                   │
│ Configure               │ LD   RAID    Size   #Stripes   StrpSz  Drive-State │
│ Initialize              │  1    5     984MB      4         8KB     OPTIMAL   │
│ Objects                 │  2    5     516MB      3         8KB     OPTIMAL   │
│ Format                  │  3    1     507MB      2         8KB     OPTIMAL   │
│ Rebuild                 │                                   │
│─Logical Drives─         │                                   │
│ Logical Drive 1         │                                   │
│ Logical Drive 2         │                                   │
│ Logical Drive 3         │                                   │
│                         └───────────────────────────────────┘
│
│                          ┌─────────────────────────┐
│                          │ Select The Logical Drive │
│                          └─────────────────────────┘
    SPACE-(De)Select,  F2-(De)Select All Drives,  F10-Check Consistency
```

Press the arrow keys to select the desired logical drives. Press the spacebar to select or deselect a drive for consistency checking. Press <F2> to select or deselect all the logical drives.

Press <F10> to begin the consistency check. A progress indicator for each selected logical drive appears, as shown below:

```
┌─Check Consistency Progress──────────────┐
│                                          │
│         ─Chk Consistency 1─              │
│  ████████░░░░░░░9%░░░░░░░░░░░░░░░         │
│                                          │
└──────────────────────────────────────────┘
```

When the consistency check is finished, press any key to clear the progress display and press <Esc> to display the main menu.

MegaRAID Manager Advanced Menu

Table 29. Advanced Menu Options

Option	Description
Reconstruct Logical Drive	You can select or deselect a logical drive. Choose this option before you add or remove a physical drive.
Enclosure Management	When implemented, this option is used to monitor an external enclosure containing SCSI devices. MegaRAID can monitor the fan speed, power supply voltage, and temperature, appropriate signals from the enclosure.
	For additional information on the implementation of the Enclosure Management signals, contact American Megatrends, Inc. at 770-246-8600.
	Beside each SCSI device listing, a diamond-shaped indicator shows the condition of that device. A green diamond indicates normal operation. A red diamond indicates failure. If the fan, temperature or power supply goes bad, the word for the device will change from green to red.

MegaRAID Manager Select Adapter Menu

This menu item appears only if more than one MegaRAID host adapter is installed in the computer. The following appears when you choose the Select Adapter option:

```
┌──Sel. Adapter──┐
│ Adapter-1      │
│ Adapter-2      │
│ Adapter-3      │
│                │
└────────────────┘
```
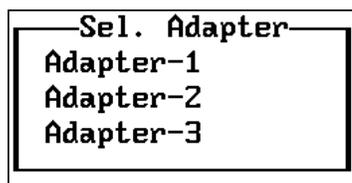
Select the MegaRAID adapter that you want to configure from this menu.

Configuring Arrays and Logical Drives

You can configure physical arrays and logical drives with MegaRAID Manager using:

- Auto Configuration
- Easy Configuration
- New Configuration
- View/Add Configuration

Each configuration method requires a different level of user input. The general flow of operations for array and logical drive configuration is:

1. Choose a configuration method.
2. Designate hot spares (optional).
3. Create arrays using the available physical drives.
4. Define logical drives using the space in the arrays.

5. Save the configuration information.
6. Initialize the logical drives.

Choosing the Configuration Method

Automatic Configuration

In Automatic Configuration, the MegaRAID controller examines the physical drives connected to it and automatically configures them into arrays and logical drives.

If logical drives have already been configured when you select Auto Configuration, the configuration information is not disturbed. See page 73 for additional information.

Easy Configuration

In Easy Configuration, each physical array you create is associated with exactly one logical drive, and you can modify the following parameters:

- RAID level,
- stripe size,
- cache write policy,
- Read policy, and
- I/O policy.

If logical drives have already been configured when you select Easy Configuration, the configuration information is not disturbed.

See page 74 for instructions on Easy Configuration.

New Configuration

In New Configuration, you can modify the following logical drive parameters:

- RAID level,
- stripe size
- cache write policy,
- Read policy,
- I/O Policy,
- logical drive size, and
- spanning of arrays.

If you select New Configuration, the existing configuration information on the selected controller is *destroyed when the new configuration is saved*. See page 77 for instructions on New Configuration.

View/Add Configuration

View/Add Configuration allows you to control over the same logical drive parameters as New Configuration *with*out disturbing the existing configuration information.

See page 81 for additional information.

Designating Drives as Hot Spares

Hot spares are physical drives that are powered up along with the RAID drives and usually stay in a standby state. If a disk drive used in a RAID logical drive fails, a hot spare will automatically take its place and the data on the failed drive is reconstructed on the hot spare. Hot spares can be used for level 1, 3 and 5 RAID. Each MegaRAID controller supports up to eight hot spares. See Hot spares on page 11 for additional information.

The two methods for designating physical drives as hot spares are:

- press <F4> while creating arrays in Easy, New or View/Add Configuration mode, or
- Highlight a drive using the space bar and press <Enter>. Select Make HotSpare.
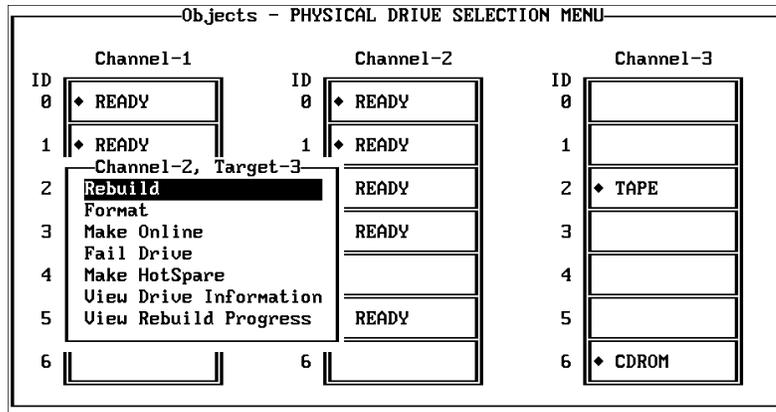
Press <F4>

When you choose any configuration option in the Configure menu, all physical devices connected to the current controller appear:

```
┌─────────────────Configuration - ARRAY SELECTION MENU─────────────────┐
│                                                                        │
│      Channel-1              Channel-2              Channel-3           │
│   ID                     ID                     ID                     │
│    0  ┌─────────────┐     0  ┌─────────────┐     0  ┌─────────────┐    │
│       │ ◆ READY     │        │ ◆ READY     │        │             │    │
│    1  │ ◆ READY     │     1  │ ◆ READY     │     1  │             │    │
│                                                                        │
│    2  │ ◆ READY     │     2  │ ◆ READY     │     2  │ ◆ TAPE      │    │
│                                                                        │
│    3  │ ◆ READY     │     3  │ ◆ READY     │     3  │             │    │
│                                                                        │
│    4  │ ◆ READY     │     4  │             │     4  │             │    │
│                                                                        │
│    5  │ ◆ READY     │     5  │ ◆ READY     │     5  │             │    │
│                                                                        │
│    6  │             │     6  │             │     6  │ ◆ CDROM     │    │
│       └─────────────┘        └─────────────┘        └─────────────┘    │
│                                                                        │
└────────────────────────────────────────────────────────────────────────┘
```

Press the arrow keys to select a disk drive that has a READY indicator and press <F4> to designate it as a hot spare. The indicator changes to HOTSP.

Objects Menu

Select Objects from the Configure menu, then select Physical Drive. A physical drive selection screen will appear. Press the spacebar to select a disk drive and press <Enter> to display the action menu for the drive.

```
┌─────────Objects - PHYSICAL DRIVE SELECTION MENU─────────┐
│                                                          │
│       Channel-1              Channel-2           Channel-3│
│   ID ┌──────────┐      ID ┌──────────┐      ID ┌──────────┐│
│   0  │ ◆ READY  │      0  │ ◆ READY  │      0  │          ││
│      └──────────┘         └──────────┘         └──────────┘│
│   1  │ ◆ READY  │      1  │ ◆ READY  │      1  │          ││
│      ┌─Channel-2, Target-3─┐         └─────────└──────────┘│
│   2  │ Rebuild             │  READY  │      2  │ ◆ TAPE   ││
│      │ Format              ├─────────┘         └──────────┘│
│   3  │ Make Online         │  READY  │      3  │          ││
│      │ Fail Drive          ├─────────┘         └──────────┘│
│   4  │ Make HotSpare       │         │      4  │          ││
│      │ View Drive Information         └─────────└──────────┘│
│   5  │ View Rebuild Progress  READY  │      5  │          ││
│      └─────────────────────┘─────────┘         └──────────┘│
│   6  │          │          6  │          │     6  │ ◆ CDROM ││
│      └──────────┘            └──────────┘        └──────────┘│
│                                                          │
└──────────────────────────────────────────────────────────┘
```

Press the arrow keys to select *Make Hot Spare* and press <Enter>. The indicator for the selected drive changes to HOTSP.

Using Auto Configuration

In Auto Configuration, MegaRAID examines the physical drives connected to it and automatically configures them into arrays and logical drives. MegaRAID uses the following configuration guidelines in the following sequence:

- Gather drives with the same capacity into groups of five, four, or three. These groups become arrays associated with RAID level 5 logical drives.

- Gather pairs of drives with the same capacity together. These pairs become arrays associated with RAID 1 logical drives.

- Configure any remaining single disk drives as arrays associated with RAID 0 logical drives.

The logical drive settings will be:

Table 30. Logical Drive Settings

Parameter	Setting
Stripe size	8 KB
Write Policy	Write-through
Read Policy	Readahead
Cache Policy	Cached I/O
Spanning	Off

The write policy, read policy, and cache policy can be changed by the user after configuration is complete.

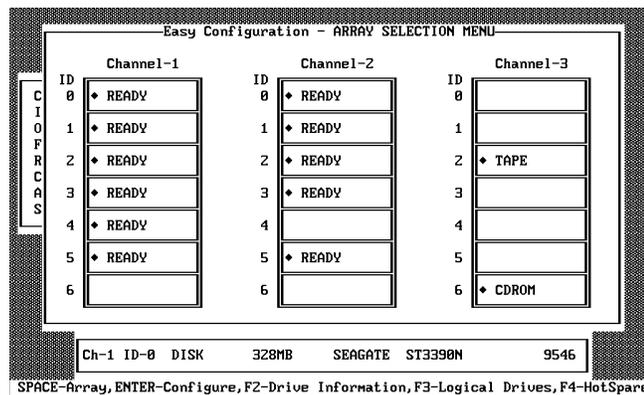Perform the following steps when using auto configuration:

1. Designate hot spares (optional, but if chosen, should be done first).
2. Choose Configure from the MegaRAID Manager main menu.
3. Choose Auto Configuration from the Configure menu and respond to the confirmation prompt.
4. The logical drives that result from Auto Configuration are displayed on the screen with a save prompt. Choose *Yes* to save the configuration.

5. If you chose *Yes* at the space prompt, initialize the logical drives. See page 84 for additional information.

Using Easy Configuration

In Easy Configuration, each array is associated with exactly one logical drive. Follow the steps below to create arrays using Easy Configuration:

1. Choose Configure from the MegaRAID Manager main menu.

2. Choose Easy Configuration from the Configure menu. The array selection menu appears:
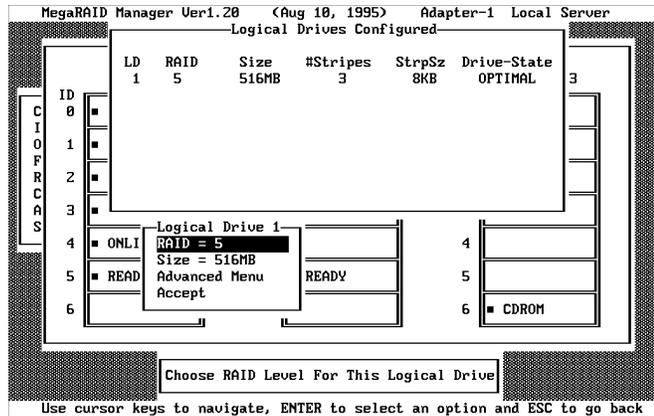
```
┌─────────────Easy Configuration - ARRAY SELECTION MENU─────────────┐
│                                                                   │
│         Channel-1            Channel-2            Channel-3        │
│     ID┌──────────┐       ID┌──────────┐       ID┌──────────┐      │
│ C   0 │♦ READY   │        0 │♦ READY   │        0 │          │     │
│ I     └──────────┘         └──────────┘         └──────────┘      │
│ O   1 │♦ READY   │        1 │♦ READY   │        1 │          │     │
│ F     └──────────┘         └──────────┘         └──────────┘      │
│ R   2 │♦ READY   │        2 │♦ READY   │        2 │♦ TAPE    │     │
│ C     └──────────┘         └──────────┘         └──────────┘      │
│ A   3 │♦ READY   │        3 │♦ READY   │        3 │          │     │
│ S     └──────────┘         └──────────┘         └──────────┘      │
│     4 │♦ READY   │        4 │          │        4 │          │     │
│       └──────────┘         └──────────┘         └──────────┘      │
│     5 │♦ READY   │        5 │♦ READY   │        5 │          │     │
│       └──────────┘         └──────────┘         └──────────┘      │
│     6 │          │        6 │          │        6 │♦ CDROM   │     │
│       └──────────┘         └──────────┘         └──────────┘      │
│                                                                   │
│    ┌──────────────────────────────────────────────────────┐      │
│    │ Ch-1 ID-0  DISK    328MB    SEAGATE ST3390N     9546  │      │
│    └──────────────────────────────────────────────────────┘      │
└───────────────────────────────────────────────────────────────────┘
 SPACE-Array,ENTER-Configure,F2-Drive Information,F3-Logical Drives,F4-HotSpare
```

3. Press the arrow keys to select specific physical drives. Press the spacebar to associate the selected physical drive with the current array. The indicator for the selected drive changes from READY to ONLIN A[*array number*]-[*drive number*]. For example, ONLIN A2-3 means disk drive 3 in array 2.

    Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.
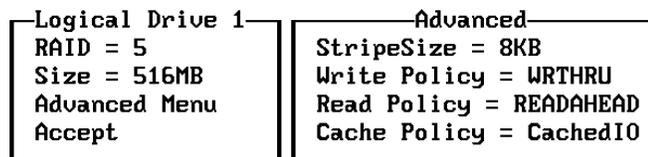
    The number of physical drives in a specific array determine the RAID levels that can be implemented with the array.

4. Press <Enter> when you are finished creating the current array. The logical drive configuration screen appears.

```
     MegaRAID Manager Ver1.20   (Aug 10, 1995)   Adapter-1  Local Server
                       Logical Drives Configured
        LD   RAID    Size    #Stripes   StrpSz   Drive-State
         1    5      516MB       3        8KB      OPTIMAL      3
    ID
C   0  ■
I
0   1  ■
F
R   2  ■
C
A   3  ■
S          Logical Drive 1
    4  ■ ONLI  RAID = 5                          4
              Size = 516MB
    5  ■ READ  Advanced Menu     READY           5
              Accept
    6                                            6  ■ CDROM

                  Choose RAID Level For This Logical Drive
    Use cursor keys to navigate, ENTER to select an option and ESC to go back
```

The window at the top of the screen shows the logical drive that is currently being configured as well as any existing logical drives. The column headings are:

- LD - The logical drive number
- RAID - The RAID level
- Size - The logical drive size
- #Stripes - The number of stripes (physical drives) in the associated physical array
- StrpSz - The stripe size
- Drive-State - The state of the logical drive

5. Set the RAID level for the logical drive. Highlight *RAID* and press <Enter>. The available RAID levels for the current logical drive are displayed. Select a RAID level and press <Enter> to confirm. See page 14 for an explanation of the RAID levels.

6. Set the stripe size, cache write policy, Read policy, and I/O (cache) policy from the Advanced Menu.

Press <Esc> to exit the Advanced Menu.

```
┌Logical Drive 1─┐ ┌────────Advanced─────────┐
│ RAID = 5       │ │ StripeSize = 8KB        │
│ Size = 516MB   │ │ Write Policy = WRTHRU   │
│ Advanced Menu  │ │ Read Policy = READAHEAD │
│ Accept         │ │ Cache Policy = CachedIO │
└────────────────┘ └─────────────────────────┘
```

Table 31. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through.
	In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
	In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting.
	Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. You can set this parameter to *Normal*, *Read-ahead,* or *Adaptive.*
	Normal specifies that the controller does not use read-ahead for the current logical drive.
	Read-ahead specifies that the controller uses read-ahead for the current logical drive. This is the default setting.
	Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive.
	Cached I/O specifies that the controller cache is used. This is the default setting.
	Direct I/O specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

7. When you are finished defining the current logical drive, select *Accept* and press <Enter>. The array selection screen appears if any unconfigured disk drives remain.

8. Repeat steps 3 through 7 to configure another array and logical drive. MegaRAID supports up to eight logical drives per controller. If you are finished configuring logical drives, press <Esc> to exit Easy Configuration. A list of the currently configured logical drives appears:

```
                                      ┌Save Configuration?┐
                                      │     YES           │
                                      │     NO            │
                                      └───────────────────┘

                    ┌─────────────Logical Drives Configured─────────────┐
                    │                                                   │
                    │  LD    RAID     Size     #Stripes    StrpSz   Drive-State │
                    │   1     5       984MB       4          8KB      OPTIMAL   │
                    │   2     5       516MB       3          8KB      OPTIMAL   │
                    │   3     1       507MB       2          8KB      OPTIMAL   │
                    │                                                   │
                    │                                                   │
                    │                                                   │
                    │                                                   │
                    └───────────────────────────────────────────────────┘
```

After you respond to the Save prompt, the Configure menu appears.

9. Initialize the logical drives you have just configured. See Initializing Logical Drives on page 84.

Using New Configuration

The New Configuration option allows you to associate logical drives with partial and/or multiple physical arrays (the latter is called spanning of arrays).

Erase Configuration Choose the New Configuration option to *erase* the existing configuration information about the selected controller.

To use the spanning feature and keep the existing configuration, use View/Add Configuration (see page 81).

1. Choose Configure from the MegaRAID Manager main menu.

2. Choose New Configuration from the Configure menu. An array selection window is displayed showing the devices connected to the current controller.

```
    MegaRAID Manager Ver1.30   (Oct 10, 1995)   Adapter-1   Local Server
┌────────────────New Configuration - ARRAY SELECTION MENU────────────────┐
│                                                                        │
│        Channel-1          Channel-2          Channel-3                 │
│   ID │               ID │               ID │                          │
│ C  0 │♦ READY          0 │♦ READY          0 │                          │
│ I    │                   │                   │                          │
│ O  1 │♦ READY          1 │♦ READY          1 │                          │
│ F    │                   │                   │                          │
│ R  2 │♦ READY          2 │♦ READY          2 │♦ TAPE                    │
│ C    │                   │                   │                          │
│ A  3 │♦ READY          3 │♦ READY          3 │                          │
│ S    │                   │                   │                          │
│    4 │♦ READY          4 │                 4 │                          │
│      │                   │                   │                          │
│    5 │♦ READY          5 │♦ READY          5 │                          │
│      │                   │                   │                          │
│    6 │                 6 │                 6 │♦ CDROM                   │
│                                                                        │
│                                                                        │
│      Ch-1 ID-0  DISK      328MB     SEAGATE  ST3390N        9546        │
└────────────────────────────────────────────────────────────────────────┘
   SPACE-Sel,ENTER-EndArray,F10-Configure,F2-Drv. Info,F3-LogDrives,F4-HotSpare
```

3. Press the arrow keys to select specific physical drives. Press the spacebar to associate the selected physical drive with the current array. The indicator for the selected drive changes from READY to ONLIN A[*array number*]-[*drive number*]. For example, ONLIN A2-3 means disk drive 3 in array 2.

    Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all the drives in the array is treated as though they have the capacity of the *smallest* drive in the array.

    The number of physical drives in a specific array determine the RAID levels that can be implemented with the array.

4. Press <Enter> when you are finished creating the current array. To continue defining arrays, repeat step 3. To begin logical drive configuration, go to step 5.

5. Press <F10> to configure logical drives. The logical drive configuration screen appears, as shown below:

```
                    ┌──────────────Logical Drives Configured───────────────┐
                    │                                                       │
                    │  LD    RAID     Size     #Stripes    StrpSz  Drive-State 3
                    │   1     5       984MB       4          8KB    OPTIMAL  │
              ID │  │                                                       │
              0  │  ■                                                       │
                 │  │                                                       │
              1  │  ■                                                       │
                 │  │                                                       │
              2  │  ■                                                       │
                 │  │                                                       │
              3  │  ■                                                       │
                 │  ┌──Logical Drive 1──┐                  ┌─────┐          │
              4  │  ■ ONLI│RAID = 5    ▓│                4 │     │          │
                 │       │Size = 984MB │                  │     │          │
              5  │  ■ READ│Advanced Menu│   READY         5 │     │          │
                 │       │Accept       │                  │     │          │
              6  │       │Span = NO    │                6 │ ■ CDROM        │
                    │    └─────────────┘                                    │
                    └───────────────────────────────────────────────────────┘
                         ┌──Choose RAID Level For This Logical Drive──┐
                         └─────────────────────────────────────────────┘
```

The window at the top of the screen shows the logical drive that is currently being configured as well as any existing logical drives. The column headings are:

*   LD - The logical drive number

*   RAID - The RAID level

*   Size - The logical drive size

*   #Stripes - The number of stripes (physical drives) in the associated physical array

- StrpSz - The stripe size
- Drive-State - The state of the logical drive

6. Set the RAID level for the logical drive. Highlight *RAID* and press <Enter>. The available RAID levels for the current logical drive are listed. Select a RAID level and press <Enter> to confirm. See page 13 for an explanation of the RAID levels.
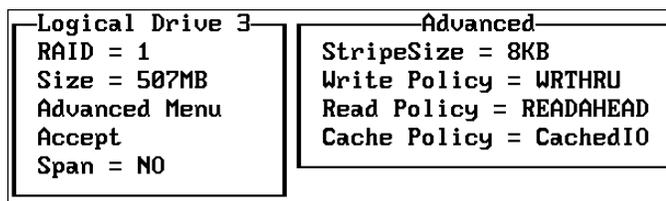
7. Set the spanning mode for the current logical drive. Highlight *Span* and press <Enter>. The choices are:

- CanSpan - Array spanning is enabled for the current logical drive. The logical drive can occupy space in more than one array.
- NoSpan - Array spanning is disabled for the current logical drive. The logical drive can occupy space in only one array.

For two arrays to be spannable, they must have the same stripe width (they must contain the same number of physical drives) and the arrays must be consecutively numbered. For example, assuming Array 2 contains four disk drives, it can be spanned only with Array 1 and/or Array 3, and only if Arrays 1 and 3 also contain four disk drives. If the two criteria for spanning are met, MegaRAID allows spanning. If the criteria are not met, the Span setting makes no difference for the current logical drive. Highlight the spanning option and press <Enter>.

- Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.
- Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.
- Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.

8. Set the logical drive size. Move the cursor to Size and press <Enter>. By default, the logical drive size is set to all available space in the array(s) being associated with the current logical drive, accounting for the *Span* setting and for partially used array space. For example, if the previous logical drive used only a part of the space in an array, the current logical drive size is set to the remaining space by default.

9. Choose the Advanced menu (see below) to set remaining options.

    Press <Esc> to exit the Advanced Menu.

```
┌─Logical Drive 1─┐   ┌──────Advanced──────┐
│ RAID = 5        │   │ StripeSize = 8KB   │
│ Size = 984MB    │   │ Write Policy = WRTHRU │
│ Advanced Menu   │   │ Read Policy = READAHEAD │
│ Accept          │   │ Cache Policy = CachedIO │
│ Span = NO       │   │                    │
└─────────────────┘   └────────────────────┘
```

Table 32. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through.
	In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
	In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting.
	Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. You can set this parameter to *Normal*, *Read-ahead,* or *Adaptive.*
	Normal specifies that the controller does not use read-ahead for the current logical drive.
	Read-ahead specifies that the controller uses read-ahead for the current logical drive. This is the default setting.
	Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive.
	Cached I/O specifies that the controller cache is used. This is the default setting.
	Direct I/O specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

10. After the current logical drive is defined, select *Accept* and press <Enter>. If space remains in the arrays, the next logical drive to be configured appears. Repeat steps 6 to 9 to configure another logical drive. If all array space has been used, a list of the existing logical drives appears. Press any key to continue and respond to the Save prompt.

11. Initialize the logical drives you have just configured. See Initializing Logical Drives on page 84.

Using View/Add Configuration

View/Add Configuration allows you to associate logical drives with partial and/or multiple physical arrays. This is called array spanning.

The existing configuration is left intact, so you can also use View/Add Configuration simply to look at the current configuration.

1. Choose Configure from the MegaRAID Manager main menu.

2. Choose View/Add Configuration from the Configure menu. An array selection window (shown below) is displayed showing the devices connected to the current controller.

```
┌─────────View/Add Configuration - ARRAY SELECTION MENU─────────┐
│                                                               │
│       Channel-1           Channel-2           Channel-3       │
│   ID                  ID                  ID                  │
│ C  0 │◆ ONLIN A1-1     0 │◆ ONLIN A1-3     0 │              │ │
│ I                                                             │
│ O  1 │◆ ONLIN A1-2     1 │◆ ONLIN A1-4     1 │              │ │
│ F                                                             │
│ R  2 │◆ ONLIN A2-1     2 │◆ READY          2 │◆ TAPE        │ │
│ C                                                             │
│ A  3 │◆ ONLIN A2-2     3 │◆ READY          3 │              │ │
│ S                                                             │
│    4 │◆ ONLIN A2-3     4 │                 4 │              │ │
│                                                               │
│    5 │◆ READY          5 │◆ READY          5 │              │ │
│                                                               │
│    6 │                 6 │                 6 │◆ CDROM       │ │
│                                                               │
│   Ch-1 ID-5  DISK    507MB    FUJITSU  M2684S-512     2036   │
└───────────────────────────────────────────────────────────────┘
SPACE-Sel,ENTER-EndArray,F10-Configure,F2-Drv. Info,F3-LogDrives,F4-HotSpare
```
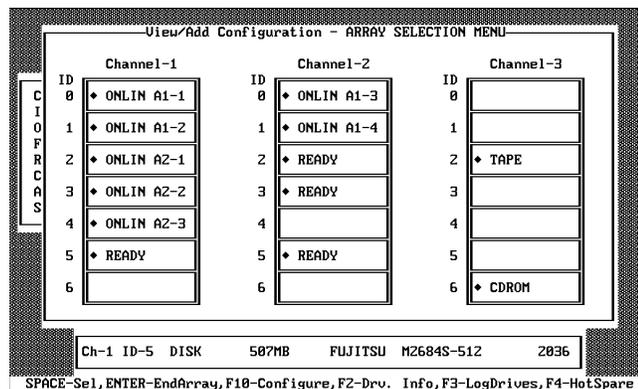
3. Press the arrow keys to select the physical drives. Press the spacebar to select physical drives to be associated with the current array. The indicator for the selected drive changes from READY to ONLIN A[*array number*]-[*drive number*]. For example, ONLIN A2-3 means disk drive 3 in array 2.

   Add physical drives to the current array as desired. Try to use drives of the same capacity in a specific array. If you use drives with different capacities in an array, all drives in the array are treated as if they have the capacity of the *smallest* drive in the array.

   The number of physical drives in a specific array determine the RAID levels that can be implemented with the array.

4. Press <Enter> to end the selection process. To continue defining arrays, repeat step 3. To begin logical drive configuration, go to step 5.

5. Press <F10> to configure logical drives. The logical drive configuration screen appears:

```
                         ┌─Logical Drives Configured─┐
                         │                           │
          ┌──────┐       │ LD   RAID    Size  #Stripes  StrpSz  Drive-State   │  3
          │      │       │  1    5     984MB      4       8KB    OPTIMAL       │
      ID  │      ├──┐    │  2    5     516MB      3       8KB    OPTIMAL       │
       0  │    ■ │  │    │  3    1     507MB      2       8KB    OPTIMAL       │
          │      │  │    │                                                    │
       1  │    ■ │  │    │                                                    │
          │      │  │    │                                                    │
       2  │    ■ │  │    │                                                    │
          │      │  │    │                                                    │
       3  │    ■ │  │    └────────────────────────────────────────────┘
          │      │  │   ┌─Logical Drive 3─┐
       4  │ ■ ONLI│   │ RAID = 1        ■ │                 4  │              │
          │      │  │   │ Size = 507MB    │                    │              │
       5  │ ■ ONLI│   │ Advanced Menu   │  │ ONLIN A3-2 │      5  │           │
          │      │  │   │ Accept          │                    │              │
       6  │      │  │   │ Span = NO       │                 6  │ ■ CDROM      │
          └──────┘      └─────────────────┘                   └──────────────┘

                    ┌───────────────────────────────────────────┐
                    │ Choose RAID Level For This Logical Drive   │
                    └───────────────────────────────────────────┘
```

The window at the top of the screen shows the logical drive that is currently being configured as well as any existing logical drives. The column headings are:

- LD - The logical drive number
- RAID - The RAID level
- Size - The logical drive size
- #Stripes - The number of stripes (physical drives) in the associated physical array
- StrpSz - The stripe size
- Drive-State - The state of the logical drive

6. Set the RAID level for the logical drive. Highlight *RAID* and press <Enter>. The available RAID levels for the current logical drive are displayed. Select a RAID level and press <Enter> to confirm. See page 13 for an explanation of the RAID levels.

7. Set the spanning mode for the current logical drive. Highlight *Span* and press <Enter>. The choices are:

- CanSpan - Array spanning is enabled for the current logical drive. The drive can occupy space in more than one array.
- NoSpan - Array spanning is disabled for the current logical drive. The drive can occupy space in only one array.

For two arrays to be spannable, they must have the same stripe width (they must contain the same number of physical drives) and must be consecutively numbered. For example, assuming Array 2 contains four disk drives, it can be spanned only with Array 1 and/or Array 3, and only if Arrays 1 and 3 also contain four disk drives. If the two criteria for spanning are not met, the *Span* setting makes no difference for the current logical drive. Highlight a spanning option and press <Enter>.

- Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.
- Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.
- Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.

8. Set the logical drive size. Move the cursor to *Size* and press <Enter>. By default, the logical drive size is set to all available space in the array(s) being associated with the current logical drive, accounting for the *Span* setting and for partially used array space. For example: if the previous logical drive used only a part of the space in an array, the current logical drive size is set to the remaining space by default.

9. Open the Advanced menu to set the remaining options.

    Press <Esc> to exit the Advanced Menu.

```
┌─Logical Drive 3─┐   ┌──────Advanced──────┐
│ RAID = 1        │   │ StripeSize = 8KB   │
│ Size = 507MB    │   │ Write Policy = WRTHRU│
│ Advanced Menu   │   │ Read Policy = READAHEAD│
│ Accept          │   │ Cache Policy = CachedIO│
│ Span = NO       │   └────────────────────┘
└─────────────────┘
```

Table 33. Advanced Menu Options

Option	Description
Stripe size	This parameter specifies the size of the segments written to each disk in a RAID 0, 3, or 5 logical drive. You can set the stripe size to 1 KB, 2 KB, 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size produces better read performance, especially if your computer does mostly sequential reads. If you are sure that your computer does random read requests more often, choose a small stripe size. The default is 8 KB.
Write Policy	This option sets the caching method to write-back or write-through.
	In *Write-back caching,* the controller sends a data transfer completion signal to the host when the controller cache has received all the data in a transaction.
	In *Write-through caching,* the controller sends a data transfer completion signal to the host when the disk subsystem has received all the data in a transaction. This is the default setting.
	Write-through caching has a data security advantage over write-back caching. Write-back caching has a performance advantage over write-through caching. *Do not use write-back for any logical drive that is to be used as a Novell NetWare volume.*
Read-ahead	This option enables the SCSI read-ahead feature for the logical drive. You can set this parameter to *Normal*, *Read-ahead,* or *Adaptive.*
	Normal specifies that the controller does not use read-ahead for the current logical drive.
	Read-ahead specifies that the controller uses read-ahead for the current logical drive. This is the default setting.
	Adaptive specifies that the controller begins using read-ahead if the two most recent disk accesses occurred in sequential sectors. If all read requests are random, the algorithm reverts to Normal, however, all requests are still evaluated for possible sequential operation.
Cache Policy	This parameter enables the controller cache during data transfers involving the selected logical drive.
	Cached I/O specifies that the controller cache is used. This is the default setting.
	Direct I/O specifies that the controller cache is not used. Direct I/O does not override the cache policy settings. Data is transferred to cache and the host concurrently. If the same data block is read again, it comes from cache memory.

10. When you are finished defining the current logical drive, select Accept and press <Enter>. If space remains in the arrays, the next logical drive to be configured appears. Repeat steps 6 to 9 to configure another logical drive. If the array space is used, a list of the existing logical drives appears. Press any key to continue. Respond to the Save prompt.

11. Initialize the logical drives you have just configured. See Initializing Logical Drives.

Initializing Logical Drives

You should initialize each new logical drive you configure. You can initialize the logical drives in two ways:

- Batch Initialization - The Initialize option in the main menu lets you initialize up to eight logical drives simultaneously.

- Individual Initialization - The Objects/Logical Drive action menu for an individual logical drive has an Initialize option.

Batch Initialization

1. Choose Initialize from the MegaRAID Manager main menu. A list of the current logical drives appears, as shown below:

```
┌─Management Menu─┐ ┌─────────────────Logical Drives Configured─────────────────┐
│ Configure       │                                                               
│ Initialize      │  LD   RAID    Size     #Stripes    StrpSz   Drive-State       
│ Objects         │  1    5       984MB    4           8KB      OPTIMAL           
│ Format          │  2    5       516MB    3           8KB      OPTIMAL           
│ Rebuild         │  3    1       507MB    2           8KB      OPTIMAL           
│─Logical Drives──│                                                               
│ Logical Drive 1 │                                                               
│ Logical Drive 2 │                                                               
│ Logical Drive 3 │                                                               
└─────────────────┘ └───────────────────────────────────────────────────────────┘
```

2. Press the arrow keys to select all drives to be initialized. Press the spacebar to select the selected logical drive for initialization. Press <F2> to select or deselect all the logical drives.

3. When you have selected the logical drives, press <F10> and choose *Yes* at the confirmation prompt. The progress of the initialization for each drive is shown in bar graph format.

```
┌────────────────Initialize Logical Drive Progress────────────────┐
│                      ┌─────Initialize-1─────┐                     │
│                      │███████     11%       │                     │
│                      └──────────────────────┘                     │
│                      ┌─────Initialize-2─────┐                     │
│                      │███████     11%       │                     │
│                      └──────────────────────┘                     │
│                      ┌─────Initialize-3─────┐                     │
│                      │███████     11%       │                     │
│                      └──────────────────────┘                     │
└─────────────────────────────────────────────────────────────────┘
```
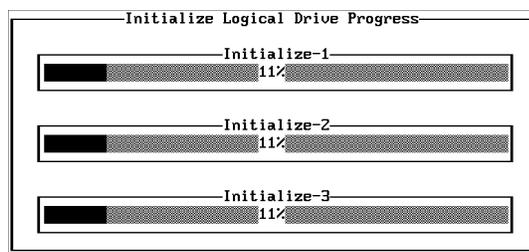
4. When initialization is complete, press any key to continue.

5. Press <Esc> to display the main menu.

Individual Initialization

1. Choose the Objects option from the MegaRAID Manager main menu. Choose the Logical Drive option from the Objects menu, shown below:
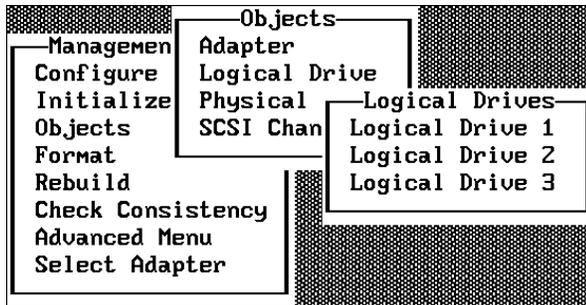
2. Select the logical drive to be initialized. The following appears:
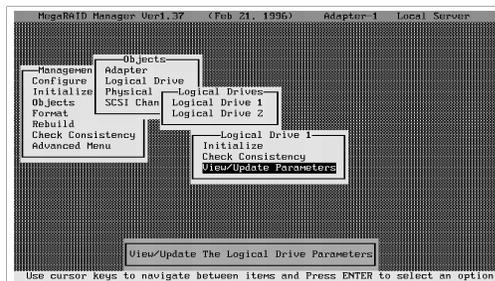
3. Choose Initialize from the Action menu. The progress of the initialization appears as a graph on the screen.

4. When initialization completes, press any key to display the previous menu.

Using Logical Drives in the Operating System

For information on an operating system other than DOS, see the software manual for that operating system. To use the logical drive(s) in DOS:

1. Exit MegaRAID Manager and reboot the computer.

2. Run DOS FDISK and configure one or more partitions using the logical drives.

3. Format the partitions with the FORMAT command.

Formatting Physical Drives

You can do low-level formatting of SCSI drives using MegaRAID Manager.

Since most SCSI disk drives are low-level formatted at the factory, this step is usually not necessary. You typically must format a disk if:

- the disk drive was not low-level formatted at the factory, or
- an excessive number of media errors have been detected on the disk drive.

Check the properties screen for the drive you wish to format. You can check this screen by choosing Objects from the Physical Drive menu, pressing the arrow keys to select the selected drive and pressing <F2>.

The error count appears at the bottom of the properties screen. If you feel that the number of errors is excessive, you should probably format the disk drive. If more than 32 media errors were detected, MegaRAID automatically puts the drive in FAIL state. In cases such as this, formatting the drive can clear up the problem.

You do not have to use the Format option to erase existing information on your SCSI disks, such as a DOS partition. That information is erased when you initialize logical drives.

You can format the physical drives using:

- Batch Formatting - The Format option in the MegaRAID Manager main menu lets you format up to eight disk drives simultaneously.

- Individual Formatting - Choose the Format option from Objects on the Physical Drive action menu for an individual disk drive.

Batch Formatting

1. Choose Format from the MegaRAID Manager main menu. A device selection window is displayed showing the devices connected to the current controller, as shown below:

```
MegaRAID Manager Ver1.20    (Aug 10, 1995)    Adapter-1  Local Server
┌──────────────────Format - PHYSICAL DRIVES SELECTION MENU──────────────────┐
│         Channel-1              Channel-2              Channel-3            │
│    ID                     ID                     ID                        │
│  C  0 ┃ ◆ READY ┃       0 ┃ ◆ READY ┃       0 ┃         ┃                │
│  I                                                                        │
│  O  1 ┃ ◆ READY ┃       1 ┃ ◆ READY ┃       1 ┃         ┃                │
│  F                                                                        │
│  R  2 ┃ ◆ READY ┃       2 ┃ ◆ READY ┃       2 ┃ ◆ TAPE  ┃                │
│  C                                                                        │
│  A  3 ┃ ◆ READY ┃       3 ┃ ◆ READY ┃       3 ┃         ┃                │
│  S                                                                        │
│     4 ┃ ◆ READY ┃       4 ┃         ┃       4 ┃         ┃                │
│                                                                           │
│     5 ┃ ◆ READY ┃       5 ┃ ◆ READY ┃       5 ┃         ┃                │
│                                                                           │
│     6 ┃         ┃       6 ┃         ┃       6 ┃ ◆ CDROM ┃                │
│                                                                           │
│    Ch-1 ID-0  DISK      328MB      SEAGATE  ST3390N        9546           │
└───────────────────────────────────────────────────────────────────────────┘
SPACE-(De)Sel, F10-Start Format, F2-Drive Information,  F3-View Logical Drives
```
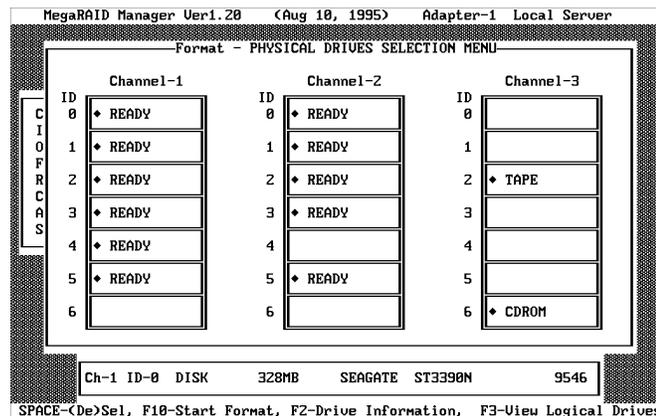
2. Press the arrow keys to select all drives to be formatted. Press the spacebar to select the selected physical drive for formatting. The indicators for selected drives flashes.

3. When you have selected the physical drives, press <F10> and choose *Yes* to the confirmation prompt to begin formatting. The indicators for the selected drives changes to FRMT[*number*], where *number* reflects the drive selection order. Formatting can take some time, depending on the number of drives you have selected and the drive capacities.

4. When initialization is complete, press any key to continue.

5. Press <Esc> to display the main menu.

Individual Formatting

1. Choose the Objects option from the MegaRAID Manager main menu. Choose the Physical Drive option from the Objects menu. A device selection window is displayed showing the devices connected to the current controller, as shown below:

```
┌──────────Objects - PHYSICAL DRIVE SELECTION MENU──────────┐
│                                                            │
│        Channel-1            Channel-2            Channel-3 │
│    ID┌──────────┐       ID┌──────────┐       ID┌──────────┐│
│  C 0 │♦ READY   │       0 │♦ READY   │       0 │          ││
│  I   ├──────────┤         ├──────────┤         ├──────────┤│
│  O 1 │♦ READY   │       1 │♦ READY   │       1 │          ││
│  F   ├──────────┤         ├──────────┤         ├──────────┤│
│  R 2 │♦ READY   │       2 │♦ READY   │       2 │♦ TAPE    ││
│  C   ├──────────┤         ├──────────┤         ├──────────┤│
│  A 3 │♦ READY   │       3 │♦ READY   │       3 │          ││
│  S   ├──────────┤         ├──────────┤         ├──────────┤│
│    4 │♦ READY   │       4 │          │       4 │          ││
│      ├──────────┤         ├──────────┤         ├──────────┤│
│    5 │♦ READY   │       5 │♦ READY   │       5 │          ││
│      ├──────────┤         ├──────────┤         ├──────────┤│
│    6 │          │       6 │          │       6 │♦ CDROM   ││
│      └──────────┘         └──────────┘         └──────────┘│
│                                                            │
│   ┌────────────────────────────────────────────────────┐  │
│   │ Ch-1 ID-0  DISK    328MB    SEAGATE  ST3390N   9546 │  │
│   └────────────────────────────────────────────────────┘  │
│  ENTER-Drive Object Menu, F2-Drive Information, F3-View Logical Drives │
└────────────────────────────────────────────────────────────┘
```

2. Press the arrow keys to select the physical drive to be formatted and press <Enter>. The following action menu appears:

```
┌──Channel-2, Target-3──┐
│ Rebuild               │
│ Format                │
│ Make Online           │
│ Fail Drive            │
│ Make HotSpare         │
│ View Drive Information │
│ View Rebuild Progress │
└───────────────────────┘
```

3. Choose the Format option from the action menu and respond to the confirmation prompt. Formatting can take some time, depending on the drive capacity.

4. When formatting completes, press any key to display the previous menu.

Rebuilding Failed Disk Drives

If a disk drive fails in an array that is configured as a RAID 1, 3, or 5 logical drive, you can recover the lost data by rebuilding the drive.

Automatic Rebuild

If you have configured hot spares, MegaRAID automatically tries to use them to rebuild failed disks. Display the Objects/Physical Drive screen while a rebuild is in progress. The drive indicator for the hot spare disk drive has changed to REBLD A[*array number*]-[*drive number*], indicating the disk drive being replaced by the hot spare.

Manual Rebuild

Manual rebuild is necessary if no hot spares with enough capacity to rebuild the failed drives are available. Select the MegaRAID Manager main menu Rebuild option or the Rebuild option on the Objects/Physical Drive menu.

Manual Rebuild – Rebuilding an Individual Drive

1. Choose the Objects option from the MegaRAID Manager main menu. Choose Physical Drive from the Objects menu. A device selection window is displayed showing the devices connected to the current controller:

```
┌─────────────────Objects - PHYSICAL DRIVE SELECTION MENU─────────────────┐
│                                                                          │
│          Channel-1              Channel-2              Channel-3          │
│    ID                     ID                     ID                       │
│  C  0 │♦ READY │         0 │♦ READY │         0 │        │                │
│  I                                                                        │
│  O  1 │♦ READY │         1 │♦ READY │         1 │        │                │
│  F                                                                        │
│  R  2 │♦ READY │         2 │♦ READY │         2 │♦ TAPE  │                │
│  C                                                                        │
│  A  3 │♦ READY │         3 │♦ READY │         3 │        │                │
│  S                                                                        │
│     4 │♦ READY │         4 │        │         4 │        │                │
│                                                                          │
│     5 │♦ READY │         5 │♦ READY │         5 │        │                │
│                                                                          │
│     6 │        │         6 │        │         6 │♦ CDROM │                │
│                                                                          │
│                                                                          │
│     Ch-1 ID-0  DISK     328MB      SEAGATE  ST3390N        9546           │
│   ENTER-Drive Object Menu, F2-Drive Information,  F3-View Logical Drives  │
└──────────────────────────────────────────────────────────────────────────┘
```

2. Press the arrow keys to select the physical drive to be rebuilt and press <Enter>. The following action menu appears:

```
┌──Channel-2, Target-3──┐
│  Rebuild              │
│  Format              │
│  Make Online         │
│  Fail Drive          │
│  Make HotSpare       │
│  View Drive Information│
│  View Rebuild Progress│
└──────────────────────┘
```

3. Choose the Rebuild option from the action menu and respond to the confirmation prompt. Rebuilding can take some time, depending on the drive capacity.

4. When rebuild completes, press any key to display the previous menu.

Manual Rebuild – Batch Mode

1. Choose Rebuild from the MegaRAID Manager main menu. A device selection window is displayed showing the devices connected to the current controller. The failed drives have FAIL indicators.

2. Press the arrow keys to select all drives to be rebuilt. Press the spacebar to select the selected physical drive for rebuild.

3. After selecting the physical drives, press <F10> and type Yes at the confirmation prompt. The indicators for the selected drives changes to *REBLD*. Rebuilding can take some time, depending on the number of drives you have selected and their capacities.

4. When rebuild is complete, press any key to continue.
5. Press <Esc> to display the main menu.

Exiting MegaRAID Manager

To exit MegaRAID Manager, press <Esc> at the main menu and choose *Yes* at the prompt. A message appears if uninitialized logical drives remain in the system.

6 Power Console

Overview

Power Console is an object-oriented GUI utility that configures and monitors RAID systems locally or over a network with several servers. Power Console can be executed from any workstation. Power Console allows you to control and monitor the status of hard disk drives, tape drives, and CD-ROM drives. Power Console runs under Microsoft Windows, Windows 95, and Windows NT.

⟹ **NOTE**

Windows NT Users - If you have more than one MegaRAID controller in a host system, make sure at least one logical drive is configured on every MegaRAID controller in the host system before you access these controllers from Power Console in Windows NT. You can set up these logical drives using BIOS Setup (see chapter 4).

Installing Power Console

Insert the MegaRAID Installation diskette in floppy drive A: (or B:). From the DOS prompt, type

A:(or B):SETUP

and press <Enter>. Follow the instructions on the screen to install the Power Console utility.

Running Power Console

Double-click on the Power Console icon from the MegaRAID program group on the Windows screen. The following appears:
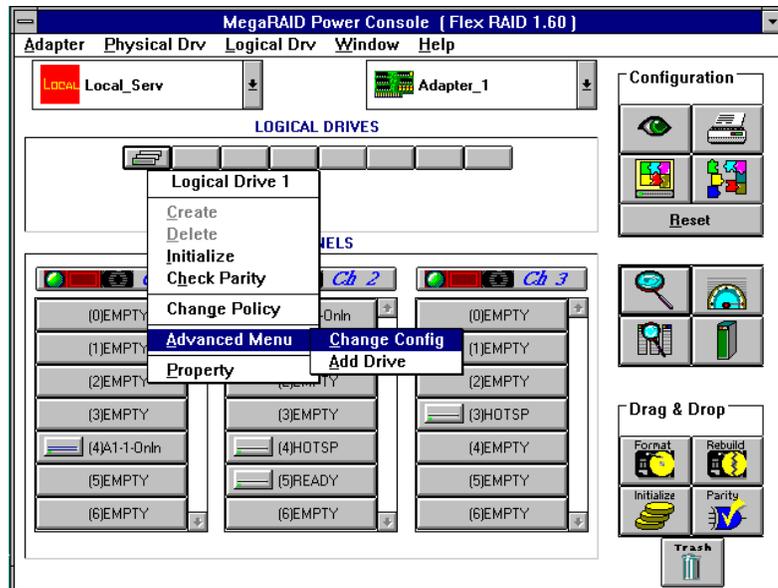
Power Console Icons

Power Console includes several toolbox icons at the top of the screen. These buttons provide easy access to Power Console features. You can remove the toolbox from the screen by clicking on Hide Toolbox in the Adapter menu. The buttons are described below.

The Display Configuration icon is shown to the left. Click on this icon to display the current RAID system configuration, for example:

Raid System Configuration

Server : Local_Serv   Adapter : Adapter_1

```
Number Of Logical Drives: 1.

Logical Drive 1
State            : Dead
RAID TYPE        : 0
Write Policy     : Write Back
Read Policy      : Read Ahead
Cache Policy     : Caching I/O
Stripe Size      : 64K Bytes
No. of Stripes   : 2
Size             : 4098MB
Component Physical Drives :

RANK 0
      CHANNEL : 1, TARGET : 0
      CHANNEL : 2, TARGET : 0
```

✓ **Ok**
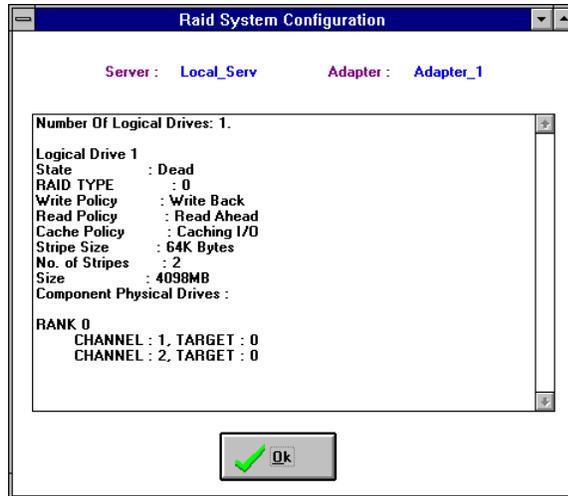
The print icon is shown to the left. Click on this icon to print the current configuration.

The auto configuration icon is shown to the left. Click on this icon to allow MegaRAID to automatically configure the RAID subsystem.

The custom configuration icon is shown to the left. Click on this icon to allow MegaRAID to automatically configure the RAID subsystem.

Reset

The reset button is shown to the left. Click on this icon to clear the RAID configuration on the currently selected controller. A confirmation screen will appear:

MegaRAID Power Console

Reset will destroy the currently selected adapter logical drive configuration.

Do you really want to Reset Configuration ?

✓ **Ok**   ✗ **Cancel**
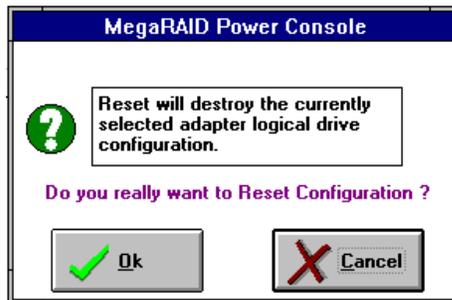
Click on OK in the confirmation screen when it appears to reset the configuration.

The display log icon is shown to the left. Click here to display a list of MegaRAID activities.

The rebuild rate icon is shown to the left. Click on this icon to set the RAID rebuild drive rate.

The rescan icon is shown to the left. When you click on this icon, the currently selected MegaRAID controller rescans its SCSI channels to make sure that all drive configuration information is current.

The enclosure management icon is shown to the left. Click on this icon to display the enclosure management screen. Enclosure management displays the drive temperature, drive fan status, and other information.

The hard disk drive format icon is shown to the left. Drag the drive icon that represents the physical drive to be formatted to this icon to format the selected drive.

The rebuild disk icon is shown to the left. Drag the drive icon that represents the drive to be rebuilt to this icon to rebuild the selected drive.

The initialize logical drive icon is shown to the left. Drag the logical drive icon that represents the drive to be initialized to this icon.

If you have inadvertently reset your configuration, you can recover it by immediately re-configuring the physical drives involves into the EXACT same array and logical drive structure in which they had been, and by saving the configuration *without* initializing.

The logical drive parity check icon is shown to the left. Drag the logical drive icon to this icon.

The change RAID level icon is shown to the left. Drag the drive icon that represents the drive to be changed to this icon.

Logical Drives

The logical drive icons are shown above. You can select one or more logical drive icons to group drives into RAID arrays. The button on the logical drive icon indicates its status. With the cursor over a configured logical drive, right-click the mouse for a pull-down menu of action options for that logical drive

Channels

The channel icon consists of a stack of drive icons. Each drive on the SCSI channel is represented by a disk, CD-ROM, or tape icon. With the cursor over one of the channel bars, click the right mouse button to display a list of actions that can be applied to that channel, as shown below:
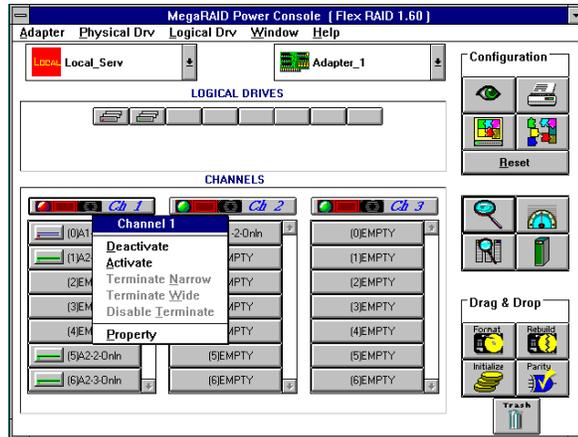
The "Deactivate" option only lasts for 60 seconds when invoked.

The channel indicator light on each channel icon indicates the status of that channel:

Table 34. Channel Indicator Lights

Color	Meaning
Green	The drives in the channel are operating normally.
Yellow	One or more logical drives are degraded.
Red	Failed logical drive.

Power Console Menu Bar

Table 35. Power Console Menu Bar Options

Option	Description
Adapter	Choose this option for adapter-related functions. You can configure logical drives, enable the speaker, toggle object identification, invoke the performance monitor, and display the toolbar by selecting an item from this menu.
Physical Drv	Choose this option to rebuild, format, and display the properties of the physical drives.
Logical Drv	Choose this option to create, delete, initialize, display the properties of, and check parity of logical drives.
Window	Choose this option to view the progress of a disk rebuild, diagnostic, initialization, parity check, reconstruction or to view the performance monitor.
Help	Choose this to display information on Power Console.

Power Console Adapter Menu

The options on the Power Console Adapter menu are described below. The Power Console Adapter menu is shown on the following page.

Table 36. Adapter Menu Options

Option	Description
Configuration	Select this option to configure or reconfigure RAID arrays and drives.
Flush Cache	Select this option to force the MegaRAID controller to send the contents of cache memory to the logical drives.
View Log	Select this option to display an event log.
Diagnostics	This option is not yet implemented.
Firmware Download	This option is not yet implemented.
Enclosure Management	Select this option to manage the drives in each physical RAID drive cabinet. A picture of a RAID enclosure is displayed. The actual real-time state of each RAID channel is displayed. You can monitor the addition and removal of devices in the enclosure online.
Properties	Select this option to display the adapter properties, including the firmware and BIOS versions, the rebuild rate, and cache memory size.
Hide/Show Toolbox	Select this option to display the toolbox if it is not displayed on the Power Console screen, or to remove the toolbox from the screen if it is already displayed.
Performance Monitor On/Off	Select this option to display a graphical representation of the performance of a logical drive. You can select a bar graph or a line graph.
Object Identification On/Off	Select this option to turn the Object Identification feature on if it is not already on. Select this option to turn it off it is on. Object identification is a Power Console feature that identifies all objects displayed on the screen.
Enable/Disable Sound	Select this option to enable or disable the onboard speaker. To silence the speaker when it is activated, you must choose Disable Sound *and* Disable Alarm.
Enable/Disable Alarm	Select this option to enable or disable the system alarm when a drive failure occurs.
Exit	Select this option to quit Power Console. You cannot exit if disk operations are ongoing. *New configurations are not saved unless the Save Configuration option was selected.*

Configuration Pop-up Menu

Choose Configuration from the Adapter menu to configure RAID arrays and logical drives. The following screen appears:
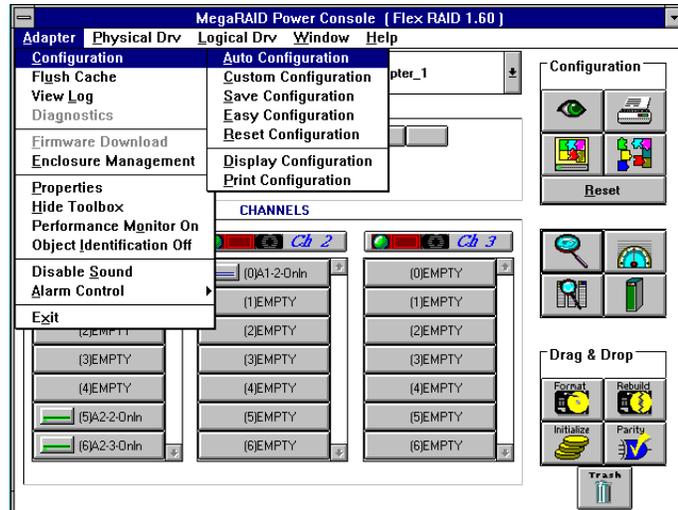
Auto Configuration

Select this option to automatically configure RAID arrays and logical drives. This option generates the simplest RAID configuration possible with the current physical drives attached to the selected adapter. Auto configuration:

1. Attempts to gather physical drives of the same size into groups of five.
2. Attempts to gather the remaining drives into groups with up to three drives per group.
3. Groups the remaining drives into groups of two drives each and single drives.
4. Combines each group of three or more drives into a RAID 5 logical drive.
5. Combines each group of two drives into a RAID 1 logical drive.
6. Designates single physical drives as RAID 0 logical drives.

The drive configuration that results from auto configuration is displayed. Select OK to program this configuration in the MegaRAID firmware. All new configurations are added to existing configurations. Any existing logical drive configuration is not changed.

Custom Configuration

Select this option to delete existing configuration information and configure new arrays and logical drives into different groups. You can perform logical drive configuration functions and associate logical drives with multiple or partial arrays. You must first create an array. Arrays are groups of physical drives that define the stripe width common to one RAID type. Arrays are combined into logical drives. Logical drives can be created out of part of an array or can be a combination of several arrays if the arrays have the same properties.

Save Configuration

Select this option to save the new RAID drive configuration.

Easy Configuration

With this option, each array you create is automatically treated as exactly one logical drive. The Create Logical Drive screen (see below) appears when you select this option. Select the physical drives that will make up the logical drive. Select the RAID type, stripe size, and write policy.

Configuring RAID 10, RAID 30, or RAID 50 Logical Drives

Configure RAID 10 by spanning two contiguous RAID 1 logical drives. The RAID 1 logical drives must have the same stripe size.

Configure RAID 30 by spanning two contiguous RAID 3 logical drives. The RAID 3 logical drives must have the same stripe size.

Configure RAID 50 by spanning two contiguous RAID 5 logical drives. The RAID 5 logical drives must have the same stripe size.
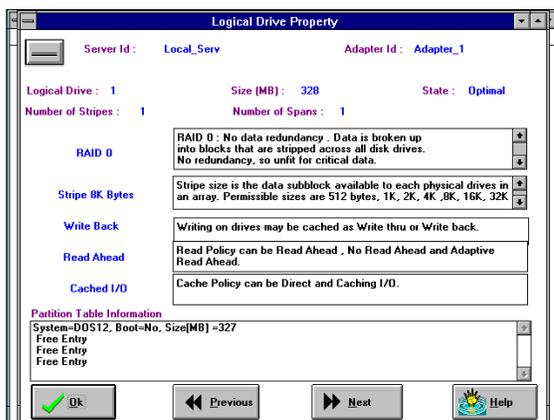
Reset Configuration

Select this option to erase the current configuration information from the MegaRAID controller non-volatile memory. The current RAID configuration becomes invalid after you select this option.

⚠ CAUTION

Use this option carefully. This option should be used only when configuring a new system.

Display Configuration

Select this method to display the configuration. You can also display other arrays and logical drives.

Print Configuration

Select this option to print the current RAID drive configuration.

Flush Cache

If the MegaRAID system must be powered down rapidly, you must flush the contents of the cache memory to preserve data integrity.

View Log

Select this option to display the MegaRAID event log.

Enclosure Management

Select this option to manage the physical drives in the RAID drive cabinets. Each enclosure
displays the status of the physical drives in the enclosure. You can remove and insert hard drives.
A red light on a drive indicates a failed channel or drive. Green indicates optimal conditions.
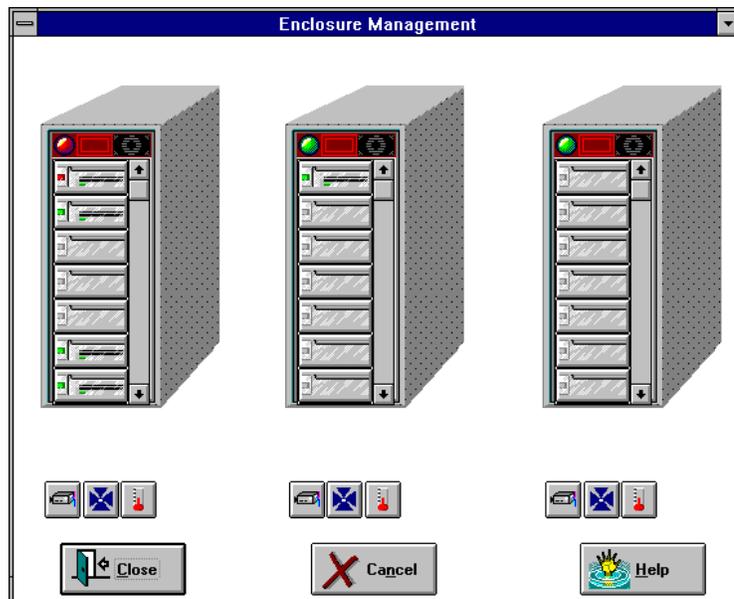
Click on any device displayed on the enclosure management screen to display device information, as shown below:

Properties

Select this option to display the adapter properties. A screen like the following appears:
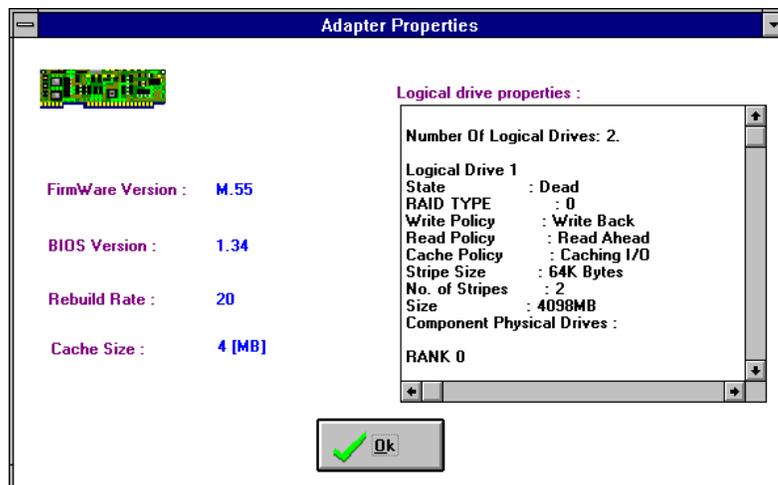
Performance Monitor

Click the left mouse button on a drive icon and select Performance Monitor to display a graphic representation of drive performance. A sample Performance Monitor screen follows. You can choose different logical drives, the type of graph, and the screen arrangement from the Performance Monitor menus.
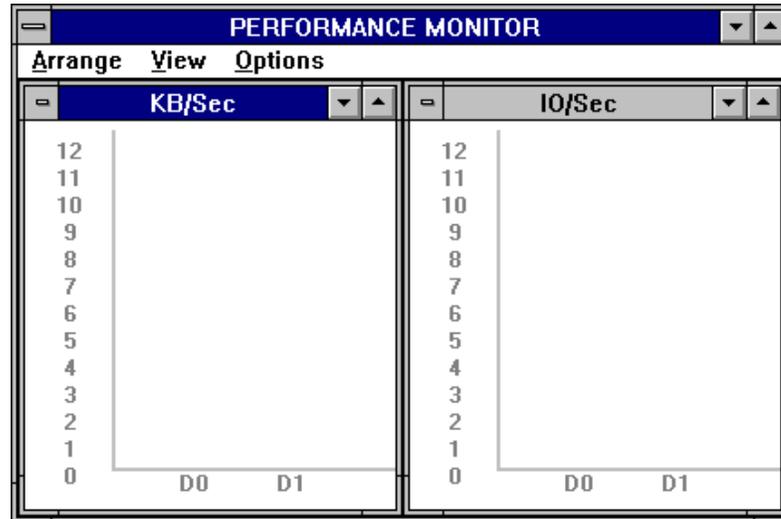
Object Identification

Select this item to turn the object identification feature ("bubble help") on or off. This feature identifies icons in the Power Console screens.

Enable/Disable Sound

Choose this option to enable or disable the onboard tone generator. To silence a sounding alarm, choose Disable Sound *and* Disable Alarm.

Enable/Disable Alarm

Choose this option to enable or disable the audible alarms and warnings.

Exit

Choose this item to leave Power Console.

Power Console Physical Drive Menu

The Power Console Physical Drive menu is shown below:
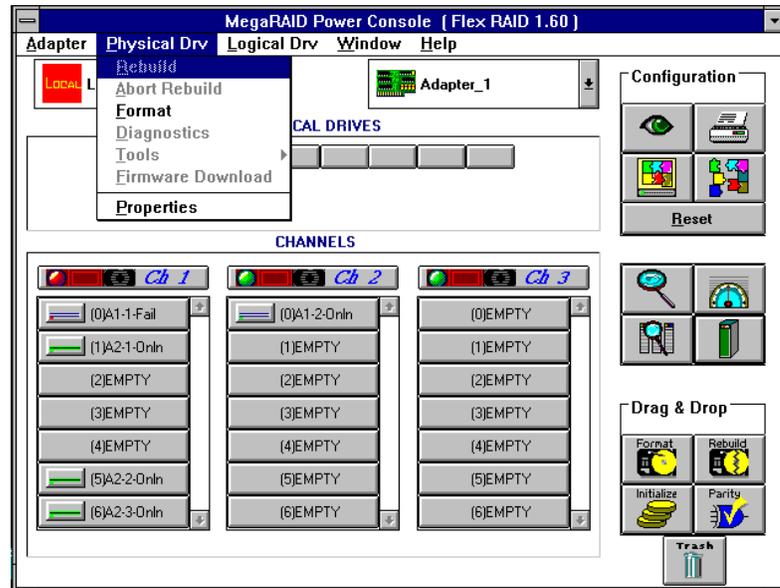
Rebuild

Choose the Rebuild option from the Power Console main menu to rebuild one or more failed disk drives. Select *Abort Rebuild* to stop the rebuild process at any time. The drive will revert to its original status before the rebuild began.

A RAID 1, 3, or 5 configuration has built-in redundancy. If a drive in a RAID group fails, the RAID subsystem continues to work but no additional redundancy is provided. Another drive failure will bring the system down. But the failed drive can be replaced and added into the RAID system by rebuilding the drive. Select Rebuild to perform this function. The rebuild process can take place while the RAID system is still running, although performance may be slightly affected.

Format

This option low-level formats one or more physical drives. A physical drive can be formatted if it is not part of a configuration and is in a Ready state. Since most SCSI drives are factory formatted, do this only if the drive:

- was not low-level formatted at the factory, or
- has an excessive number of media errors.

Do not use Format to erase information or partitions on a SCSI drive. That information is erased when you initialize the logical drive(s).
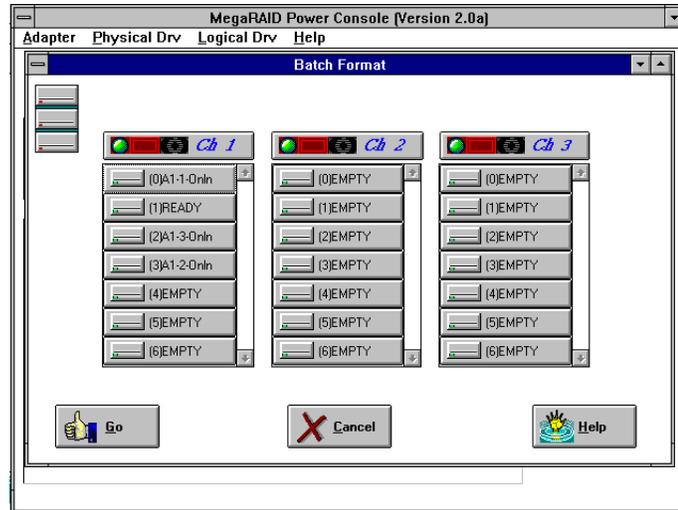
Diagnostics

This option is not yet implemented.

Tools

Choose this option to fail a drive, make a hot spare, enable narrow SCSI, enable wide SCSI, and perform other actions.

Firmware Download

This option is not yet implemented.

Properties

Choose this option to display drive properties.

Designating Drives as Hot Spares

Hot spares are physical drives that are powered up along with the RAID drives and usually are placed in a standby state.

Hot spares can be used for RAID levels 0, 1, 3 and 5. To make a drive a hot spare, more than one logical drive must be configured. Click on the drive icon of the drive to be made the hot spare. Select *Tools* from the menu. Select Make HotSpare from the Tools submenu.

⟹ **NOTE**

The drive to be made a hot spare must have a the same or a greater capacity than the other drives in the RAID array.
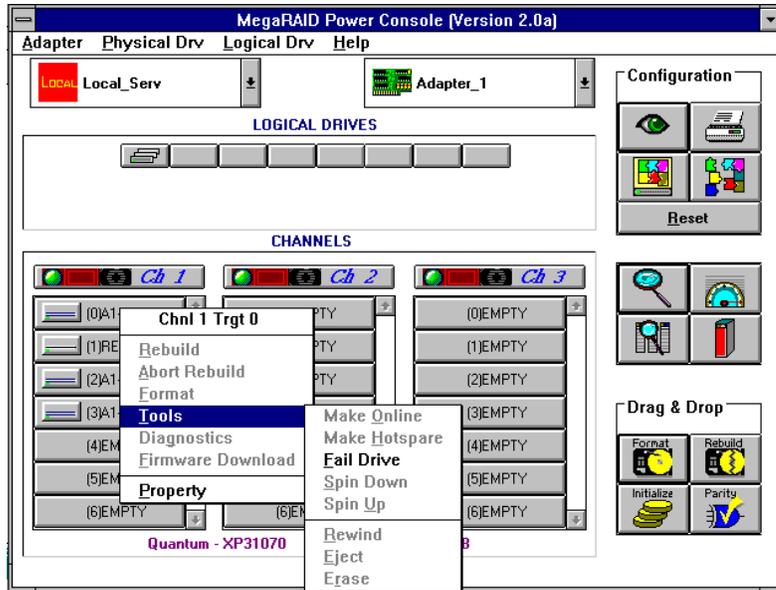
Power Console Logical Drive Menu

The Logical Drive Menu is shown below:
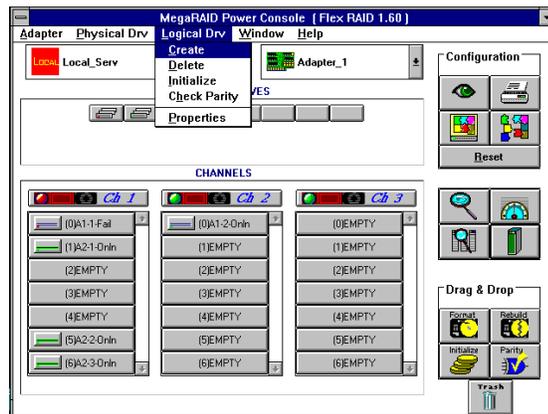
Create Array

Choose the Create option to create arrays. A screen such as the following appears. You can select the RAID type, stripe size, write policy, read policy, and cache policy.
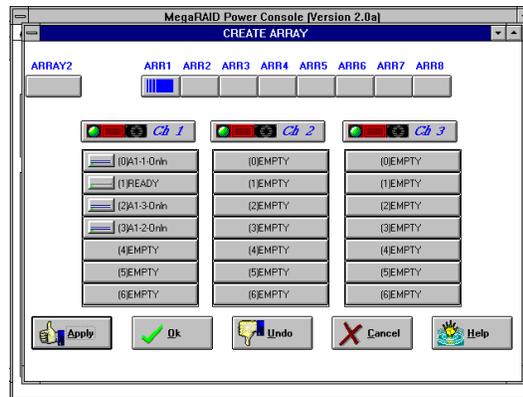
Select the array to be created by clicking on ARR1 - ARR8 at the top of the screen. Select the drives to be included in the array by clicking on the device icons displayed in the middle of the screen. You can include SCSI devices from more than one channel in the new array.

Physical Drive Type

When you select the icon for a SCSI device from the SCSI channels display in the middle of the above screen, the drive type and the capacity of the selected drive is displayed at the bottom of the screen.

Array Properties

Click on Apply to configure the new array. Verify that the appropriate drives are included in the array and click on OK. You must also initialize these drives.

Delete

Choose this option to remove a RAID array. A screen similar to the Create Array screen appears. Choose the array (ARR1 - ARR8) to be deleted and click on the OK button.

Initialize

Choose this option to initialize logical drives. A screen such as the following appears. Choose the logical drives to be initialized and click on the Go button.

⚠️ CAUTION

Power Console allows you to initialize a drive at any time. Make sure that the drive being initialized does not hold live data. All data will be lost.
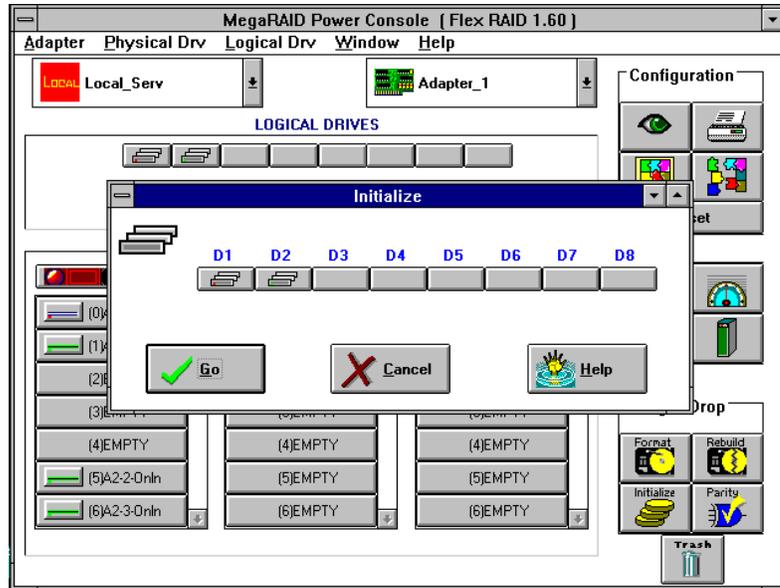
You can also initialize a drive by dragging the drive icon to the Format icon and dropping it.

Channel Information

Position the cursor on one of the SCSI channels and click on the right mouse button to display information about the SCSI channel, as shown in the following sample screen:
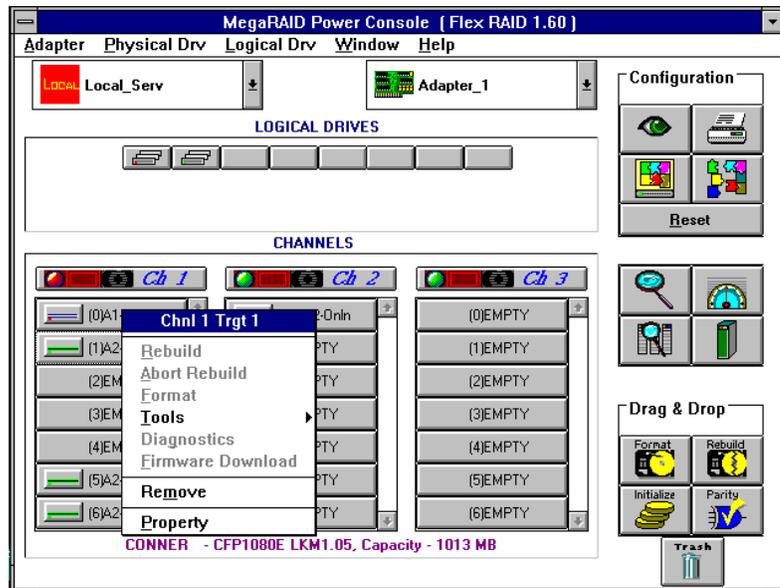
Check Parity

Choose Check Parity to make sure that parity is correct for the selected drives. A screen such as the following appears. Click on the drive to be checked (D1 - D8) and click on the Go button.

RAID levels 1, 3, and 5 use an extra drive to store parity data blocks. Parity is checked between these parity data blocks and the selected drives when you select this option.
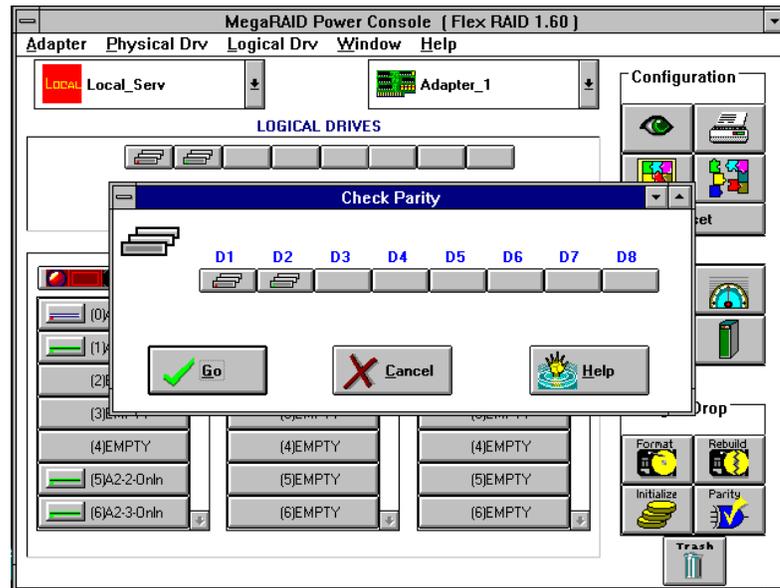
Properties

Choose Properties to display the logical drive properties of the selected logical drive. A screen such as the following appears. Each logical drive can be displayed by selecting the Previous or Next buttons.
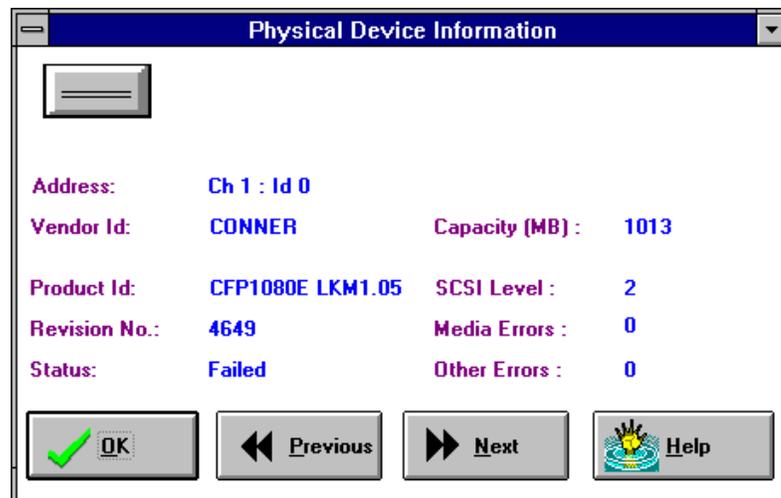
Securing Power Console under Windows NT

To secure Power Console utility while running in Windows NT:

1. Log in as the Administrator.
2. Run File Manager.
3. Select the path containing the Power Console executable.
4. Pull down the Security menu in File Manager and choose PERMISSIONS.
5. When the permission dialog box appears, assign the LIST permission to all Groups except Administrator, Backup Operators, System, and Creator Owner.
6. In the Permission dialog box, select REPLACE PERMISSIONS ON SUBDIRECTORIES to apply the permissions that you are setting here to the subdirectories as well.
7. After you have set Permissions, choose OK and exit file manager. Now log in as a guest and make sure the permission changes have been saved.

If you follow these instructions, only those who are part of the selected groups can delete, copy, move, or execute any power console file.

7 Troubleshooting

Table 37. Troubleshooting Suggested Solutions

Problem	Suggested Solution
Some operating systems do not load in a computer with a MegaRAID adapter.	Check the system BIOS configuration for PCI interrupt assignments. Make sure some Interrupts are assigned for PCI. Initialize the logical drive before installing the operating system.
One of the hard drive in the array fails often.	Check the drive error counts using Power Console. Format the drive. If the drive continues to fail, replace the drive with another drive with the same capacity.
Pressed <Ctrl> <M>. Ran Megaconf.exe and tried to make a new configuration. The system hangs when scanning devices.	Check the drives Ids on each channel to make sure each device has a different ID. Check the termination. The device at the end of the channel must be terminated. Replace the drive cable.
Multiple drives connected to MegaRAID using the same power supply. There is a problem spinning the drives all at once.	Set the drives to spin on command. This will allow MegaRAID to spin two devices simultaneously.
Pressing <Ctrl> <M> or running megaconf.exe does not display the Management Menu.	These utilities require a color monitor.
At system power-up with the MegaRAID installed, the screen display is garbled.	At least 1 MB of memory must be installed in bank 0 (the lower memory socket) before power-up. For proper cache memory operation, you should install at least 4 MB of memory in MegaRAID.
Cannot flash or update the EEPROM.	Make sure that Pins 2-3 of J5 are shorted on the MegaRAID adapter card. If J5 is OK, you may need a new EEPROM.
The MegaRAID BIOS and firmware banner does not appear.	Make sure that J2 (Enable Expansion BIOS) is jumpered on at least one of the MegaRAID controllers in the system.
`Firmware Initializing…` appears and remains on the screen.	Make sure that TERMPWR is being properly provided to each peripheral device populated channel. Make sure that each end of the channel chain is properly terminated using the recommended terminator type for the peripheral device. The channel is automatically terminated at the MegaRAID card if only one cable is connected to a channel. Make sure that (on a channel basis) that only two type of cables are connected at any one time. Both internal SCSI connectors on a channel can used, but both internal SCSI connectors and the external SCSI connector for the same channel cannot be used. Make sure that memory modules are rate at 70 ns or faster. Make sure that the MegaRAID controller is properly seated in the PCI slot.

Continued

Table 37. Troubleshooting Suggested Solutions (continued)

Problem	Suggested Solution
What is the maximum number of MegaRAID adapters per computer?	Currently, all the utilities and drivers support up to four MegaRAID adapters per system.
What SCSI IDs can a non-hard disk device have and what is maximum number allowed per adapter?	Non-hard disk devices can only accommodate SCSI IDs 1, 2, 3, 4, 5 or 6, regardless of the channel used. A maximum of six non-hard disk devices are supported per MegaRAID adapter.
Why does a failed logical array still get a drive assignment?	To maintain the DOS Path statement integrity.

DOS ASPI Driver Error Messages

Table 38. DOS ASPI Driver Error Messages

Message	Corrective Action
American Megatrends Inc. ASPI Manager has NOT been loaded	The ASPI manager is not loaded. One of the failure codes listed below is displayed next.
Controller setup FAILED error code=[0xab]	Correct the condition that caused the failure. The failure codes are: 0x40 No MegaRAID adapters found. 0x80 Timed out waiting for interrupt to be posted. 0x81 Timed out waiting for MegaRAID Response command. 0x82 Invalid command completion count. 0x83 Invalid completion status received. 0x84 Invalid command ID received. 0x85 No MegaRAID adapters found or no PCI BIOS support. 0x90 Unknown AMIBIOS Setup completion error. 0x91 No ASPI accessible devices.
No non-disk devices were located	The driver did not find any non-hard drive devices during scanning. A SCSI device that is not a hard disk drive, such as a tape drive or CD-ROM drive, must be attached to this SCSI channel. The SCSI ID must be unique for each adapter and cannot be SCSI ID 0. The supported SCSI IDs are 1, 2, 3, 4, 5, and 6.
'ERROR: VDS support is *INACTIVE* for MegaRAID logical drives	The /h option is appended to driver in CONMFIG.SYS or this driver is used with a BIOS that is earlier than v1.10

Glossary

Array Management Software	Software that provides common control and management for a disk array. Array Management Software most often executes in a disk controller or intelligent host bus adapter, but can also execute in a host computer. When it executes in a disk controller or adapter, Array Management Software is often called firmware.
Asynchronous Operations	Operations that bear no relationship to each other in time and can overlap. The concept of asynchronous I/O operations is central to independent access arrays in throughput-intensive applications.
Channel	An electrical path for the transfer of data and control information between a disk and a disk controller.
Cold Swap	The substitution of a replacement unit in a disk subsystem for a defective one, where power must be removed from the subsystem to do the substitution.
Data Transfer Capacity	The amount of data per unit time moved through a channel. For disk I/O, bandwidth is expressed in megabytes per second (MBs).
Disk	A non-volatile, randomly addressable, rewritable mass storage device, including both rotating magnetic and optical disks and solid-state disks, or non-volatile electronic storage elements. It does not include specialized devices such as write-once-read-many (WORM) optical disks, nor does it include so-called RAM disks implemented using software to control a dedicated portion of a host computer volatile random access memory.
Disk Array	A collection of disks from one or more disk subsystems combined with array management software. It controls the disks and presents them to the array operating environment as one or more virtual disks.
Disk Striping	A type of disk array mapping. Consecutive stripes of data are mapped round-robin to consecutive array members. A striped array (RAID Level 0) provides high I/O performance at low cost, but provides lowers data reliability than any of its member disks.
Disk Subsystem	A collection of disks and the hardware that connects them to one or more host computers. The hardware can include an intelligent controller or the disks can attach directly to a host computer I/O a bus adapter.

Double Buffering	A technique that achieves maximum data transfer bandwidth by constantly keeping two I/O requests for adjacent data outstanding. A software component begins a double-buffered I/O stream by issuing two requests in rapid sequence. Thereafter, each time an I/O request completes, another is immediately issued. If the disk subsystem is capable of processing requests fast enough, double buffering allows data to be transferred at the full-volume transfer rate.
GB	Shorthand for 1, 000, 000,000 (10 to the ninth power) bytes.
Host-based Array	A disk array with an Array Management Software in its host computer rather than in a disk subsystem.
Host Computer	Any computer that disks are directly attached to. Mainframes, servers, workstations, and personal computers can all be considered host computers.
Hot Swap	The substitution of a replacement unit in a disk subsystem for a defective one, where the substitution can be performed while the subsystem is running (performing its normal functions). Hot swaps are manual.
I/O Driver	A host computer software component (usually part of the operating system) that controls the operation of peripheral controllers or adapters attached to the host computer. I/O drivers communicate between applications and I/O devices, and in some cases participates in data transfer.
Logical Disk	A set of contiguous chunks on a physical disk. Logical disks are used in array implementations as constituents of logical volumes or partitions. Logical disks are normally transparent to the host environment, except when the array containing them is being configured.
Mapping	The conversion between multiple data addressing schemes, especially conversions between member disk block addresses and block addresses of the virtual disks presented to the operating environment by Array Management Software.
MB	(Megabyte) An abbreviation for 1,000,000 (10 to the sixth power) bytes.
Multi-threaded	Having multiple concurrent or pseudo-concurrent execution sequences. Used to describe processes in computer systems. Multi-threaded processes allow throughput-intensive applications to efficiently use a disk array to increase I/O performance.

Operating Environment	The operating environment includes the host computer where the array is attached, any I/O buses and adapters, the host operating system, and any additional software required to operate the array. For host-based arrays, the operating environment includes I/O driver software for the member disks, but does not include Array Management Software, which is regarded as part of the array itself.
Partition	An array virtual disk made up of logical disks rather than physical ones.
Rebuild	The regeneration of all data from a failed disk in a RAID level 1, 3, 4 5, or 6 array to a replacement disk. A disk rebuild normally occurs without interruption of application access to data stored on the array virtual disk.
Replacement Disk	A disk available for use as or used to replace a failed member disk in a RAID array.
Replacement Unit	A component or collection of components in a disk subsystem that are always replaced as a unit when any part of the collection fails. Typical replacement units in a disk subsystem includes disks, controller logic boards, power supplies, and cables. Also called a hot spare.
SAF-TE	(SCSI Accessed Fault-Tolerant Enclosure) An industry protocol for managing RAID enclosures and reporting enclosure environmental information.
SMARTer	System Management and Reporting Technologies with Error Recovery. An industry standard protocol for reporting server system information.

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