SANS DIGITAL®

MOBILE RAID

# MR5S1/MR5CT1

## User's Manual

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## WARRANTY

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## FCC STATEMENT

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

## CE Mark

This equipment is in confirmity with EM directive.

# Contents

# 1. Introduction

Sans Digital MobileRAID RAID subsystem is designed for SOHO or small business to extend storage capacity and secure their data as hard disk failed. The MR5CT1 comes with Firewire 800, USB2.0 & eSATA host interfaces and five SATA ll channels for disk drives. The MR5S1 supports 320 SCSI host channel and five SATA ll channels for disk drives. The RAID subsystem is designed with a high-performance SATA ll drive bus disk array Controller. When properly configured, the RAID subsystem can provide non-stop service with a high degree of fault tolerance through the use of RAID technology and advanced array management features. The RAID subsystem connects to the host system through Firewire 800 or USB2.0 or eSATA or SCSI interface. The HOST interface on the host may be located either on the system board, or on a plug-in host bus adapter (HBA) card.

The RAID subsystem allows easy scalability from RAID 0 to RAID 6. It can be configured to RAID levels 0, 1, 10, 3, 5 and 6. The RAID 6 function allows two HDD failure without impact on the existing data and failed drive Data can be reconstructed from the remaining data and parity drives. RAID configuration and monitoring can be done through the LCD front control panel or serial port/LAN port.

MobileRAID subsystem is the only available RAID solution that does not require a conventional PCI slot. It uses the standard protocol to connect the host system controller, just like SCSI or SATA. It is also a standard part of all major operating systems such as Windows 95/98/2000/NT/ME/XP, Novell, MAC, Linux, UNIX, etc., the host system does not require additional or proprietary software to work with the controller.

## 1.1 System Architecture

### 1.1.1 Firewire 800/ USB 2.0/ eSATA Interface

The MR5CT1 host interface appears to the host system as a eSATA target device or a removable Firewire/USB device . The eSATA interface can support transfer rates of up to 150MB per second. The Firewire 800 can support transfer rates of up to 80MB per second. Both Firewire 800 and eSATA interfaces can concurrently access

different volume sets (logical drives).

### 1.1.2 Ultra 320 Host Interface

The MR5S1 appears to the host system as an SCSI Ultra 320 target device. The Ultra 320 can support transfer rates up to 320MB per second.

### 1.1.3 Serial ATA ll Drive Interface

Sans Digital MobileRAID communicates directly with the array's 5 Serial ATA ll drives via a built-in SATA interface. When the host is directly controlling the drives. The RAID subsystem uses the RAID subsystem SATA ll I/O controller chip on each SATA channel to allow the controller to simultaneously communicate with the host system, and read or write data on several drives. Up to five disk drives can be installed to each RAID subsystem.

## 1.2 RAID subsystem Controller Board

Sans Digital MobileRAID series have an SATA ll controller which supports SATA ll support up to 5 SATA ll Hard drives. The RAID 6 engine supports a XOR engine and RAID 6 engine for P+Q and parity generator/checker, one RS-232 and LAN port interface for system management (Remote Control, and Local Monitor) and an interface to a display/operation panel.

### 1.2.1 Cache Memory Subsystem

Sans Digital MobileRAID series' new high-performance architecture comes from Intel 80219 I/O processor, a 133MHz/64-bit PCI-X, and DDR200 memory architecture. The data flow at 133MHz/64 bit PCI-X bus and 64-bit 200Mhz ECC DDR SDRAM makes its high data throughput. Data can be transferred between the controller and the drives through a high-speed 133MHz/64-bit path at a burst rate up to 1000MB/S. The system's overall performance can support up to Ultra320 SCSI host channels. The controller default supports 128MB on-board cache.

### 1.2.2 User Interface

Manual configuration and monitoring can be done through the LCD front control panel. The firmware also contains an embedded management program that can support the RS-232C (Serial Console) port out-of-band management. The subsystem can use any of the interfaces to simplify the setup and management of their associated disk drives. This out-of-band method is a convenient platform-independent management utility. User can through this port to implement Bootable CD VT-100, VT-100 Terminal and HTTP Proxy browser-based management utility.The controller has embedded the web browser-based RAID manager in the firmware. User can remote manage the RAID system without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port.

### 1.2.3 Controller Firmware

The system provides RAID levels 0, 1, 10, 3, 5 and 6 RAID configurations. It can be managed either through the LCD control panel or by the system-embedded configuration utilities. Its high data availability and protection derives from the following capabilities: Online Capacity Expansion, Online RAID Level Migration, Dynamic Volume Extension, Array Roaming, Global Online Spare, Automatic Drive Failure Detection, Automatic Failed Drive Rebuilding, Disk Hot Spare, and Instant Availability/Background Initialization.

The RAID subsystem firmware is stored on the controller flash ROM and is executed by the Intel 80219 I/O processor. The firmware can also be updated through the RS-232or LAN port without the need to replace any hardware chips. During the controller ROM flash process, it is possible for a problem to occur resulting in corruption of the controller firmware. A corrupted firmware in the controller firmware would make the controller inoperable and bring the system down. The Redundant Flash provides a unique redundancy feature that helps ensure against controller availability. This reduces the risk of system failure due to firmware crash. In addition to the stored programs in ROM. The NVRAM store the event log and lists of pending write operation issued to any drives. These data are checksum protected so that after a power failure, the controller will  consistency for all check outstanding writes on region.

## 1.3 RAID Concept

### 1.3.1 RAID Set

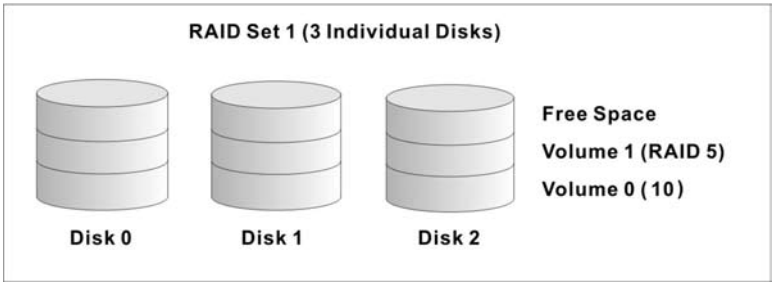
A RAID Set is a group of disk containing one or more volume sets. It has the following features in the RAID controller. A volume Set must be created either on an existing RAID set or on a group of available individual disks (disks that are not yet a part of an RAID set). If there are pre-existing RAID sets with available capacity and enough disks for specified RAID level desired, then the volume set will be created in the existing RAID set of the user's choice. If physical disk of different capacity are grouped together in a RAID set, then the capacity of the smallest disk will become the effective capacity of all the disks in the RAID set.

## 1.3.2 Volume Set

A Volume Set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a Volume Set. A Volume Set capacity can consume all or a portion of disk capacity available in a RAID Set. Multiple Volume Sets can exist on a group of disks in a RAID Set.

In the illustration below, Volume 1 can be assigned a RAID 5 level of operation while Volume 0 might be assigned a RAID 10 level of operation.

## 1.3.3 Easy of Use Features




### 1.3.3.1 Instant Availability/Background Initialization

RAID 0 and RAID 1 volume sets can be used immediately after creation because they do not create parity data. However, RAID 3, 5 and 6 volume sets must be initialized to generate parity information. In Normal Initialization, the initialization proceeds as a background task, and the volume set is fully accessible for system reads and writes. The operating system can instantly access the newly created arrays without requiring a reboot and without waiting for initialization to complete. Furthermore, the RAID volume set is protected against a single disk failure while initialing. If using Fast Initialization, the initialization process must be completed before the volume set is ready for system accesses.

### 1.3.3.2 Array Roaming

The MobileRAID stores RAID configuration information on the disk drives. The adapters therefor protect the configuration settings in the event of controller failure. Array roaming allows the administrators the ability to move a completele RAID set to another system without losing RAID configuration information or data on that RAID set. So, if a server fails, the RAID set disk drives can be moved to another server with an identical RAID card and the disks can be inserted in any order.

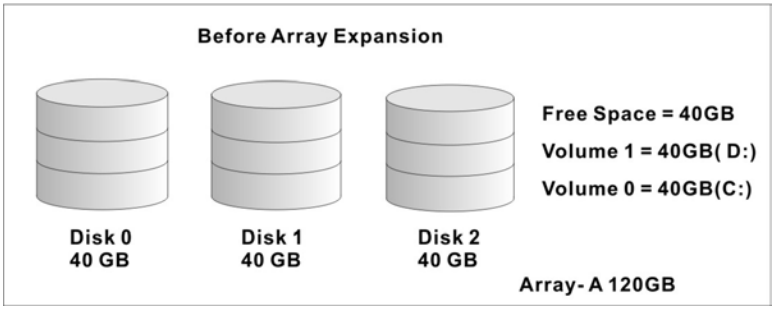
### 1.3.3.3 Online Capacity Expansion

Online Capacity Expansion makes it possible to add one or more physical drives to a volume set without interrupting server operation, eliminating the need to backup and restore after reconfiguration of the RAID set. When disks are added to a RAID set, unused capacity is added to the end of the RAID set. Then, data on the existing volume sets (residing on the newly expanded RAID set) is redistributed evenly across all the disks. A contiguous block of unused capacity is made available on the RAID set. The unused capacity can be used to create additional volume sets.

A disk, to be added to a RAID set, must be in normal mode (not failed), free (not spare, in a RAID set, or passed through to host) and must have at least the same capacity as the smallest disk capacity already in the RAID set.

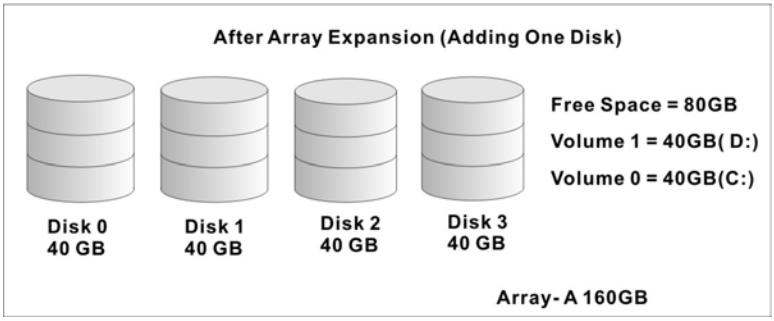
Capacity expansion is only permitted to proceed if all volumes on the RAID set are in the normal status. During the expansion process, the volume sets being expanded can be accessed by the host system. In addition, the volume sets with RAID levels 0, 1, 10, 3, 5 or 6 are protected against data loss in the event of disk failure(s). In the case of disk failure, the volume set transitions from "migrating" state to "migrating+degraded" state. When the expansion is completed, the volume set would then transition to "degraded" mode. If a global hot spare is present, then it further transitions to the "rebuilding" state.
The expansion process is illustrated as following figure.
The RAID subsystem controller redistributes the original volume

set over the original and newly added disks, using the same fault-tolerance configuration. The unused capacity on the expand




RAID set can then be used to create an additional volume set, with a different fault tolerance setting (if required by the user.)

The RAID subsystem controller redistributes the original volume set over the original and newly added disks, using the same




fault-tolerance configuration. The unused capacity on the expand RAID set can then be used to create an additional volume sets, with a different fault tolerance setting if user need to change.

### 1.3.3.4 Online RAID Level and Stripe Size Migration

For those who wish to later upgrade to any RAID capabilities, a system with online RAID level/stripe size migration allows a simplified upgrade to any supported RAID level without having to reinstall the operating system.

The MobileRAID can migrate both the RAID level and stripe size of an existing volume set, while the server is online and the volume set is in use. Online RAID level/stripe size migration can prove helpful during performance tuning activities as well as when additional physical disks are added to the SATA RAID controller. For example, in a system using two drives in RAID level 1, it is possible to add a single drive and add capacity and retain fault tolerance. (Normally, expanding a RAID level 1 array would require the addition of two disks). A third disk can be added to the existing RAID logical drive and the array can then be migrated from RAID level 1 to 5. The result would be parity fault tolerance and double the available capacity without taking the system down. A forth disk could be added to migrate to RAID level 6. It is only possible to migrate to a higher RAID level by adding a disk; disks in an existing array can't be reconfigured for a higher RAID level without adding a disk.

Online migration is only permitted to begin. If all volume to be migrated are in the normal mode. During the migration process, the volume sets being migrated are accessed by the host system. In addition, the volume sets with RAID levels 1, 10, 3, 5 or 6 are protected against data loss in the event of disk failure(s). In the case of disk failure, the volume set transitions from migrating state to (migrating+degraded) state. When the migration is completed, the volume set transitions to degraded mode. If a global hot spare is present, then it further transitions to rebuilding state.

### 1.3.3.5 Online Volume Expansion

Performing a volume expansion on the controller is the process of growing the size of a volume. A more flexible option is for the array to concatenate an additional drive into the RAID set and then expand the volumes on the fly. This happens transparently while the volumes are online, but, at the end of the process, the operating system will detect free space at after the existing

volume; the free space will not automatically be incorporated into the existing operating system partition.

Windows, NetWare, and other advanced operating systems support volume expansion, which enables you to incorporate the additional free space within the volume into the operating system partition. The operating system partition is extended to incorporate the free space so it can be used by the operating system without creating a new operating system partition.

You can use the Diskpart.exe command line utility, included with Windows Server 2003 or the Windows 2000 Resource Kit, to extend an existing partition into free space in the Dynamic disk.

Third-party software vendors have created utilities that can be used to repartition disks without data loss. Most of these utilities work offline. Partition Magic is one such utility.

## 1.4 High availability

### 1.4.1 Global Hot Spares

A Global Hot Spare is an unused online available drive, which is ready for replacing the failure disk. The Global Hot Spares is one of the most important features that MobileRAID subsystem RAID controller provide to deliver a high degree of fault-tolerance. A global Hot Spare is a spare physical drive that has been marked as a global hot spare and therefore is not a member of any RAID set. If a disk drive used in a RAID Volume Set fails, then the Global Hot spare will automatically take its place and he data previously located on the failed drive is reconstructed on the Global Hot spare.

For this feature to work properly, the global hot spare must have at least the same capacity as the drive it replaces. Global Hot spares only work with RAID level 1, 10, 3, 5, or 6 volume set. You can configure up to three Global hot spares with MobileRAID.

The Create Hot Spare option gives you the ability to define a

global hot spare disk drive. To effectively use the global hot spare feature, you must always maintain at least one drive that is marked as a global spare.

**Important:**

The hot spare must have at least the same capacity as the drive it replaces.

## 1.4.2 Hot-Swap Disk Drive Support

The SATA RAID controller includes a protection circuit that supports the replacement of SATA hard disk drives without having to shut down or reboot the system. A removable hard drive tray can deliver "hot swappable" fault-tolerant RAID solutions at prices much less than the cost of conventional SCSI hard disk SATA RAID controllers. This feature provides advanced fault tolerant RAID protection and "online" drive replacement.

## 1.4.3 Auto Declare Hot-Spare

If a disk drive is brought online into a system operating in degraded mode, MR5CT1/MR5S1 subsystem RAID controller will automatically declare the new disk as a spare and begin rebuilding the degraded volume. The Auto Declare Hot-Spare function requires that the smallest drive contained within the volume set in which the failure occurred.

In the normal status, the newly installed drive will be reconfigured an online free disk. But, the newly-installed drive is automatically assigned as a hot spare if any hot spare disk was used to rebuild and without new installed drive replaced it. In this condition, the Auto Declare Hot-Spare status will disappeared if the RAID subsystem has since powered off/on.

The Hot-Swap function can be used to rebuild disk drives in arrays with data redundancy such as RAID level 0, 1, 10, 3, 5, and 6.

## 1.4.4 Auto Rebuilding

If a hot spare is available, the rebuild starts automatically when a drive fails. MobileRAID subsystem RAID controller automatically and transparently rebuild failed drives in the background at user-definable rebuild rates.

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 automatically rebuilt and so that fault tolerance can be maintained.

The MobileRAID subsystem RAID controller will automatically restart the system and the rebuild process if the system is shut down or powered off abnormally during a reconstruction procedure condition.

When a disk is Hot Swapped, although the system is functionally operational, the system may no longer be fault tolerant. Fault tolerance will be lost until the removed drive is replaced and the rebuild operation is completed.

During the automatic rebuild process, system activity will continue as normal, however, the system performance and fault tolerance will be affected.

### 1.4.5 Adjustable Rebuild Priority

Rebuilding a degraded volume incurs a load on the RAID subsystem. The MobileRAID subsystem RAID controller allows the user to select the rebuild priority to balance volume access and rebuild tasks appropriately. The Background Task Priority is a relative indication of how much time the controller devotes to a background operation, such as rebuilding or migrating.

The RAID subsystem allows user to choose the task priority (Ultra Low (5%), Low (20%), Medium (50%), High (80%)) to balance volume set access and background tasks appropriately. For high array performance, specify an Ultra Low value. Like volume initialization, after a volume rebuilds, it does not require a system reboot.

## 1.5 High Reliability

### 1.5.1 Hard Drive Failure Prediction

In an effort to help users avoid data loss, disk manufacturers are now incorporating logic into their drives that acts as an "early warning system" for pending drive problems. This system is called SMART. The disk integrated controller works with multiple sensors to monitor various aspects of the drive's performance, determines from this information if the drive is behaving normally or not, and makes available status information to RAID controller firmware that probes the drive and look at it.
S.M.A.R.T. can often predict a problem before failure occurs. MobileRAID controllers will recognize a S.M.A.R.T. error code and notify the administer of an impending hard drive failure.

### 1.5.2 Auto Reassign Sector

Under normal operation, even initially defect-free drive media can develop defects. This is a common phenomenon. The bit density and rotational speed of disks is increasing every year, and so is the potential of problems. Usually a drive can internally remap bad sectors without external help using cyclic redundancy check (CRC) checksums stored at the end of each sector.

SATA drives perform automatic defect re-assignment for both read and write errors. Writes are always completed - if a location to be written is found to be defective, the drive will automatically relocate that write command to a new location and map out the defective location. If there is a recoverable read error, the correct data will be transferred to the host and that location will be tested by the drive to be certain the location is not defective. If it is found to have a defect, data will be automatically relocated, and the defective location is mapped out to prevent future write attempts.

In the event of an unrecoverable read error, the error will be reported to the host and the location flagged as potentially defective. A subsequent write to that location will initiate a sector test and relocation should that location have a defect. Auto

Reassign Sector does not affect disk subsystem performance because it runs as a background task. Auto Reassign Sector discontinues when the operating system makes a request.

### 1.5.3 Consistency Check

A consistency check is a process that verifies the integrity of redundant data. For example, performing a consistency check of a mirrored drive assures that the data on both drives of the mirrored pair is exactly the same. To verify RAID 3, 5 or 6 redundancy, a consistency check reads all associated data blocks, computes parity, reads parity, and verifies that the computed parity matches the read parity.
Consistency checks are very important because they detect and correct parity errors or bad disk blocks in the drive. A consistency check forces every block on a volume to be read, and any bad blocks are marked; those blocks are not used again. This is critical and important because a bad disk block can prevent a disk rebuild from completing. We strongly recommend that you run consistency checks on a regular basis—at least once per week. Note that consistency checks degrade performance, so you should run them when the system load can tolerate it.

## 1.6 Data Protection

### 1.6.1 RECOVERY ROM

The RAID subsystem firmware is stored on the controller flash ROM and is executed by the I/O processor. The firmware can also be updated through Ethernet port (if equipped) without the need to replace any hardware chips. During the controller firmware upgrade flash process, it is possible for a problem to occur resulting in corruption of the controller firmware. With our Redundant Flash image feature, the controller will revert back to the last known version of firmware and continue operating. This reduces the risk of system failure due to firmware crash.

## 1.7 Understanding RAID

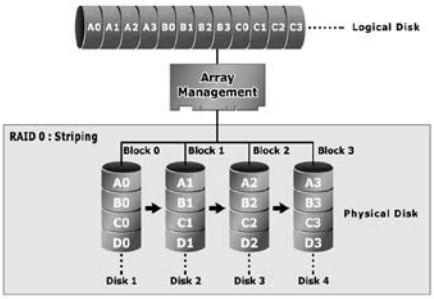
RAID is an acronym for Redundant Array of Independent Disks. It

is an array of multiple independent hard disk drives that provides high performance and fault tolerance. The SATA RAID controller implements several levels of the Berkeley RAID technology. An appropriate RAID level is selected when the volume sets are defined or created. This decision should be based on the desired disk capacity, data availability (fault tolerance or redundancy), and disk performance. The following section discusses the RAID levels supported by the SATA RAID controller.

The SATA RAID controller makes the RAID implementation and the disks' physical configuration transparent to the host operating stem. This means that the host operating system drivers and software utilities are not affected, regardless of the RAID level selected. Correct installation of the disk array and the controller requires a proper understanding of RAID technology and the concepts.

## 1.7.1 RAID 0

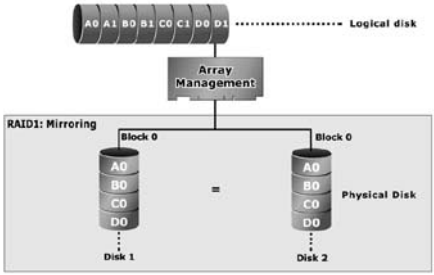
RAID 0, also referred to as striping, writes stripes of data across multiple disk drives instead of just one disk drive. RAID 0 does not provide any data redundancy, but does offer the best high-speed data throughput. RAID 0 breaks up data into smaller blocks and then writes a block to each drive in the array. Disk striping enhances performance because multiple drives are accessed simultaneously; the reliability of RAID Level 0 is less because the entire array will fail if any one disk drive fails, due to a lack of



redundancy.

### 1.7.2 RAID 1

RAID 1 is also known as "disk mirroring"; data written to one disk drive is simultaneously written to another disk drive. Read performance may be enhanced if the array controller can, in parallel, accesses both members of a mirrored pair. During writes, there will be a minor performance penalty when compared to writing to a single disk. If one drive fails, all data (and software applications) are preserved on the other drive. RAID 1 offers extremely high data reliability, but at the cost of doubling the required data

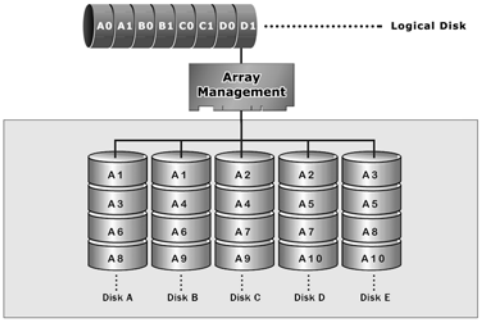



storage capacity.

### 1.7.3 RAID 10

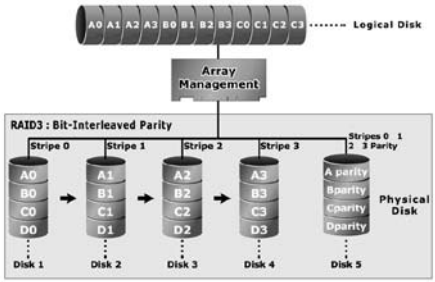
RAID 10 is a combination of RAID 0 and RAID 1, combing stripping with disk mirroring. RAID Level 10 combines the fast performanceof Level 0 with the data redundancy of Leve1 1. In this configuration, data is distributed across several disk drives, similar to Level 0, which are then duplicated to another set of drive for data protection. RAID 10 has been traditionally implemented using an even number of disks, some hybrids can use an odd number of disks as well. Figure 2 illustrates an example of a hybrid RAID 10 array comprised of five disks; A, B, C, D and E. In this configuration, each strip is mirrored on an adjacent disk with wrap-around. In fact this scheme - or a slightly modified version of it - is often referred to as RAID 1E and was originally proposed by IBM. When the number of disks comprising a RAID 1E is even, the striping pattern is identical to that of a traditional RAID 10,

with each disk being mirrored by exactly one other unique disk. Therefore, all the characteristics for a traditional RAID 10 apply to a RAID 1E when the latter has an even number of disks. Sans Digital RAID 10 offers a little more flexibility in choosing the number of disks that can be used to constitute an array. The number can be even or odd.




## 1.7.4 RAID 3

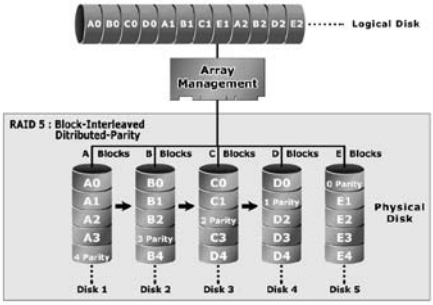
RAID 3 provides disk striping and complete data redundancy though a dedicated parity drive. RAID 3 breaks up data into smaller blocks, calculates parity by performing an exclusive-or on the blocks, and then writes the blocks to all but one drive in the array. The parity data created during the exclusive-or is then written to the last drive in the array. If a single drive fails, data is still available by computing the exclusive-or of the contents corresponding strips of the surviving member disk. RAID 3 is best for applications that require very fast data- transfer rates or long



data blocks.

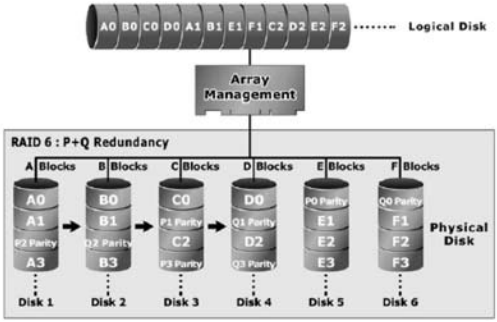
### 1.7.5 RAID 5

RAID 5 is sometimes called striping with parity at byte level. In RAID 5, the parity information is written to all of the drives in the controllers rather than being concentrated on a dedicated parity disk. If one drive in the system fails, the parity information can be used to reconstruct the data from that drive. All drives in the array system can be used for seek operations at the same time, greatly increasing the performance of the RAID system. This relieves the write bottleneck that characterizes RAID 4, and is the primary reason that RAID 5 is more often implemented in RAID arrays.




### 1.7.6 RAID 6

RAID 6 provides the highest reliability, but is not yet widely used. It is similar to RAID 5, but it performs two different parity computations or the same computation on overlapping subsets of the data. RAID 6 can offer fault tolerance greater than RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed parity data. RAID 6 is an extension of RAID 5 but uses a second, independent distributed parity scheme. Data is striped on a block level across a set of drives, and then a second set of parity is calculated and written across all of the drives.




## Summary of RAID Levels

SATA RAID controller supports RAID Levels 0, 1, 10, 3, 5 and 6. Table below provides a summary of RAID levels.

| Features and Performance | | | | | | |
|---|---|---|---|---|---|---|
| RAID Level | Description | Min. Drives | Max. Drives | Data Reliability | Data Transfer Rate | I/O Request Rates |
| 0 | Also known as stripping<br>Data distributed across multiple drives in the array. There is no data protection | 1 | 5 | No data Protection | Very High | Very High for<br>Both Reads and Writes |
| 1 | Also known as mirroring<br>All data replicated on N<br>Separated disks. N is almost always 2.<br>This is a high availability<br>Solution, but due to the 100% duplication, it is also a costly solution. | 2 | 2 | Lower than RAID 6;<br>Higher than RAID 3,5 | Reads are higher Than a single disk;<br><br>Writes similar to a single disk | Reads are twice faster than a single disk;<br><br>Write are similar to a single disk. |
| 10 | Also known Block-Interleaved Parity.<br>Data and parity information is subdivided and distributed across all disk. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk. | 3 | 5 | Lower than RAID 6;<br>Higher than RAID 3,5 | Transfer rates more similar to RAID 1 than RAID 0 | Reads are twice faster than a single disk;<br><br>Writes are similar to a single disk. |
| 3 | Also known Bit-Interleaved Parity.<br>Data and parity information is subdivided and distributed across all disk. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk. | 3 | 5 | Lower than RAID 1, 10, 6;<br><br>Higher than a single drive | Reads are similar to RAID 0;<br><br>Writes are slower than a single disk | Reads are similar twice faster than a single disk;<br><br>Writes are similar to a single disk. |

| | | | | | | |
|---|---|---|---|---|---|---|
| 5 | Also known Block-Interleaved Distributed Parity.<br>Data and parity information is subdivided and distributed across all disk. Parity must be the equal to the smallest disk capacity in the array. Parity information normally stored on a dedicated parity disk. | 3 | 5 | Lower than RAID 1, 10, 6;<br><br>Higher than a single drive. | Reads are similar to RAID 0;<br><br>Writes are slower than a single disk. | Reads are similar to RAID 0;<br><br>Writes are slower than a single disk. |
| 6 | RAID 6 provides highest reliability, but not widely used. Similar to RAID 5, but does two different parity computations or the same computation on overlapping subsets of the data. The RAID 6 can offer fault tolerance greater that RAID 1 or RAID 5 but only consumes the capacity of 2 disk drives for distributed parity data. | 4 | 5 | highest reliability | Reads/ Writes are similar to RAID 5. | Reads are similar to RAID 0;<br><br>Writes are slower than the RAID 5. |

# 2. Hardware Installation

This section describes the procedures for installing MobileRAID series.

## 2.1 Overview

This chapter describes how to install the RAID Subsystem and connect UDMA/SATA ll drives to make the RAID subsystem ready to use. The following contains step-by-step instructions to successfully install your new RAID subsystem in your computer system.

## 2.2 RAID Subsystem Requirements

MobileRAID is a stand alone RAID subsystem with standard Firewire 800 or USB2.0 or eSATA or SCSI Ultra 320 (MR5S1). Before installing MobileRAID, please verify that the channel on host system is working well.

## 2.3 Step Action

1. Unpack the RAID subsystem and inspect for damage. Make sure all items are in the package.
2. Identify RAID subsystem Part.
3. Turn off the computer.
4. Mounting RAID subsystem in system.
5. Connecting HOST Firewire800/USB2.0/SATA/(MobileRAID-5S-WBS1) or SCSI Ultra 320(MR5S1) to RAID subsystem.
6. Loading Drive to the Drive Tray.
7. RAID Creation Method.
8. Turn on the host computer power.
9. Configure the RAID subsystem.

**• Step 1 Unpack**

Unpack and install the hardware in a static-free environment. The RAID subsystem is packed inside an anti-static bag between two sponge sheets. Remove it and inspect it for damage. If the RAID subsystem appears damaged, or if any items of the contents listed below are missing or damaged, please contact your dealer or distributor immediately.

**Checklist**

The RAID subsystem kit may have included the following items in the ship package:

| Item | Quantity |
|---|---|
| MobileRAID | 1 (For MR5CT1) |
| USB cable | 1 (For MR5CT1) |
| 1394b cable | 1 (For MR5CT1) |
| eSATA cable | 1 (For MR5CT1) |
| SCSI cable | 1 (For MR5S1) |
| Terminator | 1 (For MR5S1) |
| RS232 cable | 1 |
| Removable Tray Module | 5 |
| User's Guide | 1 |
| CD Title | 1 |
| Power cord | 1 |
| Screws | 32 |

(including 22 x 6#-32 screws and 10 x M3 X 6 screws, 2 x keys)

**• Step 2 Identify RAID subsystem part**

The following figures illustrate the indicator and connector locations for the RAID subsystem.

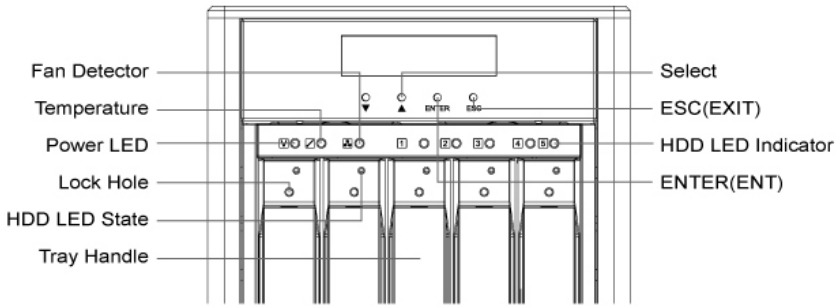



Figure 2-1 MobileRAID Front View

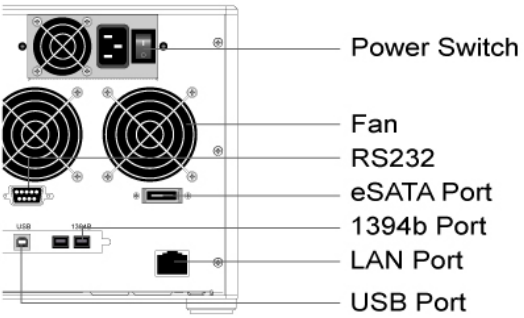



**Figure 2-2 MR55S1 (Back)**

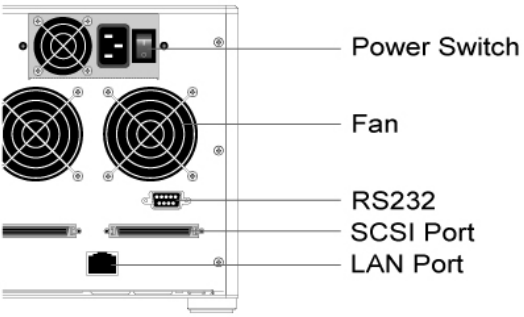



**Figure 2-3 MR55S1 (Back)**

- **Step 3 Power Down the System**

- **Step 4 Loading Drive to the Drive Tray**

The RAID subsystem supports five channel SATA ll channels. For SATA ll drive each channel can run up to 300MB/S.

1. Press the key in the lock hole.
2. Demount the transport holder.
3. Mount the HDD into the tray.
4. Push the tray with the HDD back to the case.

- **Step 5 Connecting RAID subsystem Power**

Connect AC power cable to the power connector on the rear side of the RAID subsystem.

- **Step 6 Connecting MR5CT1 RAID subsystem to HOST Channel**

1. Connect the eSATA/USB2.0/Firewire 800 cable to RAID subsystem eSATA/USB2.0/Firewire 800 connector on rear Panel of MobileRAID.
2. There are two Firewire 800 connectors on MobileRAID Rear Panel to support daisy-chained configuration.

- **Step 7 Connecting MR5S1 RAID Subsystem to HOST SCSI Channel**

There are two SCSI connectors are provided on the back of the RAID subsystem for connecting the array to SCSI HOST Adapter. Installation of the RAID subsystem is very similar to the installation of a standard SCSI drive. Refer to your system and/or SCSI host adapter manual for additional installation procedures that may apply to your system or host adapter. By installing HOST SCSI Channel and RAID subsystem using the SCSI cables included in your kits.
Follow these steps to connect HOST SCSI Channel and RAID subsystem:

1. The RAID subsystem is the last internal device in the daisy-chained configuration.

   a. Add the other SCSI LVD cable supplied with the RAID subsystem kit to its SCSI- OUT connector and place an LVD SCSI active terminator on the other end of this connector.

2. The RAID subsystem is the first internal device in the daisy-chained configuration.

   a. Plug the SCSI cable supplied with the RAID subsystem kit to the SCSI adapter internal connector and the its SCSI-IN connector.
   b. Add the SCSI LVD cable supplied with the SCSI adapter kit to RAID subsystem SCSI OUT connector. The end of the SCSI bus farthest from its SCSI OUT must have a terminator installed.

- **Step 8 RAID Creation Method**

**Method 1:** LCD Panel with Keypad
The LCD status panel informs you of the Disk Array's current operating status at a glance. For additional information on using the LCD panel and keypad to configure the RAID subsystem see "LCD Configuration" on Chapter 6.
**Method 2:** Serial Port Connection
The RAID subsystem can be configured via a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program. You can attach a serial (Character-Based) terminal or server com port to the RAID subsystem for access to the text-based Setup Menu, note the following:

1. Connect a serial terminal to the port labelled COM1.
2. Connect the Host system serial port to the port labelled COM1.

**Method 3:** Lan Port Connection
The controller has embedded the TCP/IP & Web Browser-based RAID manager in the firmware. User can remote manage the RAID system without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port.

- **Step 9 Turn on the host computer Power**

- **Step 10 Configure RAID Subsystems**
You can configure RAID subsystem either through the LCD Configuration utility or RS232C/LAN port out of band management utility. The RAID subsystem supports VT-100 terminal or CD-ROM bootable VT-100 utility and HTTP Proxy web-browser management through the RS-232C port. Please reference the Chapter 4, Chapter 5 and Chapter 6 for the configuration.

**Note:** SCSI Termination

All SCSI buses require termination on both ends of the bus to prevent signal degradation. Most SCSI card supplies the termination on the origination end of the SCSI bus. Termination for the opposite end if the bus is provide by the vendor.

**Note:** LCD status Termination

There are a variety of failure conditions that cause the RAID subsystem monitoring LED to light. Table1-1 provides a summary of the front panel LED and RAID subsystem LED.

| LED | Normal Status | Problem Indication |
|---|---|---|
| Power LED (LCD panel) | Bright Green | This LED does not light up after power switched on |
| BUSY LED (LCD panel) | Blink yellow during host computer accessing the RAID subsystem | LED never flickers |
| FAULT LED (LCD panel) | LED never light up | This LED light up: "Red", when the disk drive fail |
| Disk Activity LED (LCD panel) | This LED blinks during hard drive read and write activity | |

| | | |
|---|---|---|
| Voltage LED (LCD panel) | This LED will remain on green when the power is on | This LED will blink red if there is a voltage error |
| Themperature LED (LCD panel) | This LED will remain on green when the power is on | This LED will blink red if there is a fan problem |
| Fan LED (LCD panel) | This LED will remain on green when the power is on | This LED will blink red if the internal temperature rises above the Spec setting |

## 2.4 Hot-plug Drive Replacement

The RAID subsystem supports the ability of performing a hot-swap drive replacement without powering down the system. A disk can be disconnected, removed, or replaced with a different disk without taking the system off-line. The RAID rebuilding will be processed automatically in the background. When a disk is hot swap, the RAID subsystem may no longer be fault tolerant. Fault tolerance will be lost until the hot swap drive is subsequently replaced and the rebuild operation is completed.

### 2.4.1 Recognizing a Drive Failure

A drive failure can be identified in one of the following ways:

1. An error status message lists failed drives in the.
2. Amber LED illuminates on the front of RAID subsystem system if failed drives are inside.

### 2.4.2 Replacing a Failed Drive

With our RAID subsystem drive tray, you can replace a defective

physical drive while your computer is still operating. When a new drive has been installed, data reconstruction will be automatically started to rebuild the contents of the disk drive.
Follow the follow below and refer to the pictures to replace the "Hot-Swap" drive.

**Step a. Gently pull-out the HDD tray**
(When a HDD error occurs, the HDD LED indicator lights up "Amber")
Remove the drive tray you wish to replace from the RAID subsystem by firmly pulling on the drive carrier's handle and sliding out the drive tray.

**Step b. Unscrew**
Remove all the four mounting screws

**Step c. Replace a new drive**

**Step d. Gently plug-in the HDD tray**

**Note:**

The capacity of the replacement drives must be at least as large as the capacity of the other drives in the RAID set. Drives of insufficient capacity will be failed immediately by the RAID subsystem without starting the Automatic Data Rebuild.

# 3. Configuration Methods

After the hardware installation, the SATA disk drives connected to the internal RAID subsystem must be configured and the volume set units initialized before they are ready to use. This can be accomplished by one of the following methods:

- Front panel touch-control keypad.
- VT100 terminal connected through the controller's serial port.
- Using HTTP Proxy through the controller's serial port to access web browser-based RAID manager in Windows and Linux system.
- Firmware-embedded & web browser-based RAID manager/SNMP a gent/SMTP via the controller's 10/100 Ethernet LAN port.

Those user interfaces can access the built-in configuration and administration utility that resides in the controller's firmware. They provide complete control and management of the controller and disk arrays, eliminating the need for additional hardware or software.

## 3.1 Using local front panel touch-control keypad

The front panel keypad and liquid crystal display (LCD) is the primary user interface for the RAID subsystem. All configuration and management of the controller and its properly connected disk arrays can be performed from this interface.

The front panel keypad and LCD are connected to the RAID subsystem to access the built-in configuration and administration utility that resides in the controller's firmware. Complete control and management of the array's physical drives and logical units can be performed from the front panel, requiring no additional hardware or software drivers for that purpose.

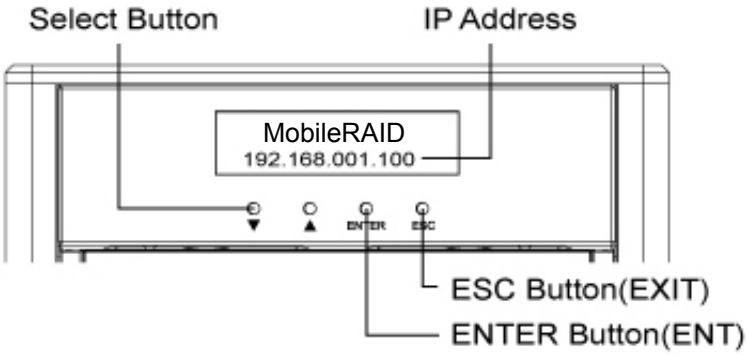
This technical manual provides, in quick reference form, procedures that use the built-in LCD panel to configure and operate the controller.

A touch-control keypad and a liquid crystal display (LCD) mounted on the front panel of the RAID subsystem is the primary operational interface and monitor display for the disk array controller. This user interface controls all configuration and management functions

for the RAID subsystem controller and for all or SATA disk array subsystems to which it is properly connected.

The LCD provides a system of screens with areas for information, status indication, or menus. The LCD screen displays up to two lines at a time of menu items or other information.

The Initial screen as the following:
Function Key Definitions
The four function buttons on the front panel perform the following functions:
For additional information on using the LCD panel and keypad to




configure the RAID controller see ‘‘LCD Configuration” on Chapter 4

| Key | Function |
|---|---|
| Up Arrow | Use to scroll the cursor Upward/Rightward |
| Down Arrow | Use to scroll the cursor Downward/Leftward |
| ENT Key | Submit Select ion Function (Confirm a selected Item) |
| ESC Key | Return to Previous Screen (Exit a selection configuration) |

## 3.2 VT100 terminal (Using the controller's serial port)

The serial port on the controller's back panel can be used in VT100 mode. The firmware-based terminal array management interface can access the array through this RS-232 port. You can attach a VT-100 compatible terminal or a PC running a VT-100 terminal emulation program to the serial port for accessing the text-based Setup Menu.

### 3.2.1 RAID Subsystem RS-232C Port Pin Assignment

To ensure proper communications between the RAID subsystem and the VT-100 Terminal Emulation, Please configure the VT100 terminal emulation settings to the values shown below:

**Keyboard Navigation**

| Terminal requirment | |
|---|---|
| Connection | Null-modem cable |
| Baud Rate | 115,200 |
| Data bits | 8 |
| Stop | 1 |
| Flow Control | None |

The following definition is the VT-100 RAID configuration utility keyboard navigation.

| Key | Function |
|---|---|
| Arrow Key | Move cursor |
| Enter Key | Submit selection function |
| ESC Key | Return to previous screen |
| L Key | Line draw |
| X Key | Redraw |

### 3.2.2 Start-up VT100 Screen

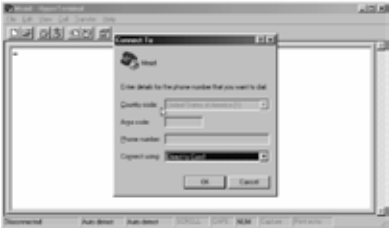
By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all RAID subsystem monitoring, configuration and administration functions can be exercised from the VT100 terminal.
There are a wide variety of Terminal Emulation packages, but for the most part they should be very similar. The following setup procedure is an example Setup VT100 Terminal in Windows system using Hyper Terminal use Version 3.0 or higher.

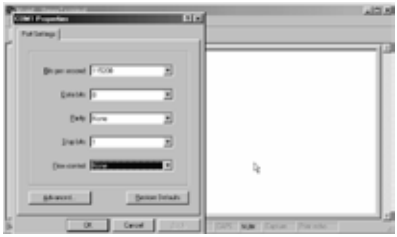
**Step 1.** From the Desktop open the Start menu. Pick Programs, Accessories, Communications and Hyper Terminal. Open Hyper Terminal (requires version 3.0 or higher)

# CONFIGURATION METHOD

**Step 2.** Open **HYPERTRM.EXE** and Enter a name for your Terminal. Click **OK**.

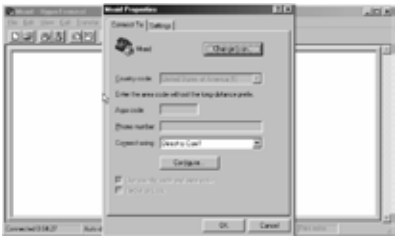
**Step 3.** Select an appropriate connecting port in your Terminal. Click OK. Configure the port parameter settings. Bits per second: "**115200**", Data bits: "**8**", Parity:"**None**", Stop bits: "**1**", Flow control:"**None**". Click **OK**



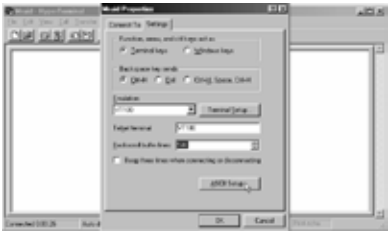


**Step 4.** Open the File menu, and then open Properties.

**Step 5.** Open the Settings Tab.



**Step 6.** Open the Settings Tab. Function, arrow and ctrl keys act as: Terminal Keys, Backspace key sends: **Crtl+H**, Emulation: VT100, Telnet terminal: VT100, Back scroll buffer lines: 500. Click **OK**.



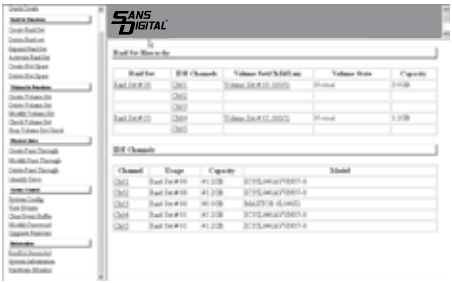
Now, the VT100 is ready to use.
After you have finished the VT100 Terminal setup, you may press " **X** " key (in your Terminal) to link the RAID subsystem and Terminal together.
Press" **X** " key to display the disk array Monitor Utility screen on your VT100 Terminal.

## 3.3 Web browser-based RAID manager

Firmware-embedded web browser RAID manager is an HTTP –based application, which utilizes the browser installed on your operating system. Web browser-based RAID manager can be used to manage all the RAID function via RS-232C port after starts up the operating system. Please reference the section 3.3 to connect the controller's serial port.

The controller also embeds the TCP/IP protocol in the controller's firmware. User can use the Ethernet LAN port to configure the controller without adding any application and device drive. User can plug and play the web browser RAID manager in the remote station. The provided LAN interface cable connects the RAID controller's LAN port into a LAN port from your local network. Use only shield cable to avoid radiated emission that may cause interruptions.

The Storage Console current configuration screen displays the current configuration of your RAID subsystem. Detail procedures please reference the Chapter 6 Web Browser-based configuration method.



### 3.3.1 Web browser-based RAID manager via HTTP Proxy (Using the controller's serial port)

User needs to install Com2Http Proxy Server software to the RAID controller server system. Com2Http Proxy Server software is an S/W utility, which allows user through web browser to create and modify RAID set, volume set, and monitor RAID subsystem status.

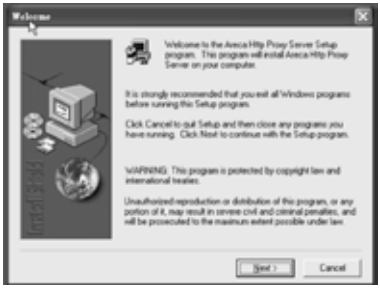
### 3.3.1.1 Start-up Web Browser-based RAID Management for Local Administration

MobileRAID now offers an alternative means of communication for the RAID Subsystem - Web Browser-based RAID Management program.. The Web Browser-based RAID Manager program is an HTML-based application, which utilizes the browser (IE, Netscape and Mozilla etc) installed on your monitor station.

#### 3.3.1.1.1 For Windows

Screen in this section are taken from a Windows/XP installation. If you are running other Windows, your installing screen may look different, but the Com2http proxy server installation is essentially the same.

1. Insert the RAID subsystem CD in the CD-ROM drive.
2. Run the setup.exe file that resides at: CD-ROM:\MobileRAID Series\GUI-Com2.Http\windows\setup.exe
3. Click on the Setup file then the Welcome screen appears.




Follow the on-screen prompts to complete Com2Http Proxy Server software installation.
A program bar appears that measures the progress of MobileRAID Com2http setup. When this screen complete, you have completed the Com2Http Proxy Server software setup.

4. After a successful installation, the Setup Complete dialog box of the installation program is displayed. Click the Finish button to complete the installation.


5. Click on the Start Button in the Windows 2000/XP task bar and then click Program, select the Com2http and run "Com2Http Proxy Server". The Com2http dialog box appears. If user doesn't want to launch the web browser, goes to step


9.
The Parameters for the General Setting:
(1). TCP Port value = 1 ~ 65535.
(2). RAID Connected to value = 1 ~ 10 where 1 for COM1, 2 for COM2 and so on...
(3). BaudRate value = {2400, 4800, 9600, 19200, 38400, 57600, 115200}

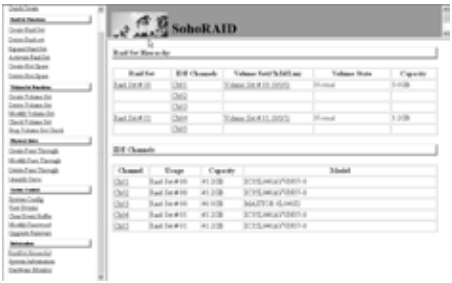
**Note:**

RAID subsystem controller default setting baud rate is 115200.

6. To start the com2Http Proxy Server web-browser management, click the Start Button.


The Enter Network Password dialog screen appears, type the User Name and Password. The RAID subsystem controller default User Name is "**admin**" and the Password is "**0000**" . After completing entering user name and password, press Enter to start-up the Com2Http Proxy Server.
Note: It is strongly recommended to modify the password after the first login.

7. The Storage Console current configuration screen displays the current configuration of your RAID subsystem.




8. If you don't default start-up the web browser, clear "the Launch Web Browser when server started!!" setting. To start the Com2Http Proxy Server web-browser management, click the Start button.

9. User may execute the Com2Http Proxy Server by entering http://[IP Address] in your web browser.

#### 3.3.1.1.2 For Linux

The following is the Linux installation procedure in the local server.

1. Insert the RAID subsystem CD in the CD-ROM drive.
2. Run the Com2http file that resides at:CD-ROM:\MobileRAID Series\GUI-Com2Http\Linux
3. Usage: Com2Http TCP_PORT COM_PORT BAUDRATE
   Parameters: TCP_PORT value = 1 ~ 65535
   COM_PORT value = 1 ~ 10 where 1 for COM1, 2 for COM2 and so on...
   BAUDRATE value = {2400, 4800, 9600, 19200, 38400, 57600, 115200}

For Example:
Start the Com2Http Proxy Server for TCP_PORT = 6666, COM_PORT = 1 and BAUDRATE = 115200, user can type "./Com2Http 6666 1 115200" on command line and enter to execute it.
2. Execute the Com2Http Proxy Server by entering http://[IP Address] in the Netscape browser provided with Linux. Note that Linux prompts you to login to the machine with an ID of root.

**Note:**

The RAID subsystem controller default User Name (ID) is "admin" and the Password is "0000". It is strongly recommended to modify the password after the first login.

### 3.3.1.2 Start-up Web Browser-based RAID Management for Remote Administration

To configure MobileRAID RAID subsystem on a remote machine, you need to know its IP Address. You must first start up your local Com2Http Proxy Server. (Please reference this chapter section 6.1.2.1). Launch your com2Http Proxy Server by entering http://[IP Address] in the remote web browser.

**Note:**

You must be logged in as administrator with local admin rights on the remote machine to remotely configure it. The RAID subsystem controller default User Name is "admin" and the Password is "0000".

### 3.3.2 Firmware-embedded TCP/IP & web browser-based RAID manager (using the controller's 10/100 Ethernet LAN port)

To ensure proper communications between the RAID subsystem and Web browser-based RAID management, Please connect the RAID system Ethernet LAN port to any LAN switch port.
The controller has embedded the TCP/IP & Web Browser-based RAID manager in the firmware. User can remote manage the RAID system without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port.
To configure Internal RAID subsystem on a local or remote machine, you need to know its IP Address. The IP address will default show in the LCD screen. Launch your firmware-embedded TCP/IP & Web Browser-based RAID manager by entering http://[IP Address] in the web browser.

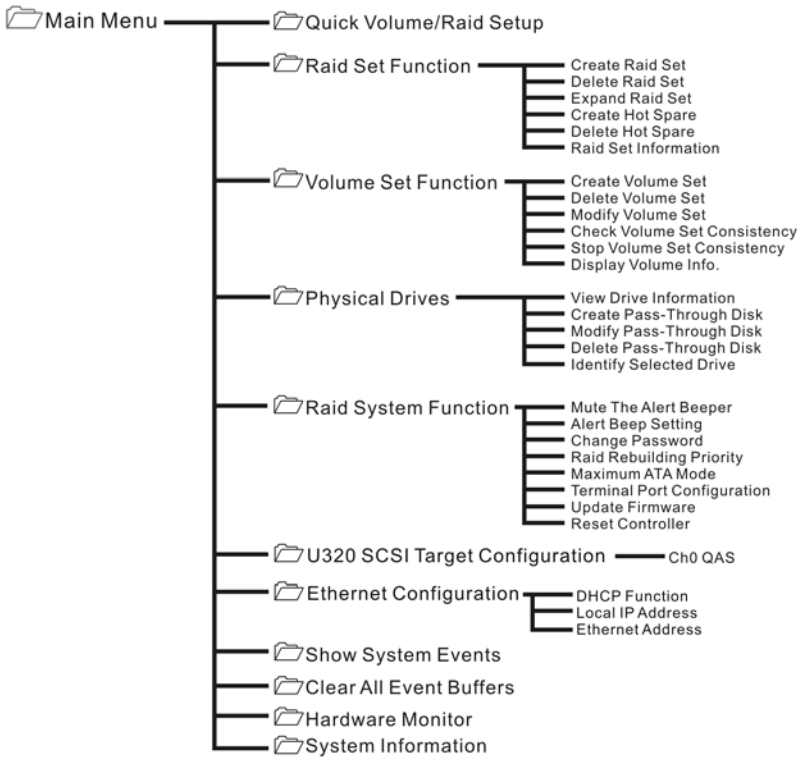
**Note:**

You must be logged in as administrator with local admin rights on the remote machine to remotely configure it. The RAID subsystem controller default User Name is "admin" and the Password is "0000".

## 3.4 Configuration Menu Tree

The following is an expansion of the menus in configuration Utility that can be accessed through the LCD panel, RS-232 serial port and Ethernet LAN port.

# CONFIGURATION METHOD




**Note:**

Ethernet Configuration, Alert By Mail Config, and SNMP Config can only be set in the web-based configuration.

* U320 SCSI Target configuration available on MR5S1 only.

# 4. LCD Configuration Menu

The RAID subsystem LCD configuration utility is a character-based utility that you can run after powering the unit. Use LCD Configuration Utility to:

- Create RAID set,
- Expand RAID set,
- Define volume set,
- Add physical drive,
- Modify volume set,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Modify system function and,
- Designate drives as hot spares.

The LCD display front panel function keys are the primary user interface for the RAID subsystem. Except for the "Firmware update", all configurations can be performed through this interface.

**Function Key Definitions**
The four function keys at the button of the front panel perform the following functions:

| Key | Function |
|---|---|
| Up Arrow | Use to scroll the cursor Upward/Rightward |
| Down Arrow | Use to scroll the cursor Downward/Leftward |
| ENT Key | Submit Select ion Function (Confirm a selected Item) |
| ESC Key | Return to Previous Screen (Exit a selection configuration) |

## 4.1 Starting LCD Configuration Utility

The main menu appears on the LCD screen, as shown below: Use the up and down arrow buttons to move left and right and highlight a menu item. Press **Enter** to select the highlighted item. Press the **UP/DOWN** to browse the selection. Press **ESC** to return to the previous screen.

## 4.2 LCD Configuration Utility Main Menu Options

Select an option and the related information or submenu items display beneath it. The submenus for each item are explained on the section 4.8.3. The configuration utility main menu options are:

| Option | Description |
|---|---|
| Quick Volume and RAID Set Setup | Create a default configurations which are based on the number of physical disk installed |
| RAID Set Functions | Create a customized RAID set |
| Volume Set Functions | Create a customized volume set |
| Physical Drive Functions | View individual disk information |
| RAID System Functions | Setting the RAID system configurations |
| U320 SCSI Target Configuration | SCSI Ultra 320 configuration (for MR5S1 only) |
| Ethernet Configuration | Ethernet LAN setting |
| Show System Events | Record all system events in the buffer |
| Clear All Event Buffer | Clear all event buffer information |
| Hardware Monitor Information | Show all system environment status |
| Show System informatiaon | View the controller information |

## 4.3 Configuring RAID Sets and Volume Sets

You can configure RAID sets and volume sets with LCD configuration utility using Quick Volume And RAID Set Setup, RAID Set Functions/Volume Set Functions configuration method. Each configuration method requires a different level of user input. The general flow of operations for RAID set and volume set configuration is:

| Step | Action |
|---|---|
| 1 | Designate hot spares/pass-through (optional) |
| 2 | Choose a configuration method |
| 3 | Create RAID set using the available physical drives |
| 4 | Define volume set using the space in the RAID set |
| 5 | Initialize the volume set and use volume set in the HOST OS |

## 4.4 Designating Drives as Hot Spares

To designate drives as hot spares, press **Enter** to enter the Main menu. Press **UP/DOWN** to select the RAID Set Functions option and then press **Enter**. All RAID set functions will be displayed. Press UP/DOWN to select the Create Hot Spare Disk option and then press **Enter**. The first unused physical device connected to the current controller appears: Press **UP/DOWN** to scroll the unused physical devices and select the target disk to assign as a Hot Spare and press **Enter** to designate it as a hot spare.

## 4.5 Using Quick Volume and RAID Set Setup

In Quick Volume And RAID Setup Configuration, The RAID set you create is associated with exactly one volume set, and you can modify the RAID level, stripe size, and capacity. Designating Drives as Hot Spares will also combine with RAID level in this setup.

| Parameter | Setting |
|---|---|
| Volume Name | Volume Set#00 |
| SCSI Channel/SCSI ID/SCSI LUN | 0/0/0 (For MR5S1) |
| IDE Host Channel/IDE Drive Select | 0/0-Master (For MR5CT1) |
| Cache Mode | Write Back |
| Tag Queuing | Yes |
| Max Sync Rate | Depend your host adapter setting (For MR5S1) |
| IDE Xfer Mode | Depend your host adapter setting (For MobileRAID-5S-WBS1) |

The volume set default settings will be:
The default setting values can be changed after configuration is complete.
Follow the steps below to create RAID set using Quick Volume And

# LCD CONFIGURATION MENU

| Step | Action |
|---|---|
| 1 | Choose **Quick Volume /RAID Setup** from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed. |
| 2 | Recommend use drives have same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific array determine the RAID levels that can be implemented with the array.<br>RAID 0 requires 1 or more physical drives<br>RAID 1 requires at least 2 physical drives<br>RAID 1+Spare requires at least 3 physical drives<br>RAID 3 requires at least 3 physical drives<br>RAID 5 requires at least 3 physical drives<br>RAID 6 requires at least 4 physical drives.<br>RAID 3 +Spare requires at least 4 physical drives<br>RAID 5 + Spare requires at least 4 physical drives<br>RAID 6 + Spare requires at least 5 physical drives.<br>Highlight ***RAID level*** for the volume set and press **Enter** key to confirm. |
| 3 | Set the capacity size for the current volume set. After Highlight RAID level and press **Enter** key.<br>The selected capacity for the current volume set is displayed. Using the **UP** and **DOWN** arrow key to create the current volume set capacity size and press **Enter** key to confirm. The available stripe sizes for the current volume set are displayed. |
| 4 | Using **UP** and **DOWN** arrow key to select the current volume set stripe size and press **Enter** key to confirm it. This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 5 or 6 Volume Set. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB. A larger stripe size provides better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random read requests more often, choose a small stripe size. |
| 5 | When you are finished defining the volume set, press **Enter** key to confirm the Quick Volume And RAID Set Setup function. |
| 6 | Press **Enter** key to define fast initialization or Selected the Background (Instant Available). When background Initialization, the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. When Initialization, the initialization proceeds must be completed before the volume set ready for system accesses. |
| 7 | Initialize the volume set you have just configured. |
| 8 | If you need to add additional volume set, using main menu Create Volume Set function |

## 4.6 Using RAID Set and Volume Set Functions

In RAID Set Function, you can use the Create RAID Set function to generate the new RAID set. In Volume Set Function, you can use the create volume set function to generate its associated volume set and parameters. If the current controller has unused physical devices connected, you can choose the Create Hot Spare option in the RAID Set Function to define a global hot spare.
Select this method to configure new RAID sets and volume sets. This configuration option allows you to associate volume set with partial and full RAID set.

| Step | Action |
|---|---|
| 1 | To setup the Hot Spare (option), choose **RAID Set Function** from the main menu. Select the **Create Hot Spare** and press **Enter** key to set the Hot Spare. |
| 2 | Choose RAID Set Function from the main menu. Select the Create RAID Set and press Enter key. |
| 3 | Select a Drive For RAID Set window is displayed showing the SATA drive connected to the current controller. |
| 4 | Press **UP** and **DOWN** arrow keys to select specific physical drives. Press the **Enter** key to associate the selected physical drive with the current RAID set.<br>Recommend use drives has same capacity in a specific RAID set. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific RAID set determine the RAID levels that can be implemented with the RAID set.<br>RAID 0 requires 1 or more physical drives per RAID set.<br>RAID 1 requires at least 2 physical drives per RAID set.<br>RAID 1 + Spare requires at least 3 physical drives per RAID set.<br>RAID 3 requires at least 3 physical drives per RAID set.<br>RAID 5 requires at least 3 physical drives per RAID set.<br>RAID 6 requires at least 4 physical drives per RAID set.<br>RAID 3 + Spare requires at least 4 physical drives per RAID set.<br>RAID 5 + Spare requires at least 4 physical drives per RAID set.<br>RAID 6 + Spare requires at least 5 physical drives. |
| 5 | After adding physical drives to the current RAID set as desired, press Yes to confirm the Create RAID Set function. |
| 6 | An Edit The RAID Set Name dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as RAID Set. #. Press Enter to finish the name editing. |

| | |
|---|---|
| 7 | Press **Enter** key when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8. |
| 8 | Choose **Volume Set Function** from the Main menu. Select the **Create Volume Set** and press **Enter** key. |
| 9 | Choose one RAID set from the Create Volume From RAID Set window. Press Enter key to confirm it. |
| 10 | The volume set attributes screen appers:<br>The volume set attributes screen shows the volume set default configuration value that is currently being configured. The volume set attributes are:<br>RAID Level,<br>Stripe Size,<br>SCSI HOST/SCSI ID/SCSI LUN/ (For MR5S1)<br>IDE HOST Channel/IDE Drive Select (For MR5CT1)<br>Cache Mode,<br>TaggedQueuing,<br>SCSI Max Rate (For MR5S1)<br>IDE Xfer Mode (For MR5CT1), and<br>Volume Name (number).<br>All value can be changing by the user. Press the **UP/DOWN** to select the attributes. Press the **Enter** to modify each attribute of the default value. Using the **UP/DOWN** to select attribute value and press the **Enter** to accept the default value. |
| 11 | After user completes modifying the attribute, press the **ESC** to enter the select Capacity for the volume set. Using the **UP/DOWN** to set the volume set capacity and press **Enter** to confirm it. |
| 12 | When you are finished defining the volume set, press **Enter** to confirm the Create function. |
| 13 | Press **Enter** to define fast initialization and ESC to normal initialization. The controller will begin to initialize the volume set, you have just configured. If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 13 to configure another volume set. |

## 4.7 Navigation Map of the LCD For MobileRAID

The password option allows user to set or clear the RAID subsystem's password protection feature. Once the password has been set, the user can only monitor and configure the RAID subsystem by providing the correct password. The password is used to protect the RAID subsystem from unauthorized entry. The controller will check the password only when entering the Main menu from the initial screen. The RAID subsystem will automatically go back

to the initial screen when it does not receive any command in twenty seconds. The RAID subsystem password is default setting at 0000 by the manufacture.

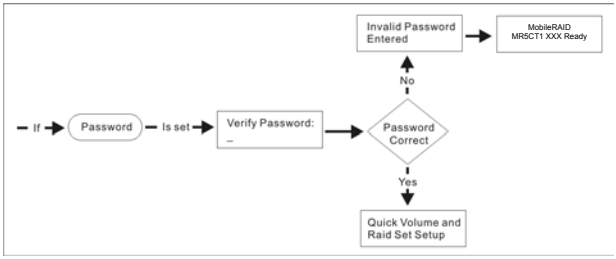



Figure 4.7-1
MR5CT1

## 4.7.1 Quick Volume/RAID Setup

Quick Volume And RAID Setup is the fastest way to prepare a RAID set and volume set. It only needs a few keystrokes to complete it. Although disk drives of different capacity may be used in the RAID set, it will use the smallest capacity of the disk drive as the capacity of all disk drives in the RAID set. The Quick Volume And RAID Setup option creates a RAID set with the following properties:

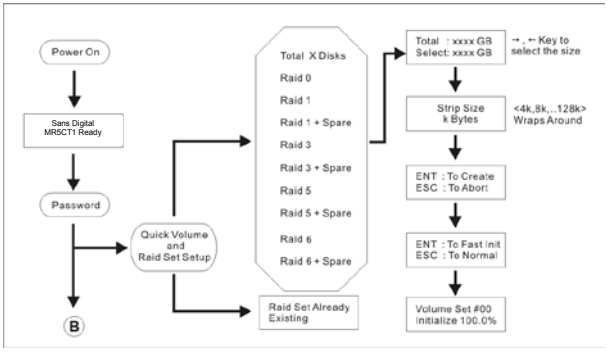


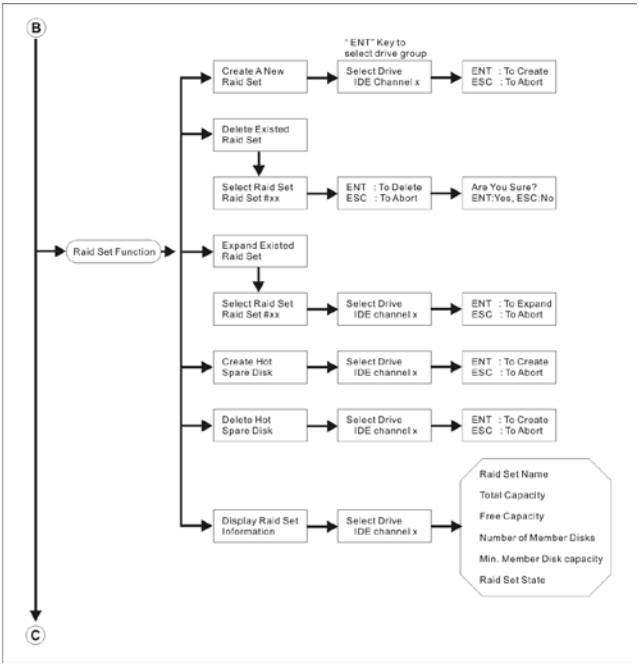

Figure 4.7.1-1
MR5CT1

1. All of the physical disk drives are contained in a RAID set.
2. The RAID levels associated with hot spare, capacity, and stripe size are selected during the configuration process.
3. A single volume set is created and consumed all or a portion of the disk capacity available in this RAID set.
4. If you need to add additional volume set, using main menu Volume Set functions Detail procedure references to this chapter section 4.5.

### 4.7.2 RAID Set Function

User manual configuration can complete control of the RAID set setting, but it will take longer time to complete than the Quick Volume And RAID Setup configuration. Select the RAID Set Function to manually configure the RAID set for the first time or deletes existing RAID set and reconfigures the RAID set.
To enter a RAID Set Functions, press **Enter** to enter the Main menu. Press **UP/DOWN** to select the RAID Set Functions option and then press **Enter** to enter further submenus. All RAID set submenus will be displayed.

Figure 4.7.2-1



### 4.7.2.1 Create A New RAID Set

Detail procedure references to this chapter section 4.6.

### 4.7.2.2 Delete Existed RAID Set

Press **UP/DOWN** to choose the Delete Existed RAID Set option. Using **UP/DOWN** to select the RAID set number that user want to delete and then press **Enter** to accept the RAID set number. The Confirmation screen appears, then press **Enter** to accept the delete existed RAID set function. The double confirmation screen appears, then press **Yes** to make sure of the delete existed RAID set function

### 4.7.2.3 Expand Existed RAID Set

Instead of deleting a RAID set and recreating it with additional disk drives, the Expand Existed RAID Set function allows the user to add disk drives to the RAID set that was created.
To expand existed RAID set, press **UP/DOWN** to choose the Expand Existed RAID Set option. Using **UP/DOWN** to select the RAID set number that user want to expand and then press **Enter** to accept the RAID set number. If there is an available disk, then the Select Drive IDE Channel x appears. Using **UP/DOWN** to select the target disk and then press **Enter** to select it. Press **Enter** to start expanding the existed RAID set.
The new add capacity will be define one or more volume sets. Follow the instruction presented in the Volume Set Function to create the volume sets.

**Note:**

1. Once the Expand RAID Set process has started, user cannot stop it. The process must be completed.
2. If a disk drive fails during RAID set expansion and a hot spare is available, an auto rebuild operation will occur after the RAID set expansion completes.

Migrating occurs when a disk is added to a RAID set. Migration status is displayed in the RAID status area of the RAID Set information when a disk is added to a RAID set. Migrating status is also displayed in the associated volume status area of the volume set Information when a disk is added to a RAID set

### 4.7.2.4 Activate Incomplete RAID Set

When one of the disk drive is removed in power off state, the RAID set state will change to Incomplete State. If user wants to continue to work, when the RAID subsystem is power on. User can use the Activate Incomplete RAID Set option to active the RAID set. After user complete the function, the RAID State will change to Degraded Mode.

### 4.7.2.5 Create Hot Spare Disk

Please refer to this chapter section 4.4: Designating Drives as Hot Spares.

### 4.7.2.6 Delete Hot Spare Disk

To delete hot spare, press **UP/DOWN** to choose the Delete Hot Spare Disk option. Using **UP/DOWN** to select the hot spare number that user want to delete and then press **Enter** to select it. The confirmation screens appear and press **Enter** to delete the hot spare.

### 4.7.2.7 Display RAID Set Information

Using **UP/DOWN** to choose the Display RAID Set Information option and press **Enter**. Using **UP/DOWN** to select the RAID set number that user want to display. The RAID set information will be displayed.
Using **UP/DOWN** to scroll the RAID set information, it shows RAID Set Name, Total Capacity, Free Capacity, Number of Member Disks, Min. Member Disk Capacity and RAID Set State.

## 4.7.3 Volume Set Function

A volume set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a Volume Set. A Volume Set capacity can consume all or a portion of the disk capacity available in a RAID Set. Multiple Volume Sets can exist on a group of disks in a RAID Set. Additional Volume Sets created in a specified RAID Set will reside on all the physical disks in the RAID Set. Thus each Volume Set on the RAID Set will have its data spread evenly across all the disks in the RAID Set.
To enter a Volume Set Functions, press **Enter** to enter the main menu. Press **UP/DOWN** to select the Volume Set Functions option and then press **Enter** to enter further submenus. All volume set submenus will be displayed.

### 4.7.3.1 Create RAID Volume Set

To create a volume set, Please refer to this chapter section 4.6: Using RAID Set and Volume Set Functions. The volume set attributes screen shows the volume set default configuration value that is currently being configured.

**For MR5CT1**

1. The attributes for MR5CT1 are RAID Level, Stripe Size, ache Mode, IDE Host Channel, IDE Drive Select, Tagged Queuing, IDE Xfer Mode, and Volume Name (number). See Figure 4.7.3.1-1

**For MR5S1**

1. The attributes for MR5S1 are RAID Level, Stripe Size, Cache Mode, SCSI HOST, SCSI ID, SCSI LUN, Tagged Queuing, SCSI Max Rate, and Volume Name (number). See Figure 4.7.3.1-2

All value can be changed by user. Press the UP/DOWN to select attribute. Press the **Enter** to modify the default value. Using the **UP/DOWN** to select attribute value and press the **Enter** to accept the default value. The following is the attributes descriptions. Please reference this chapter section 4.6 Using RAID Set

and Volume Set Functions to complete the create volume set function.

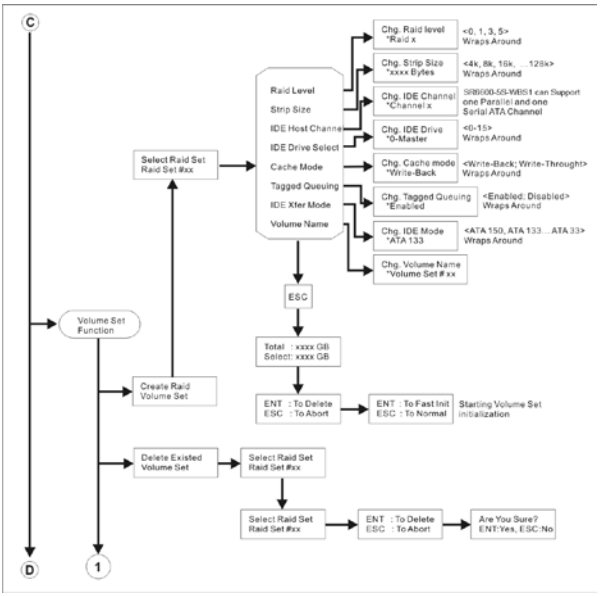



Figure 4.7.3.1-1
MR5CT1

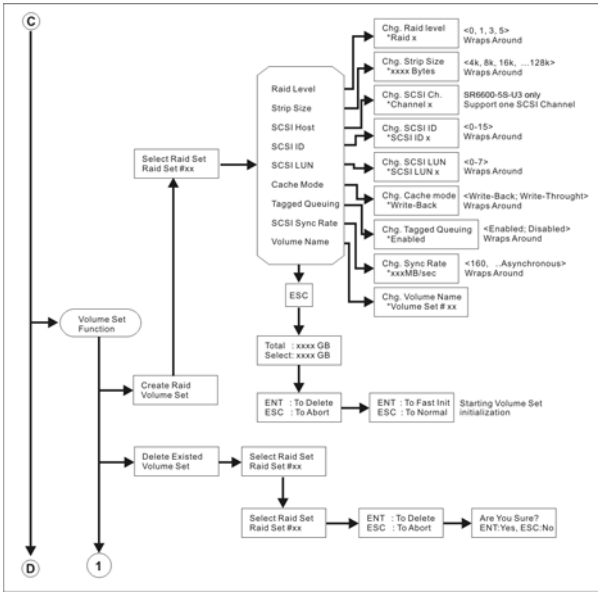



Figure 4.7.3.1-2
MR5S1

#### 4.7.3.1.1 Capacity

The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the **UP** and **DOWN** arrow key. Each volume set has a selected capacity which is less than or equal to the total capacity of the RAID set on which it resides.

#### 4.7.3.1.2 RAID Level

The controller can support RAID level 0, 1, 10, 3, 5 and 6.

#### 4.7.3.1.3 Strip Size

This parameter sets the size of the segment written to each disk in a RAID 0, 1, 5 or 6 logical drive. You can set the stripe size to 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. However, if you are sure that your computer does random reads more often, select a small stripe size.

#### 4.7.3.1.4 Volume Name

The default volume name will always appear as Volume Set. #. You can rename the volume set name providing it does not exceed the 15 characters limit.

#### 4.7.3.1.5 IDE and SATA Host Channel (MR5CT1)

IDE Channels:The MR5CT1 can support dual host channels IDE(for Firewire/USB) (Channel 0) and Serial ATA (Channel 1). Multiple channels can be applied to the RAID subsystem if user selects the Independent option in the Interface Mode at RAID System Function. Single channel can be applied to the RAID subsystem if user selects the Share Volume option in the Interface Mode at RAID System Function. Both IDE and SATA con-

nection are setting as Channel 0&1.

#### 4.7.3.1.6 IDE Drive Select (MR5CT1)

Host Channel setting at IDE (for Firewire/USB) and SATA host channel can concurrently access different volume sets. The IDE (Channel 0) can support one master and one slave volume sets . The SATA (Channel 1) can support one master volume set. The Max volume set can be accessed by MR5CT1 is 3.
Host Channel setting at Share Volume-The MR5CT1 can support dual IDE and Serial ATA accesses same volume set. But user can only connect one channel at one time. If user connects the Firewire/USB (Host Channel 0), the RAID subsystem supports 2 volumes (Master/Slave). If user connects the SATA, the RAID subsystem supports 1 volume (Master) (Host Channel 0). Both IDE and SATA connection are setting as Channel 0&1.

#### 4.7.3.1.7 SCSI Channel (MR5S1)

MR5S1 only support one ultra 320 SCSI channel.

#### 4.7.3.1.8 SCSI ID (MR5S1)

Each SCSI device attached to the SCSI card, as well as the card itself, must be assigned a unique SCSI ID number. A Wide SCSI channel can connect up to 15 devices. RAID subsystem is as a large SCSI device. We should assign an ID from a list of SCSI IDs.

#### 4.7.3.1.9 SCSI LUN (MR5S1)

Each SCSI ID can support up to 8 LUNs. Most SCSI host adapter treats each LUN like a SCSI disk.

#### 4.7.3.1.10 Cache Mode

User can set the cache mode as Write-Through Cache or Write-Back Cache.

#### 4.7.3.1.11 Tag Queuing

The Enabled option is useful for enhancing overall system

performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SCSI command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using older SCSI drives that do not support command tag queuing.

#### 4.7.3.1.12 IDE Xfer Mode (MR5CT1)

The MR5CT1 RAID subsystem supports ATA133, ATA100, ATA66, and ATA33 Mode.

#### 4.7.3.1.13 Max Sync Rate (MR5S1)

The RAID subsystem supports 320MB/sec for MR5S1 as the highest data transfer rate.

### 4.7.3.2 Delete Volume Set

Press **UP/DOWN** to choose the Delete Existed Volume Set option. Using **UP/DOWN** to select the RAID set number that user want to delete and press **Enter**. Scrolling the **UP/DOWN** to select the volume set number that user want to delete and press **Enter**. The Confirmation screen appears, and then press **Enter** to accept the delete volume set function. The double confirmation screen appears, then press **Yes** to make sure of the delete volume set function.

# LCD CONFIGURATION MENU

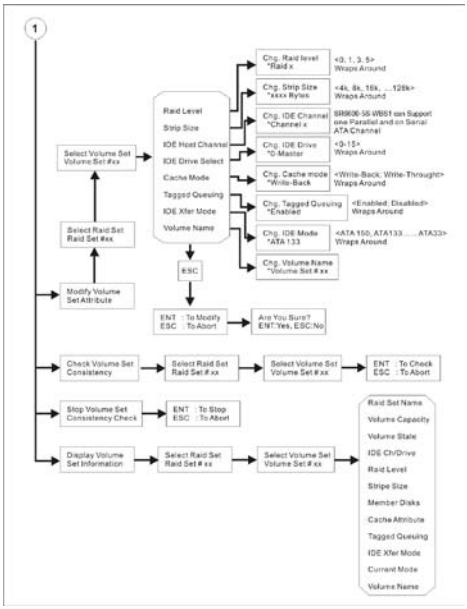



Figure 4.7.3.2-1
MR5CT1

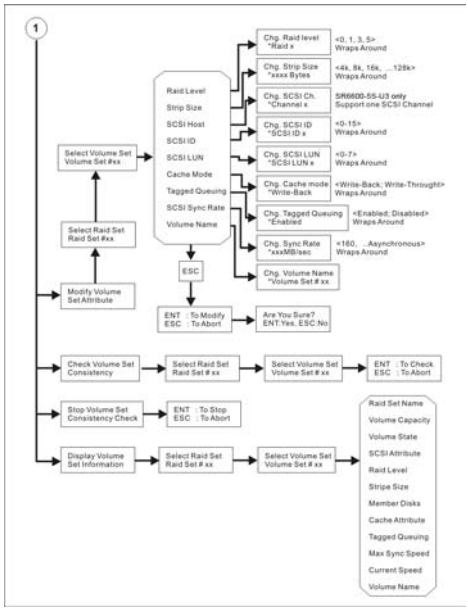



Figure 4.7.3.2-2
MR5S1

### 4.7.3.3 Modify Volume Set

Use this option to modify volume set configuration. To modify volume set attributes from RAID set system function, press UP/DOWN to choose the Modify Volume Set Attribute option. Using **UP/DOWN** to select the RAID set number that user want to modify and press **Enter**. Scrolling the **UP/DOWN** to select the volume set number that user want to modify and press **Enter**. Press **Enter** to select the existed volume set attribute. The volume set attributes screen shows the volume set setting configuration attributes that was currently being configured. The attributes are RAID Level, Stripe Size, Cache Mode, SCSI HOST/Fibre SCSI ID/SCSI LUN/Tagged Queuing, SCSI Max Rate, and Volume Name (number). All value can be modifying by the user. Press the **UP/DOWN** to select attribute. Press the **Enter** to modify the default value. Using the **UP/DOWN** to select attribute value and press the **Enter** to accept the selection value. Choose this option to display the properties of the selected Volume Set.

#### 4.7.3.3.1 Volume Set Migration

Migrating occurs when a volume set is migrating from one RAID level to another, a volume set strip size changes, or when a disk is added to a RAID set. Migration status is displayed in the volume state area of the Display Volume Set Information when one RAID level to another, a Volume set strip size changes or when a disk is added to a RAID set.

### 4.7.3.4 Check Volume Set Consistency

Use this option to check volume set consistency. To check volume set consistency from volume set system function, press **UP/DOWN** to choose the Check Volume Set Consistency option. Using **UP/DOWN** to select the RAID set number that user want to check and press **Enter**. Scrolling the **UP/DOWN** to select the volume set number that user want to check and press **Enter**. The Confirmation screen appears, press **Enter** to start the check volume set consistency.

#### 4.7.3.5 Stop Volume Set Consistency Check

Use this option to stop volume set consistency check. To stop volume set consistency check from volume set system function, press **UP/DOWN** to choose the Stop Volume Set Consistency Check option and then press **Enter** to stop the check volume set consistency.

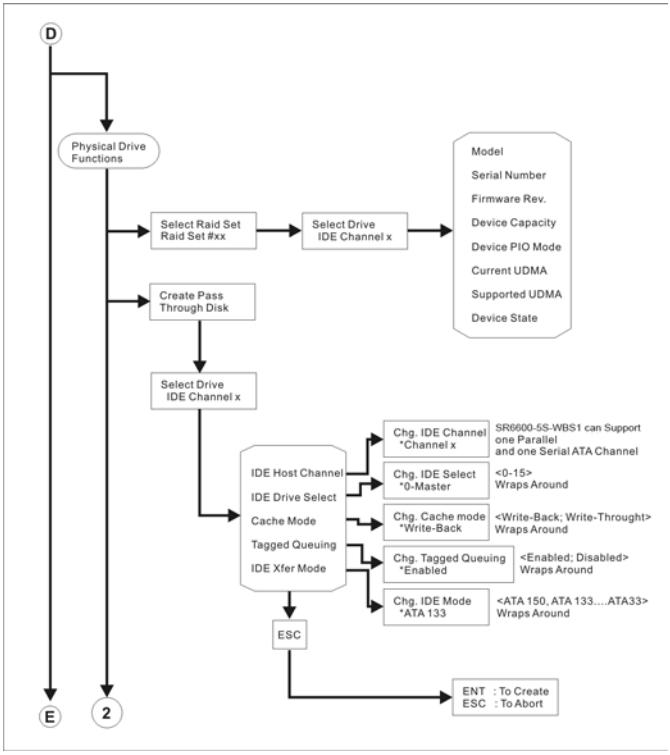
#### 4.7.3.6 Display Volume Set Information

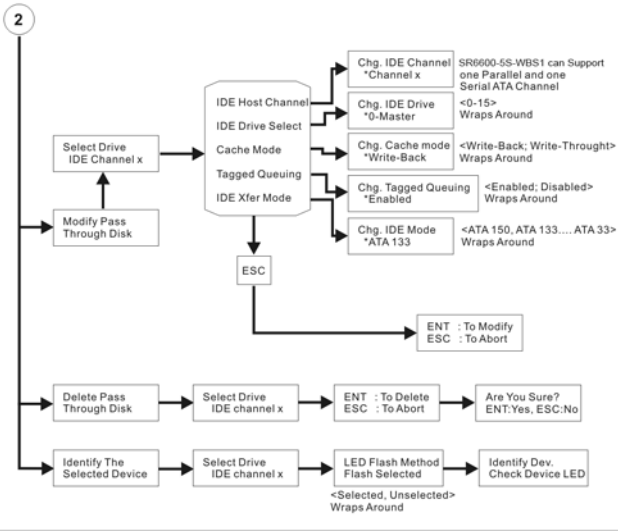
This option is display volume set information. To display volume set information from Volume set system function, press **UP/DOWN** to choose the Display Volume Set Information option. Using **UP/DOWN** to select the RAID set number that user wants to show and press **Enter**. Scrolling the **UP/DOWN** to select the volume set number that user want to display and press **Enter**. The volume set attributes screen shows the volume set setting configuration value that was currently being configured. The attributes are RAID Level, Stripe Size, Cache Mode, SCSI HOST, SCSI ID, SCSI LUN, Tagged Queuing, SCSI Max Rate, and Volume Name (number). All value cannot be modifying by this option.

### 4.7.4 Physical Drive

Choose this option from the Main Menu to select a physical disk and to perform the operations listed below. To enter a Physical Drive Functions, press **Enter** to enter the main menu. Press **UP/DOWN** to select the Physical Drive Functions option and then press **Enter** to enter further submenus.  All physical drive submenus will be displayed.

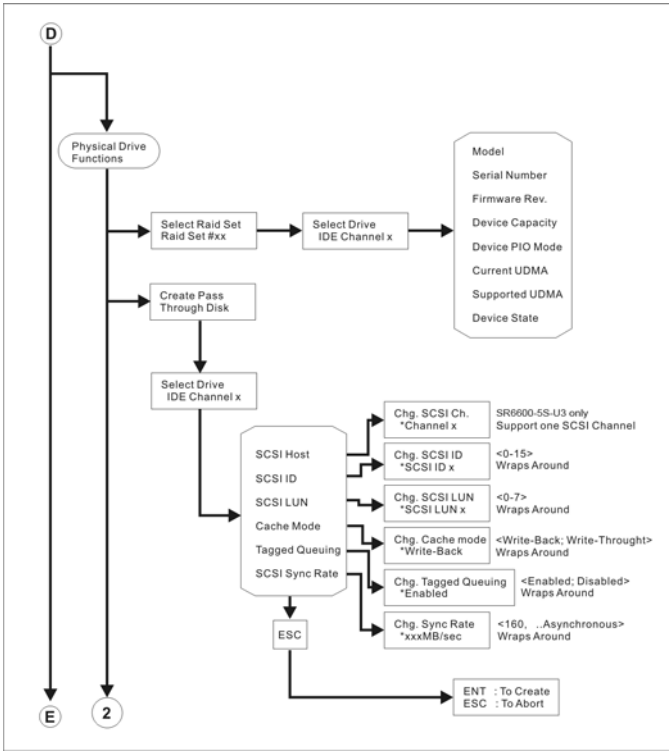
Figure 4.7.4-1
MR5CT1

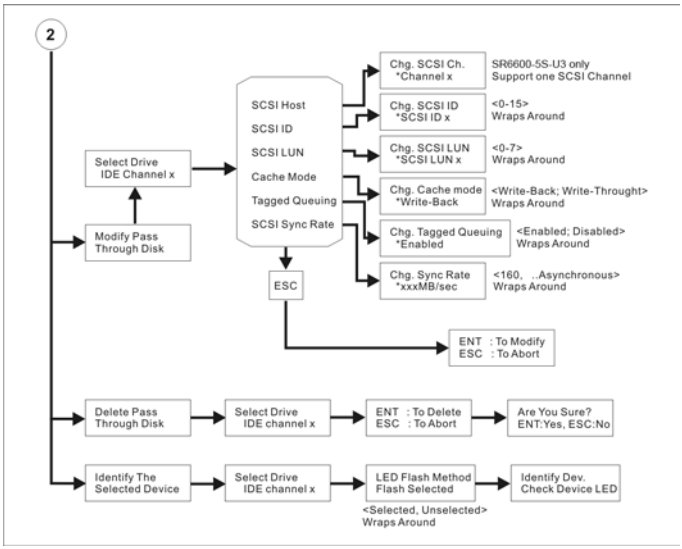


# LCD CONFIGURATION MENU

Figure 4.7.4-2
MR5S1



### 4.7.4.1 Display Drive Information

Using **UP/DOWN** to choose the View Drive Information option and press **Enter**. Using **UP/DOWN** to select the drive IDE number that user want to display. The drive information will be displayed. The drive information screen shows the Model Name, Serial Number, Firmware Rev., Device Capacity, Device PIO Mode, Current UDMA, Supported UDMA, and Device State.

### 4.7.4.2 Create Pass-Through

Disk is no controlled by the RAID subsystem firmware and thus cannot be a part of a RAID set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem firmware.
Using **UP/DOWN** to choose the Create Pass-Through Disk option and press **Enter**. Using **UP/DOWN** to select the drive IDE number that user want to create. The drive attributes will be displayed.

**For MR5CT1**

1. The attributes for MR5CT1 show the Cache Model, IDE Host Channel, IDE Drive Select, Tagged Queuing, and IDE Xfer Mode.

**For MR5S1**

1. The attributes for MR5S1 show the Cache Mode, SCSI Host, SCSI ID, SCSI LUN, Tagged Queuing, and SCSI Sync Rate.

All values can be changing by the user. Press the **UP/DOWN** to attribue and then press the **Enter** to modify the efault value. Using the **UP/DOWN** to select attribute value and press the **Enter** to accept the selection value.

### 4.7.4.3 Modify Pass-Through

Use this option to modify the Pass-Through Disk attributes. To modify Pass-Through Disk attributes from Pass-Through Disk pool, press **UP/DOWN** to choose the Modify Pass-Through

Drive option, and then press **Enter** key. The Select Drive Function menu will show all Pass-Through Drive number items. Using **UP/DOWN** to select the Pass-Through Disk that user wants to modify and press **Enter**. The attributes screen shows the Pass-Through Disk setting value that was currently being configured.

**For MR5CT1**

1. The attributes for MR5CT1 are the Cache Model, IDE Host Channel, IDE Drive Select, Tagged Queuing, and IDE Xfer Mode.

**For MR5CT1**

1. The attributes for MR5S1 are the Cache Mode, SCSI Host, SCSI ID, SCSI LUN, Tagged Queuing, and SCSI Max Rate.

All value can be modifying by the user. Press the **UP/DOWN** arrow keys to select attribute. Press the **Enter** to modify the default value. Using the **UP/ DOWN** key to select attribute value and press the **Enter** to accept the selection value. After completing the modification, press **ESC** to enter the confirmation screen and then press **Enter** to accept the Modify Pass-Through Disk function.

### 4.7.4.4 Delete Pass-Through

To delete pass-through drive from the pass-through drive pool, press **UP/DOWN** to choose the Delete Pass-Through Drive option, and then press **Enter**. The Select Drive Function menu will show all Pass-Through Drive number items. Using **UP/DOWN** to select the Pass-Through Disk that user want to delete and press **Enter**. The Delete Pass-Through confirmation screen will appear, presses **Enter** to delete it.

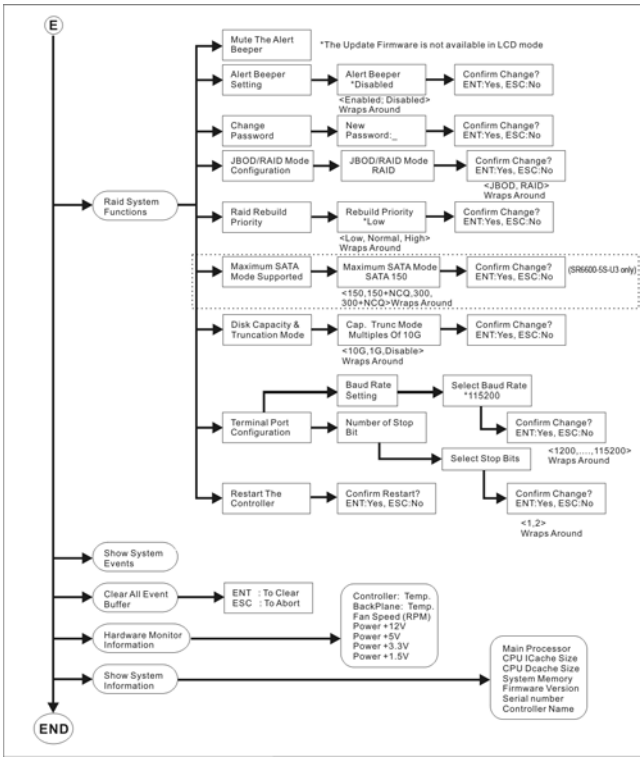
### 4.7.4.5 Identify Selected Drive

To prevent removing the wrong drive, the selected disk HDD LED Indicator will light for physically locating the selected disk when the Identify Selected Drive function is selected..
To identify selected drive from the physical drive pool, press **UP/DOWN** to choose the Identify Selected Drive option, then

press **Enter** key. The Select Drive function menu will show all physical drive number items. Using **UP/DOWN** to select the Disk that user want to identify and press **Enter**. The selected disk HDD LED indicator will flash.

## 4.7.5 RAID System Function

To enter a RAID System Function, press **Enter** to enter the Main menu. Press **UP/DOWN** to select the RAID System Function option and then press **Enter** to enter further submenus. All RAID system submenus will be displayed. Using UP/DOWN to select the submenus option and then press **Enter** to enter the selection function.




### 4.7.5.1 Mute The Alert Beeper

The Mute The Alert Beeper function item is used to control the RAID subsystem Beeper. Select the "**No**" and press Enter key in

the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

### 4.7.5.2 Alert Beeper Setting

The Alert Beeper function item is used to Disabled or Enable the RAID subsystem controller alarm tone generator. Using the UP/ DOWN to select alert beeper and then press the ENT to accept the selection. After completing the selection, the confirmation screen will be displayed and then press ENT to accept the function. Select the Disabled and press Enter key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

### 4.7.5.3 Change Password

To set or change the RAID subsystem password, press the **UP/ DOWN** to select Change Password and then press the **Enter** to accept the selection. The New Password: screen appears and enter new password that user want to change. Using the **UP/ DOWN** to set the password value. After completing the modification, the confirmation screen will be displayed and then press **Enter** to accept the function. To disable the password, presses **Enter** only in the New Password: column. The existing password will be cleared. No password checking will occur when entering the main menu from the starting screen.

### 4.7.5.4 JBOD/RAID Configuration

**For MR5CT1**
JBOD is an acronym for "Just a Bunch Of Disk". It represents a volume set that is created by the concatenation of partitions on the disks. For the MR5CT1, it can only see the first two disks, when you select the JBOD option. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

**For MR5S1**
JBOD is an acronym for "Just a Bunch Of Disk". It represents a volume set that is created by the concatenation of partitions on the disks. For the MR5S1, it can see the five individual disks,

when you select the JBOD option. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

### 4.7.5.5 RAID Rebuild Priority

The "RAID Rebuild Priority" is a relative indication of how much time the controller devotes to a rebuild operation. The RAID subsystem allows user to choose the rebuild priority (low, normal, high) to balance volume set access and rebuild tasks appropriately.
To set or change the RAID subsystem RAID Rebuild Priority, press the **UP/DOWN** to select RAID Rebuild Priority and press the **Enter** to accept the selection. The rebuild priority selection screen appears and uses the **UP/DOWN** to set the rebuild value. After completing the modification, the confirmation screen will be displayed and then press **Enter** to accept the function.

### 4.7.5.6 Maximum SATA Mode

Within the subsystem, the SCSI chip acts as a target and 5 SATA ll bus are connected to the drive. The 5 SATA drive channel can support up to SATA ll, which runs up to 300MB/s. NCQ is a command protocol in Serial ATA that can only be implemented on native Serial ATA hard drives. It allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows user to choose the SATA Mode: SATA150, SAT150+NCQ, SAT300, SATA300+NCQ.

### 4.7.5.7 Disk Capacity Truncation Mode

MobileRAID RAID controllers use drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units.
The controller provides three truncation modes in the system configuration: **Multiples Of 10G**, **Multiples Of 1G**, and **No**

**Truncation**.

**Multiples Of 10G:** If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. Sans Digital drive Truncation mode **Multiples Of 10G** uses the same capacity for both of these drives so that one could replace the other.

**Multiples Of 1G:** If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. Sans Digital drive Truncation mode **Multiples Of 1G** uses the same capacity for both of these drives so that one could replace the other.

**No Truncation:** It does not truncate the capacity.

### 4.7.5.8 Terminal Port Configuration

Parity value is fixed at None.
Handshaking value is fixed at None.
Speed setting values are 1200, 2400, 4800, 9600, 19200,38400, 57600, and 115200.
Stop Bits values are 1 bit and 2 bits.
To set or change the RAID subsystem COMA configuration, press the **UP/DOWN** to select COMA Configuration and then press the ENT to accept the selection. The baud rate setting or number of stop bit screen appears and uses the **UP/DOWN** select the setting function. The respect selection screen appears and uses the **UP/DOWN** arrow to set the value. After completing the modification, the confirmation screen will be displayed and then press **Enter** to accept the function.

### 4.7.5.9 Restart Controller

Use the Restart Controller function to restart the RAID subsystem controller. To restart the RAID subsystem, press the **UP/DOWN** to select Restart Controller and then press the **Enter** to accept the selection. The confirmation screen will be displayed and then press **Enter** to accept the function.

**Note:**

It only can work properly at Host and Drive without any activity.

### 4.7.6 U320 SCSI Target Configuration (MR5S1)

Use this feature to Enable/Disable the Ch0 QAS, press **Enter** to enter the Main menu. Press **UP/DOWN** key to select the Show U320 SCSI Target option, and then press **Enter**.

### 4.7.7 Ethernet Configuration

To configuration Ethenet function, press **Enter** to enter the Main menu. Press **UP/DOWN** key to select the option.

### 4.7.8 Show System Events

To view the RAID subsystem events, press **Enter** to enter the Main menu. Press **UP/DOWN** key to select the Show System Events option, and then press **Enter**. The system events will be displayed. Press **UP/DOWN** to browse all the system events.

### 4.7.9 Clear all Event Buffers

Use this feature to clear the entire events buffer information. To clear all event buffers, press **Enter** to enter the main menu. Press **UP/DOWN** to select the Clear all Event Buffers option, and then press **Enter**. The confirmation message will be displayed and press the **Enter** to clear all event buffers or **ESC** to abort the action.

### 4.7.10 Hardware Information

To view the RAID subsystem controller's hardware monitor information, press **Enter** to enter the main menu. Press **UP/DOWN** to select the Hardware Information option, and then press **Enter**. All hardware information will be displayed. Press **UP/DOWN** to

browse all the hardware information.
The Hardware Monitor Information provides the temperature, fan speed (chassis fan) and voltage of the internal RAID subsystem. The temperature items list the current states of the controller board and backplane. All items are also unchangeable. The warning messages will indicate through the LCM, LED and alarm

| Item | Warning Condition |
|---|---|
| Controller Board Temperature | **> 60º** |
| Backplane Temperature | **> 55º** |
| Controller Fan Speed | **< 1900 RPM** |
| Power Supply +12V | **< 10.5V or > 13.5V** |
| Power Supply +5V | **< 4.7V or > 5.3V** |
| Power Supply +3.3V | **< 3.0V or > 3.6V** |
| CPU Core Voltage +1.5V | **< 1.35V or > 1.65V** |

buzzer.

### 4.7.11 System Information

Choose this option to display Main processor, CPU Instruction cache and data cache size, firmware version, serial number, controller model name, and the cache memory size. To check the system information, press **Enter** to enter the main menu. Press **UP/DOWN** to select the Show System Information option, and then press **Enter**. All major controller system information will be displayed. Press **UP/DOWN** to browse all the system informa-

# 5. VT-100 Utility Configuration

The RAID subsystem configuration utility is firmware-based and uses to configure RAID sets and volume sets. Because the utility resides in the RAID controller firmware, its operation is independent of the operating systems on your computer. Use this utility to:

- Create RAID set,
- Expand RAID set,
- Define volume set,
- Add physical drive,
- Modify volume set,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Update firmware,
- Modify system function and,
- Designate drives as hot spares.

### Keyboard Navigation

The following definition is the VT-100 RAID configuration utility keyboard navigation.

| Key | Function |
|---|---|
| Arrow Key | Move Cursor |
| Enter Key | Submit selection function |
| ESC Key | Return to previous screen |
| L Key | Line Draw |
| X Key | Redraw |

## 5.1 Configuring RAID Sets and Volume Sets

You can configure RAID sets and volume sets with VT-100 terminal function using Quick Volume/RAID Setup, or RAID Set/Volume Set Function configuration method. Each configuration method requires a different level of user input. The general flow of operations for RAID set and volume set configuration is:

| Step | Action |
|---|---|
| 1 | Designate hot spares/pass-through (optional). |
| 2 | Choose a configuration method. |
| 3 | Create RAID sets using the available physical drives. |
| 4 | Define volume sets using the space in the RAID set. |
| 5 | Initialize the volume sets (logical drives) and use volume sets in the host OS. |

## 5.2 Designating Drives as Hot Spares

All unused disk drive that is not part of a RAID set can be created as a Hot Spare. The Quick Volume/RAID Setup configuration will automatically add the spare disk drive with the RAID level for user to select. For the RAID Set Function configuration, user can use the Create Hot Spare option to define the hot spare disk drive.
A Hot Spare disk drive can be created when you choose the Create Hot Spare option in the RAID Set Function, all unused physical devices connected to the current controller appear:
Select the target disk by clicking on the appropriate check box. Press the **Enter** key to select a disk drive, and press **Yes** in the Create Hot Spare to designate it as a hot spare.

## 5.3 Using Quick Volume /RAID Setup Configuration

In Quick Volume /RAID Setup Configuration, it collects all drives in the tray and include them in a RAID set. The RAID set you create is associated with exactly one volume set, and you can modify the default RAID level, stripe size, and capacity of the volume set. Designating Drives as Hot Spares will also show in the RAID level selection option. The volume set default settings will be:

| Parameter | Setting |
|---|---|
| Volume Name | Volume Set # 00 |
| SCSI Channel/SCSI ID/SCSI LUN | 0/0/0 (For MR5S1) |
| IDE Host Channel/IDE Drive Select | 0/0-Master (For MR5CT1) |
| Cache Mode | Write Back |
| Tag Queuing | Yes |

| | |
|---|---|
| Max Sync Rate | Depend on your hous adapter setting (For MR5S1) |
| IDE Xfer Mode | Depend on your host adapter setting (For MobileRAID-5S-WBS1) |

The default setting values can be changed after configuration is complete. Follow the steps below to create arrays using Quick Volume /RAID Setup Configuration:

| Step | Action |
|---|---|
| 1 | Choose **Quick Volume /RAID Setup** from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed. |
| 2 | Recommend use drives have same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific array determine the RAID levels that can be implemented with the array.<br>RAID 0 requires 1 or more physical drives.<br>RAID 1 requires at least 2 physical drives.<br>RAID 1+Spare requires at least 3 physical drives.<br>RAID 3 requires at least 3 physical drives.<br>RAID 5 requires at least 3 physical drives.<br>RAID 6 requires at least 4 physical drives.<br>RAID 3 +Spare requires at least 4 physical drives.<br>RAID 5 + Spare requires at least 4 physical drives.<br>RAID 6 + Spare requires at least 5 physical drives.<br>Highlight ***RAID level*** for the volume set and press **Enter** key to confirm. |
| 3 | Set the capacity size for the current volume set. After Highlight RAID level and press **Enter** key.<br>The selected capacity for the current volume set is displayed. Using the **UP** and **DOWN** arrow key to create the current volume set capacity size and press **Enter** key to confirm. The available stripe sizes for the current volume set are displayed. |
| 4 | Using **UP** and **DOWN** arrow key to select the current volume set stripe size and press **Enter** key to confirm it. This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 5 or 6 Volume Set. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.<br>A larger stripe size provides better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random read requests more often, choose a small stripe size. |
| 5 | When you are finished defining the volume set, press **Enter** key to confirm the Quick Volume And RAID Set Setup function. |

| | |
|---|---|
| 6 | Press **Enter** key to define fast initialization or Selected the Background (Instant Available). When background Initialization, the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. When Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses. |
| 7 | Initialize the volume set you have just configured. |
| 8 | If you need to add additional volume set, using main menu Create Volume Set function |

## 5.4 Using RAID Set/Volume Set Function Method

In RAID Set Function, you can use the Create RAID Set function to generate the new RAID set. In Volume Set Function, you can use the Create Volume Set function to generate its associated volume set and parameters.
If the current controller has unused physical devices connected, you can choose the Create Hot Spare option in the RAID Set Function to define a global hot spare. Select this method to configure new RAID sets and volume sets. The RAID Set/Volume Set Function configuration option allows you to associate volume set with partial and full RAID set.

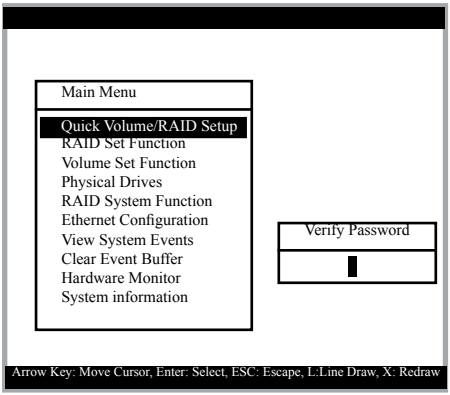
**Note:**

User can use this method to examine the existing configuration. Modify volume set configuration method provides the same functions as create volume set configuration method. In volume set function, you can use the modify volume set function to modify the volume set parameters except the capacity size:

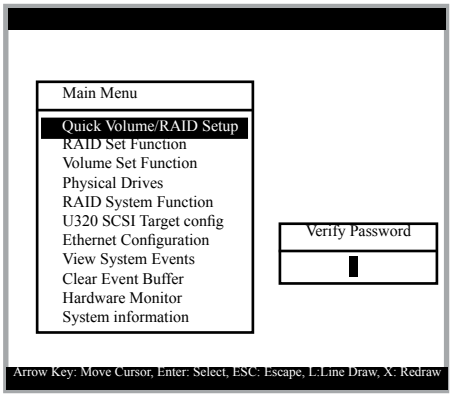
| Step | Action |
|---|---|
| 1 | To setup the Hot Spare (option), choose **RAID Set Function** from the main menu. Select the **Create Hot Spare** and press **Enter** key to set the Hot Spare. |
| 2 | Choose RAID Set Function from the main menu. Select the Create RAID Set and press Enter key. |
| 3 | Select a Drive For RAID Set window is displayed showing the IDE drive connected to the current controller. |
| 4 | Press **UP** and **DOWN** arrow keys to select specific physical drives. Press the **Enter** key to associate the selected physical drive with the current RAID set.<br>Recommend use drives has same capacity in a specific RAID set. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific RAID set determine the RAID levels that can be implemented with the RAID set.<br>RAID 0 requires 1 or more physical drives.<br>RAID 1 requires at least 2 physical drives.<br>RAID 1+Spare requires at least 3 physical drives.<br>RAID 3 requires at least 3 physical drives.<br>RAID 5 requires at least 3 physical drives.<br>RAID 6 requires at least 4 physical drives.<br>RAID 3 +Spare requires at least 4 physical drives.<br>RAID 5 + Spare requires at least 4 physical drives<br>RAID 6 + Spare requires at least 5 physical drives. |
| 5 | After adding physical drives to the current RAID set as desired, press Yes to confirm the Create RAID Set function. |
| 6 | An Edit The RAID Set Name dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as RAID Set. #. Press Enter to finish the name editing. |
| 7 | Press **Enter** key when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8. |
| 8 | Choose **Volume Set Function** from the Main menu. Select the **Create Volume Set** and press **Enter** key. |
| 9 | Choose one RAID set from the Create Volume From RAID Set window. Press Enter key to confirm it. |
| 10 | Foreground (Fast Completion) Press **Enter** key to define fast initialization or Selected the Background (Instant Available). In the background Initialization, the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses. |
| 11 | If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 10 to configure another volume set. |

## 5.5 Main Menu

The main menu shows all function that enables the customer to execute actions by clicking on the appropriate link.




MR5CT1




MR5S1

**Note:**

The manufacture default password is set at **0000**, this password can be by selected the **Change Password** in the section of **RAID System Function**.

| Option | Description |
|---|---|
| Quick Volume/RAID Setup | Create a default configuration which based on numbers of physical disk installed |
| RAID Set Function | Create a customized RAID set |
| Volume Set Function | Create a customized volume set |
| Physical Drives | View individual disk information |
| RAID System Function | Setting the RAID system configuration |
| View System Events | Record all system events in the buffer |
| Clear Event Buffer | Clear all event buffer information |
| Hardware Monitor | Show all system environment status |
| System Information | View the controller information |

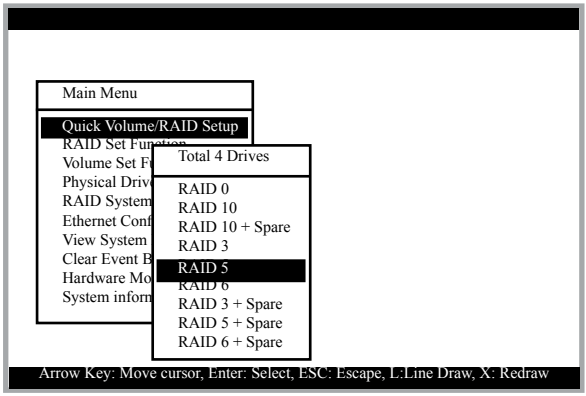
This password option allows user to set or clear the RAID controller's password protection feature. Once the password has been set, the user can only monitor and configure the RAID controller by providing the correct password. The password is used to protect the internal RAID controller from unauthorized entry. The controller will check the password only when entering the Main menu from the initial screen. The RAID controller will automatically go back to

### 5.5.1 Quick Volume/RAID Setup

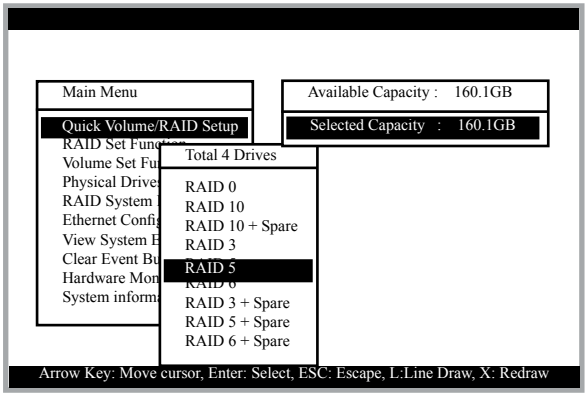
Quick Volume/RAID Setup is the fastest way to prepare a RAID set and volume set. It only needs a few keystrokes to complete it. Although disk drives of different capacity may be used in the RAID set, it will use the smallest capacity of disk drive as the capacity of all disk drives in the RAID set. The Quick Volume/RAID Setup option creates a RAID set with the following properties:

1. All of the physical drives are contained in a RAID set.
2. The RAID levels associated with hot spare, capacity, and stripe size are selected during the configuration process.
3. A single volume set is created and consumed all or a portion of the disk capacity available in this RAID set.
4. If you need to add additional volume set, using main menu Create Volume set function.

The total physical drives in a specific RAID set determine the RAID levels that can be implemented with the RAID set. Press the **Quick Volume/RAID Setup** from the main menu; all possible RAID levels screen will be displayed.

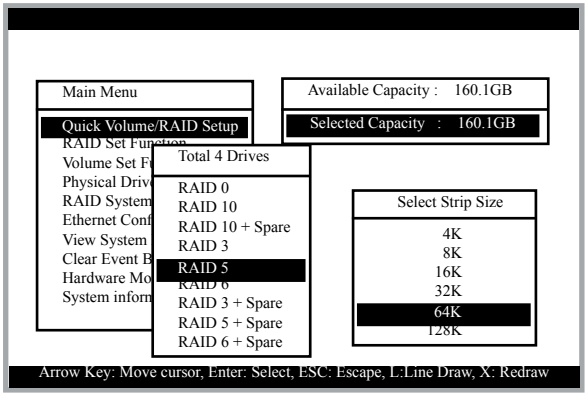



A single volume set is created and consumed all or a portion of the disk capacity available in this RAID set. Define the capacity of volume set in the Available Capacity popup. The default value for the volume set is displayed in the selected capacity. To enter a value less than the available capacity, type the value and press the **Enter** key to accept this value. If it only use part of the RAID set capacity, you can use the **Create Volume Set** option to define another volume sets.

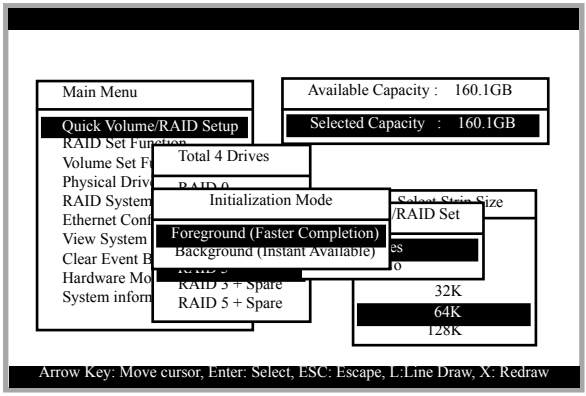



**Stripe size** This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 5 or 6 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.
A larger stripe size produces better-read performance, especially

if your computer does mostly sequential reads. However, if you are sure that your computer does random reads more often, select a small stripe size.

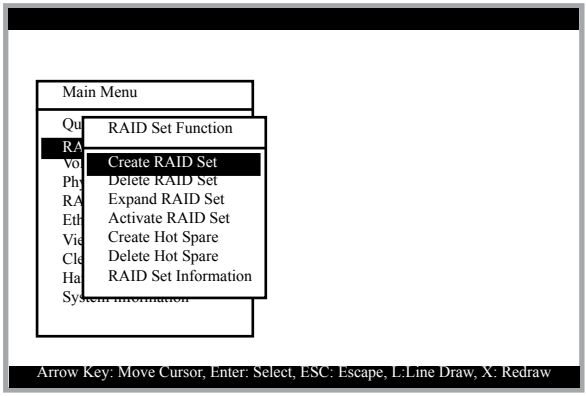



Press the **Yes** key in the Create Vol/RAID Set dialog box, the Initialization dialog box will appear. Select the mode for intialize, the RAID set and volume set will start to initialize it.



## 5.5.2 RAID Set Function

User manual configuration can complete control of the RAID set setting, but it will take longer to complete than the Quick Volume/RAID Setup configuration. Select the RAID Set Function to manually configure the RAID set for the first time or deletes existing RAID set and reconfigures the RAID set.

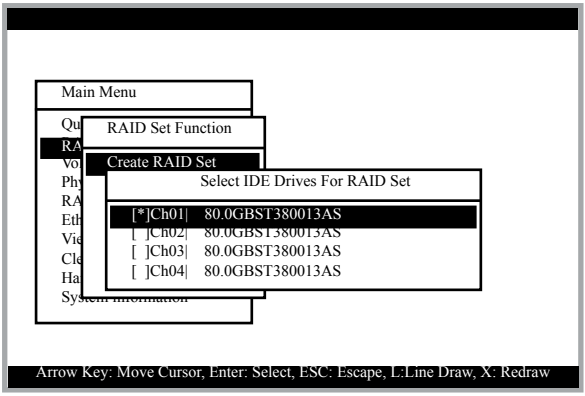



### 5.5.2.1 Create RAID Set

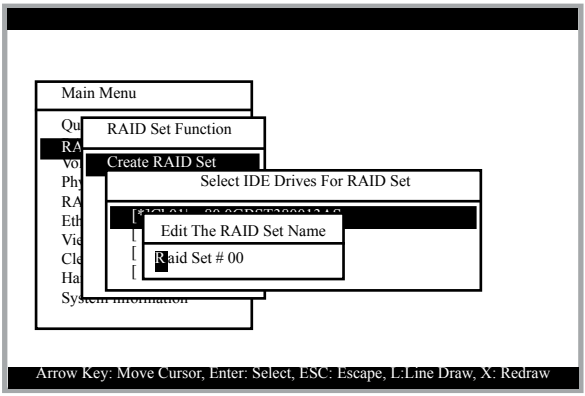
To define RAID set, follow the procedure below:

1. Select RAID Set Function from the main menu.
2. Select Create RAID Set option from the RAID Set Function dialog box.
3. A Select IDE Drive For RAID Set window is displayed showing the IDE drive connected to the current controller. Press the **UP** and **DOWN** arrow keys to select specific physical drives. Press the Enter key to associate the selected physical drive with the current RAID set. Repeat this step, as many disk drives as user want to add in a single RAID set.

To finish selecting IDE drives For RAID Set, press **Esc** key. A Create RAID Set confirmation screen appears, Press **Yes** key to confirm it.

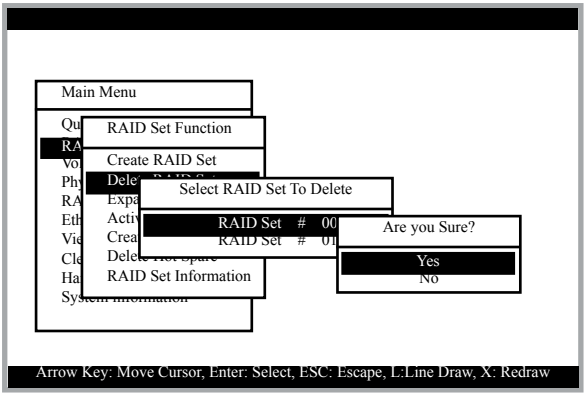



4. An Edit The RAID Set Name dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as RAID Set.



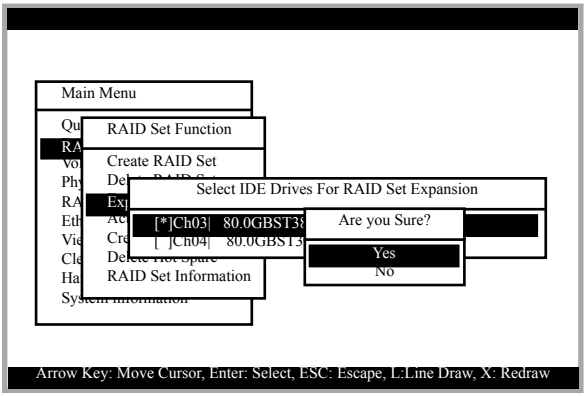

### 5.5.2.2 Delete RAID Set

To change a RAID set, you should first delete it and re-create the RAID set. To delete a RAID set, select the RAID set number that user want to delete in the Select RAID Set to Delete screen. The Delete RAID Set dialog box appears, then press **Yes** key to delete it.



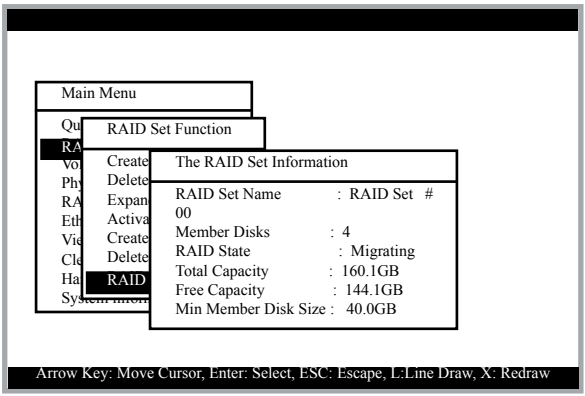

### 5.5.2.3 Expand RAID Set

Instead of deleting a RAID set and recreating it with additional disk drives, the Expand RAID Set function allows the users to add disk drive to the RAID set that was created.




To expand a RAID set:
Click on Expand RAID Set option. If there is an available disk, then the Select IDE Drives For RAID Set Expansion screen appears.
Select the target RAID Set by clicking on the appropriate radial button. Select the target disk by clicking on the appropriate check box.
Presses **Yes** key to start expand the RAID set.
The new add capacity will be define one or more volume sets. Follow the instruction presented in the Volume Set Function to create the volume set's.

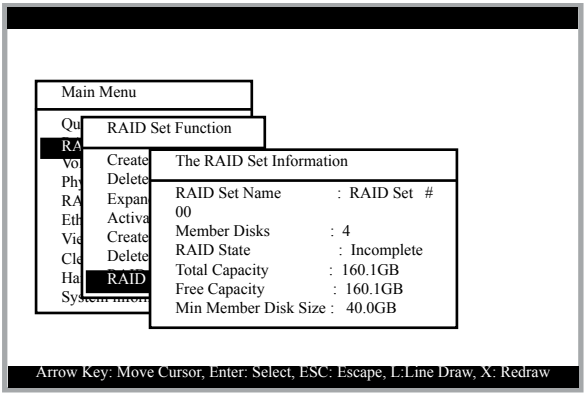
- **Migrating**




Migrating occurs when a disk is added to a RAID Set. Migration status is displayed in the RAID status area of the RAID Set information when a disk is added to a RAID set. Migrating status is also displayed in the associated volume status area of the Volume Set Information when a disk is added to a RAID set.

### 5.5.2.4 Activate Incomplete RAID Set

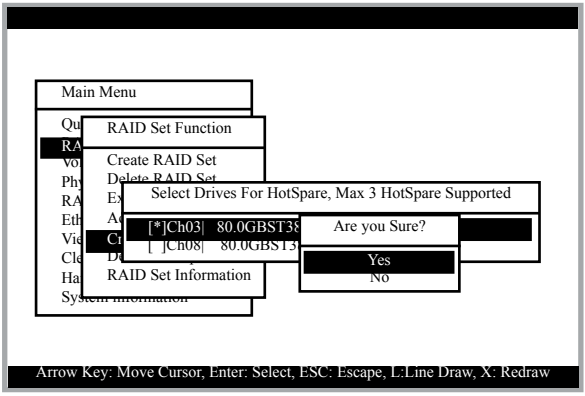
The following screen is the RAID Set Information after one of its disk drive has removed in the power off state.




When one of the disk drive is removed in power off state, the RAID set state will change to Incomplete State. If user wants to continue to work, when the SATA RAID controller is power on. User can use the Activate RAID Set option to active the RAID

set. After user complete the function, the RAID State will change to Degraded Mode.

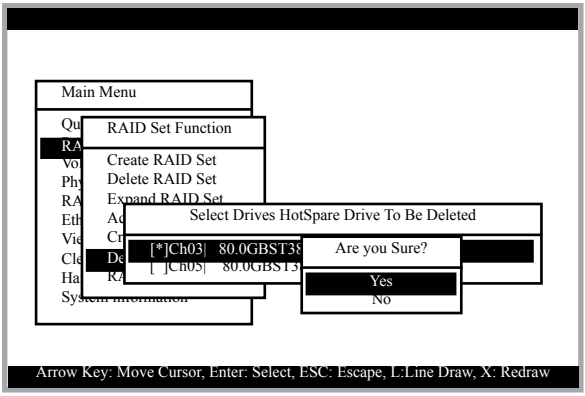
### 5.5.2.5 Create Hot Spare




When you choose the Create Hot Spare option in the RAID Set Function, all unused physical devices connected to the current controller appear:
Select the target disk by clicking on the appropriate check box.
Press the **Enter** key to select a disk drive and press **Yes** in the Create Hot Spare to designate it as a hot spare.
The create Hot Spare option gives you the ability to define a global hot spare.

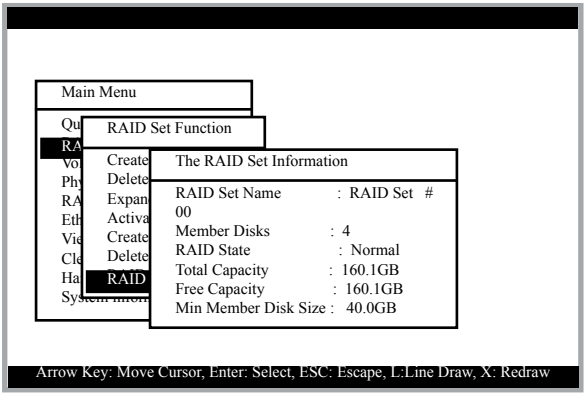
### 5.5.2.6 Delete Hot Spare

Select the target Hot Spare disk to delete by clicking on the appropriate check box.
Press the **Enter** keys to select a disk drive, and press **Yes** in the Delete Hot Spare to delete the hot spare.

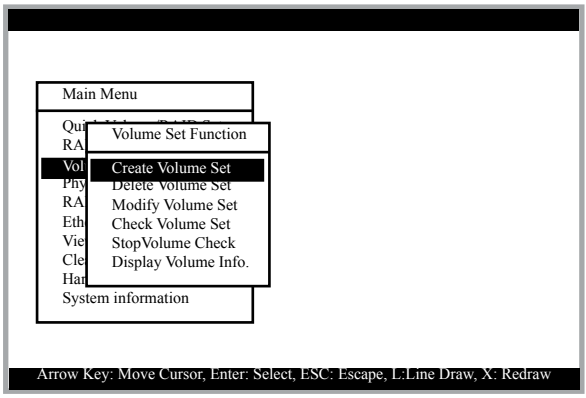



## 5.5.2.7 RAID Set Information

To display RAID Set information, move the cursor bar to the desired RAID Set number, then press **Enter** key. The RAID Set Information will show as above.
You can only view the information of this RAID Set.



## 5.5.3 Volume Set Function




A Volume Set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a Volume Set. A Volume Set capacity can consume all or a portion of the disk capacity available in a RAID Set. Multiple Volume Sets can exist on a group of disks in a RAID Set. Additional Volume Sets created in a specified RAID Set will reside on all the physical disks in the RAID Set. Thus each Volume Set on the RAID Set will have its data spread evenly across all the disks in the RAID Set.

### 5.5.3.1 Create Volume Set

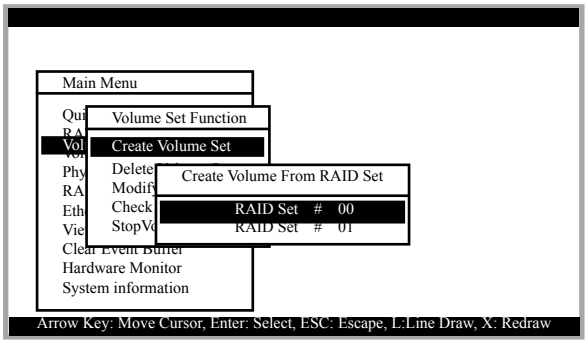
#### 5.5.3.1.1 For MR5S1

The following steps is the volume set features:

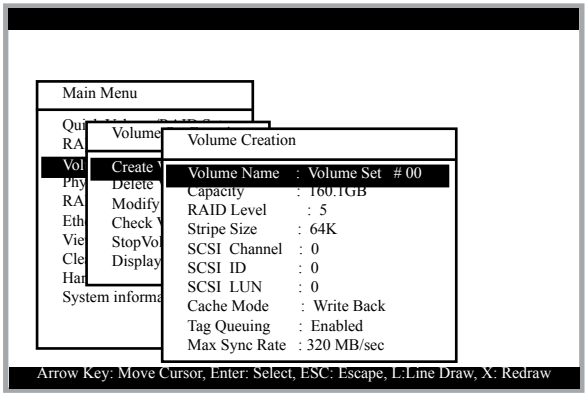
1. Volume sets of different RAID levels may coexist on the same RAID set.
2. Up to 16 volume sets in a RAID set can be created by the RAID subsystem controller.
3. The maximum addressable size of the single volume set is 2 TB (32-bit mode).
4. Support greather than 2TB capacity per volume set (64-bit LBA mode).

To Create a volume set, follow the following steps:

1. Select the Volume Set Function from the Main menu.
2. Choose the Create Volume Set from Volume Set Functions dialog box screen.
3. The Create Volume From RAID Set dialog box appears. This screen displays the existing arranged RAID sets. Select the RAID set number and press **Enter** key. The Volume Creation is displayed in the screen.

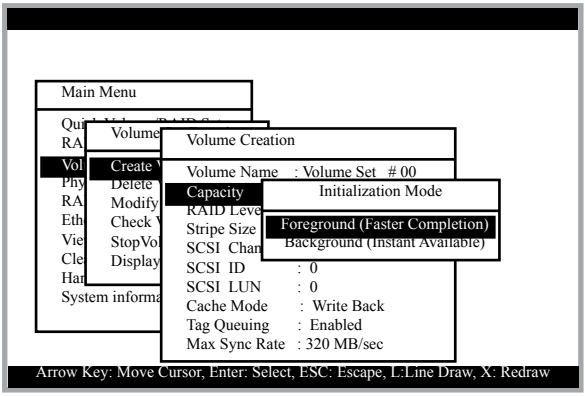



4. A window with a summary of the current volume set's settings. The "**Volume Creation**" option allows user to select the Volume name, capacity, RAID level, strip size, SCSI ID/ LUN, Cache mode and tag queuing. User can modify the default values in this screen; the modification procedures are at 5.5.3.1.1.1 to 5.5.3.1.1.10 section.



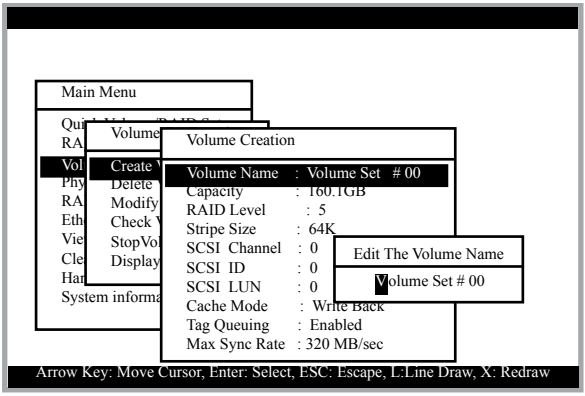

5. After completing the modification of the volume set, press Esc key to confirm it. A Fast Initialization screen is presented (only RAID Level 3, and 5).

• Select Yes Key to start the Fast Initialization of the selected volume set.
• Select No Key to start the Normal Initialization of the selected volume set.



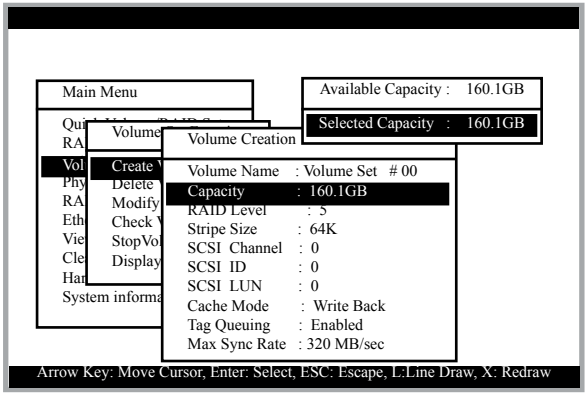

6. Repeat steps 3 to 5 to create additional volume sets.
7. The initialization percentage of volume set will be displayed at the button line.

### 5.5.3.1.1.1 Volume Name



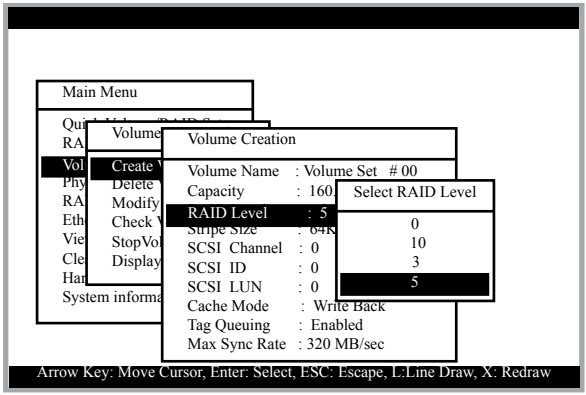

The default volume name will always appear as Volume Set. #. You can rename the volume set name providing it does not exceed the 15 characters limit.

### 5.5.3.1.1.2 Capacity



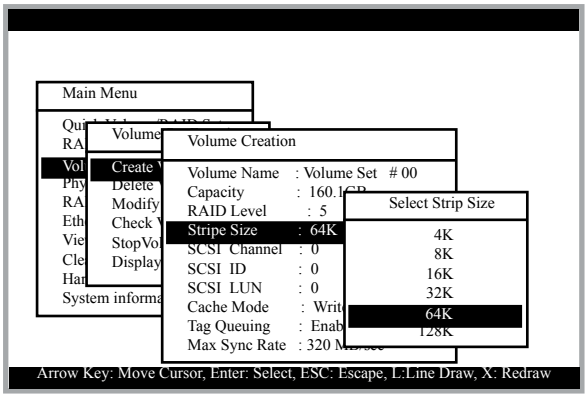

The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the **UP** and **DOWN** arrow key. Each volume set has a selected capacity which is less than or equal to the total capacity of the RAID set on which it resides.

### 5.5.3.1.1.3 RAID Level



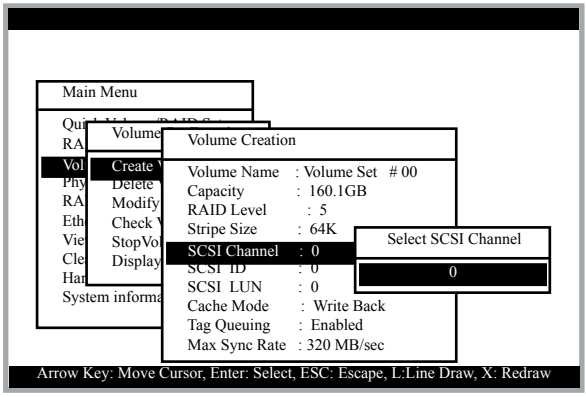

Set the RAID level for the Volume Set. Highlight RAID Level and press <**Enter**>.
The available RAID levels for the current Volume Set are displayed. Select a RAID level and press **Enter** key to confirm.

### 5.5.3.1.1.4 Strip Size



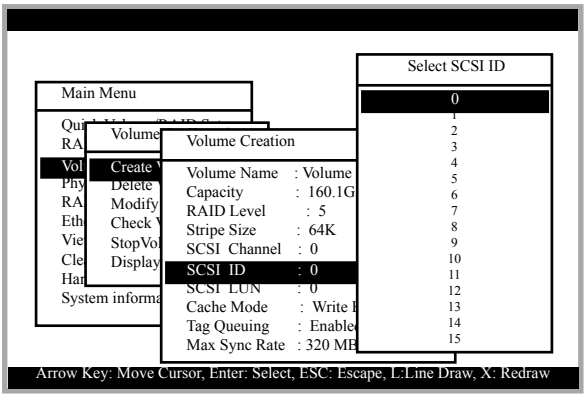

This parameter sets the size of the segment written to each disk in a RAID 0, 1, or 5 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.

### 5.5.3.1.1.5 SCSI Channel



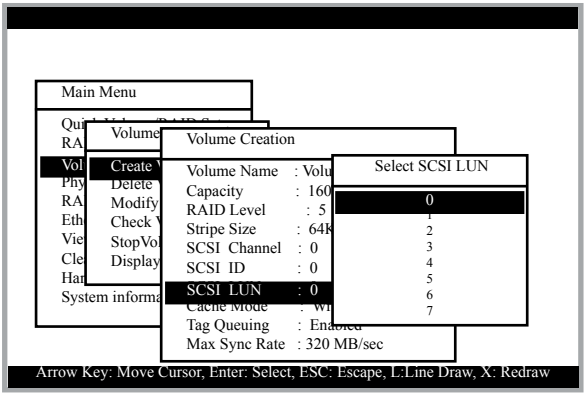

One SCSI channel can be appllied to the internal RAID subsystem. Choose the SCSI channel. A Select SCSI Channel dialog box appears, select the channel number and press **Enter** key to confirm it.

### 5.5.3.1.1.6 SCSI ID



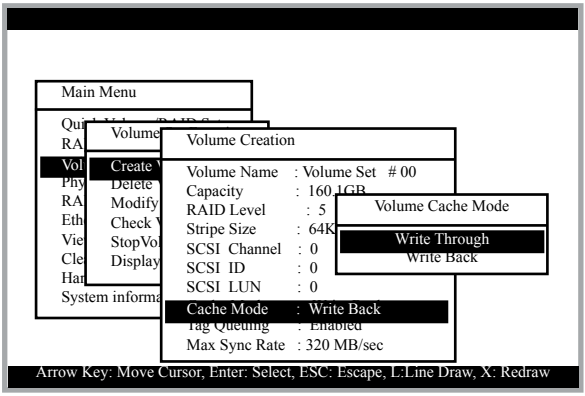

Each SCSI device attached to the SCSI card, as well as the card itself, must be assigned a unique SCSI ID number. A SCSI channel can connect up to 15 devices. The SATA RAID controller is as a lots of large SCSI device. We should assign an ID from a list of SCSI IDs.

### 5.5.3.1.1.7 SCSI LUN



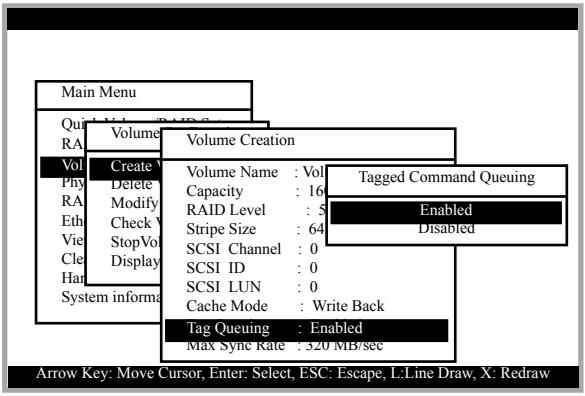

Each SCSI ID can support up to 8 LUNs. Most SCSI controller treats each LUN like a SCSI disk.

### 5.5.3.1.1.8 Cache Mode



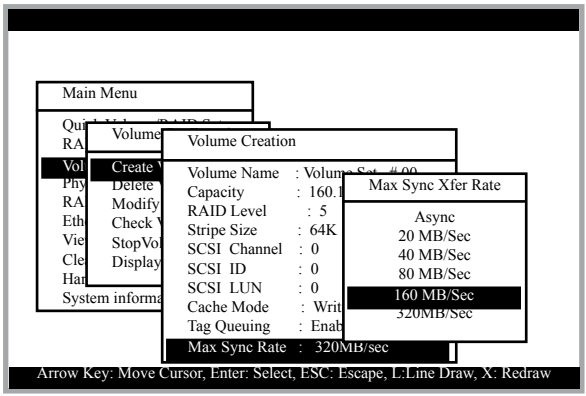

User can set the cache mode to: Write-Through Cache or Write-Back Cache.

### 5.5.3.1.1.9 Tag Queuing




The Enabled option is useful for enhancing overall system performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SCSI command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using older SCSI drives that do not support command tag queuing.

### 5.5.3.1.1.10 Max Sync Rate



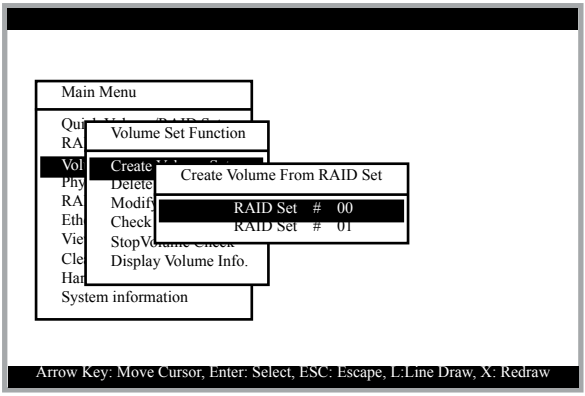

### 5.5.3.1.2 For MR5CT1

The following steps is the volume set features:

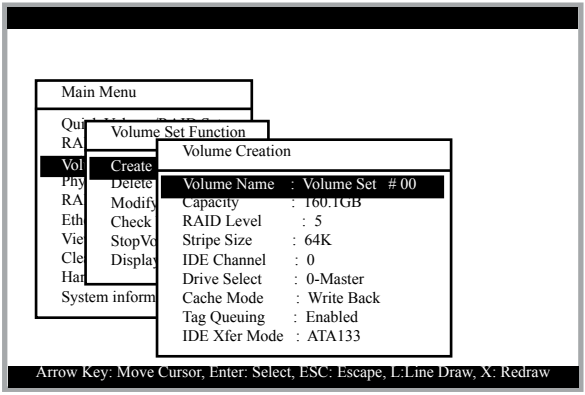
1. Volume sets of different RAID levels may coexist on the same RAID set.
2. Up to 3 volume sets in a RAID set can be created by the RAID subsystem controller. (PATA support Master/Slave volume set, SATA supports Master volume set)
3. The maximum addressable size of the single volume set is 2 TB(32-bit Mode).

To Create a volume set, following the below steps:

1. Select the Volume Set Function from the Main menu.
2. Choose the Create Volume Set from Volume Set Functions dialog box screen.
3. The Create Volume From RAID Set dialog box appears. This screen displays the existing arranged RAID sets. Select the RAID set number and press **Enter** key. The Volume Creation is displayed in the screen.

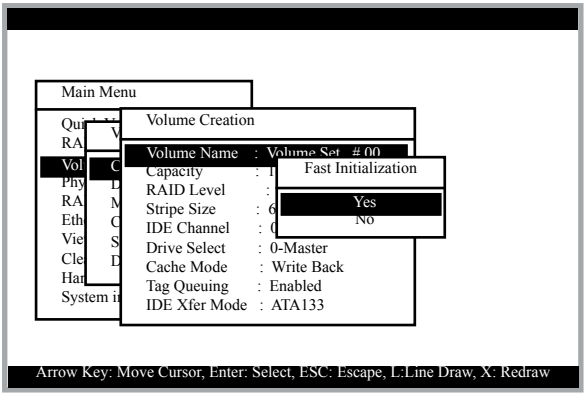



4. A window with a summary of the current volume set's settings. The "**Volume Creation**" option allows user to select the Volume name, capacity, RAID level, strip size, IDE Channel/IDE Drive Select, Cache mode and tag queuing. User can modify the default values in this screen; the modification procedures are at 5.5.3.1.2.1 to 5.5.3.1.2.9 section.



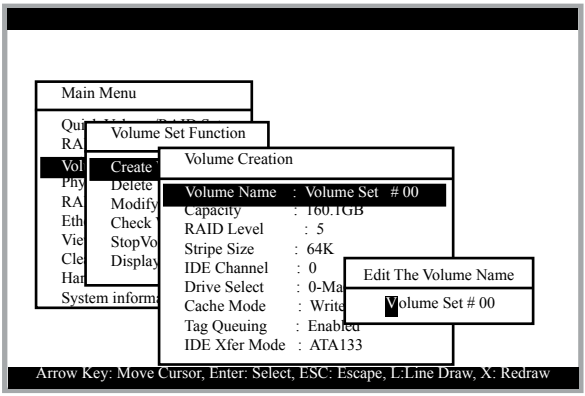

5. After completing the modification of the volume set, press Esc key to confirm it. A Fast Initialization screen is presented(only RAID Level 3 and 5).

- Select Yes Key to start the Fast Initialization of the selected volume set.
- Select No Key to start the Normal Initialization of the selected volume set.



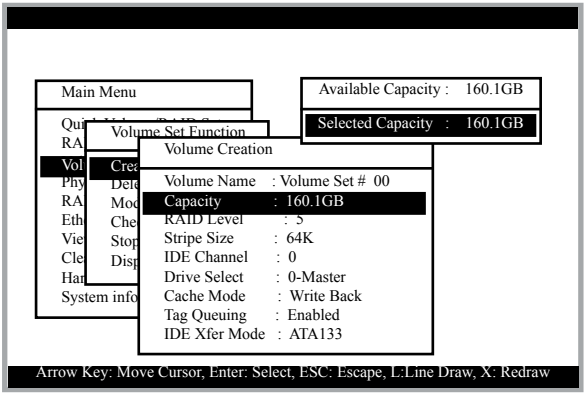

6. Repeat steps 3 to 5 to create additional volume sets.
7. The initialization percentage of volume set will be displayed at the button line.

### 5.5.3.1.2.1 Volume Name



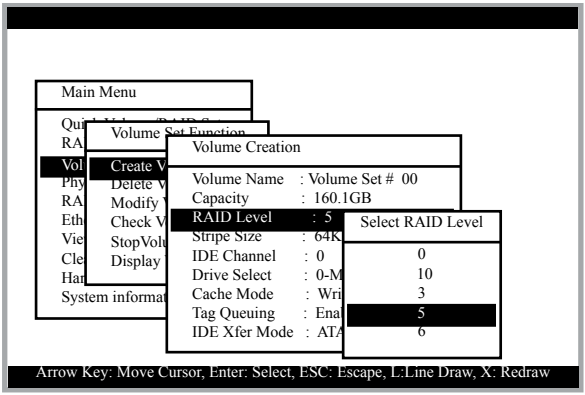

The default volume name will always appear as Volume Set. #. You can rename the volume set name providing it does not exceed the 15 characters limit.

### 5.5.3.1.2.2 Capacity



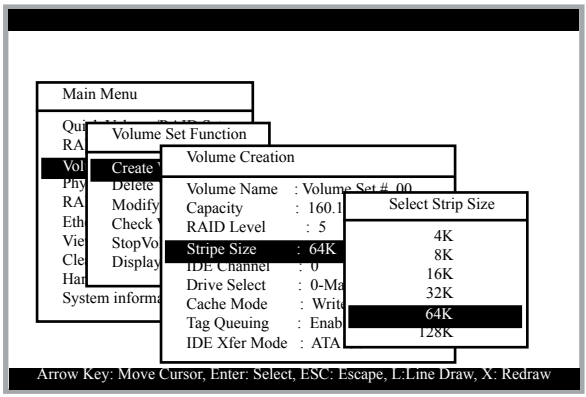

The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the **UP** and **DOWN** arrow key. Each volume set has a selected capacity which is less than or equal to the total capacity of the RAID set on which it resides.

### 5.5.3.1.2.3 RAID Level



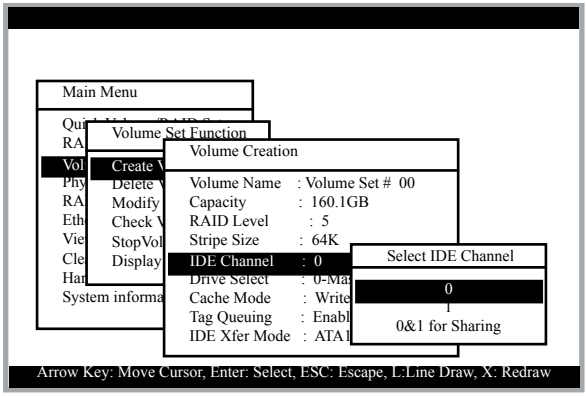

Set the RAID level for the Volume Set. Highlight RAID Level and press <**Enter**>.
The available RAID levels for the current Volume Set are displayed. Select a RAID level and press **Enter** key to confirm.

### 5.5.3.1.2.4 Strip Size



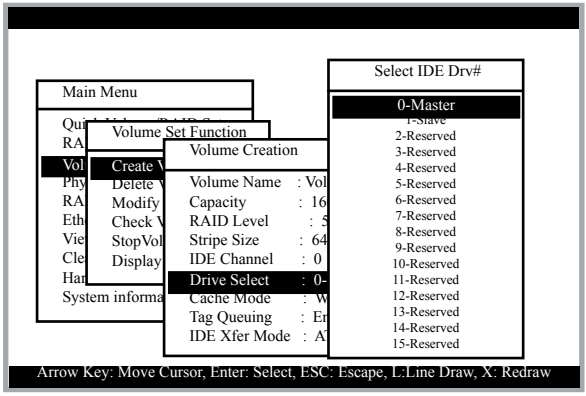

This parameter sets the size of the segment written to each disk in a RAID 0, 1, 5 or 6 logical drive. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.

### 5.5.3.1.2.5 IDE Channel



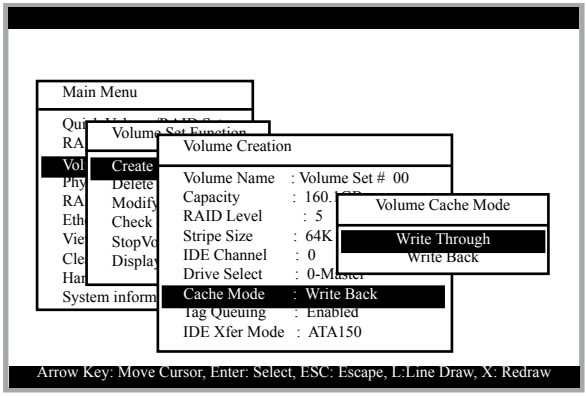

The MR5CT1 can support dual ATA Host channel-Parallel ATA(For Firewire/USB) (Connect to Channel 0) and Serial ATA (Connect to Channel 1). Multiple ATA Host is the IDE Host Channel. Each ATA Host channel can be applied to different volume sets if user selects the 0 or 1 option in the IDE Host Channel Mode, 0, for Parallel ATA host channel and 1 for Serial ATA host channel. The volume set initializes for Parallel ATA host channel, now user wants to change to the Serial ATA. User needs to modify configurations the IDE Host Channel =1 and IDE Drive select = 0.

### 5.5.3.1.2.6 Drive Select



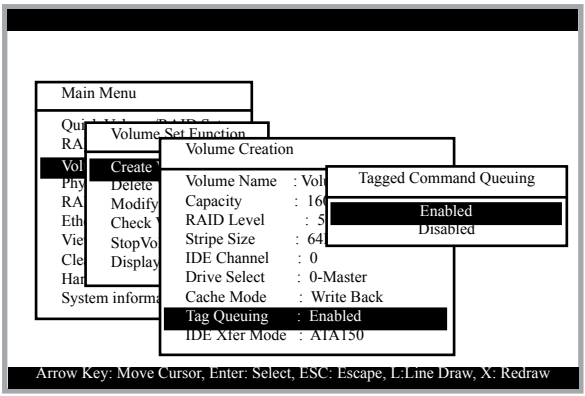

IDE Host Channel setting at 0 or 1-PATA and SATA host channel can concurrently access different volume sets. The PATA (For Firewire/USB)(Channel 0) can support Master and Slave volume set. The SATA (Channel 1) can support one master volume set. The Max volume set can be accessed by MR5CT1 is 3.
IDE Host Channel setting at 0&1 Cluster - The MR5CT1 can support dual ATA host Channel-Paralle ATA Master and Serial ATA accesses the same volume set. But user can only write through one channel at the time.

### 5.5.3.1.2.7 Cache Mode




User can set the cache mode to: Write-Through Cache or Write-Back Cache.

### 5.5.3.1.2.8 Tag Queuing

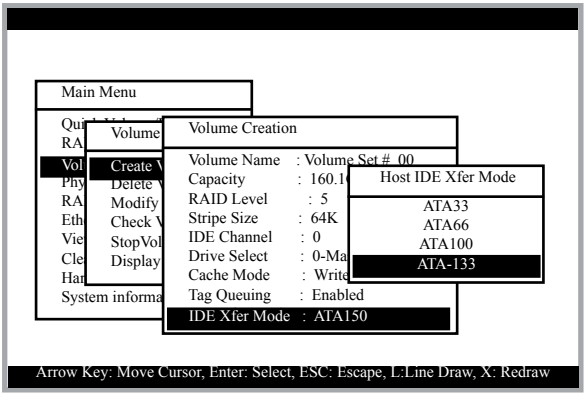



The Enabled option is useful for enhancing overall system performance under multi-tasking operating systems.

**Note:**

Because OS drive doesn't support this function yet, therefore, it needs special driver to support this fuction.

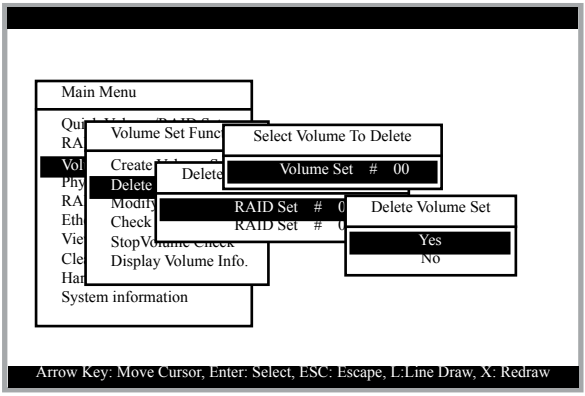
### 5.5.3.1.2.9 IDE Xfer Mode



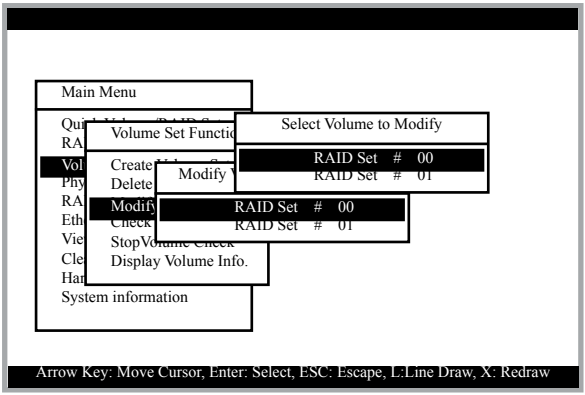

The MR5CT1 RAID subsytem supports ATA/133, ATA/100, ATA/66, and ATA/33 Mode.

### 5.5.3.2 Delete Volume Set

To delete Volume set from RAID set system function, move the cursor bar to the Volume Set Functions menu and select the Delete Volume Set item, then press **Enter** key. The Volume Set Functions menu will show all RAID Set # item. Move the cursor bar to an RAID Set number, then press **Enter** key to show all Volume Set # in the RAID set. Move cursor to the deleted Volume Set number, press **Enter** key to delete it.




### 5.5.3.3 Modify Volume Set



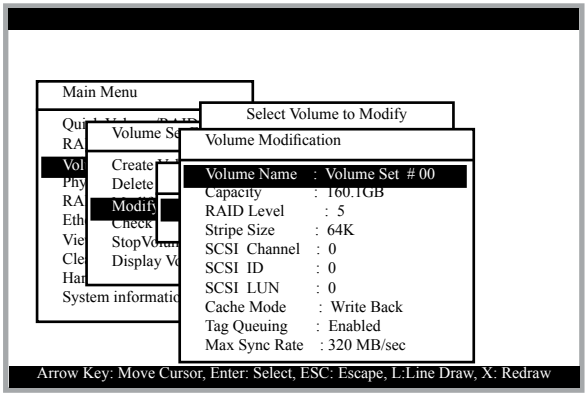

Use this option to modify volume set configuration. To modify Volume Set values from RAID Set system function, move the cursor bar to the Volume Set Functions menu and select the

Modify Volume Set item, then press **Enter** key. The Volume Set Functions menu will show all RAID Set number items. Move the cursor bar to an RAID Set number item, then press **Enter** key to show all Volume Set item Select the Volume Set from the list you which to change, press **Enter** key to modify it.

### 5.5.3.3.1 Volume Expansion

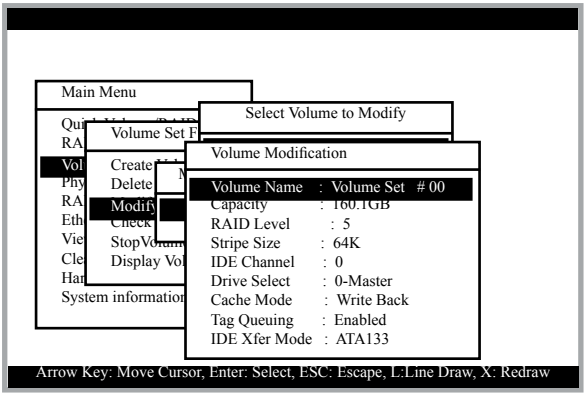
Use the RAID set expands to expand a RAID set, when a disk is added to your system. The expand capacity can use to enlarge the volume set size or create another volume set. The modify volume set function can support the volume set expansion function. To expand volume set capacity value from RAID set system function, move the cursor bar to the volume set Volume capacity item and entry the capacity size. Tick on the Confirm The Operation and click on the Submit button to complete the action. The volume set start to expand.

**For MR5S1**



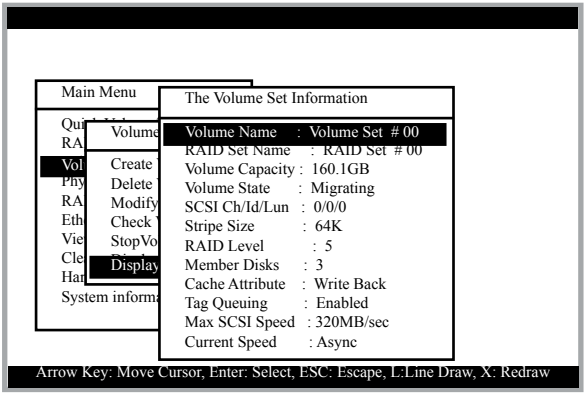

As shown in the above can be modified at this screen. Choose this option to display the properties of the selected Volume set.

**For MR5CT1**



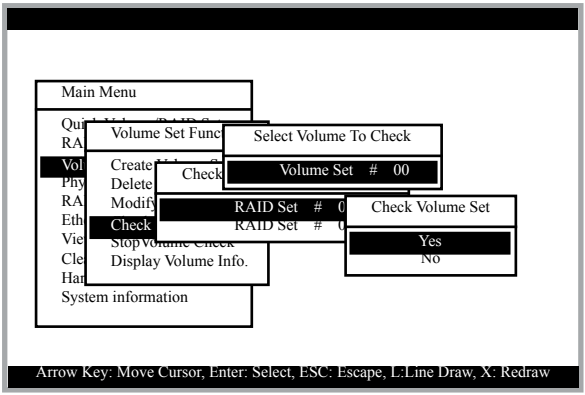

As shown in the above can be modified at this screen. Choose this option to display the properties of the selected Volume set.

## 5.5.3.3.2 Volume Set Migration




Migrating occurs when a volume set is migrating from one RAID level to another, a Volume set strip size changes, or when a disk is added to a RAID Set. Migration status is displayed in the volume status area of the Volume Set Information when one RAID level to another, a Volume set strip size changes or when a disk is added to a RAID set.

### 5.5.3.4 Check Volume Set

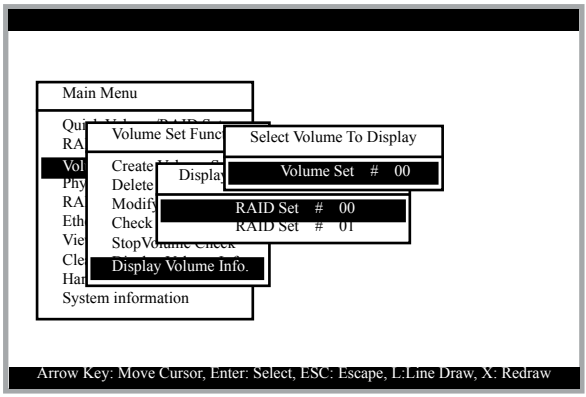



Use this option to verify the correctness of the redundant data in a volume set. For example, in a system with dedicated parity, volume set check means computing the parity of the data disk drives and comparing the results to the contents of the dedicated parity disk drive. To check Volume Set from RAID Set system function, move the cursor bar to the Volume Set Functions menu and select the Check Volume Set item, then press **Enter** key. The Volume Set Functions menu will show all RAID Set number items. Move the cursor bar to an RAID Set number item, then press **Enter** key to show all Volume Set item Select the Volume Set from the list you which to check, press **Enter** key to select it. After completing the selection, the confirmation screen appears, presses **Yes** to start check.

### 5.5.3.5 Stop Volume Set Check

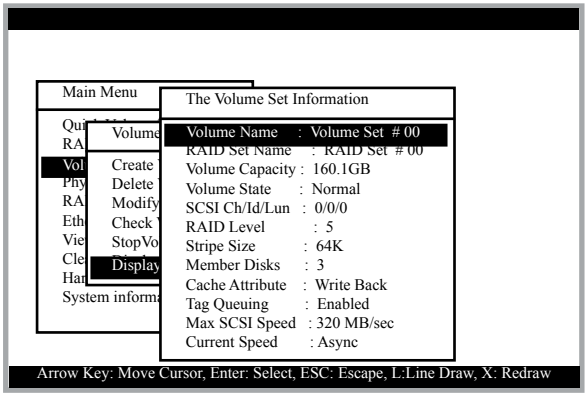
Use this option to stop all the Check Volume Set function.

### 5.5.3.6 Display Volume Set Info.

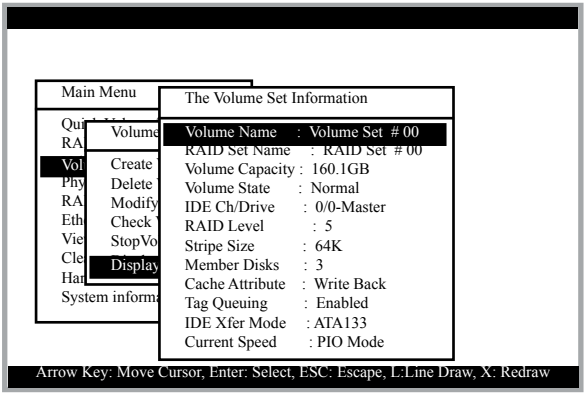



To display Volume Set information, move the cursor bar to the desired Volume Set number, then press **Enter** key. The Volume Set Information will show as following. You can only view the information of this Volume Set.

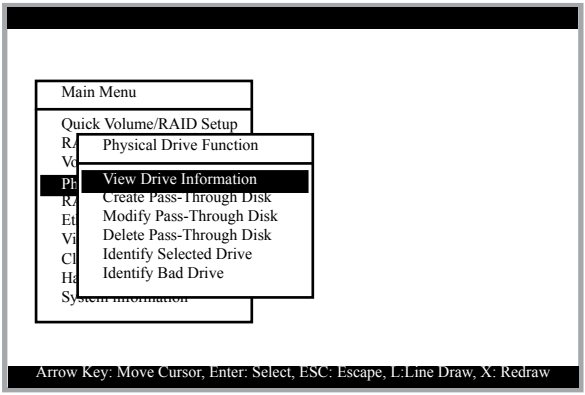
#### 5.5.3.6.1 For MR5S1



### 5.5.3.6.2 For MR5CT1

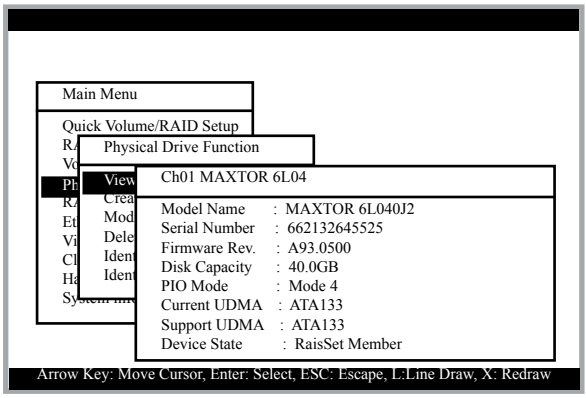



## 5.5.4 Physical Drives




Choose this option from the Main Menu to select a physical disk and to perform the operations listed above.

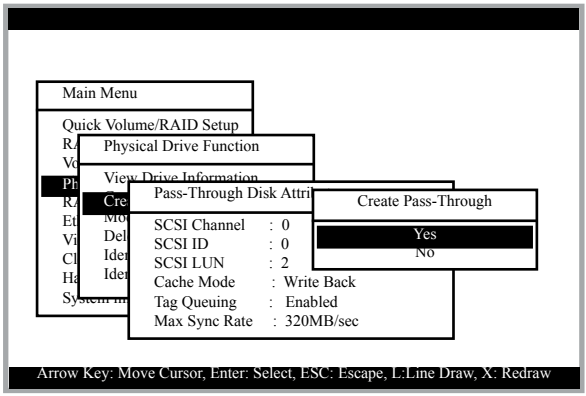
### 5.5.4.1 View Drive Information




When you choose this option, the physical disks in the SATA RAID controller are listed. Move the cursor to the desired drive and press **Enter**. The following appears:

### 5.5.4.2 Create Pass-Through Disk

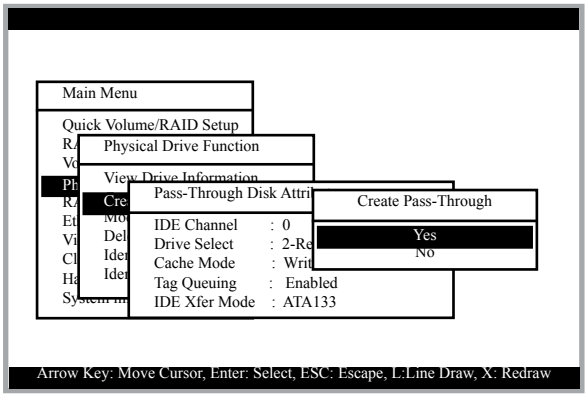
#### 5.5.4.2.1 For MR5S1




Disk drive is not controlled by the RAID subsystem firmware and thus cannot be a part of a Volume Set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem firmware. The SCSI

Channel, SCSI ID, SCSI LUN, Cache Mode, Tag Queuing, and Max Sync Rate items detail descriptioini can reference the Create Volume Set for MR5S1 section.

### 5.5.4.2.2 For MR5CT1

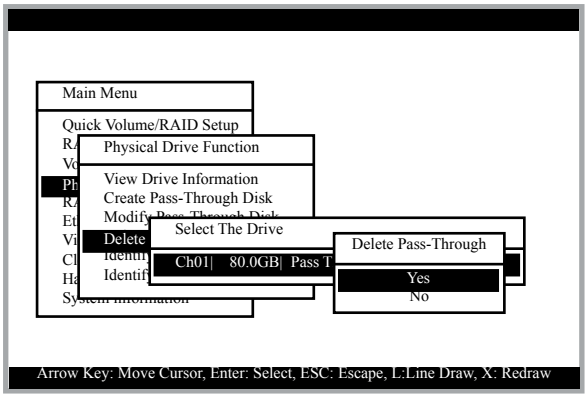



Disk drive is not controlled by the RAID subsystem firmware and thus cannot be a part of a Volume Set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID subsystem firmware. The IDE Channel, Drive Select, Cache Mode, Tag Queuing, and IDE Xfer Mode items detail descriptioini can reference the Create Volume Set for MR5CT1 section.

### 5.5.4.3 Modify Pass-Through Disk

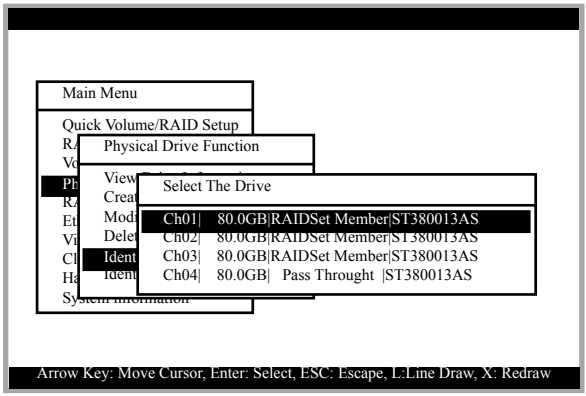
Use this option to modify the Pass-Through Disk Attribute. To modify Pass-Through Disk parameters values from Pass-Through Disk pool, move the cursor bar to the Physical Drive Function menu and select the Modify Pass-Through Drive option and then press **Enter** key. The Physical Drive Function menu will show all RAID Pass-Through Drive number option. Move the cursor bar to a desired item, then press **Enter** key to show all Pass-Through Disk Attribute. Select the parameter from the list you which to change, press **Enter** key to modify it.

### 5.5.4.4 Delete Pass-Through Disk



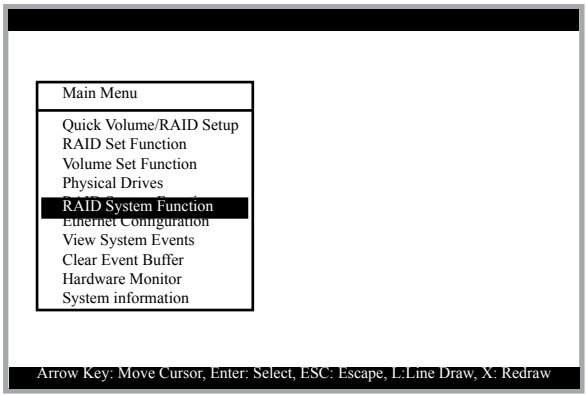

To delete Pass-through drive from the Pass-through drive pool, move the cursor bar to the Physical Drive Function menu and select the Delete pass-through drive item, then press **Enter** key. The Delete Pass-Through confirmation screen will appear and press **Yes** key to delete it.

### 5.5.4.5 Identify Selected Drive



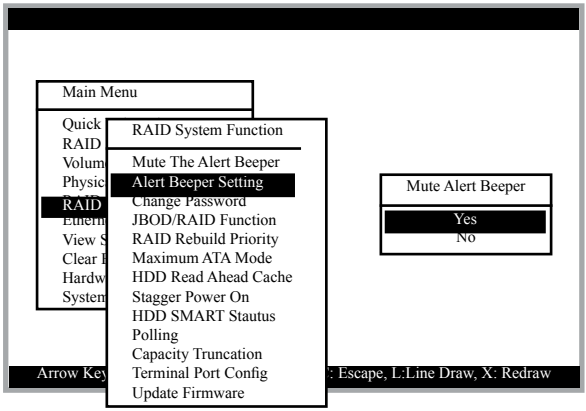

To prevent removing the wrong drive, the selected disk HDD LED Indicator will light for physically locating the selected disk when the Identify Selected Device is selected.

## 5.5.5 RAID System Function



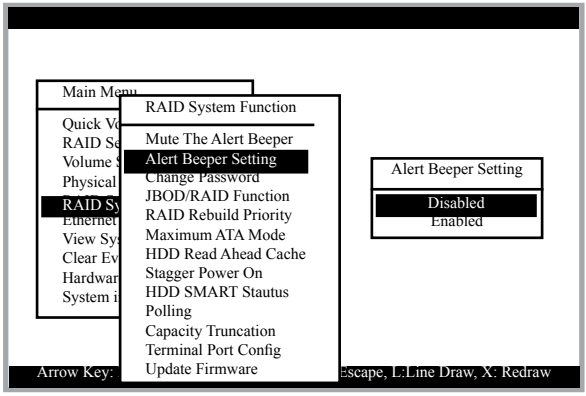

To set the RAID system function, move the cursor bar to the main menu and select the "**RAID System Function**" item and then press **Enter** key. The RAID System Function menu will show all items. Move the cursor bar to an item, then press **Enter** key to select the desired function.

### 5.5.5.1 Mute The Alert Beeper



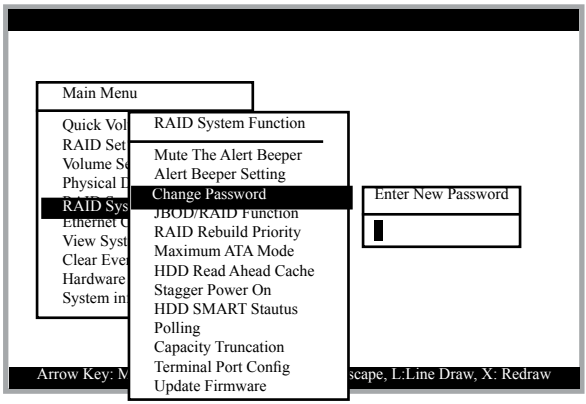

The Mute The Alert Beeper function item is used to control the SATA RAID controller Beeper. Select the **No** and press **Enter** key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

### 5.5.5.2 Alert Beeper Setting




The Mute The Alert Beeper function item is used to control the SATA RAID controller Beeper. Select the **No** and press **Enter** key in the dialog box to turn the beeper off temporarily. The beeper will still activate on the next event.

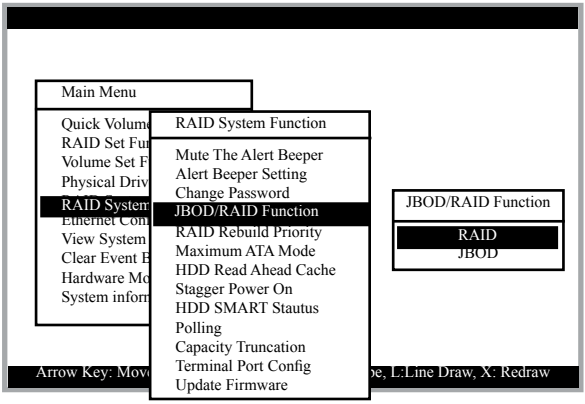
### 5.5.5.3 Change Password




The password option allows user to set or clear the password protection feature. Once the password has been set, the user can only monitor and configure the controller by providing the correct password. This feature is used to protect the internal RAID system from unauthorized entry. The controller will check the password only when entering the Main menu from the initial screen. The system will automatically go back to the initial

screen when it does not received any command in 20 seconds. To set or change the password, move the cursor to RAID System Function screen, press the Change Password item. The Enter New Password screen appears.
To disable the password, press **Enter** only in both the Enter New Password and Re-Enter New Password column. The existing password will be cleared. No password checking will occur when entering the main menu from the starting screen.

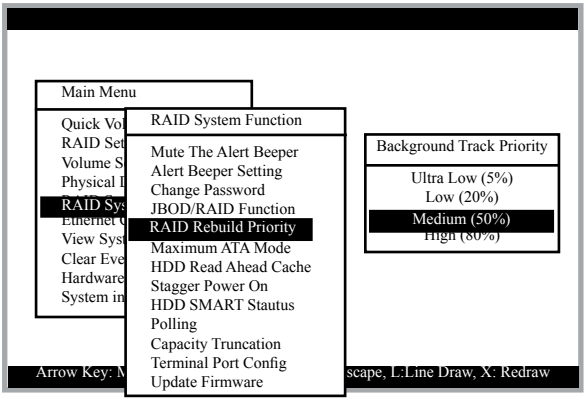
### 5.5.5.4 JBOD/RAID Configuration




**JBOD/RAID Configuration (For MR5CT1)**
JBOD is an acronym for "**just a Bunch Of Disk**". It represents a volume set that is created by the concatenation of partitions on the disk. For MR5CT1, it only can see 2 disks, when you selected the JBOD option. User needs to deleted the RAID set, when you want to change the option from the **RAID** to the **JBOD** function.

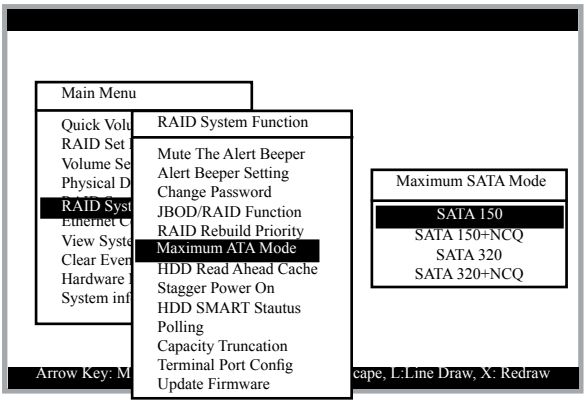
**JBOD/RAID Configuration (For MR5S1)**
JBOD is an acronym for "**just a Bunch Of Disk**". It represents a volume set that is created by the concatenation of partitions on the disk. For MR5S1, it can see 5 individual disks, when you selected the JBOD option. User needs to deleted the RAID set, when you want to change the option from the **RAID** to the **JBOD** function.

### 5.5.5.5 RAID Rebuild Priority




The "**RAID Rebuild Priority**" is a relative indication of how much time the controller devotes to a background operation, such as rebuild or migrating. The RAID controller allows user to choose the rebuild priority to balance volume set access and background tasks appropriately.

### 5.5.5.6 Maximum SATA Mode

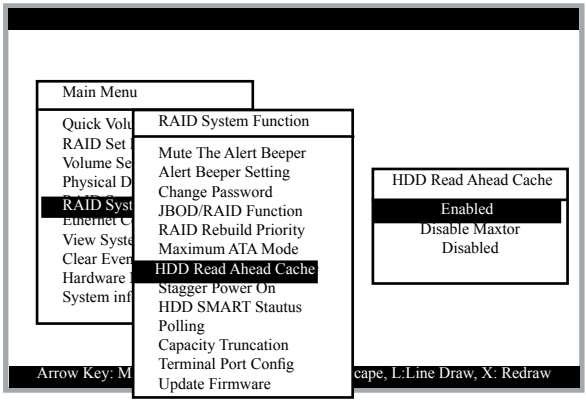



Within the subsystem, the SCSI chip acts as a target and 5 SATA ll bus are connected to the drive. The 5 SATA drive channel can support up to SATA ll, which runs up to 300MB/s. NCQ is a command protocol in Serial ATA that can only be implemented on

native Serial ATA hard drives. It allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows user to choose the SATA Mode: SATA150, SAT150+NCQ, SAT300, SATA300+NCQ.

### 5.5.5.7 HDD Read Ahead Cache

Allow Read Ahead (Default: Enabled)—When Enabled, the drive' s read ahead cache algorithm is used, providing maximum performance under most circumstances.

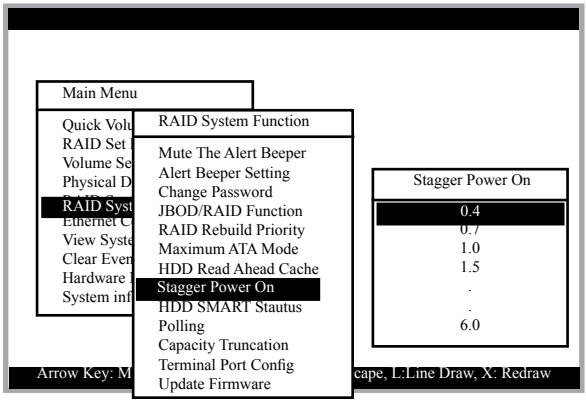



### 5.5.5.8 Stagger Power On

In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But in systems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other system components. This damage can be avoided by allowing the host to stagger the spin-up of the drives. New SATA drives have support staggered spin-up capabilities to boost reliability. Staggered spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the host the ability

to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

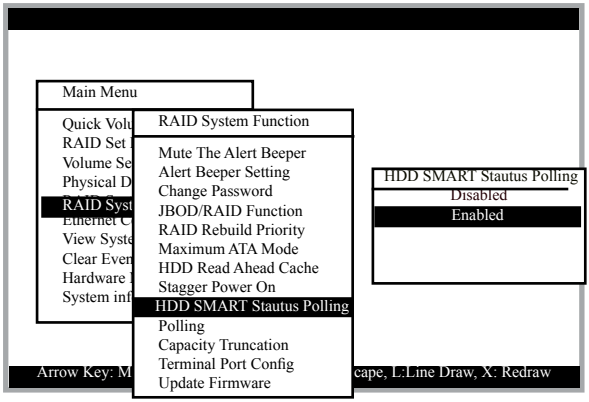
Sans Digital has supported the fixed value staggered power up function in its previous version firmware. But from firmware version 1.39, Sans Digital RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected from 0.4ms to 6ms per step which powers up one drive.




### 5.5.5.9 HDD SMART Status Polling

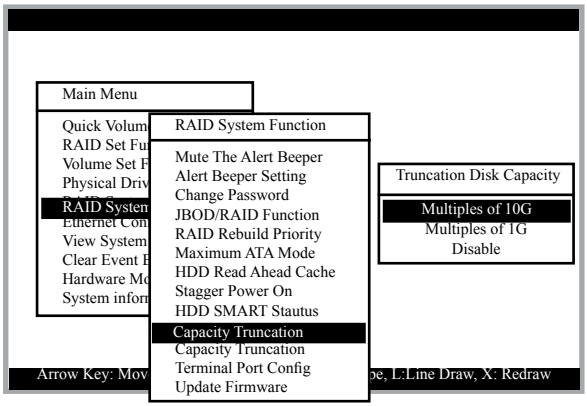
An external RAID enclosure has the hardware monitor in the dedicated backplane that can report HDD temperature status to the controller. However, PCI cards do not use backplanes if the drives are internal to the main server chassis. The type of enclosure cannot report the HDD temperature to the controller. For this reason, HDD SMART Status Polling was added to enable scanning of the HDD temperature function in the version 1.36 date: 2005-05-19 (and later). It is necessary to enable "HDD SMART Status Polling" function before SMART information is accessible. This function is disabled by default.

The following screen shot shows how to change the BIOS setting to enable the Polling function.



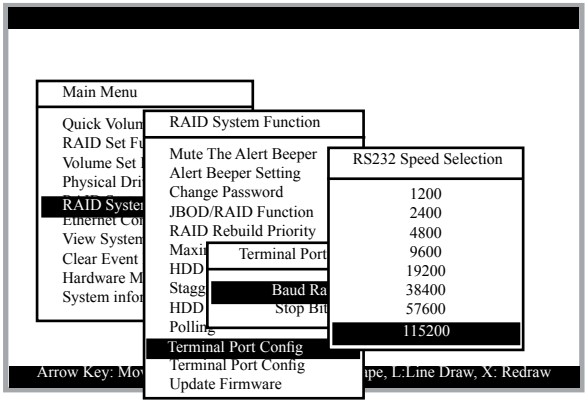

## 5.5.5.10 Disk Capacity Truncation Mode

Sans Digital RAID controllers use drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units.
The controller provides three truncation modes in the system configuration: **Multiples Of 10G**, **Multiples Of 1G**, and **No Truncation**.

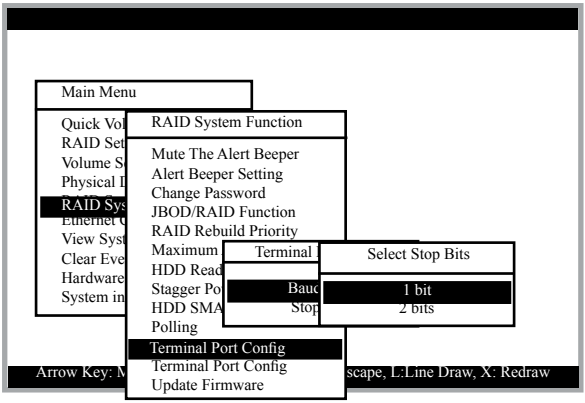


**Multiples Of 10G:** If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. Sans Digital drive Truncation mode **Multiples Of 10G** uses the same capacity for both of these drives so that one could replace the other.

**Multiples Of 1G:** If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. Sans Digital drive Truncation mode **Multiples Of 1G** uses the same capacity for both of these drives so that one could replace the other.
**No Truncation:** It does not truncate the capacity.




Parity Value is fixed at None.
Handshaking value is fixed at None.
Speed sending values are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.




Stop Bits values are 1 bit and 2 bits.

### 5.5.5.12 Update Firmware

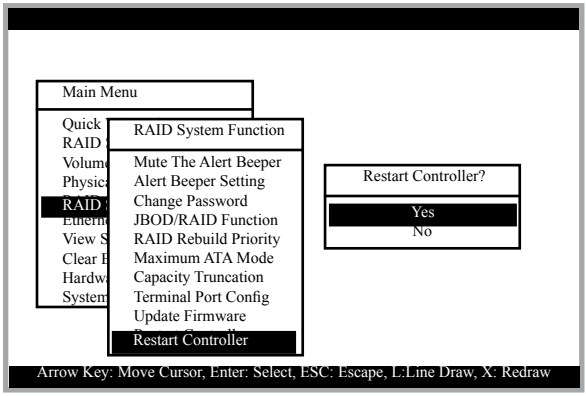
Please refer to the appendix B firmware utility for updating firmware.

**Note:**

1. The Bootable CD VT100 utility connected through the con troller's serial port cannot support the update firmware feature.
2. User can only update the firmware through the VT100 Terminal or web browser-based RAID Management via HTTP Proxy through the controller's serial port or LAN port.

### 5.5.5.13 Restart Controller

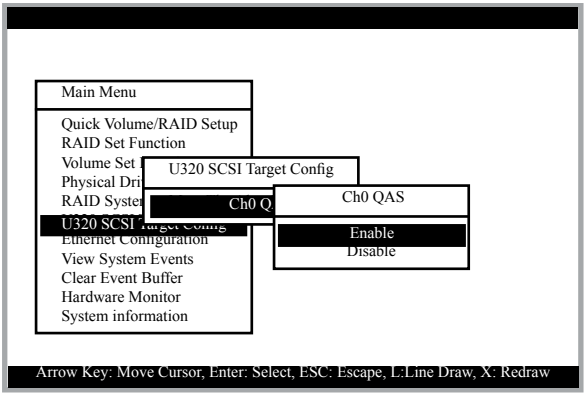
Use the Restart Controller Function to restart the RAID subsystem controller. To restart the controller, move the cursor bar to the Main menu RAID System Function itme and then press the **Enter** key. The RAID system Function menu appears on the screen. Press **Enter** key to select Restart Controller item. The Restart Controller confirmation screen appers. Select Yes **key** to restart entire RAID System.




**Note:**

It can only work properly at Host and Drive without any activity.

### 5.5.6 U320 SCSI Target Configuration (MR5S1 only)




Arbitration allows one SCSI device to gain control of the SCSI bus to allow that SCSI device to initiate or resume a task. There are two methods that a SCSI device may use to arbitrate for the SCSI

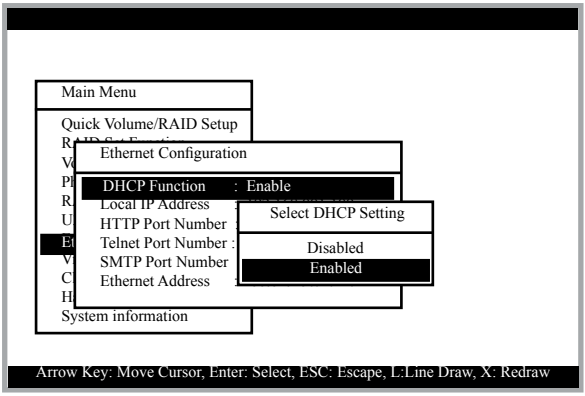
bus: normal arbitration and QAS. Normal arbitration is mandatory and requires the detection of a BUS FREE phase on the SCSI bus before starting. QAS is optional and, when enabled, requires the initiation and detection of a QAS REQUEST message before starting. Press **Enter** to enter the Main menu. Press **UP/DOWN** key to select the U320 SCSI Target option, and then press **Enter**.

## 5.5.7 Ethernet Configuration

Use this feature to set the controller Ethernet port configuration. Customer doesn't need to create a reserved space on the arrays before the Ethernet port and HTTP service working.

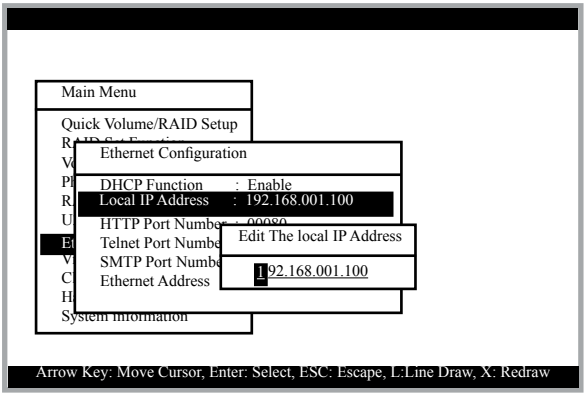
### 5.5.7.1 DHCP Function

DHCP (Dynamic Host Configuration Protocol) is a protocol that lets network administrators manage centrally and automate the assignment of IP (Internet Protocol) configurations on a computer network. When using the Internet's set of protocols (TCP/IP), in order for a computer system to communicate to another computer system it needs a unique IP address. Without DHCP, the IP address must be entered manually at each computer system. DHCP lets a network administrator supervise and distribute IP addresses from a central point. The purpose of DHCP is to provide the automatic (dynamic) allocation of IP client configurations for a specific time period (called a lease period) and to eliminate the work necessary to administer a large IP network. To manually configure the IP address of the controller, move the cursor bar to the Main menu Ethernet Configuration Function item and then press the Enter key. The Ethernet Configuration menu appears on the screen. Move the cursor bar to DHCP Function item, then press Enter key to show the DHCP setting. Select the "Disabled' or 'Enabled" option to enable or disable the DHCP function.




## 5.5.7.2 Local IP address

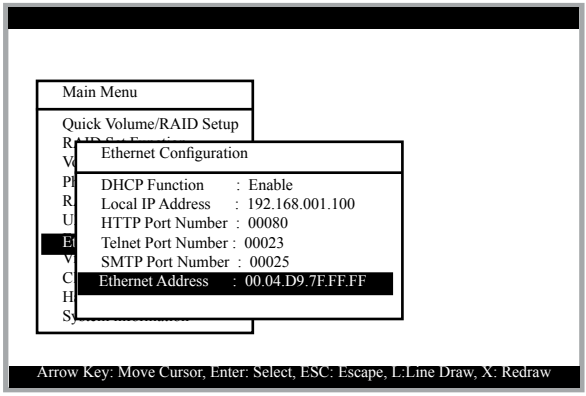
If you intend to set up your client computers manually, make sure that the assigned IP address is in the same range of your default router address and that it is unique to your private network. However we would highly recommend that if you have a network of computers and the option to assign your TCP/IP client configurations automatically, please do. An IP address allocation scheme will reduce the time it takes to set-up client computers and eliminate the possibilities of administrative errors. To manually configure the IP address of the controller, move the cursor bar to the Main menu Ethernet Configuration Function item and then press the Enter key. The Ethernet Configuration menu appears on the screen.



Move the cursor bar to Local IP Address item, then press Enter key to show the default address setting in the RAID controller. You can reassign the IP address of the controller.

### 5.5.7.3 Ethernet Address

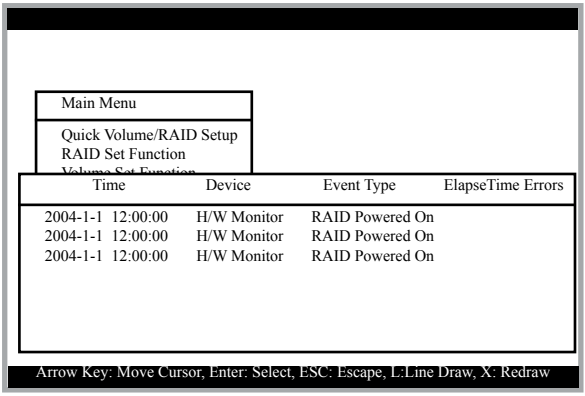
A MAC address stands for Media Access Control address and is your computer's unique hardware number. On an Ethernet LAN, it's the same as your Ethernet address. When you're connected to the Internet from the RAID controller Ethernet port, a correspondence table relates your IP address to the RAID controller's physical (MAC) address on the LAN.




## 5.5.8 View System Events

To view the SATA RAID controller's information, move the cursor bar to the main menu and select the View Events link, then press the **Enter** key The SATA RAID controller's events screen appear.

Choose this option to view the system events information: Timer, Device, Event type, Elapse Time and Errors. The RAID system does not built the real time clock. The Time information is the relative time from the SATA RAID controller power on.



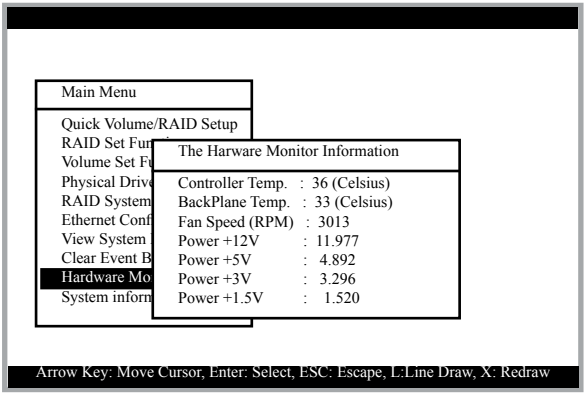

## 5.5.9 Clear Events Buffer

Use this feature to clear the entire events buffer information.

## 5.5.10 Hardware Monitor Information

The Hardware Monitor Information provides the temperature, fan speed (chassis fan) and voltage of the internal RAID subsystem. The temperature items list the current states of the controller board and backplane. All items are also unchangeable. The warning messages will indicate through the LCM, LED and alarm buzzer.

Below screen is Hardware Monitor Information.



| Item | Warning Condition |
|---|---|
| Controller Board Temperature | **> 60°** |
| Backplane Temperature | **> 55°** |
| Controller Fan Speed | **< 1900 RPM** |
| Power Supply +12V | **< 10.5V or > 13.5V** |
| Power Supply +5V | **< 4.7V or > 5.3V** |
| Power Supply +3.3V | **< 3.0V or > 3.6V** |
| CPU Core Voltage +1.5V | **< 1.35V or > 1.65V** |

## 5.5.11 System Information

Choose this option to display Main processor, CPU Instruction cache and data cache size, firmware version, serial number, controller model name, and the cache memory size. To check the system information, move the cursor bar to System Information item, then press **Enter** key. All major controller system information will be displayed.

# 6. Web Browser-based Configuration

The RAID subsystem web browser-based configuration utility is firmware-based and uses to configure RAID sets and volume sets. Use this utility to:

- Create RAID set,
- Expand RAID set,
- Define volume set,
- Add physical drive,
- Modify volume set,
- Modify RAID level/stripe size,
- Define pass-through disk drives,
- Modify system function,
- Update firmware and,
- Designate drives as hot spares.

If you need to boot the operating system from a RAID system, you must first create a RAID volume by using front panel touch-control keypad, Bootable CD VT-100 utility at X86-based system, Web Browser through Ethernet LAN, or VT-100 terminal.

## 6.1 Firmware-embedded TCP/IP & web browser-based RAID manager (using the controller's 10/100 Ethernet LAN port)

To ensure proper communications between the RAID subsystem and Web browser-based RAID management, Please connect the RAID system Ethernet LAN port to any LAN switch port.
The controller has embedded the TCP/IP & Web Browser-based RAID manager in the firmware. User can remote manage the RAID system without adding any user specific software (platform independent) via standard web browsers directly connected to the 10/100 Ethernet RJ45 LAN port.
To configure Internal RAID subsystem on a local or remote machine, you need to know its IP Address. The IP address will default show in the LCD screen. Launch your firmware-embedded TCP/IP & Web Browser-based RAID manager by entering http://[IP Address] in the web browser.
Note that you must be logged in as administrator with local admin

rights on the remote machine to remotely configure it. The RAID subsystem controller default User Name is "admin" and the Password is "0000".

## 6.2 Configuring RAID Sets and Volume Sets

You can configure RAID sets and volume sets with web browser-based RAID manager using Quick Create automatically, or RAID Set/Volume Set Function manually configuration method. Each configuration method requires a different level of user input. The general flow of operations for RAID set and volume set configuration is:

| Step | Action |
|---|---|
| 1 | Designate hot spares/pass-through (optional) |
| 2 | Choose a configuration method |
| 3 | Create RAID set using the available physical drives |
| 4 | Define volume set using the space in the RAID set |
| 5 | Initialize the volume set and use volume set in the HOST OS |

## 6.3 Designating Drives as Hot Spares

All unused disk drive that is not part of a RAID set can be created as a Hot Spare. The Quick Create configuration will automatically add the spare disk drive with the RAID level for user to select. For the RAID Set Function configuration, user can use the Create Hot Spare option to define the hot spare disk drive. Reference the 6.9.5 Create Hot Spare section.

## 6.4 Using Quick Volume /RAID Setup Configuration

In Quick Create Configuration, it collects all drives in the tray and include them in a RAID set. The RAID set you create is associated with exactly one volume set, and you can modify the default RAID level, stripe size, and capacity of the volume set. Designating Drives as Hot Spares will also show in the RAID level selection option. The volume set default settings will be:

| Parameter | Setting |
|---|---|
| Volume Name | Volume Set # 00 |
| SCSI Channel/SCSI ID/SCSI LUN | 0/0/0 |
| Cache Mode | Write Back |
| Tag Queuing | Yes |
| Max Sync Rate | Depend on your hous adapter setting |

The default setting values can be changed after configuration is complete.
Follow the steps below to create arrays using Quick Create Configuration:

| Step | Action |
|---|---|
| 1 | Choose **Quick Volume /RAID Setup** from the main menu. The available RAID levels with hot spare for the current volume set drive are displayed. |
| 2 | Recommend use drives have same capacity in a specific array. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific array determine the RAID levels that can be implemented with the array.<br>RAID 0 requires 1 or more physical drives.<br>RAID 1 requires at least 2 physical drives.<br>RAID 1+Spare requires at least 3 physical drives.<br>RAID 3 requires at least 3 physical drives.<br>RAID 5 requires at least 3 physical drives.<br>RAID 6 requires at least 4 physical drives.<br>RAID 3 + Spare requires at least 4 physical drives.<br>RAID 5 + Spare requires at least 4 physical drives.<br>RAID 6 + Spare requires at least 5 physical drives.<br>Highlight ***RAID level*** for the volume set and press **Enter** key to confirm. |
| 3 | Set the capacity size for the current volume set. After Highlight RAID level and press **Enter** key.<br>The selected capacity for the current volume set is displayed. Using the **UP** and **DOWN** arrow key to create the current volume set capacity size and press **Enter** key to confirm. The available stripe sizes for the current volume set are displayed. |
| 4 | Using **UP** and **DOWN** arrow key to select the current volume set stripe size and press **Enter** key to confirm it. This parameter specifies the size of the stripes written to each disk in a RAID 0, 1, 5 or 6 Volume Set. You can set the stripe size to 4 KB, 8 KB, 16 KB, 32 KB, 64 KB, or 128 KB.<br>A larger stripe size provides better-read performance, especially if your computer does mostly sequential reads. However, if you are sure that your computer does random read requests more often, choose a small stripe size. |

| | |
|---|---|
| 5 | When you are finished defining the volume set, press **Enter** key to confirm the Quick Volume And RAID Set Setup function. |
| 6 | Press **Enter** key to define fast initialization or Selected the Background (Instant Available). When background Initialization, the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. When Initialization, the initialization proceeds must be completed before the volume set ready for system accesses. |
| 7 | Initialize the volume set you have just configured. |
| 8 | If you need to add additional volume set, using main menu Create Volume Set function. |

## 6.5 Using RAID Set/Volume Set Function Method

In RAID Set Function, you can use the Create RAID Set function to generate the new RAID set. In Volume Set Function, you can use the Create Volume Set function to generate its associated volume set and parameters.
If the current controller has unused physical devices connected, you can choose the Create Hot Spare option in the RAID Set Function to define a global hot spare. Select this method to configure new RAID sets and volume sets. The RAID Set/Volume Set Function configuration option allows you to associate volume set with partial and full RAID set.

**Note:**

User can use this method to examine the existing configuration. Modify volume set configuration method provides the same functions as create volume set configuration method. In volume set function, you can use the modify volume set function to modify the volume set parameters except the capacity size:

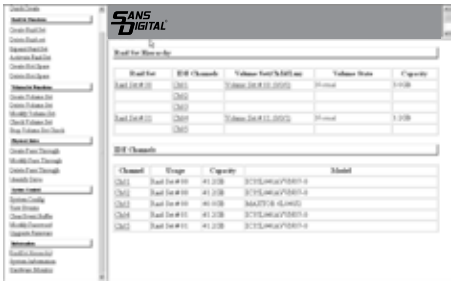
| Step | Action |
|---|---|
| 1 | To setup the Hot Spare (option), choose **RAID Set Function** from the main menu. Select the **Create Hot Spare** and press **Enter** key to set the Hot Spare. |
| 2 | Choose RAID Set Function from the main menu. Select the Create RAID Set and press Enter key. |

| | |
|---|---|
| 3 | Select a Drive For RAID Set window is displayed showing the IDE drive connected to the current controller. |
| 4 | Press **UP** and **DOWN** arrow keys to select specific physical drives. Press the **Enter** key to associate the selected physical drive with the current RAID set.<br>Recommend use drives has same capacity in a specific RAID set. If you use drives with different capacities in an array, all drives in the RAID set will select the lowest capacity of the drive in the RAID set.<br>The numbers of physical drives in a specific RAID set determine the RAID levels that can be implemented with the RAID set.<br>RAID 0 requires 1 or more physical drives.<br>RAID 1 requires at least 2 physical drives.<br>RAID 1+Spare requires at least 3 physical drives.<br>RAID 3 requires at least 3 physical drives.<br>RAID 5 requires at least 3 physical drives.<br>RAID 6 requires at least 4 physical drives.<br>RAID 3 + Spare requires at least 4 physical drives.<br>RAID 5 + Spare requires at least 4 physical drives.<br>RAID 6 + Spare requires at least 5 physical drives. |
| 5 | After adding physical drives to the current RAID set as desired, press Yes to confirm the Create RAID Set function. |
| 6 | An Edit The RAID Set Name dialog box appears. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as RAID Set. #. Press Enter to finish the name editing. |
| 7 | Press **Enter** key when you are finished creating the current RAID set. To continue defining another RAID set, repeat step 3. To begin volume set configuration, go to step 8. |
| 8 | Choose **Volume Set Function** from the Main menu. Select the **Create Volume Set** and press **Enter** key. |
| 9 | Choose one RAID set from the Create Volume From RAID Set window. Press Enter key to confirm it. |
| 10 | The Volume Creation screen shows the volume set default attribute values that are currently being configured. The attribute column headings are:<br>The RAID Level,<br>The Stripe Size,<br>The SCSI HOST/SCSI ID/SCSI LUN (MR5S1)<br>The IDE Host channel /IDE Driver select (MR5CT1)<br>The Cache Mode,<br>The Tagged Queuing,<br>The SCSI Max Rate (MR5S1),<br>The IDE Xfer Mode (MR5CT1) and<br>The Volume Name (number).<br>The user can change all values<br>After the current volume set attributes are defined, press Esc key to enter Initialization selection screen. |

| | |
|---|---|
| 11 | Fast Initialization Press Enter key to define fast initialization and Esc key to normal initialization. In the Normal Initialization, the initialization proceeds as a background task, the volume set is fully accessible for system reads and writes. The operating system can instantly access to the newly created arrays without requiring a reboot and waiting the initialization complete. In Fast Initialization, the initialization proceeds must be completed before the volume set ready for system accesses. |
| 12 | If space remains in the RAID set, the next volume set can be configured. Repeat steps 8 to 10 to configure another volume set. |

## 6.6 Configuring RAID Sets and Volume Sets

The web browser start-up screen will display the current configuration of your RAID subsystem. It displays the RAID Set List, Volume Set List and Physical Disk List. The RAID set information, volume set information and drive information can also be viewed by clicking on the RAIDSet Hierarchy screen. The current configuration can also be viewed by clicking on RAIDSet Hierarchy in the menu.



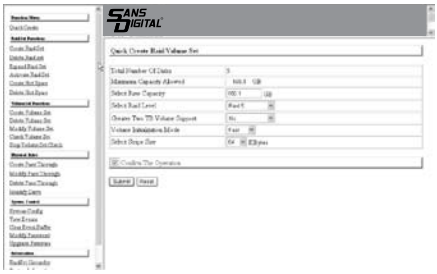
To display RAID set information, move the mouse cursor to the desired RAID set number, then click it. The RAID set Information will show in the screen.
To display volume set information, move the mouse cursor to the desired Volume Set number, then click it. The volume set Information will show in the screen.
To display drive information, move the mouse cursor to the desired physical drive number, then click it. The drive Information will show in the screen.

### 6.6.1 Main Menu

The Main Menu shows all function that enables the customer to execute actions by clicking on the appropriate link.

| Individual Category | Description |
|---|---|
| Quick Function | Create a default configuration, which is based on the number of physical disk installed; it can modify the volume set Capacity, RAID Level, and Stripe Size. |
| RAIDSet Functions | Create a customized RAID set. |
| VolumeSet Functions | Create customized volume sets and modify the existed volume sets parameter. |
| Physical Drives | Create pass through disks and modify the existed pass through drives parameter. It also provides the function to identify the respect disk drive. |
| System Controls | Setting the RAID system configurations |
| Information | View the controller information. The RAID Set Hierarchy can also view through the RAIDSet Hierarchy item. |

## 6.7 Quick Create



The number of physical drives in the RAID subsystem determines the RAID levels that can be implemented with the RAID set. You can create a RAID set associated with exactly one volume set. The user can change the RAID level, stripe size, and capacity. A hot spare option is also created depending upon the existing configuration.
Tick on the Confirm The Operation and click on the Submit button in the Quick Create screen, the RAID set and volume set will start

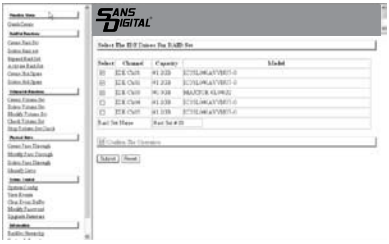
**Note:**

In Quick Create your volume set is automatically configured based on the number of disks in your system. Use the RAID Set Function and Volume Set Function if you prefer to customize your system.

## 6.8 RAID Set Functions

Use the RAID Set Function and Volume Set Function if you prefer to customize your system. User manual configuration can full control of the RAID set setting, but it will take longer to complete than the Quick Volume/RAID Setup configuration. Select the RAID Set Function to manually configure the RAID set for the first time or deletes existing RAID set and reconfigures the RAID set. A RAID set is a group of disks containing one or more volume sets.

### 6.8.1 Create RAID Set



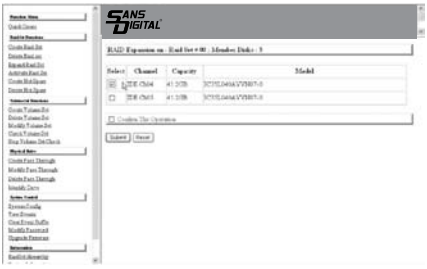
To create a RAID set, click on the Delete RAID Set link. A Select The SATA Drive For RAID Set screen is displayed showing the IDE drive connected to the current controller. Click on the selected physical drives with the current RAID set. Enter 1 to 15 alphanumeric characters to define a unique identifier for a RAID set. The default RAID set name will always appear as RAID Set. #.
Tick on the Confirm The Operation and click on the Submit button in the screen, the RAID set will start to initialize.

## 6.8.2 Delete RAID Set

To delete a RAID set, click on the Create RAID Set link. A Select The RAID SET To Delete screen is displayed showing all RAID set existing in the current controller. Click the RAID set number you which to delete in the select column to delete screen.
Tick on the Confirm The Operation and click on the Submit button in the screen to delete it.

## 6.8.3 Expand RAID Set

Use this option to expand a RAID set, when a disk is added to your system. This function is active when at least one drive is available.

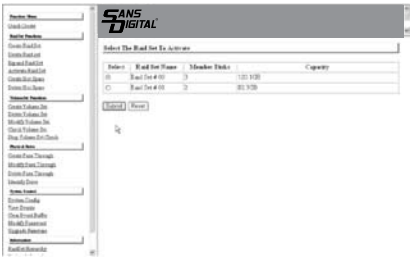


To expand a RAID set, click on the Expand RAID Set link. Select the target RAID set, which you want to expand it.
Tick on the available disk and Confirm The Operation, and then click on the Submit button in the screen to add disks to the RAID set.

## 6.8.4 Activate Incomplete RAID Set

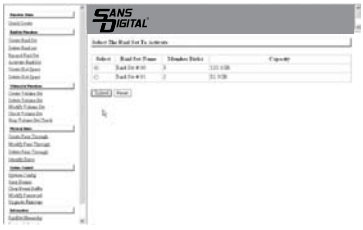
When one of the disk drive is removed in power off state, the RAID set state will change to Incomplete State. If user wants to continue to work, when the RAID subsystem is power on. User can use the Activate RAID Set option to active the RAID set. After user complete the function, the RAID State will change to Degraded Mode.

To activate the incomplete the RAID set, click on the Activate RAID Set link. A "Select The RAID SET To Activate" screen is displayed showing all RAID set existing in the current control-

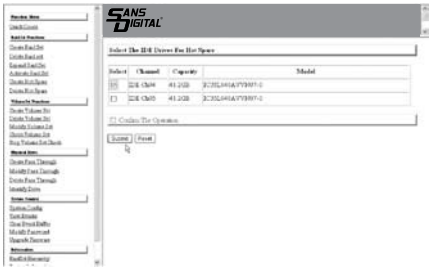


ler. Click the RAID set number you which to activate in the select column.

Click on the Submit button in the screen to activate the RAID set



### 6.8.5 Create Hot Spare



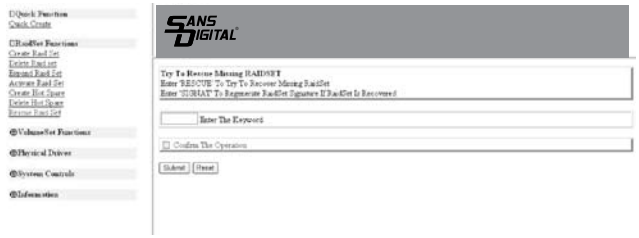
When you choose the Create Hot Spare option in the RAID Set Function, all unused physical devices connected to the current controller appear: Select the target disk by clicking on the appropriate check box. Tick on the Confirm The Operation, and click on the Submit button in the screen to create the hot spares.
The create Hot Spare option gives you the ability to define a global hot spare.

### 6.8.6 Delete Hot Spare

Select the target Hot Spare disk to delete by clicking on the appropriate check box.
Tick on the Confirm The Operation, and click on the Submit button in the screen to delete the hot spares.

### 6.8.7 Rescue RAID Set

When the system is power off in the RAID set update period, it may be disappeared in this abnormal condition. The "RESCUE" function can recover the missing RiaidSet information.
The RAID controller uses the time as the RAIDSet signature. The RAIDSet may have different time after the RAID Set is recovered. The "SIGANT" function can regenerate the signature for the RiaidSet.




# 6.9 Volume Set Functions

A volume set is seen by the host system as a single logical device. It is organized in a RAID level with one or more physical disks. RAID level refers to the level of data performance and protection of a volume set. A volume set capacity can consume all or a portion of the disk capacity available in a RAID set. Multiple volume sets can exist on a group of disks in a RAID set. Additional volume sets created in a specified RAID set will reside on all the physical disks in the RAID set. Thus each volume set on the RAID set will have its data spread evenly across all the disks in the RAID set.

## 6.9.1 Create Volume Set

### 6.9.1.1 For MR5S1

The following is the volume set features

1. Volume sets of different RAID levels may coexist on the same RAID set.
2. Up to 16 volume sets in a RAID set can be created by the SATA RAID controller.
3. The maximum addressable size of a single volume set is 2 TB(32-bit mode).
4. Support greather than 2TB capacity per volume set (64-bit LBA mode).

To create volume set from RAID set system, move the cursor bar to the main menu and click on the Create Volume Set link. The Select The RAID Set To Create On It screen will show all RAID set number. Tick on a RAID set number that you want to

create and then click on the Submit button.

The new create volume set allows user to select the Volume name, capacity, RAID level, strip size, SCSI ID/LUN, Cache mode, tag queuing and Max Sync Rate.

**• Volume Name:**
The default volume name will always appear as Volume Set. #. You can rename the volume set name providing it does not exceed the 15 characters limit.

**• Capacity:**
The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the .UP and DOWN arrow key.

**• RAID Level:**
Set the RAID level for the Volume Set. Highlight RAID Level and press <Enter>.
The available RAID levels for the current Volume Set are displayed. Select a RAID level and press <Enter> to confirm.

**• Strip Size:**
This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 5 or 6 logical drive. You can set the stripe size to 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. However, if you are sure that your computer does random reads more often, select a small stripe size.

**• Cache Mode:**
The RAID subsystem supports Write-Through Cache and Write-Back Cache.

**• Tag Queuing:**
The Enabled option is useful for enhancing overall system performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SCSI command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using older SCSI drives that do not support command tag queuing.

**• Max SCSI Speed:**
The RAID subsystem supports 320.00 MB/sec .....as the highest data transfer rate.

**• SCSI Channel/SCSI/ID**
**SCSI Channel:** The RAID subsystem only supports one SCSI Channel.
**SCSI ID:** Each SCSI device attached to the SCSI card, as well as the card itself, must be assigned a unique SCSI ID number. A Wide SCSI channel can connect up to 15 devices. The RAID subsystem is as a large SCSI device. We should assign an ID from a list of SCSI IDs.
**SCSI LUN:** Each SCSI ID can support up to 8 LUNs. Most SCSI host adapter treats each LUN like a SCSI disk.

### 6.9.1.2 For MR5CT1

The following is the volume set features
1. Volume sets of different RAID levels may coexist on the same RAID set.
2. Up to 16 volume sets in a RAID set can be created by the SATA RAID controller.
3. The maximum addressable size of a single volume set is 2 TB.

To create volume set from RAID set system, move the cursor bar to the main menu and click on the Create Volume Set link. The Select The RAID Set To Create On It screen will show all RAID set number. Tick on a RAID set number that you want to create and then click on the Submit button.
The new create volume set allows user to select the Volume name, capacity, RAID level, strip size, SCSI ID/LUN, Cache

mode, tag queuing, IDE Data Xfer Mode and IDE Channel/IDE Drive#ID.

● **Volume Name:**
The default volume name will always appear as Volume Set.

#. You can rename the volume set name providing it does not exceed the 15 characters limit.

● **Capacity:**
The maximum volume size is default in the first setting. Enter the appropriate volume size to fit your application. The capacity can also increase or decrease by the .UP and DOWN arrow key

● **RAID Level:**
Set the RAID level for the Volume Set. Highlight RAID Level and press **<Enter>**.
The available RAID levels for the current Volume Set are displayed. Select a RAID level and press **<Enter>** to confirm.

● **Strip Size:**
This parameter sets the size of the stripe written to each disk in a RAID 0, 1, 5 or 6 logical drive. You can set the stripe size to 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. However, if you are sure that your computer does random reads more often, select a small stripe size.

● **Cache Mode:**
The RAID subsystem supports Write-Through Cache and Write-Back Cache.

● **Tag Queuing:**

The Enabled option is useful for enhancing overall system performance under multi-tasking operating systems. The Command Tag (Drive Channel) function controls the SCSI command tag queuing support for each drive channel. This function should normally remain enabled. Disable this function only when using older SCSI drives that do not support command tag queuing

**● IDE Host Channel:**

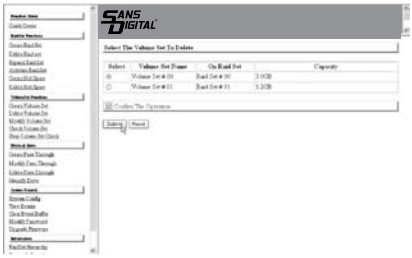
IDE Channel: The MR5CT1 can support dual ATA Host channel-Parallel ATA (For Firewire/USB)(Connect to Channel 0) and Serial ATA (Connect to Channel 1). Multiple ATA Host channel can be applied to the same volume set if user selects the 0&1 Cluster option in the IDE Host Channel. Each ATA Host channel can be applied to different volume sets if user selects the 0&1 option in the IDE Host Channel Mode, 0 for Parallel ATA host channel and 1 for Serial ATA host channel. The volume set initializes for Parallel ATA host channel, now user wants to change to Serial ATA, user needs to modify configuration as the IDE Host Channel =1 and IDE Drive select=0.

**● IDE Drive Select:**

IDE Host Channel setting at 0 or 1 PATA(for Firewire&USB) and SATA host channel can concurrently access different volume sets. The PATA (Channel 0) can support Master and Slave volume set. The SATA (Channel 1) can support one Master volume set. The Max volume set can be accessed by MR5CT1 is 3.
IDE Host Channel setting at 0&1 Cluster. The MR5CT1 can support dual ATA Host Channel - Parellel ATA Master and Serial ATA accesses the same volume set. But user only can write through one channel at the time.

## 6.9.2 Delete Volume Set

To delete Volume from RAID set system function, move the cursor



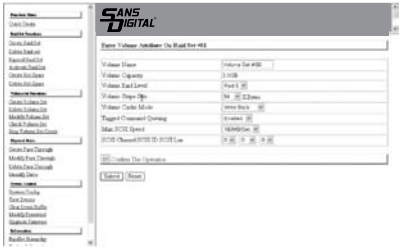
bar to the main menu and click on the Delete Volume Set link. The Select The RAID Set To Delete screen will show all RAID set number. Tick on a RAID set number and the Confirm The Operation and then click on the Submit button to show all volume set item in the selected RAID set. Tick on a volume set number and the Confirm The Operation and then click on the Submit button to delete the volume set.

### 6.9.3 Modify Volume Set

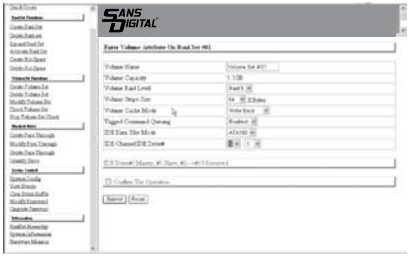
To modify a volume set from a RAID set:
(1). Click on the Modify Volume Set link.
(2). Tick on the volume set from the list that you wish to modify.

Click on the Submit button.
The following screen appears.
Use this option to modify volume set configuration. To modify volume set attribute values from RAID set system function, move the cursor bar to the volume set attribute menu and click on it. The modify value screen appears. Move the cursor bar to an attribute item, and then click on the attribute to modify the value. After you complete the modification, tick on the Confirm The Operation and click on the Submit button to complete the action. User can modify all values except the capacity.

#### 6.9.3.1 For MR5S1
#### 6.9.3.2 For MR5CT1



### 6.9.3.3 Volume Expansion



Use this RAID set expands to expand a RAID set, when a disk is

added to your system. The expand capacity can use to enlarge the volume set size or create another volume set. The modify volume set function can support the volume set expansion function. To expand volume set capacity value from RAID set system function, move the cursor bar to the volume set Volume capacity item and entry the capacity size. Tick on the Confirm The Operation and click on the Submit button to complete the action. The volume set start to expand.

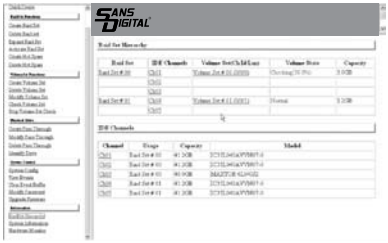
### 6.9.3.4 Volume Set Migration

Migrating occurs when a volume set is migrating from one RAID level to another, a volume set strip size changes, or when a disk is added to a RAID set. Migration status is displayed in the volume status area of the RAIDSet Hierarchy screen when one RAID level to another, a Volume set strip size changes or when a disk is added to a RAID set.

### 6.9.4 Check Volume Set

To check a volume set from a RAID set:
1. Click on the Check Volume Set link.
2. Tick on the volume set from the list that you wish to check.
Tick on Confirm The Operation and click on the Submit button.

Use this option to verify the correctness pf the redundant data in a volume set. For example, in a system with dedicated parity, volume set check means computing the parity of the data disk drives and comparing the results to the contents of the dedicated parity disk drive. The checking percentage can also be viewed by clicking on RAIDSet Hierarchy in the main menu.



### 6.9.5 Stop VolumeSet Check

Use this option to stop the Check Volume Set function.

## 6.10 Physical Drive

Choose this option from the Main Menu to select a physical disk and to perform the operations listed below.

## 6.10.1 Create Pass-Through Disk

### 6.10.1.1 For MR5S1

To create pass-through disk, move the mouse cursor to the main menu and click on the Create Pass-Through link. The relative setting function screen appears.

Disk is no controlled by the internal RAID subsystem firmware and thus cannot be a part of a volume set. The disk is available to the operating system as an individual disk. It is typically used on a system where the operating system is on a disk not controlled by the RAID firmware. User can also select the cache mode, Tagged Command Queuing, Max SCSI speed and SCSI channel/SCSI_ID/SCSI_LUN for this volume.

### 6.10.1.2 For MR5CT1

To create pass-through disk, move the mouse cursor to the main menu and click on the Create Pass-Through link. The relative setting function screen appears.

Disk is no controlled by the internal RAID subsystem firmware and thus cannot be a part of a volume set. The disk is available to the operating system as an individual disk. It is typically

used on a system where the operating system is on a disk not controlled by the RAID firmware. User can also select the cache mode, Tagged Command Queuing, IDE Data Xfer Mode and IDE Channel/IDE Drive# for this volume.

## 6.10.2 Modify Pass-Through Disk

Use this option to modify the Pass-Through Disk Attribute. User can modify the cache mode, Tagged Command Queuing, Max SCSI speed and SCSI channel/ID/LUN on an existed pass through disk.
To modify the pass-through drive attribute from the pass-through drive pool, move the mouse cursor bar to click on Modify Pass-Through link. The Select The Pass Through Disk For Modification screen appears tick on the Pass-Through Disk from the pass-through drive pool and click on the Submit button to select drive. The Enter Pass-Through Disk Attribute screen appears, modify the drive attribute values, as you want.

### 6.10.2.1 For MR5S1

### 6.10.2.2 For MR5CT1

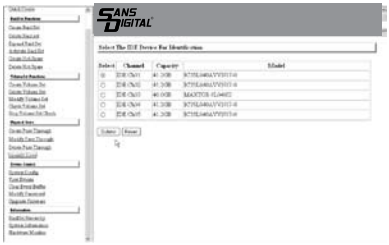
After you complete the selection, tick on the Confirm The Operation and click on the Submit button to complete the selection action.

### 6.10.3 Delete Pass-Through Disk

To delete pass-through drive from the pass-through drive pool, move the mouse cursor bar to the main menus and click on Delete Pass Through link. After you complete the selection, tick on the Confirm The Operation and click on the Submit button to complete the delete action.

### 6.10.4 Identify Drive

To prevent removing the wrong drive, the selected disk LED will light for physically locating the selected disk when the Identify Selected Drive is selected.
To identify the selected drive from the drives pool, move the mouse cursor bar to click on Identify Selected Drive link. The Select The SATA Device For identification screen appears tick on the SATA device from the drives pool and Flash method. After completing the selection, click on the Submit button to identify selected drive.



## 6.11 System Controls

### 6.11.1 System Configuration

To set the RAID system function, move the cursor bar to the main menu and click on the System Configuration link. The System Configuration menu will show all items. Move the cursor bar to an item, then press Enter key to select the desired function.

#### 6.11.1.1 For MR5S1

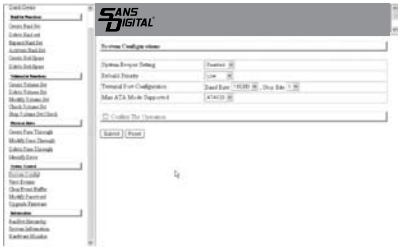
- **System Beeper Setting:**

The Alert Beeper function item is used to Disabled or Enable the

RAID subsystem controller alarm tone generator.

**• Background Track Priority:**
The RAID background Track Priority is a relative indication of how much time the controller devotes to a background operation such as rebuilding or migrating. The RAID subsystem allows user to choose the background priority to balance volume set access and background tasks appropriately. For high array performance, specify a Low value.

**• Terminal Port Configuration:**
Speed setting values are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.
Stop Bits values are 1 bit and 2 bits.
Note: Parity value is fixed at None.
Data Bits value is fixed at 8 bits.



**• JBOD/RAID Configuration:**
JBOD is an acronym for "Just a Bunch Of Disk". It repressents a volume set that is created by the concatenation of partitions on the disks. For the MobileRAID, it can see the five individual disks, when you select the JBOD option. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

**• Maximum SATA Mode Supported:**
Within the subsystem, the SCSI chip acts as a target and 5 SATA ll bus are connected to the drive. The 5 SATA drive channel can support up to SATA ll, which runs up to 300MB/s. NCQ is a command protocol in Serial ATA that can only be implemented on native Serial ATA hard drives. It allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the

necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows user to choose the SATA Mode: SATA150, SAT150+NCQ, SAT300, SATA300+NCQ.

**• HDD Read Ahead Cache**
Allow Read Ahead (Default: Enabled)—When Enabled, the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.

**• Stagger Power on**
In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But in systems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other system components. This damage can be avoided by allowing the host to stagger the spin-up of the drives. New SATA drives have support staggered spin-up capabilities to boost reliability. Staggered spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the host the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

Sans Digital has supported the fixed value staggered power up function in its previous version firmware. But from firmware version 1.39, Sans Digital RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected from 0.4ms to 6ms per step which powers up one drive.

**• HDD SMART Status Polling**
An external RAID enclosure has the hardware monitor in the dedicated backplane that can report HDD temperature status to the controller. However, PCI cards do not use backplanes if the drives are internal to the main server chassis. The type of enclosure cannot report the HDD temperature to the controller.

For this reason, HDD SMART Status Polling was added to enable scanning of the HDD temperature function in the version 1.36 date: 2005-05-19 (and later). It is necessary to enable "HDD SMART Status Polling" function before SMART information is accessible. This function is disabled by default.

The following screen shot shows how to change the BIOS setting to enable the Polling function.

● **Disk Capacity Truncation Mode:**
Sans Digital RAID controllers use drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units.
The controller provides three truncation modes in the system configuration: **Multiples Of 10G**, **Multiples Of 1G**, and **No Truncation**.
**Multiples Of 10G:** If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. Sans Digital drive Truncation mode **Multiples Of 10G** uses the same capacity for both of these drives so that one could replace the other.

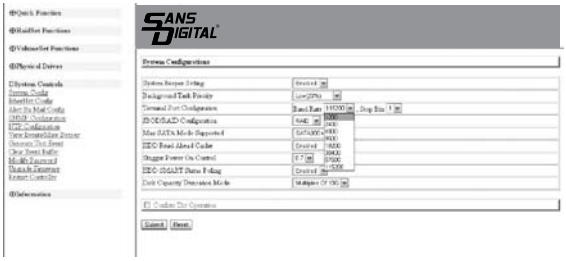
**Multiples Of 1G:** If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. Sans Digital drive Truncation mode **Multiples Of 1G** uses the same capacity for both of these drives so that one could replace the other.

### 6.11.1.2 For MR5CT1

**• System Beeper Setting**
The Alert Beeper function item is used to Disabled or Enable the RAID subsystem controller alarm tone generator.

**• Background Track Priority**
The RAID background Track Priority is a relative indication of how much time the controller devotes to a background operation such as rebuilding or migrating. The RAID subsystem allows user to choose the background priority to balance volume set access and background tasks appropriately. For high array performance, specify a Low value.

**• Terminal Port Configuration**
Speed setting values are 1200, 2400, 4800, 9600, 19200, 38400, 57600, and 115200.
Stop Bits values are 1 bit and 2 bits.
Note: Parity value is fixed at None.
Data Bits value is fixed at 8 bits.



**• JBOD/RAID Configuration**
JBOD is an acronym for "Just a Bunch Of Disk". It represents a volume set that is created by the concatenation of partitions on the disks. For the MR5CT1, it can only see the first two disks, when you select the JBOD option. User needs to delete the RAID set, when you want to change the option from the RAID to the JBOD function.

**• Max SATA Mode Supported**
Within the subsystem, the host IDE channels act as a target and 5 Serial ATA ll bus are connected to the drive. The 5 SATA ll drive channel can support up to SATA ll, which runs up to

300MB/s. NCQ is a command protocol in Serial ATA that can only be implemented on native Serial ATA hard drives. It allows multiple commands to be outstanding within a drive at the same time. Drives that support NCQ have an internal queue where outstanding commands can be dynamically rescheduled or re-ordered, along with the necessary tracking mechanisms for outstanding and completed portions of the workload. The RAID subsystem allows user to choose the SATA Mode: SATA150, SAT150+NCQ, SAT300, SATA300+NCQ.

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Allow Read Ahead (Default: Enabled)—When Enabled, the drive's read ahead cache algorithm is used, providing maximum performance under most circumstances.

**• Stagger Power on**

In a PC system with only one or two drives, the power can supply enough power to spin up both drives simultaneously. But in systems with more than two drives, the startup current from spinning up the drives all at once can overload the power supply, causing damage to the power supply, disk drives and other system components. This damage can be avoided by allowing the host to stagger the spin-up of the drives. New SATA drives have support staggered spin-up capabilities to boost reliability. Staggered spin-up is a very useful feature for managing multiple disk drives in a storage subsystem. It gives the host the ability to spin up the disk drives sequentially or in groups, allowing the drives to come ready at the optimum time without straining the system power supply. Staggering drive spin-up in a multiple drive environment also avoids the extra cost of a power supply designed to meet short-term startup power demand as well as steady state conditions.

Sans Digital has supported the fixed value staggered power up function in its previous version firmware. But from firmware version 1.39, Sans Digital RAID controller has included the option for customer to select the disk drives sequentially stagger power up value. The values can be selected from 0.4ms to 6ms per step which powers up one drive.

**• HDD SMART Status Polling**

An external RAID enclosure has the hardware monitor in the dedicated backplane that can report HDD temperature status to the controller. However, PCI cards do not use backplanes if the drives are internal to the main server chassis. The type of enclosure cannot report the HDD temperature to the controller. For this reason, HDD SMART Status Polling was added to enable scanning of the HDD temperature function in the version 1.36 date: 2005-05-19 (and later). It is necessary to enable "HDD SMART Status Polling" function before SMART information is accessible. This function is disabled by default.

**• Disk Capacity Truncation Mode**

Sans Digital RAID controllers use drive truncation so that drives from differing vendors are more likely to be able to be used as spares for each other. Drive truncation slightly decreases the usable capacity of a drive that is used in redundant units.
The controller provides three truncation modes in the system configuration: **Multiples Of 10G**, **Multiples Of 1G**, and **No Truncation**.
**Multiples Of 10G:** If you have 120 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 120 GB. Sans Digital drive Truncation mode **Multiples Of 10G** uses the same capacity for both of these drives so that one could replace the other.

**Multiples Of 1G:** If you have 123 GB drives from different vendors; chances are that the capacity varies slightly. For example, one drive might be 123.5 GB, and the other 123.4 GB. Sans Digital drive Truncation mode **Multiples Of 1G** uses the same capacity for both of these drives so that one could replace the other.

**No Truncation:** It does not truncate the capacity.

### 6.11.2 U320 SCSI Target Config (MR5S1)

Arbitration allows one SCSI device to gain control of the SCSI bus to allow that SCSI device to initiate or resume a task. There are two methods that a SCSI device may use to arbitrate for the SCSI bus: normal arbitration and QAS. Normal arbitration is mandatory and requires the detection of a BUS FREE phase on the SCSI bus before starting. QAS is optional and, when enabled, requires the initiation and detection of a QAS REQUEST message before starting.

### 6.11.3 EtherNet Config

Use this feature to set the controller Ethernet port configuration. Customer doesn't need to create a reserved space on the arrays before the Ethernet port and HTTP service working. The firmware-embedded Web Browser-based RAID manager can access it from any standard internet browser or from any host computer either directly connected or via a LAN or WAN with no software or patches required.
DHCP (Dynamic Host Configuration Protocol) is a protocol that lets network administrators manage centrally and automate the assignment of IP (Internet Protocol) configurations on a computer network. When using the Internet's set of protocols (TCP/IP), in order for a computer system to communicate to another computer system it needs a unique IP address. Without DHCP, the IP address must be entered manually at each computer system. DHCP lets a network administrator supervise and distribute IP addresses from a central point. The purpose of DHCP is to provide the automatic (dynamic) allocation of IP client configurations for a specific time period (called a lease period) and to eliminate the work necessary to administer a large IP network.

To configure the RAID controller EtherNet port, move the cursor bar to the main menu and click on the System Controls link. The System Controls menu will show all items. Move the cursor bar

to the EtherNet Config item, then press **Enter** key to select the desired function.

## 6.11.4 Alert By Mail Config

To configure the RAID controller email function, move the cursor bar to the main menu and click on the System Controls link. The System Controls menu will show all items. Move the cursor bar to the Alert By Mail Config item, then press Enter key to select the desired function. This function can only set by the web-based configuration.

The firmware contains SMTP manager monitors all system events

## 6.11.5 SNMP Configuration

To configure the RAID controller SNMP function, move the cursor bar to the main menu and click on the System Controls link. The System Controls menu will show all items. Move the cursor bar to the SNMP Configuration item, then press Enter key to select the desired function. This function can only set by the web-based configuration.

The firmware contains SNMP Agent manager monitors all system events and user can use the SNMP function from the web setting with no Agent software required.

Please reference to Appendix D SNMP operation & Definition for more detail information about the SNMP trap and definition.

## 6.11.6 NTP Configuration

The Network Time Protocol (NTP) is used to synchronize the time of a computer client or server to another server or reference time source, such as a radio or satellite receiver or modem. It provides accuracies typically within a millisecond on LANs and up to a few tens of milliseconds on WANs relative to Coordinated Universal Time (UTC) via a Global Positioning Service (GPS) receiver, for example:

- **NTP Sever Address**

  The most important factor in providing accurate, reliable time is the selection of NTP servers to be used in the configuration file. Typical NTP configurations utilize multiple redundant servers and diverse network paths in order to achieve high accuracy and reliability. Our NTP configuration supports two existing public NTP synchronization subnets.

- **Time Zone**

  Time Zone conveniently runs in the system tray and allows you to easily view the date and time in various locations around the world. You can also quickly and easily add your own personal locations to customize Time Zone the way you want.

- **Automatic Daylight Saving**

Automatic Daylight Saving will normally attempt to automatically adjust the system clock for daylight saving changes based on the computer time zone. This tweak allows you to disable the automatic adjustment.

## 6.11.7 View Events/ Mute Beeper

To view the RAID subsystem controller's information, move the mouse cursor to the main menu and click on the View Events/ Mute Beeper link. The RAID Subsystem events Information screen appears.
Choose this option to view the system events information: Timer, Device, Event type, Elapse Time and Errors. The RAID system does not built the real time clock. The Time information is the relative time from the RAID subsystem power on.

## 6.11.8 Generate Test Event

Use this feature to generate a event to test the email address which configures by the "Altert By Mail Config" option.

### 6.11.9 Clear Events Buffer

Use this feature to clear the entire events buffer information.

### 6.11.10 Modify Password

To set or change the RAID subsystem password, move the mouse cursor to RAID System Function screen, and click on the Change Password link. The Modify System Password screen appears.
The password option allows user to set or clear the RAID subsystem's password protection feature. Once the password has been set, the user can only monitor and configure the RAID subsystem by providing the correct password.
The password is used to protect the internal RAID subsystem from unauthorized entry. The controller will check the password only when entering the Main menu from the initial screen. The RAID subsystem will automatically go back to the initial screen when it does not receive any command in ten seconds.
To disable the password, press Enter key only in both the Enter New Password and Re-Enter New Password column. Once the user confirms the operation and clicks the Submit button. The existing password will be cleared. No password checking will occur when entering the main menu from the starting screen.

### 6.11.11 Upgrade Firmware

Please refer to the appendix B firmware utility.

### 6.11.12 Restart Controller

Use the Restart Controller Function to restart the RAID subsystem controller.

# 6.12 Information Menu

## 6.12.1 RAID Set Hierarchy

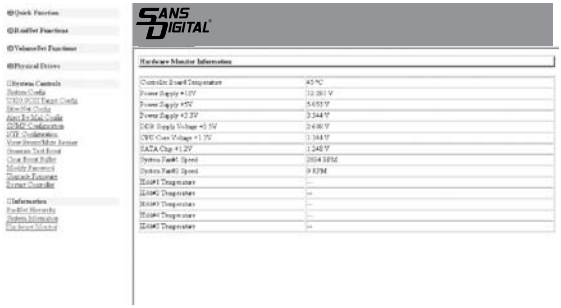
Use this feature to view the internal RAID subsystem current RAID set, current volume set and physical disk configuration. Please reference this chapter "Configuring RAID Sets and Volume Sets"

## 6.12.2 System Information

To view the RAID subsystem controller's information, move the mouse cursor to the main menu and click on the System Information link. The RAID Subsystem Information screen appears.
Use this feature to view the RAID subsystem controller's information. The controller name, firmware version, serial number, main processor, CPU data/instruction cache size and system memory size/speed appear in this screen.

## 6.12.3 Hardware Monitor

To view the RAID subsystem controller's hardware monitor information, move the mouse cursor to the main menu and click the Hardware Monitor link. The Hardware Information screen appears. The Hardware Monitor Information provides the temperature, fan speed (chassis fan) and voltage of the internal RAID subsystem. All items are also unchangeable. The warning messages will indicate through the LCM, LED and alarm buzzer.



| Item | Warning Condition |
|---|---|
| Controller Board Temperature | **> 60º** |
| Backplane Temperature | **> 55º** |
| Controller Fan Speed | **< 1900 RPM** |
| Power Supply +12V | **< 10.5V or > 13.5V** |
| Power Supply +5V | **< 4.7V or > 5.3V** |
| Power Supply +3.3V | **< 3.0V or > 3.6V** |
| CPU Core Voltage +1.5V | **< 1.35V or > 1.65V** |

# APPENDIX A

## Specifications

### Adapter Architecture

- Intel 80219 400MHz I/O processor
- 128MB on-board DDR200 SDRAM with ECC protection
- Marvell 8 channels SATA ll controller
- Sans Digital ASIC to support extreme performance RAID 6 function
- NVRAM for RAID configuration & transaction log
- Write-through or write-back cache support
- Firmware in Flash ROM for easy upgrades

### RAID Features

- RAID level 0, 1, 10, 3, 5, 6 (if RAID Engine installed) and JBOD
- Multiple RAID selection
- Online Array roaming
- Online RAID level/ stripe size migration
- Online capacity expansion and RAID level migration simultaneously
- Online Dynamic Volume set capacity expansion
- Greater than 2TB per volume set (MR5S1 only)
- Instant availability and background initialization
- Automatic insertion / removal detection and rebuild
- Support SMART, NCQ and OOB staggered spin-up capable drivers

### Disk Bus Interface

- SATA II compatible-3.0Gbps (300MB/Sec)

### Firewire 800/USB2.0/SATA to SATA ll Host Bus Interface

- Firewire 800 & USB2.0 & eSATA 1.5Gbps

## SCSI to SATA II Host Bus Interface

- Ultra 320-Wide LVD SCSI; Transfer rate up to 320MB/sec
- Tagged Command Queuing
- Concurrent I/O commands

## RAID Management

- Field-upgradeable firmware in flash ROM via RS-232 port
- Web browser-based RAID management via HTTP PROXY through RS-232 port for windows, Linux and FreeBSD system
- Firmware-embedded manager via RS-232 port (platform independent)
- Firmware-embedded web browser-based RAID manager, SMTP manager, SNMP agent and Telnet function via LAN port (plat form independent)

## Software Drivers

- Host OS Independent

## Mechanical

- **Dimension (W x H x D)**
  - 148 x 128 x 220 mm

- **Weight**
  - 4.84 lbs/2.2 kg (w/o disk drive)

- **I/O Interface**
  - 1 * AC Power Jack
  - 2 * 68 pin LVD SCSI connector (MR5S1)
  - 2 * Firewire 800 and 1*USB2.0 and 1 * SATA connector (MR5CT1 to SATA)
  - 1 * RJ45 Ethernet LAN connector
  - 1 * DB9 RS232 connector

## Environmental

- Operating Temperature
- Temperature: +5 C to +35 C
- Humidity: 15-80%, non-condensing
- Storage Temperature
- Temperature: -40 C to 70 C
- Humidity: 5-90%, non-condensing

## Electrical

- Input Voltage : AC 100V ~AC 240V

# APPENDIX

# Appendix B

## Upgrading Flash Firmware Programming Utility

Since the RAID subsystem controller features flash firmware, it is not necessary to change the hardware flash chip in order to upgrade the RAID firmware. The user can simply re-program the old firmware through the RS-232 port or Lane Port. New releases of the firmware are available in the form of a DOS file at OEM's FTP. The file available at the FTP site is usually a self-extracting file that contains the following:

XXXXVVV.BIN Firmware Binary (where "XXXX" refers to the model name and "VVV" refers to the firmware version)

README.TXT it contains the history information of the firmware change. Read this file first before upgrading the firmware.
These files must be extracted from the compressed file and copied to one directory in drive A: or C:.

## Establishing the Connection for the RS-232

The firmware can be downloaded to the RAID subsystem controller by using an ANSI/VT-100 compatible terminal emulation program or HTTP web browser management. You must complete the appropriate installation procedure before proceeding with this firmware upgrade. Please refer to chapter 4.3, "VT100 terminal (Using the controller's serial port)" for details on establishing the connection. Whichever terminal emulation program is used must support the ZMODEM file transfer protocol.
Configuration of the internal RAID subsystem web browser-based RAID management is an HTTP based application, which utilizes the browser installed on your operating system. Web browser-based RAID management can be used to update the firmware. You must complete the appropriate installation procedure before proceeding with this firmware upgrade. Please refer to chapter 6.1, "Web browser-based RAID management via HTTP Proxy (Using the controller's serial port)" for details on establishing the connection.

Note: CD-ROM bootable VT-100 utility cannot support the update firmware function.

## Upgrade Firmware Through ANSI/VT-100 Terminal Emulation

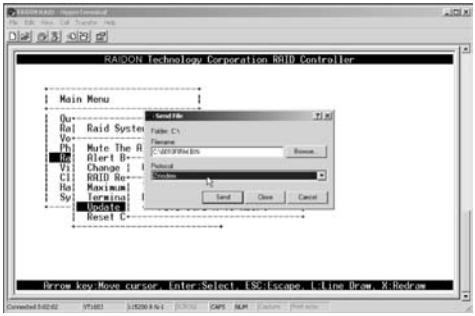
Get the new version firmware for your RAID subsystem controller. For Example, download the bin file from your OEM's web site onto the c:

1. From the Main Menu, scroll down to "RAID System Function"
2. Choose the "Update Firmware", The Update The RAID Firmware dialog box appears.

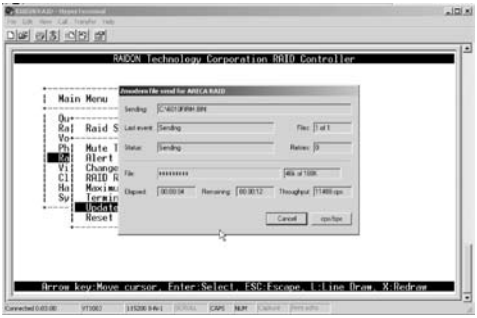

3. Go to the tool bar and select Transfer. Open Send File.


4. Select "ZMODEM modem" under Protocol. ZMODEM as the file transfer protocol of your terminal emulation software.

5. Click Browse. Look in the location where the Firmware upgrade software is located. Select the File name:




6. Click Send. Send the Firmware Binary to the controller.




7. When the Firmware completes downloading, the confirmation screen appears.  Press Yes to start program the flash ROM.


8. When the Flash programming starts, a bar indicator will show “Start Updating Firmware. Please Wait”.


9. The Firmware upgrade will take approximately thirty seconds to complete.

10. After the Firmware upgrade is complete, a bar indicator will show "Firmware Has Been Updated Successfully".


**Note:**

The user doesn't need to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will keep us the vaules before upgrade.

## Upgrade Firmware Through HTTP Proxy Web Browser Manager

Get the new version firmware for your RAID subsystem controller. For Example, download the bin file from your OEM's web site onto the c:

1. To upgrade the RAID subsystem firmware, move the mouse cursor to Upgrade Firmware link. The Upgrade The RAID System Firmware screen appears.

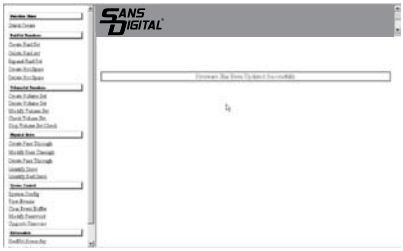
2. Click Browse. Look in the location where the Firmware upgrade

software is located. Select the File name: "6010FIRM.BIN" and click open.

3.Click the Confirm The Operation and press the Submit button.

4. The Web Browser begins to download the firmware binary to the controller and start to update the flash ROM.

5. After the firmware upgrade is complete, a bar indicator will show "Firmware has Been Updated Successfully"



**Note:**

The user doesn't need to reconfigure all of the settings after the firmware upgrade is complete, because all of the settings will keep us the vaules before upgrade.

# Appendix C

## Pin Definitions

DC Cooling Fan Power Connector

| Pin | Pin Name | Description |
|---|---|---|
| 1 | GND | Signal Ground |
| 2 | +12V | +12V Voltage Input |
| 3 | FAN CNT PULSE | FAN RPM Detection |

RS232 Connector

| Pin | Pin Name | Pin | Description |
|---|---|---|---|
| 1 | N/C | 2 | RXD0 |
| 3 | TXD0 | 4 | N/C |
| 5 | GND | 6 | N/C |
| 7 | RTS0 | 8 | CTS0 |
| 9 | N/C | 10 | N/C |

# Appendix D

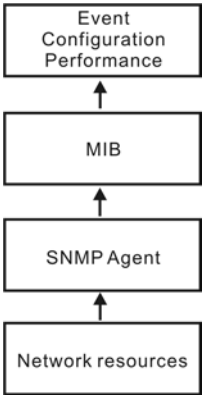
## SNMP Operation & Definition

### Overview

The Internal RAID subsystem firmware-embedded Simple Network Management Protocol (SNMP) agent for the connect array. An SNMP-based management application (also known as an SNMP manager) can monitor the disk array. An example of An SNMP management application is Hewlett-Packard's Open View. The firmware-embedded SNMP agent ca be used to augment the RAID controller if you are already running a SNMP management application at your site.

### SNMP Definition

SNMP, an IP-based protocol, has a set of commands for getting the status of target devices. The SNMP management platform is called the SNMP manager, and the managed devices have the SNMP agent loaded. Management data is organized in a hierarchical data structure called the management Information Base (MIB). These MIBs are defined and sanctioned by various industry associations. The objective is for all vendors to create products in compliance with these MIBs so that inter-vendor interoperability can be achieved. If a vendor wishes to include additional device information that is not specified in a standard MIB, then that is usually done through MIB extensions.



**SNMP Installation**

The installation of the SNMP manager is accomplished in several phases:

- Installing the Manager software on the client
- Placing a copy of the management information base (MIB) in a directory which is accessible to the management application
- Compiling the MIB description file with the management application

**MIB Compilation and Definition File creation**

Before the manager application accesses the RAID controller, user needs to integrate the MIB into the management application's database of events and status indicator codes. This process is known as compiling the MIB into the application. This process is highly vendor-specific and should be well-covered in the User's Guide of your SNMP application. Ensure the compilation process successfully integrates the contents of the Sans DigitalRAID.MIB file into the traps database.

**Location for MIB**

Depending upon the SNMP management application used, the MIB must be placed in a specific directory on the network management station running the management application. The MIB file must be manually copied to this directory. For example:

| SNMP Management Application | MIB Location |
|---|---|
| HP OpenView | \OV\MIBS |
| Netware NMS | \NMS\SNMPMIBS\CURRENT |

Your management application may have a different target directory. Consult the management application's user manual for the correct location.

# Appendix E

## Technical Support

Sans Digital Technical Support provides several options for our users to access information and updates. We encourage you to use one of our electric services, which provide product information updates for the most efficient service and support. If you decide to contact us, please have all information such as Product model and serial number, BIOS and driver version, and a description of the problem.Sans Digital provides online answers to your technical questions. Please go **http://www.sansdigital.com or e-mail us at support@sansdigital.com** We will help you to solve it.

# APPENDIX