DAC960SX
Ultra-SCSI to Ultra-SCSI RAID Controller

User Guide and Reference Manual

Part Number 771975 Rev. B

Greetings

Thank you for purchasing the Mylex DAC960SX Disk Array Controller.

This manual describes the operation and maintenance of the Mylex DAC960SX controller.

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WARNING

The DAC960SX family of disk array controllers contain electronic components that are sensitive to electrostatic discharge. ESD preventive measures are required when handling this product outside of its protective packaging.

About this Manual

The DAC960SX™ User Guide provides information about the DAC960SX Ultra-SCSI-to-Ultra-SCSI Disk Array Controller and its options.

This manual is designed to provide operations, routine maintenance, and reference information for the experienced system administrator or computer technician who is familiar with the principles and conventions of the Small Computer System Interface (SCSI) and with Redundant Array of Independent Disks (RAID) technology.

This user guide consists of the following chapters:

Chapter 1, Introduction contains an overview of the DAC960SXRAID controller features, options and specifications.

Chapter 2, Configuration Strategies provides an overview of how the DAC960SX implements RAID technology and provides suggestions for configuring disk arrays for optimal performance.

Chapter 3, RAID Management provides information on SCSI drive and disk array subsystem management specific to the DAC960SX.

Chapter 4, Controller Maintenance provides information for performing routine maintenance on the DAC960SX.

Chapter 5, User Interface Provides an overview on using the front panel, terminal emulation, and RAIDfx software for configuring and maintaining RAID disk arrays.

Chapters 6, 7 and 8 contain detailed descriptions of the DAC960SXI front panel LCD and terminal emulation menu screens.

Appendices A and B contain reference materialabout error codes and regulatory declarations.

Conventions

This guide uses the following text conventions for entering keyboard actions:

`bold`	Enter text in bold exactly as shown.
Enter	Press the key labeled “Enter” (or “Delete”, etc.)
<Ctrl>	Press the key labeled “Ctrl” (or “Delete”, etc.)

This guide provides additional information to notify you of additional useful information or of situations where special care is required:

> ☞ **Note**
>
> Notes provide supplementary information that can be useful.

> ⚠ ***Caution***
>
> Notification that an action has the *potential* to adversely affect equipment operation, system performance, or data integrity.

> **WARNING**
>
> **Notification that an action will result in equipment damage, data loss, or personal injury.**

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Chapter 1
Introduction

The Mylex DAC960SX is a high-performance, Ultra-SCSI-to-Ultra-SCSI Disk Array Controller that can provide non-stop service with a high degree of fault tolerance through the use of RAID technology and advanced array management features.

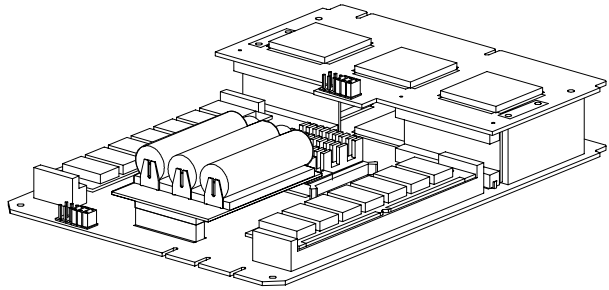


Figure 1-1. DAC960SX Mainboard and Mezzanine Board

The DAC960SX is an intelligent controller that supports either industry-standard RAID levels (0, 1, 3, 5, and 0+1) or JBOD (Just a Bunch of Disks) for multiple-drive arrays or single-drive control functionality. The DAC960SX provides high-speed, fault-tolerant RAID disk operations for all popular operating environments. Operating systems see the disk array as just another hard drive. When configured with two active controllers, the DAC960SX provides continuous access to data through a single controller failure.

DAC960SX Keypad and LCD Display

The DAC960SX has a built-in keypad and liquid crystal display (LCD) user interface for array configuration and management. This feature eliminates the need for special host software or drivers.

The compact form-factor for the DAC960SX is the same size as a 5¼ inch full-height drive and can be mounted in a server drive bay or a stand-alone external cabinet. A built-in SCSI Access Fault-Tolerant Enclosure (SAF-TE) and Array Enclosure Management Interface (AEMI) supports monitoring of power supplies, fans, and temperature in SAF-TE and AEMI-compliant cabinets.

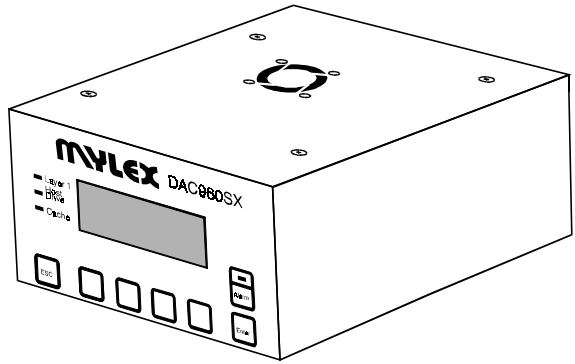


Figure 1-2. DAC960SX

Features

Enhanced SCSI Performance

- 32-bit Intel i960 RISC microprocessor that controls all functions of the controller including SCSI bus transfers, RAID processing, configuration, data striping, error recovery, and drive rebuild.
- Symbios Logic 53C770 SCSI I/O processor chips on each SCSI channel allow the controller to simultaneously communicate with the host system and read or write data on several drives.
- Ultra-SCSI channels provide high-performance data transfers at up to 40 MB/second
- Tagged-command queuing to the host allows processing of multiple data requests
- User-defined performance-tuning through selectable cache write policy and variable stripe width
- User-defined rebuild priority to optimize controller performance during automatic or manual rebuild cycles
- Supports Deep Drive Queues for improved random I/O performance
- Disconnect/reconnect capability for enhanced performance and SCSI bus optimization
- Up to 128 megabytes (minimum: 8MB) of DRAM cache
- Supports write-back, write-through, and conservative cache mode

RAID/SCSI Disk Array Management

- Supports multiple RAID levels (0, 1, 3, 5, and 0 + 1) and JBOD (Just a Bunch of Disks) allowing you to select the desired combination of storage capacity, data availability (redundancy) and I/O transfer performance for any data application
- Offers complete RAID/Ultra-SCSI array configuration and management without special software or drivers
- Supports all popular operating systems and network environments because it works independently from the operating system

- Connects up to 30 SCSI drives (using optional mezzanine board)
- Drives can be grouped and managed as a single very-large-capacity disk drive, as multiple large-capacity drive groups, or as individual disk drives
- Industry-standard Fast-20/Wide SCSI-3 (Ultra-SCSI) interface
- Programmable LUN mapping allows system drives to be assigned to any controller port(s)

Configuration on Disk (COD)

- If the array is powered off and the DAC960SX is replaced with another DAC960SX, the disks and controller automatically reconfigure when the system is restarted
- Operator intervention is not needed, unless a major change such as RAID level, stripe size, or array size is made

Mylex On-line RAID Expansion (MORE)

- Using the Add Capacity option, additional physical drives are added to an existing array and the data is restriped across the entire drive set. For example, a three-drive RAID 5 array can be increased to a four-drive RAID 5 array.
- Using the Enlarge System Drive option, the size of an existing System Drive can be increased to accommodate growing data requirements.

User Interface

- Front panel keypad and LCD interface controls all array configuration and management functions independent of the host operating system
- Serial communications port permits array configuration and control through a standard terminal emulation interface or over a network
- Software utility (RAIDfx) provides DOS-level control through a PC running ASPI drivers

Automated RAID Functions

- Automatic failed-drive detection
- Automatic rebuild of the array using stand-by (hot spare) disk after a drive failure
- Transparent drive rebuild permits automatic rebuild of failed drives during normal operation without having to take the array off-line
- Disk drive error logging specifies why a drive was placed in the “Dead” state
- Automatic detection/correction of parity errors, bad blocks, etc.
- Automatic sector re-mapping recovers defective media and corrects data errors

Increased System Availability

- Built-in diagnostics provide controller and drive fault monitoring during power-on as well as during continuous operation
- Status messages and audible alarms notify the administrator or user of critical conditions
- Supports SAF-TE or AEMI protocols for integrated monitoring of enclosure power supplies, fans, and temperature
- Battery backup protects data in the controller cache in the event of a power interruption
- Firmware resides in the on-board Flash EEPROM that retains information even after power is off and can be upgraded without replacing components

Controller Redundancy

- Each controller in a dual-active configuration monitors the status of its partner controller
- Failure of one controller in a dual-active configuration automatically initiates a process whereby the surviving controller handles operations for both controllers

- Hot replacement of a failed controller in a dual-active configuration initiates a process whereby the new controller resumes the operations of the original failed controller

Battery Backup

- Prevents data loss by providing power to the cache memory module if the power is interrupted and data is still in the cache.
- An LED indicator on the BBU illuminates when VCC power from the controller is applied to the BBU. An external LED with a Samtec TSM-112-01-T-DV connector may be connected to the BBU to view the condition remotely.
- Supports three on-board 800mAh AA-sized NiCad on-board rechargeable batteries. Includes a Molex 53015-0310 connector for attaching off-board batteries.

Mezzanine Board (Optional)

- Adds three channels to the DAC960SX for a total of one host channel, four disk channels, and one channel that can be used as a disk or host channel.

Specifications

Controller			DAC960SX
CPU			Intel i960® RISC 32-bit microprocessor
Memory			
	Module Type		Two DRAM, 60ns, 72-pin SIMMs, n x 36 (from a qualified vendor list – contact customer service for a list of approved memory components)
	Size	Minimum:	8 MB - Two 1M x 36 (4 MB)
		Optional:	16 MB - Two 2M x 36 (8 MB) 32 MB - Two 4M x 36 (16 MB) 64 MB - Two 8M x 36 (32 MB) 128 MB - Two 16M x 36 (64 MB)
	Cache	Write:	Selectable, Write Through or Write Back
		Read:	Always enabled
Firmware			
	ROM Type		Flash EEPROM, 256K x 8
SCSI			
	I/O Processors		NCR 53C770®, one per channel
	Transfer Rate		Up to 40 MB/second (synchronous)
Communications			
	Serial Port		One asynchronous, RS232
	Baud Rate		19,200
	Data bits		8
	Stop bits		2
	Parity		Odd, Even, or None
	Signals		Tx, Rx, CTS, RTS, DSR, DTR, DCD
	Connection		Null-modem cable (user supplied)

RAID Levels

RAID 0, Striping
RAID 1, Mirroring
RAID 0+1, Striping and mirroring
RAID 3, Parity, through-put oriented
RAID 5, Parity, transaction oriented
JBOD, Single-drive control
RAID 30, Parity and Striping
RAID 50, Parity and Striping

Electrical Requirements

Input Power

12V ± 5% @ 100 mA
5V ± 5% @ 3.8 Amp[1] (w/4MB memory)
5V ± 5% @ 4.5 Amp[1] (w/16MB memory)
5V ± 5% @ 5.0 Amp[1] (w/64MB memory)

Environmental

Temperature	Operating:	0°C to +50°C
	Storage:	-20°C to +70°C
Humidity	Operating:	10% to 90% rh
(non-condensing)	Non-operating:	10% to 90% rh
Altitude	Operating:	Up to 10,000 ft. (3,048 m)
	Non-operating:	Up to 50,000 ft. (15,240 m)

Battery Backup Unit (BBU)

Electrical

Battery source (internal): 3.6V - nickel cadmium 800mAh
Charge current (based on 3.6V battery): 160mA
Charge time: 7 hours (approx.) internal nickel-cadmium battery (from a deep discharge).

1. Supply currents assume drives feeding termination power.

Chapter 2
Configuration Strategies

Overview

The DAC960SX is a very flexible controller, and depending on your application, can be configured to serve many different requirements. Before configuring an array, you must do the following:

- Determine the purpose of the array
- Select a controller configuration
- Select a RAID level
- Determine drive distribution
- Determine cabling and termination needs
- Determine other factors, such as the stripe size and caching method

Understanding the CAP strategy will help you to achieve your storage goals – to maximize storage **C**apacity, to assure data **A**vailability, to provide the best possible I/O **P**erformance, or to utilize combinations of the three.

Determining the Purpose of the Array

What is the Purpose of Your Array? This is the first question you must answer before preparing to configure your array. Will the array be used to increase the capacity of your general purpose file and print server? Will it be used to support a database application that has to keep running 24 hours a day? Will it contain large files of audio or video clips that will be played back on demand? Will the array be used as a repository for imaging systems?

The Data Access Profile

Each of the above applications has a different access profile – that means the type and frequency of read and write activity that is performed against the array over the course of time. Identifying the data access profile will help you determine a strategy favoring capacity, availability, or performance.

For example, so-called “video” servers typically write data (i.e., the video clip) infrequently, but play back the data very often. The ratio of reading to writing in this type of an array is far different from a general-purpose file server that’s doing small read and write operations all day long. In addition, the characteristics of the files themselves are very different – video and image files are typically very large when compared to letters, memos, and spreadsheet files. Video server applications (or, in general, all imaging applications) need to read very large segments of data, compared to the relatively small data segments found with spreadsheet or text documents.

Selecting a Controller Configuration

Before configuring an array, you should determine the controller configuration. Depending on the configuration chosen, you can improve array performance, availability, or both.

Single Controller Configurations

Single Controller/Single Host Configuration (Simple)

The simplex configuration is the classic configuration supported by all Mylex DAC960 series SCSI-to-SCSI controllers. The controller connects to a single host bus adapter and all drives in the array. This configuration supports all RAID levels. However, in this configuration, if the controller or host bus adapter should fail, the data will not be accessible until the failure is corrected.

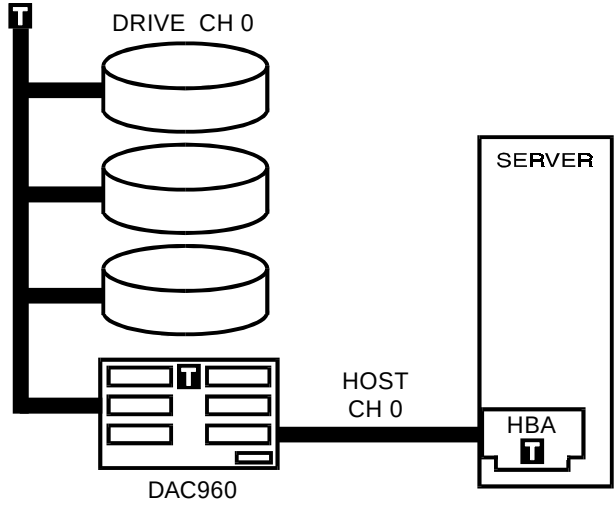


Figure 2-1. Simplex Configuration

Single Controller/Dual Host Configuration

The standard DAC960SX has three SCSI channels, with one designated as a host channel, and two as disk channels. The optional mezzanine board adds three more channels, of which two are disk channels and one can be configured as either a fifth disk channel, or a second host channel. Using the fifth channel as a second host channel is a *Dual Host* configuration.

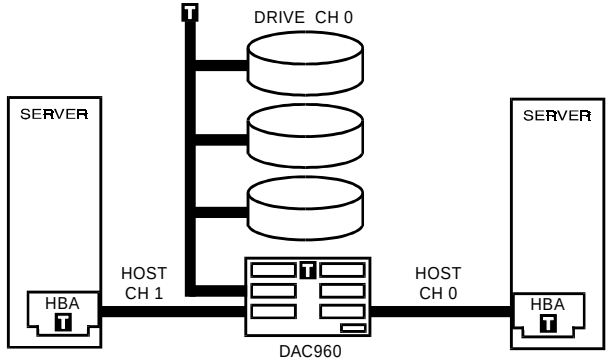


Figure 2-2. Dual-Host Configuration

The two host channels may also be connected to two Host Bus Adapters (HBAs) in a single system. A single HBA failure can occur without losing access to the disk array. This may require special software (not available from Mylex).

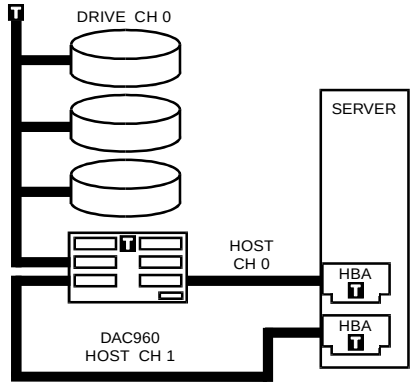


Figure 2-3. Two Host Channels Connected to two HBAs in One System

A Dual-Host configuration is very useful when the array is shared by two systems. Although the systems could share the array by connecting to the same host channel, a Dual Host configuration physically isolates the systems. This provides fault tolerance in case one system fails to release the SCSI bus. It also ensures compatibility between systems that are not designed to allow two hosts to share the SCSI bus.

> ⚠ ***Caution***
>
> If two systems independently access the same volume of data, and the operating system does not support file locking, data corruption may occur. To avoid this, create two or more volumes (or LUNs) and configure each volume to only be accessed by one system.

Dual Controller (Dual-Active) Configurations

Dual Controller (Dual-Active)/Single Host Configuration

The Dual-Active configuration uses two identically configured controllers to ensure that if either controller fails, the other will act on its behalf to process system I/O operations. Under normal conditions, when both controllers are functioning, both actively process data. Consequentially, this improves system performance.

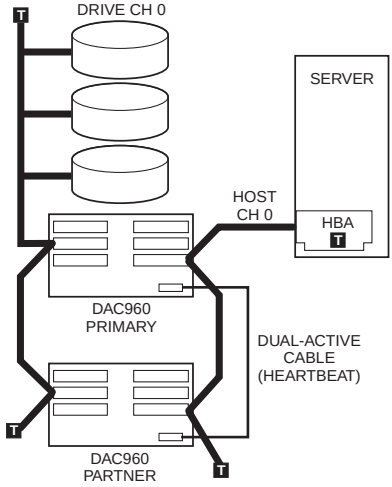


Figure 2-4. Dual-Active Configuration

Dual Controller (Dual-Active)/Dual Host Configuration

The Dual-Active Dual Host configuration offers the advantages of being able to sustain data access in the event of a controller failure and, if appropriate software is installed, of being able to sustain data access in the event of the failure of a server or an HBA.

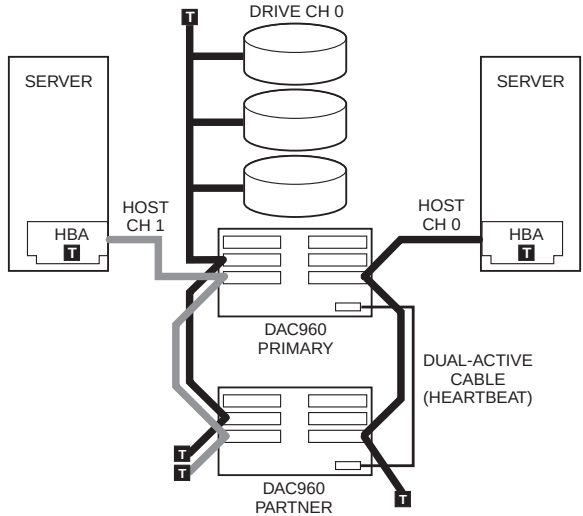


Figure 2-5. Dual Active/Dual Host Configuration

Selecting a RAID Level

You will get a better idea of how to configure your disk array if you understand how the DAC960SX implements RAID technology and organizes the disk drives. Correct installation of the disk array and the controller requires a proper understanding of RAID technology and the concepts described in this chapter.

RAID is an acronym for Redundant Array of Independent Disks. The DAC960SX implements several different versions of the Berkeley RAID technology, and some other special versions that are specific only to the DAC960 product family. Each RAID version (referred to as a RAID level) supported by the DAC960SX is shown in the table on the next page.

An appropriate RAID level must be selected when logical drives are defined or created. This decision is based on the following priorities:

- Disk capacity utilization (number of drives)
- Data redundancy (fault tolerance)
- Disk performance

The DAC960SX makes the RAID implementation and the disks' physical configuration transparent to the host operating system. This means that the host operating logical drivers and software utilities are unchanged, regardless of the RAID level selected.

Table 2-1. DAC 960 Supported RAID Levels

RAID Level	Description	# of Drives Max.	# of Drives Min.	Fault Toler.?
0	Block striping is provided, which yields higher performance than is possible with individual drives. No redundancy is provided.	2	8	No
1	Drives are paired and mirrored. All data is 100% duplicated on an equivalent drive.	2	2	Yes
3 and 5	Data is striped across several physical drives. Parity protection is used for data redundancy.	3	8	Yes

Table 2-1. DAC 960 Supported RAID Levels

RAID Level	Description	# of Drives Max.	# of Drives Min.	Fault Toler.?
0+1	Combination of RAID levels 0 and 1. Data is striped across several physical drives. This level provides redundancy through mirroring. (Mylex RAID 6)	3	8	Yes
JBOD	"Just a Bunch of Drives." Each drive is operated independently like a normal disk controller; or multiple drives may be spanned and seen as a single large drive. This level does not provide data redundancy. (Mylex RAID 7)	1	1	No
Striped 0+1 Striped 3 Striped 5	Also known as 0+1+0, 3+0, and 5+0; these variants combine striping either with RAID level 0+1 or with RAID level 3 or RAID level 5.	4*	32*	Yes

* The striped 0+1, striped RAID 3, and striped 5 RAID levels can only be implemented on Super Drive Groups (i.e., spanned drive groups with the same number of drives that have been arranged adjacent to each other). Since they are striped, these RAID levels can be thought of as RAID level 0+1+0, level 3+0, and level 5+0, respectively.

Supported RAID Levels

Selecting the proper RAID level for a specific data storage application requires that consideration be given to the benefits of each technique.

JBOD (No RAID)

JBOD is an acronym for Just a Bunch Of Disks. The disks function independently of one another, just as they would on a non-RAID SCSI controller.

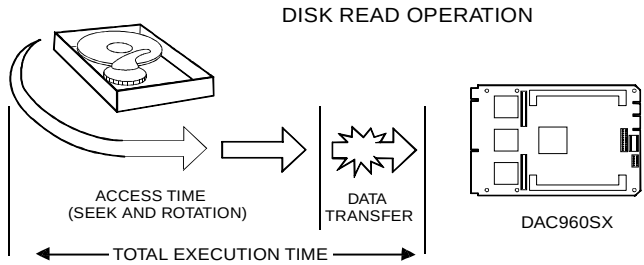


Figure 2-6. Typical JBOD Disk I/O Activity

Mirroring (RAID 1)

Mirroring refers to the duplication of data on two disk drives. Each disk contains identical data. If one fails, a copy is retained on the surviving drive.

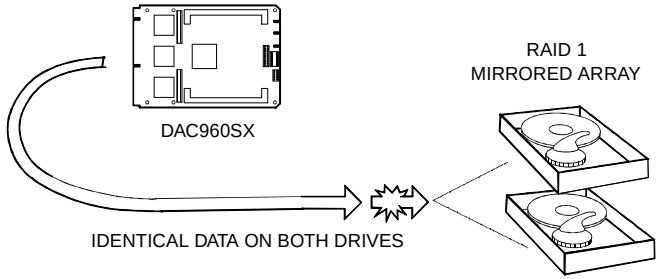


Figure 2-7. Mirrored Drive Group

Striping (RAID 0)

Striping refers to the storing of a sequential block of incoming data across multiple drives in a drive group. For example, if there are three drives in a drive group (or pack), the data is separated into blocks. A block of data can be specified to be either 16, 32, 64 or 128 sectors in *depth*. Block zero of the data will be stored on drive zero, block one on drive one, block two on drive two. Drive zero will again be the location of the next block (block three); then, block four is stored on drive one, block five on drive two, and so on. This method can significantly increase disk system throughput, particularly for transferring large, sequential data blocks.

Note

RAID 0 does not provide parity for redundancy and is susceptible to data loss in the event of a drive failure.

DRIVE 0	DRIVE 1	DRIVE 2
Block 0	Block 1	Block 2
Block 3	Block 4	Block 5
Block 6	Block 7	Block 8
Block 9	Block 10	Block 11
Block 12	Block 13	Block 14
Block n	Block n+1	Block n+2

Figure 2-8. Block Striping

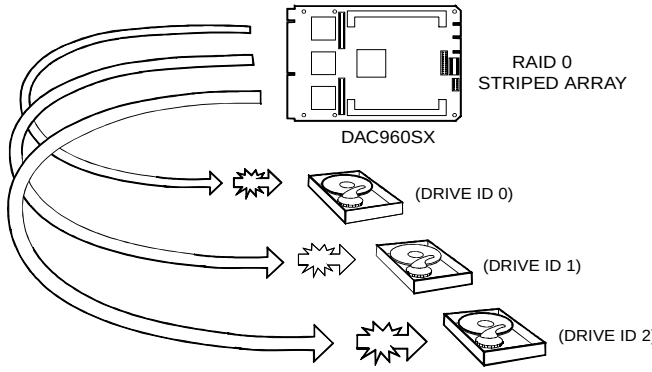


Figure 2-9. Drive Group Mapped for Block Striping

Striping with Parity (RAID 3 and RAID 5)

Striping with parity provides complete data redundancy and requires only a fraction of the storage capacity required for mirroring.

In a system configured under RAID 3 or RAID 5 (which requires at least three SCSI drives), all data and parity blocks are divided between the drives in such a way that if any single drive is removed (or fails), the data on the missing drive can be reconstructed using the data on the remaining drives.

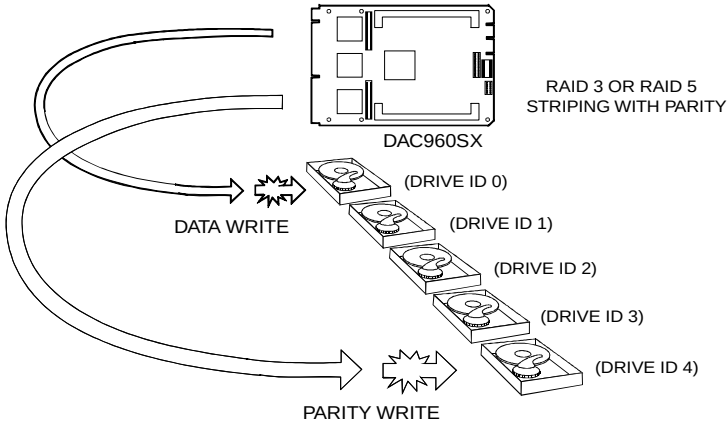


Figure 2-10. Drive Group Mapped for Block Striping with Parity

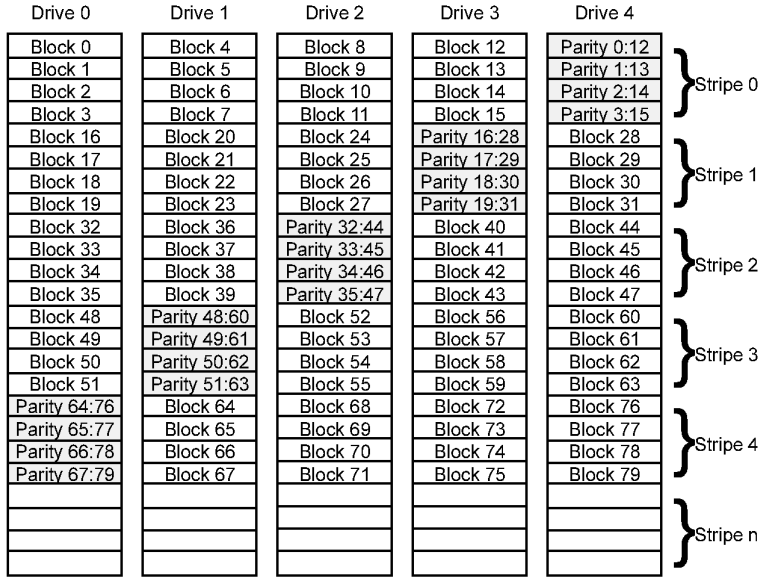


Figure 2-11. Block Striping with Parity

Striping with Mirroring (RAID 0+1)

RAID 0+1 (Mylex RAID 6) is a combination of RAID 0 (striping) and RAID 1 (mirroring).

The advantages of RAID 0+1 are fully mirrored data and better performance than RAID 1. The disadvantage of RAID 0+1 is its 50 percent utilization capacity (if all drives are the same size).

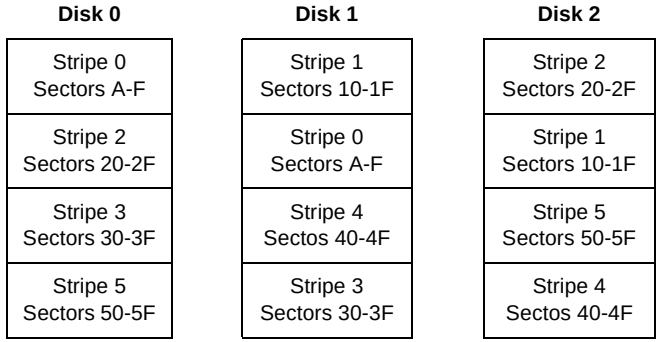


Figure 2-12. Striping with Mirroring

Using the CAP Strategy to Select a RAID Level

Capacity, Availability, and Performance: these are the three benefits that all DAC960 RAID solutions have in common. The terms, collectively known as "CAP" should characterize your expectations of the disk array subsystem.

What is your best strategy for configuring the array? Do you want to access the maximum capacity of your disk drive investment? Or do you want to configure your array for a high degree of fault-tolerant operation? Perhaps performance is extremely important to you. Every installation has a different set of requirements, and most installations have a combination of these.

Unfortunately, it isn't possible to configure an array with all of these characteristics optimized; that's a limitation of the technology (as they're somewhat mutually exclusive). For example, you can't have maximum capacity and maximum availability in a single array. Some of the disks have to be used for redundancy, and in doing so, capacity is reduced.

Similarly, configuring a single array for both maximum availability and maximum performance is not an option.

You will need to make compromises. Luckily, your DAC960 Series controller is versatile enough to offer you any of these preferences, either singly or in the most favorable combination possible.

It comes down to this: you will need to decide which capability is most important for your operational environment, and which is next most important. Once you've prioritized your expectations, it should be relatively easy to configure the array to meet your expectations.

Configuring for Maximum Capacity

You may want to optimize your array for the greatest possible capacity. To see the relationship between the different RAID levels and effective capacities offered for the quantity *X* drives of *N* capacity, refer to Figure 2-2 As an example, computed capacities for five drives of size 2GB each are provided.

Table 2-2. RAID Levels and Effective Capacity

RAID Level	Effective Capacity	Example: (Capacity in GB)
0	X*N	5*2 = 10
1	(X*N)/2	5*2/2 = 5
3	(X-1)*N	(5-1)*2 = 8
5	(X-1)*N	(5-1)*2 = 8
0+1	(X*N)/2	(5*2)/2 = 5
JBOD	X*N	5*2 = 10

As you can see, the greatest capacities are provided by RAID 0 and JBOD (Mylex RAID 7), with the entire capacity of all disks being used. Unfortunately, with these two solutions, there is no fault-tolerance.

RAID 3 and RAID 5 give the next best capacity, followed by RAID 1 and RAID 0+1.

Configuring for Maximum Availability

When considering optimizing for availability, it's important to understand some of the terminology concerning the condition of array operation. These definitions are presented in Figure 2-3

Table 2-3. Array Operational Conditions

Array Condition	Meaning
Normal	The array is operating in a fault-tolerant mode, and can sustain a drive failure without potential data loss.
Critical	The array is functioning and all data is available, but the array cannot sustain a drive failure without potential data loss.
Degraded	The array is functioning and all data is available, but the array cannot sustain a drive failure without potential data loss. Additionally, a reconstruction or rebuild operation is taking place, reducing the performance of the array. The rebuild operation takes the array from a critical condition to a normal condition.
Not fault-tolerant	No fault-tolerant RAID levels have been configured for any of the drives in the array.

An additional measure of fault-tolerance (or improved availability) can be achieved using a hot spare, or standby, disk. This disk is powered-on but idle during normal array operation. If a failure occurs on a disk in a fault-tolerant set, the hot spare disk takes over for the failed drive, and the array continues to function in a fully fault-tolerant mode after it completes its automatic rebuild cycle. This means that the array can suffer a second drive failure and continue to function before any disks are replaced.

Impact of Controller Cache on Availability

Every DAC960 Series controller has a disk cache. The DRAM, EDRAM, FPM, or EDO physical memory (depending on the controller) is used to increase the performance of data retrieval and storage operations. The amount of disk cache varies with the controller model, but is usually on the order of 4MB of cache RAM.

The controller may report to the operating system that the write is complete as soon as the controller receives the data. This is referred to as Write Back (WB) cache. This will improve performance, but will expose you to data loss if a system crash or power failure occurs before the data in the cache is written to disk.

To avoid this potential loss of data, at the very least, you should outfit your controller with a battery backup module for the cache memory. The battery backup will enable the cache to be retained until normal operation resumes, at which time the data in the cache can be written to the array. Your data is most likely as important as your server (probably much more so), and this simple and inexpensive insurance can prevent a power interruption from turning into a disaster.

If the array controller is not (and will not be) configured to use Write Back cache, then battery backup of the cache is not necessary.

If the write cache is used without the battery backup installed on the DAC960, then an uninterruptible power supply (also known as a UPS) should be used with your disk array.

RAID Levels and Availability

To see the relation between the different RAID levels offered by the DAC960 controller and the advantages (and disadvantages) of the RAID levels as they apply to availability, refer to Figure 2-4

Table 2-4. RAID Levels and Availability

RAID Level	Availability (Fault-tolerance)
0	No fault tolerance. Data is striped across a set of multiple disks. If a disk in the set ceases to function, all data contained on the set of disks is lost. (This configuration is not recommended if fault tolerance is needed.)
1	(Disk Mirroring). Mirrored fault tolerance. Data is written to one disk, and then the same data is written to another disk. If either disks fails, the other one in the pair is automatically used to store and retrieve the data.
3	Striped fault tolerance. Data and parity are striped across a set of multiple (at least three) drives. If any of the drives fails, the data (or parity) information from the failed drive is computed from the information from the remaining drives.
5	Striped fault tolerance. Data and parity are striped across a set of multiple (at least three) drives. If any of the drives fails, the data (or parity) information from the failed drive is computed from the information from the remaining drives.
0+1	(Data Mirroring). Mirrored and striped fault tolerance. Data is striped across multiple drives, and written to a mirrored set of drives.
JBOD	"Just a Bunch of Disks." This configuration offers no redundancy and is not recommended for applications requiring fault tolerance.

Configuring for Maximum Performance

Your array can be optimally configured for the type of application you plan to deploy, but you should be aware that an optimal setting for one type of access profile is not optimal for all applications. What's the best RAID level for a particular application or environment? The relative performance advantages of each of the RAID levels is presented in Figure 2-5

Table 2-5. RAID Levels and Performance

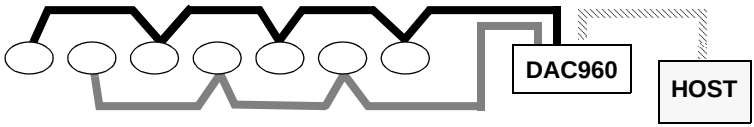
RAID Level	Access profile characteristics
0	Excellent for all types of I/O activity
1	Excellent for write-intensive applications
3	Excellent for sequential or random reads and sequential writes
5	Excellent for sequential or random reads and sequential writes
0+1	Excellent for write-intensive applications
JBOD	Mimics normal, individual disk performance characteristics

Determining Drive Distribution

You must organize physical disks into drive groups and logical drives that can support the various RAID levels.

Physical disk drives are connected to one (or several) of the DAC960 SCSI channels, as shown below. When using a DAC960 Series controller with two or more channels, it is recommended that disk drives be evenly distributed among the available SCSI channels for optimal performance. This will minimize the effect of any overhead relative to the SCSI bus arbitration scheme.

The example below shows a three-channel DAC960SX.

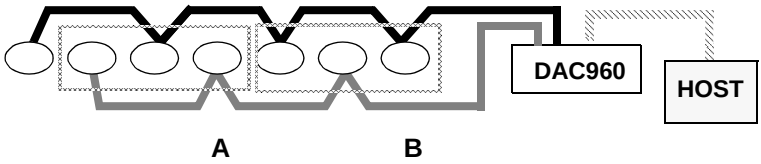


Drive Groups

Organize the disk drives into drive groups, or “packs,” after they are connected to the controller, formatted, and initialized.

Up to eight drive groups are supported per controller. From one to eight drives can be included in an individual drive group. The number of drives in a drive group determines the possible RAID level.

The following illustration shows a single drive, not included in any drive group, and two drive groups (A and B), each with three drives.



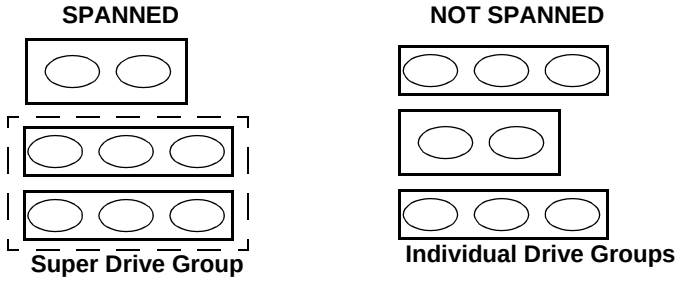
Arranging Drive Groups

After drive groups have been created, they need to be arranged. Arranging drive groups provides a means to further organize the array. For example, Drive Group B in the previous illustration can be arranged to be the first drive group on the controller. This would permit the creation of a primary logical drive on Drive Group B that could function as a boot drive.

By sequentially arranging two drive groups with an identical number of disk drives, each drive group's capacity is combined, or *spanned*, creating a *Super Drive Group*. Such arrangement is done automatically by the DAC960 controller when two drive groups with an identical number of disks are arranged, one after another. Data is striped across the drive groups of the Super Drive Group, irrespective of how data is distributed across the individual drive group. A logical drive can span across up to four (4) drive groups.

Arranging drive groups so that a pack with a different number of drives is in between two groups of equal number drives will prevent this spanning feature from being enabled. Another simple way to prevent automatic spanning is to completely finish arranging a drive group, defining its RAID level and logical drives, and initializing the array before continuing on with creating another drive group that contains the same number of drives.

In the following illustration, a Super Drive Group, on the left, has been created with the effective capacity of six disk drives because the drive groups, with three drives each, are arranged sequentially. In the example on the right, three unspanned drive groups have been created: two groups of three drives, and one group of two drives.



Determining Cabling and Termination Requirements

Termination

The DAC960SX controller uses ALT-2 type (active) SCSI terminators on all drive channels. Terminating a SCSI chain is accomplished either by adding a terminator to the each end of each SCSI drive and Host channel, or by terminating the devices closest to each of the two ends of each SCSI drive and Host channel.

> **Note**
>
> It is better to terminate the ends of the SCSI bus itself than it is to terminate the end devices on the bus. This allows hot swapping of drives and controllers (in Dual-Active configurations) without affecting bus termination.

The following table describes termination guidelines for each configuration type.

Table 2-6. Termination Guidelines

Configuration Type	Controller Settings
Single Controller, Single Host (Simplex)	Terminate the host channel. Externally terminate the ends of the SCSI drive channel(s).
Single Controller, Dual Host	Externally terminate both host channels. Externally terminate the ends of the SCSI drive channel(s).
Dual Controller, Single Host (Dual-active)	Terminate the host port at the end of the host channel. Externally terminate the host channel. Do not terminate any SCSI devices that are connected to both controllers.
Dual Controller, Dual Host (Dual-active)	Terminate the host port at the end of each host channel. Externally terminate the host channel(s). Do not terminate any SCSI devices that are connected to both controllers.

SCSI Cabling

The DAC960SX supports up to five SCSI disk channels. In a single-controller configuration, each disk channel supports up to 15 disks. In a Dual-Active configuration, each disk channel supports up to 14 disks.

When planning the cable requirements, be aware of the SCSI rules for bus termination and maximum cable lengths to avoid performance problems. Maximum cable lengths are shown in the table below.

Table 2-7. Supported SCSI Formats and Cable Lengths

SCSI Trade Association (STA) Terms	Bus Speed, MB/Sec, Max.	Bus Width, Bits	Max. Bus Length, Meters*		Max. Device Support (Including Controllers)	Max. # Drives	
			Single-ended	Differential		Single Controller	Dual-Active
SCSI-1	5	8	6	25	8	7	6
Fast SCSI	10	8	3	25	8	7	6
Fast Wide SCSI	20	16	3	25	16	15	14
Ultra SCSI	20	8	1.5	25	8	7	6
Ultra SCSI	20	8	3	25	4	3	2
Wide Ultra SCSI	40	16	-	25	16	15	14
Wide Ultra SCSI	40	16	1.5	-	8	7	6
Wide Ultra SCSI	40	16	3	-	4	3	2

* The listed maximum bus lengths may be exceeded in point-to-point and engineered applications

Dual-Active Cabling Requirements

To help plan cable requirements for a Dual-Active system, read through the following rules. Dual-Active system examples are shown, starting with Figure 2-2.

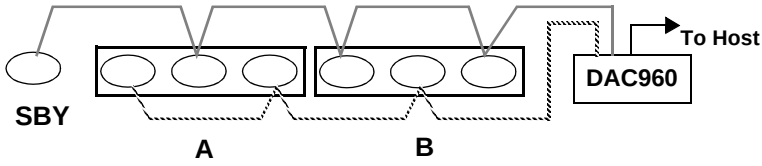
- Disk drives must be connected in series between SCSI ports on the distribution boards.
- Host ports on both controllers must be interconnected; that is, Host Port 0 must be connected to Host Port 0, and Host Port 1 must be connected to Host Port 1, and so on.
- The Dual-Active ports on both controllers must be connected using a Dual-Active cable (Mylex P/N A750159).
- To ensure access to data in the event of a disk or controller failure, all SCSI drive and host busses must be terminated externally, not on the devices.
- All drive channels on both controllers must be interconnected even if they are not used; Ch 1 to Ch1, Ch2 to Ch2, etc.

Determining Other Factors

Standby/Hot Spare Drives

Drives that are not included in any drive group at the time of configuration are automatically used by the DAC960 controller as standby, or hot spare drives. There is no limit on the number of available drives that can be configured as standby drives.

Two arranged packs and a standby drive are shown in the following illustration. Notice that what is being illustrated is how the controller is organizing the drives; since the cabling scheme depicted in this configuration is the same as the one shown in the first illustration. The physical capacity of the drive group is six drives, but the effective capacity will be less, after normal RAID capacity utilization is taken into account.



Cache Management

The DAC960SX provides performance enhancement of data transfers through its on-board cache memory. The controller supports cache memory sizes from 8 MB (minimum) to 128 MB (maximum). Cache memory is allocated by the controller memory management functions for Read Cache and Write Cache. Write cache policy is user-selectable for optimum performance within specific applications.

Read-Ahead Cache

Read-ahead cache is a caching strategy where the DAC960SX controller instructs the drives to read data which is anticipated to be requested next and caches the data. When a request is made and the data is in the cache, performance is improved. If the request is not served by the data in the cache, the time allotted to the read ahead is lost and a drive read must be performed.

Read-ahead cache is recommended for sequential data (for example, video servers) and is not recommended for random data (for example, database servers). Unless the information requests are very random, it is recommended that read-ahead cache is left enabled.

Write-Through Cache

Write-Through Cache refers to a cache writing strategy whereby data is written to the SCSI Drive before a completion status is returned to the host operating system. This caching strategy is considered more secure, since a power failure will be less likely to cause loss of data. However, a Write-Through cache results in a lower performance in most environments.

Write-Back Cache

Write-Back Cache refers to a caching strategy whereby write operations result in a completion status being sent to the host operating system as soon as the cache (not the disk drive) receives the data to be written. The target SCSI Drive receives the data at a more appropriate time in order to increase controller performance.

In dual-active configurations, write data is always copied to the cache of the second controller before completion status is issued to the host initiator.

> ⚠ ***Caution***
>
> A cache battery backup protects against cache data loss in the event of a power failure and is required when using write-back cache.

Dual-Active Configurations

The hardware requirements for a Dual-Active installation are as follows:

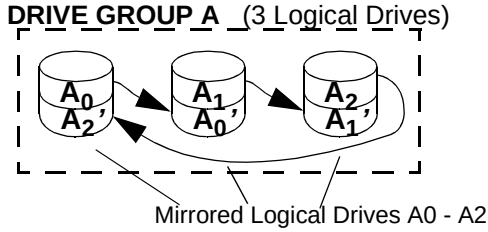
- Both controllers must have the same amount of memory.
- Both controllers must have the same number of host and drive channels.
- Both controllers must be at the same firmware revision level.
- All SCSI drive channels must be connected one to one. For example, Channel 0 on the primary controller (C0) must be connected to Channel 0 on the partner controller (C1), and Channel 1 on the C0 must be connected to Channel 1 on C1. This is true even when a drive channel does not have any other devices connected to it.

  If a mezzanine board is installed, Channel 2 on C0 must be connected to Channel 2 on C1, and Channel 3 on C0 must be connected to Channel 3 on C1.
- The controllers must be connected through the Dual-Active (Heartbeat) cable. Serial channel B is reserved for this purpose.

Creating Logical (System) Drives

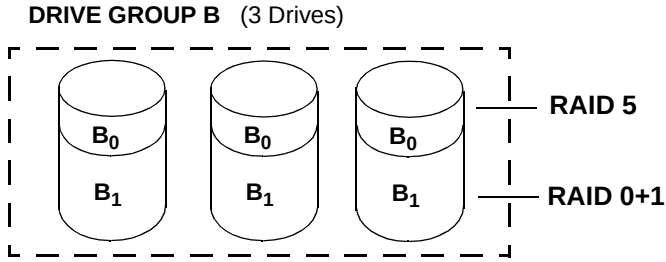
After all the physical drive groups are defined and arranged, one or more logical drives must be created. Logical drives are the *system drives* that are presented to the operating system.

A logical drive's capacity can encompass any portion of a drive group (up to the total capacity of that drive group), or the capacity of more than one drive group (up to four drive groups). Up to eight logical drives can be created with DAC960 firmware versions below 2.6. With firmware versions at or above 2.6, up to 32 logical drives can be created per controller. The following illustration shows a RAID 0+1 configuration with three mirrored logical drives created in a drive group containing three disk drives.



Assigning RAID Levels to Logical Drives

Each logical drive has a defined RAID level (0, 1, 3, 5, 0+1, JBOD) based on the number of drives in the drive group upon which it is created. If a drive group has enough drives to support several different RAID levels, the logical drive can be assigned any of the *available* levels. However, a logical drive may have only *one* RAID level.



In the illustration above, the smaller logical drive (B_0)can be assigned a

RAID 5 level of operation, while the larger logical drive (B_1)might be assigned a RAID 0+1 level of operation.

Remember that different RAID levels exhibit different performance characteristics for a particular application or environment. DAC960 Series controllers allow for complete versatility in this regard, by allowing multiple, different RAID levels to be assigned to a drive group.

RAID Rules

A small, but important set of guidelines should be followed when connecting devices and configuring them to work with a DAC960 controller. They are:

1. To lessen their impact on the SCSI bus, connect SCSI-based tape, CD-ROM and other non-disk devices on a single channel which preferably does not service any disk drives.
2. If you have more than two disk drives, distribute the drives equally among all the channels on the controller. This will result in better performance. DAC960 Series controllers have between one and five channels, depending upon the model.
3. A maximum of eight devices can comprise a drive group.
4. A drive group can contain devices on any channel.
5. Include all drives of the same capacity (up to eight total) in the same drive group.
6. If configuring for a standby or hot spare drive, make sure that the standby drive size is greater than or equal to the capacity of the smallest drive in ALL the redundant drive groups.
7. When replacing a failed drive, make sure that the replacement drive size is greater than or equal to the size of the smallest drive in the affected drive group.

Chapter 3
RAID Management

Drive Management

The DAC960SX functions that monitor and control the operation of the physical drives and logical units are instrumental to the controller's ability to perform RAID management and automated error recovery tasks.

Controlling Physical Drive States

The *state* of a physical drive refers to a SCSI drive's current operational status. At any given time, a SCSI drive can be in one of several states: ONLINE, STANDBY, DEAD, or WRITE-ONLY.

The operational state of a disk drive is indicated by a one-letter status code on the VT100 monitor screen, by a three-letter status code on the RAIDfx software utility, or by a three-letter status code on the LCD Screen.

> ☞ **Note**
>
> The controller stores the state of the attached SCSI drives in its non-volatile memory as well as on the disks. This information is retained even after power-off.

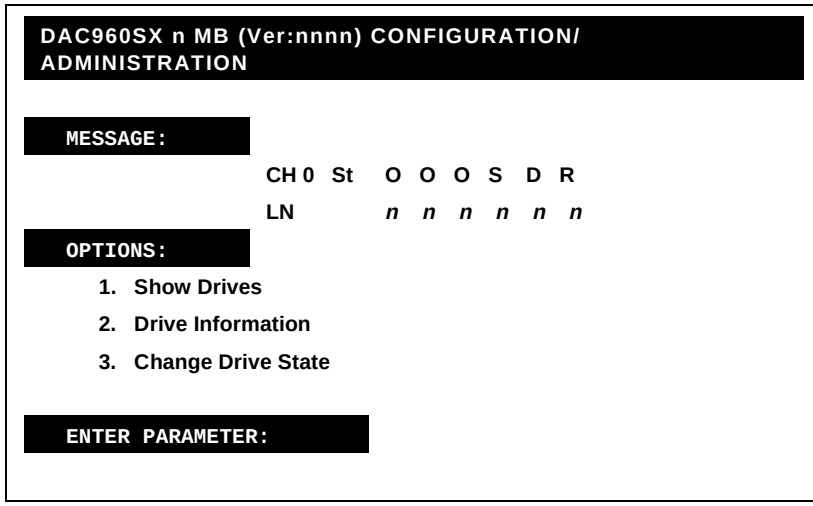


Figure 3-1. Drives States on the *Show Drives* VT100 Screen

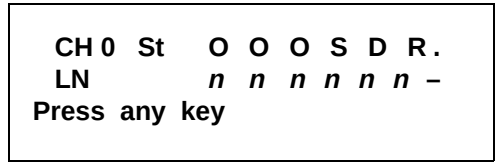


Figure 3-2. Drives States on the *Show Drives* LCD Screen

On-line (O or ONL)

A SCSI drive (physical drive) is on-line if it:

1. is powered on,
2. has been defined as a member of a drive group, and
3. is operating properly.

Standby (S or SBY)

A SCSI disk drive is in a *standby* state if it:

1. is powered on,
2. is able to operate properly,
3. has *not* been defined as part of any drive group, and
4. has been defined as a standby.

Dead (D or DED)

A drive is *dead* if it:

1. is not present.
2. is present, but not powered on.
3. fails to operate properly and is killed by the controller (whether or not it has been defined as a member of a drive group)

When the controller detects a failure on a disk, it *kills* that disk by changing its state to dead. A SCSI drive that is in the dead state does not participate in any I/O activity. No commands are issued to dead drives.

Rebuild (R)

A SCSI drive is in the process of being rebuilt, that is,

- during a RAID 1 rebuild, data is being copied from the mirrored drive to the replacement drive, or
- during a RAID 3, RAID 5, or RAID 0+1 rebuild, data is being regenerated via the exclusive OR (XOR) redundancy algorithm and written to the replacement drive.

Controlling Logical Unit States

The state of a DAC960SX logical unit can be ONLINE, CRITICAL, or OFF-LINE. Notice that the same term, *on-line*, is used for both physical drives and logical units.

> ☞ **Note**
>
> I/O operations can be performed only with logical units that are either *on-line* or *critical*.

On-line

A logical unit is *on-line* if all of its participating physical drives are on-line.

Critical

A logical unit is considered *critical* when any failure of another of its physical drives may result in a loss of data.

A logical unit is *critical* if it meets both of the following conditions:

1. It is configured for RAID 1, RAID 3, RAID 5, or RAID 0+1
2. One of its physical drives is *not* on-line.

Off-line

No data can be read from or written to an *off-line* logical unit. No operations can be performed on off-line logical units. System commands issued to off-line logical units are returned with an error status.

A logical unit can be off-line under one of two conditions:

1. It is configured with a redundant RAID level (1, 3, 5, or 0+1) and two or more of its SCSI drives are *not* on-line.
2. It is configured as RAID 0 or JBOD (or in a spanned set) and one or more of its SCSI drives is *not* on-line.

Automated Management

Controlling Standby Replacement Drives (Hot Spares)

The *standby replacement* drive, or *hot spare*, is one of the most important features the DAC960SX controller provides to achieve a high degree of fault-tolerance. With the standby rebuild function, the controller performs a rebuild operation automatically when a SCSI disk drive fails and both of the following conditions are true:

- A standby SCSI disk drive of identical or larger size is found attached to the same controller;
- All system drives that are dependent on the failed disk are configured in a RAID 1, RAID 3, RAID 5, or RAID 0+1 logical unit.

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

> ☞ **Note**
>
> The priority of rebuild activity can be adjusted using the configuration utilities to adjust performance versus rebuild time.

Using Standby Rebuild

To use the automatic standby rebuild feature, it is necessary to maintain a standby disk in the system.

A *standby* disk can be created in one of two ways.

1. A disk may be labeled as standby using the *Create Standby* option under the Configuration menu.
2. When the DAC960SX configuration is created or changed using the software utility, all disks attached to the controller that are not assigned to a drive group will be automatically labeled as standby disks.

Standby Replacement Table

A standby replacement table stores data on up to eight automatic replacement events in any session (from one power-on/reset to the next power-off/ reset). When the limit of eight is reached and a disk failure occurs, a standby replacement can take place but is not recorded in the replacement table.

The standby replacement table can be cleared from the DAC960SX by using the *Save Configuration* option under the Configuration menu.

Hot-Swap Drive Replacement

The DAC960SX supports the ability of certain drive enclosures to perform a *hot-swap* drive replacement while the system is on-line. A disk can be disconnected, removed, or replaced with a different disk without taking the system off-line. The SCSI bus termination must be arranged so that a drive can be removed without disrupting the termination scheme.

Disk Failure Detection

The DAC960SX controller automatically detects SCSI disk failures. A monitoring process running on the controller checks, among other things, elapsed time on all commands issued to disks. A time-out causes the disk to be reset and the command will be retried. If the command time-out occurs again, the disk is killed by the controller (that is, its state changed to dead).

The DAC960SX controller also monitors SCSI bus parity errors and other potential problems. Any disk with too many errors will be killed by the controller.

Disk Media Error Management

The DAC960SX controller manages SCSI disk media errors in a manner transparent to the user.

Disks are programmed to report errors. When a disk reports a media error during a read, the controller reads the data from the mirror (RAID 1 or RAID 0+1), or computes the data from the other blocks (RAID 3 or RAID 5), and writes the data back to the disk that encountered the error. If the *write* fails, or the following *verify-of-data* fails, (media error on write), the controller issues a REASSIGN BLOCKS command to the disk, and then writes the data to a new location. Since the problem has been resolved, no error is reported to the host system.

When a disk reports a media error during a write, the controller issues a REASSIGN command to the disk, and writes the data out to a new location on the disk.

Checking Consistency

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 are exactly the same. To verify RAID 3 or RAID 5 redundancy, a consistency check reads all associated data blocks, computes parity, reads parity, and verifies that the computed parity matches the read parity.

Hot Plug Capability

The controllers in a dual-active system are *hot-pluggable*. This means that a failed controller can be removed and replaced while the remaining active controller is powered on and processing requests.

While this allows you to remove a working controller during operations, it is not considered good practice. It is recommended that an operating controller be shut down before removal using the Kill Partner function from the Administration Menu (refer to Chapter 7). After the controller is replaced, use the Relinquish Controller function to restore it to normal operation.

Chapter 4
Controller Maintenance

This section describes some routine maintenance activities that may be performed by the user. These maintenance activities are limited to the Field Replaceable Unit level and include: how to access, remove, upgrade and replace the DAC960SX controller and its battery backup unit.

Accessing the Controller

To access the controller, remove the four screws that secure the top cover/ front panel assembly from the top of the unit and carefully lift off the assembly (refer to Figure 4-1).

WARNING

This unit contains electronic components that are sensitive to electrostatic discharge. ESD handling precautions are required.

Be careful not to damage the cables connecting the LCD panel and the cooling fan when removing the top cover assembly.

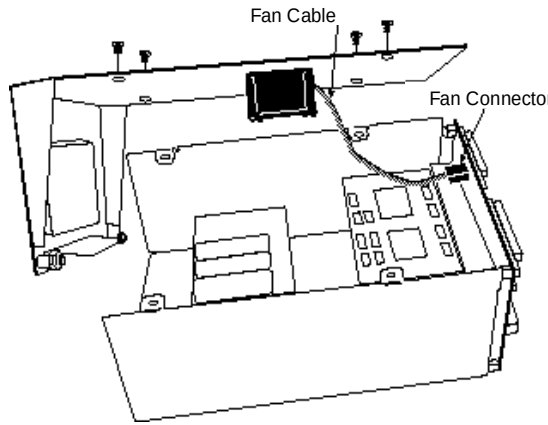


Figure 4-1. Removing the DAC960SX Controller Top Cover

Replacing a Controller

This section explains how to replace a controller, whether it is working or has failed and whether it is a single controller or a dual-active configuration.

Replacing a controller in a single controller configuration is easy. Simply power down the host system and the array, replace the controller, and COD (Configuration on Disk) restores the configuration information to the new controller.

Replacing a controller in a dual-active configuration can be a little more complicated. However, it can be done while the array is up and running.

Select from the following:

For information on replacing a controller in a single controller configuration, see “Replacing a Controller in a Single Controller Configuration” on page 4-2.

For information on replacing a controller in a dual-active configuration, see “Replacing a Controller in a Dual-Active Configuration” on page 4-3.

Replacing a Controller in a Single Controller Configuration

To replace a controller in a single controller configuration, complete the following procedure:

> ☞ **Note**
>
> Download the firmware to the controller and define controller settings before installation. For more information, refer to the Installation Guide.
>
> The controller must have the same number of host and disk SCSI channels, the same physical configuration (amount of memory, distribution board, daughter board, BBU), and the same firmware revision, build, and type as the controller it is replacing.

1. Follow the instructions in the Installation Guide to download the correct firmware to the new controller.
2. Power down the host system.
3. Power down the array.
4. Remove the failed controller.

5. Following the instructions provided in your enclosure vendor's documentation, install the replacement controller.
6. Follow the instructions in the Installation Guide to reconfigure your controller, as required.

Replacing a Controller in a Dual-Active Configuration

To replace a controller in a dual-active pair, complete the following procedure:

> ☛ **Note**
>
> Download the firmware to the controller and define controller settings before configuring it into the dual-active system. For more information, refer to the Installation Guide.
>
> Both controllers must have the same number of host and disk SCSI channels, the same physical configuration (amount of memory, distribution board, daughter board, BBU), and the same firmware revision, build, and type.

1. Follow the instructions in the Installation Guide to download the correct firmware to the new controller.
2. Follow the instructions in the Installation Guide to configure the following controller parameters:
   - Disable Force Simplex.
   - Ctlr Pres/Fault (Controller Present/Fault) configured the same on both controllers (enabled or disabled, as required).

     > ☛ **Note**
     >
     > Dual-active installations using a Mylex distribution board and dual-active cable should set this parameter to disabled.

   - Ctlr Pres/Flt Sel (Controller Present/Fault Select) configured the same on both controllers (A or B, as required).

3. If you are replacing a working controller, issue a Kill Partner command from the controller that is not being replaced. See Chapter 7, “Administration Menu”.
4. Depending on your system setup, you may have to power off the enclosure.
5. Remove the failed controller.
6. Following the instructions provided in your enclosure vendor’s documentation, install the replacement controller.
7. Follow the instructions in the Installation Guide to reconfigure your controller, as required.
8. Follow the instructions in Chapter 7, “Administration Menu” to bring the new controller online using the Relinquish Partner function.
9. Optionally, follow the instructions in the Installation Guide to Show Drives and make sure the new controller sees all the disk drives.

Replacing a Battery Backup Unit (BBU)

The controller memory is battery backed with a DBB960SX battery backup unit (BBU). The BBU holds three 800mAh NiCad rechargeable batteries on a circuit board that plugs into connector J2 on the controller board.

The procedures for replacing a BBU are described in this section.

Testing the BBU

The BBU can be tested by following these steps:

1. Initiate an operation, such as a copy of a file to a dummy file, and power-off the system before the cache has time to be flushed (approximately 4 seconds).
2. Power-on the system.
3. Check to see if the dummy file exists. If so, the BBU was able to keep the cache intact. To further test the integrity of the BBU, compare the original file with the copy.

Removing the BBU

Removing the BBU requires that you access the bottom of the controller board. If the BBU needs to be removed, follow this procedure:

1. Power-off the system.
2. Remove jumper J2. For the location of J2, refer to the Installation Guide.
3. Remove the DAC960SX from its enclosure.
4. Turn the DAC960SX controller board over so that the BBU is down.

> ⚠ ***Caution***
>
> Do not attempt to pull the BBU away from the controller board without releasing the nylon stand-off. Doing so will damage the BBU.

5. Locate the nylon stand-off on the underside of the controller board. Refer to Figure 4-2.

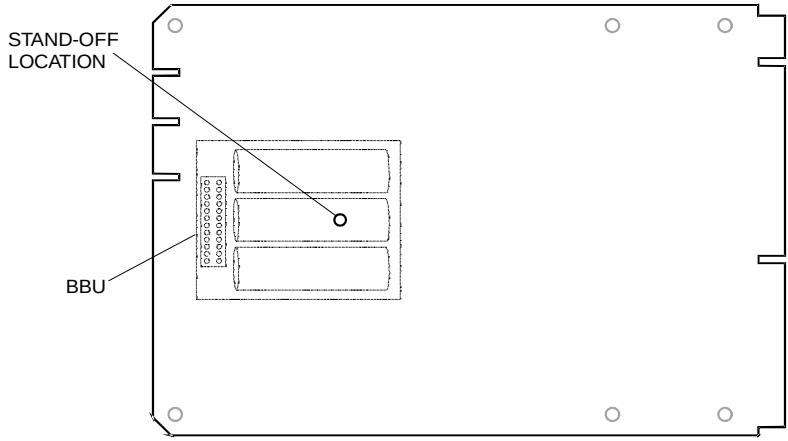


Figure 4-2. BBU Stand-Off Location

6. Using a pair of needle-nose pliers, pinch the end of nylon stand-off together to release it from the controller board.
7. Grasp the BBU by the board edges and pull the BBU straight off the DAC960SX connector. The nylon stand-off should stay attached to the BBU.

> **Note**
>
> For the DAC960SX to operate, a BBU must be installed or the BBU Jumper must be in place (P/N D040014) on the BBU connector (J-2).

To reinstall a BBU, refer to “Installation” on page 4-6.

Installation

The BBU is attached to the DAC960SX by one nylon standoff and Connector J2 on the DAC960SX. Figure 4-3 shows the mounting locations for the BBU.

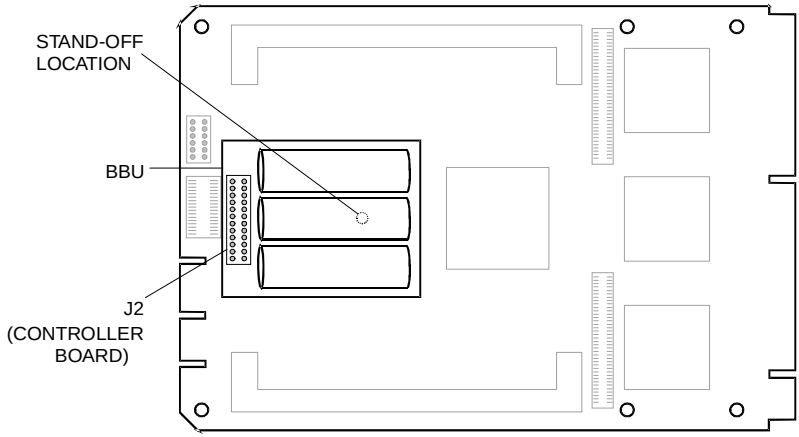


Figure 4-3. Installing the BBU

If the BBU requires removal and replacement, use the following procedure for installing the new BBU. Refer to “Removing the BBU” on page 4-5 for removal instructions.

> ⚠ ***Caution***
>
> Be sure to use proper electrostatic protection procedures when removing the DAC960SX controller from the system.

1. If the nylon stand-off is missing from the controller board, install it at the location shown in Figure 4-3.

   > ☛ **Note**
   >
   > A tool may be required to exert the pressure necessary to install the stand-off.

2. Insert connector J3 of the BBU into connector J2 on the DAC960SX controller.
3. Make sure the stand-off is properly aligned and press the sides of the BBU to clamp the nylon stand-off into the hole on the DAC960SX.
4. Reinstall the DAC960SX disk array controller.

5. Power-on the system and boot the operating system.
6. In the RAIDfx configuration utility, make sure **Enable Battery Backup** in the *Advanced Functions/Hardware Parameters* menu is selected.
7. Reboot the system.
8. Prepare the battery and set up the cache write policy as described in the next section.

Battery Conditioning Prior to Use

Nickel Cadmium batteries need to be conditioned before they are placed into operation. If the battery is furnished partially charged, and is then immediately recharged, it has a tendency to develop a memory of the shortened charge time. This produces the effect of having a battery with a reduced capacity. To prevent this from occurring, the battery should be completely discharged before it is put into operation.

The following procedure is recommended prior to the first use of the BBU. This procedure should also be followed any time after a power failure that causes the BBU to maintain cache memory for a significant duration.

1. Power-on the system long enough for the DAC960SX controller to restore cached data to the disks (more than 5 seconds with no write activity).
2. Initiate an operation, such as a copy of a file to a dummy file, and power down the system before the cache has time to be flushed (approximately 4 seconds).
3. Allow the BBU to completely discharge (to estimate discharge time, see *Calculations for Battery Duration*, located later in this manual).
4. Restart the system after the BBU has completely discharged.
5. Recharging the battery will begin after the system is restarted.
6. Allow the battery to charge for at least seven hours.

Upgrading the DAC960SX

This section describes how to perform upgrades for the DAC960SX

Installing a Mezzanine Board

The following sections describe how to install the mezzanine board onto the DAC960SX mainboard.

> ☞ **Note**
>
> Only six-channel distribution boards accept the Mezzanine Board.

Termination

All host channels should be terminated unless a differential distribution board is used or the controller is in a dual-active configuration. Differential SCSI and dual-active configurations require external termination and on-board termination must be disabled.

To change host channel termination settings, locate the termination jumper block. The termination jumper block is unlabeled on the mezzanine board, and is labeled as J5 on the DAC960SX controller.

Figure 4-4. Termination Jumper Block (J5 on DAC960SX, Unlabeled on DBI960SX)

Table 0-1. DAC960SX and DBI960SX Jumper Settings

DAC960SX Termination Jumpers (J5)	DBI960SX Termination Jumpers
Pin 1 - Termination of Disk Channel 0	Pin 1 - Termination of Disk Channel 2
Pin 2 - Termination of Disk Channel 1	Pin 2 - Termination of Disk Channel 3
Pin 3 - Termination of Host Channel 0	Pin 3 - Termination of Host Channel 1 or Disk Channel 4*
Pins 4 & 5 - Do not Jumper	Pins 4 & 5 - Do not Jumper

Note

For more information, refer to the Installation Guide.

Installation

The Mezzanine Board connects to the DAC960SX by two paddle cards. Two mounting blocks and eight screws secure the Mezzanine Board to the DAC960SX mainboard. Connectors on the DAC960SX are labelled J3 and J4.

1. If the DAC960SX is already installed, power down the entire system and remove the DAC960SX mainboard from the chassis.
2. Attach the mounting blocks to the mezzanine board using four nylon washers and four phillips screws as shown in Figure 4-5.

Note

Be sure to orient the mounting block as shown, with the offset holes closest to the connector edge of the mezzanine board.

3. Attach the paddle boards to the mezzanine board as shown in Figure 4-5.

Caution

Each paddle board is marked with an arrow. Be sure to attach the paddle board with the arrow pointing toward the mezzanine board.

4. Attach J2 and J3 on the mezzanine board to J2 and J3 on the DAC960SX.

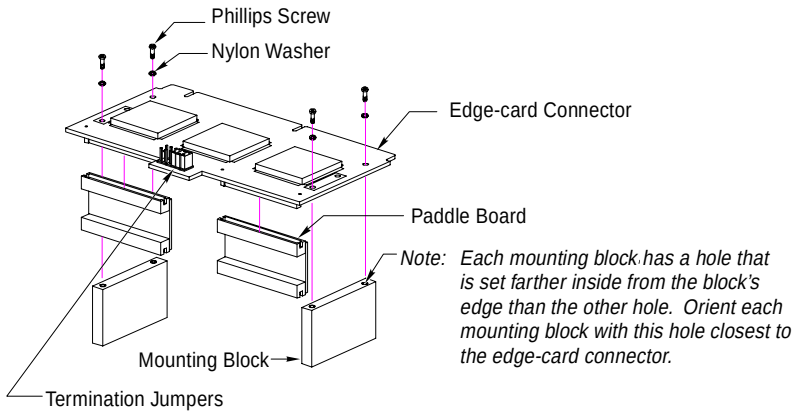


Figure 4-5. Preparing the DBI960SX for Installation

5. Secure the Mezzanine Board to the DAC960SX by installing the four remaining nylon washers and phillips screws through the controller board and into the mounting blocks.
6. Install the new board assembly into the chassis.

Chapter 5
User Interface

Overview

After the DAC960SX hardware installation, the array can be configured through one of three user interfaces:

- Front panel touch-control keypad. Refer to “Start-up LCD Screen” on page 5-3.
- VT100 terminal connected through the controller’s serial port. Refer to “Start-up VT100 Screen” on page 5-5.
- RAIDfx software running on a PC through the controller’s serial port. Refer to the *RAIDfx Manager User Guide*.

> ☛ **Note**
>
> The controller allows only one device to access menus at a time.

Both the DAC960SX front panel user interface and the VT100 terminal 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.

User Interface Screen Modes

The DAC960SX controller's distinctive operating modes are represented by different displays on the front panel LCD or terminal monitor display. These modes are:

- Start-up
- Monitor mode
- Menu mode

Navigating the LCD Screens

A touch-control keypad and a liquid crystal display (LCD) on the front panel of the DAC960SX is the primary operational interface and monitor display for the disk array controller. This user interface controls all configuration and management functions for the DAC960SX controller and for all SCSI disk array subsystems to which it is properly connected.

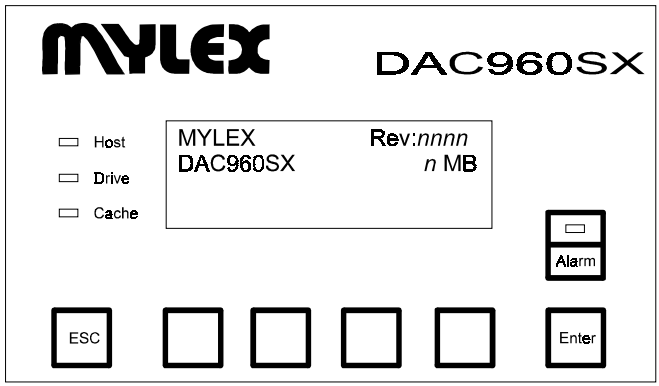


Figure 5-1. DAC960SX Front Panel Keypad and LCD

The LCD provides a system of screens with areas for information, status or menus. The LCD screen displays four lines. The first three lines contain menu items or other information. The fourth line shows controller status in Monitor mode. In Menu mode, the fourth line is usually an instruction line which shows an abbreviated list of functions that can be accessed by

pressing the corresponding front panel keypad button below each abbreviation or prompt.

By pressing the keypad button, a command or menu function associated with that prompt is executed (if possible); otherwise, an error indication or status message is provided.

Start-up LCD Screen

The start-up title screen is displayed on the front panel LCD after the controller is powered-on. A built-in power-on self test (POST) diagnostic checks the controller functions during start-up. Any errors detected by the POST diagnostic are reported on the title screen. Otherwise, a successful start-up results in a title screen that displays manufacturer identification, the on-board firmware release level, the controller board model number, the size of the on-board cache, and a status message that the startup was successful.

Figure 5-2. Title Screen Display

Monitor Mode LCD Screen

In Monitor Mode, the main title screen displays the STARTUP COMPLETE status message on the front panel LCD until one of the following occurs:

1. Controller operations generate a new status message in its place.
2. Someone logs-on the controller, putting it into Menu Mode.

Menu Mode LCD Screen

Menu mode is reached by logging-on the controller, which causes the main menu screen to appear. Holding the Enter key for at least four seconds when the title screen is displayed invokes the log-on sequence.

The main menu screen lists three sub-menu choices for Configuration, Administration, and Toolkit (utility) functions. The nxt prompt is also

displayed, but its button does not control a function on this screen.

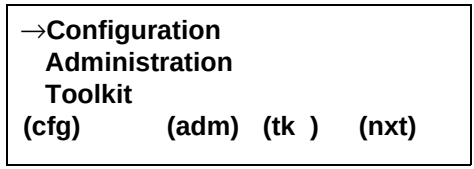


Figure 5-3. Main Menu Display

Each of the three menu choices that can be selected from the main menu screen produce subordinate screens that invoke different functions for configuring and managing the SCSI disk array. These functions produce additional screens, and most of those screens also invoke commands associated with their specific functions.

The principal main menu command selections and the submenu commands that invoke additional submenus or command functions are shown in Table 3-1 and are described throughout the subsequent chapters of this manual.

Navigating the VT100 Terminal Screens

By connecting a VT100 compatible terminal, or a PC operating in an equivalent terminal emulation mode, all controller monitoring, configuration and administration functions can be exercised from the VT100 terminal.

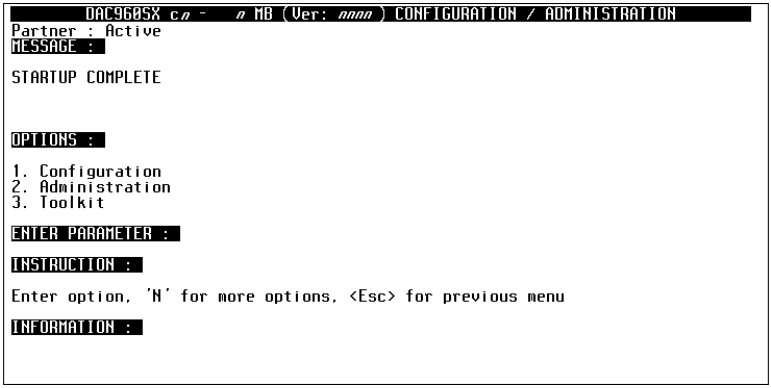


Figure 5-4. Menu Mode VT100 Utility Screen

The DAC960SX built-in utility screens is accessed by sending a Break character from the VT100 terminal keyboard. On some terminals, this is achieved by pressing the <Ctrl> and <Break> keys together; and some terminal emulation modes may also require you to press the <Enter> or <Return> key (refer to the documentation for your specific terminal or terminal emulation software).

Start-up VT100 Screen

To start-up the controller's VT100 utility, power-on the terminal, the drives and the DAC960SX. From the VT100 terminal, start the DAC960SX Configuration/ Administration utility by issuing the ***Break*** command.

The Break command causes a password prompt to appear on the monitor screen. Since password support is not implemented in this version of the DAC960SX, clear the prompt by pressing the <Enter> or <Return> key to display the DAC960SX main monitor mode screen.

After you press the <Enter> or <Return> key to clear the password prompt, the terminal displays the Monitor Mode panel header (**MESSAGE:**).

Monitor Mode VT100 Screen

In Monitor Mode, the terminal monitor screen displays the status messages in the panel below the screen prompt indicated by the **MESSAGE:** header.

Any status message displayed in this panel remains on screen until one of the following occurs:

1. Controller operations generate a new status message in its place.
2. Someone presses the <Enter> or <Return> key, putting the controller into Menu Mode.
3. Someone presses the <Esc> key, causing the controller to exit the utility and return to the main terminal screen.

Menu Mode VT100 Screen

Press the <Enter> or <Return> key to display the Menu Mode screen. Menu Mode causes additional prompts and panels to be displayed on the screen below the Monitor Mode screen's **MESSAGE:** panel.

Up to three menu items at a time appear in the panel below the **OPTIONS:** prompt. Respond to the on-screen prompts to select the desired configuration, administration or diagnostic functions.

Typing the number associated with a menu item in the **OPTIONS:** panel (such as **1**) causes the number to appear next to the prompt labeled **ENTER PARAMETER:**

When a menu item is selected, its number appears next to the **OPTIONS:** prompt to verify its selection.

Pressing the <Enter> key activates the selected function or sub-menu.

Pressing the < n > key accesses the next page of a menu when there are more than three items to list.

The panel below the **INSTRUCTIONS:** prompt shows an abbreviated list of other functions and the corresponding key to press to access each one.

Pressing the <Esc> key allows you to go back to the previous screen at nearly any point in the menus.

Controller Screen Descriptions

The following sections show the principle screens of the DAC960SX interface. They provide tabular descriptions of the controllers main features and functions.

Except for the title screen and the log-on screen, the screens are presented in the order in which they appear as subordinate command screens of the main menu selections. Some sub-menu screens have further subordinate screens, and these are shown and described immediately following their associated parent screen.

Descriptions for the Menu Mode screens and their subordinate screens are provided in the chapters that follow this one.

Menu Screen Locator

Table 5-1 provides a quick-reference guide to menu screen locations.

Table 5-1. Controller Menu Screen Locator

Main Menu Selection	Submenu Locator	Submenu Title
Configuration	Screen 1	Get Configuration
		Show Configuration
		Create Array
	Screen 2	Delete Last Array
		Create Standby
		Save Configuration
	Screen 3	Start Initialize
		Change Write Policy
		Change LUN Affinity
Administration	Screen 1	Rebuild/Check Rate
		Start Rebuild
		Start Parity Check
	Screen 2	LUN Statistics
		Enclosure Status
		Release/Relinquish Controller
	Screen 3	Kill Partner
Toolkit	Screen1	Show Drives
		Drive Information
		Change Drive State
	Screen 2	Format Drives
		Controller Parameters
		Controller Diagnostics
	Screen 3	AEMI Scan

Monitor Mode, Main Title Screen

Figure 5-5. Title Screen Display

Table 5-2. Title Screen Description

Indication/Key		Description
MYLEX		Manufacturer identification
Rev:*nnnn*		Controller firmware revision level
DAC960S		Controller model number
***n* MB**		Controller cache memory size
STARTUP COMPLETE		Status message indicates successful completion of power-on-self-test (POST) diagnostics
LCD Action/Key	**Terminal Action/Key**	
Enter		Invokes menu access log-on procedure, when held for at least four seconds
Alarm		Resets audible alarm in all screens

Menu Mode, Log-in Password Prompt

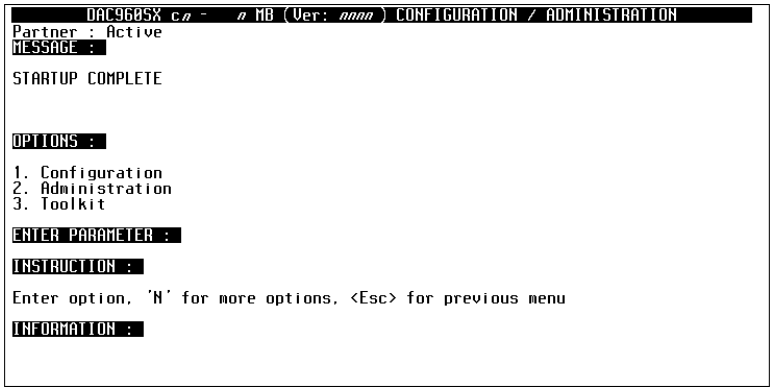
PASSWORD :

Figure 5-6. Password Prompt Display

Table 5-3. Password Screen Description

Indication/Key		Description
PASSWORD		The password feature is not implemented in this version of the DAC960SX
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the menu access routine and returns the display to the monitor mode main title screen
Enter	Enter	Clears the password prompt and launches the main menu screen

Menu Mode, Main Menu Screen



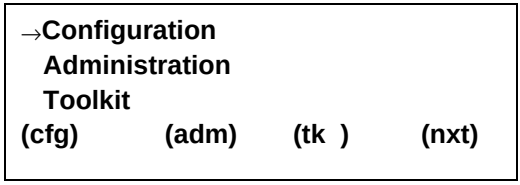


Figure 5-7. Main Menu Display

Table 5-4. Main Menu Description

Indication/Key		Description
Configuration		Menu selection that allows arrays to be created, configured, saved, or deleted
Administration		Menu selection that allows management of array resources
Toolkit		Menu selection for drive and controller utilities
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (title screen)
K1 (cfg)	1	Selects the Configuration menu screens
K2 (adm)	2	Selects the Administration menu screens
K3 (tk)	3	Selects the Toolkit menu screens
K4 (nxt)	N	Key not used on this screen
Enter	Enter	Invokes the menu selection indicated by the selection arrow

Chapter 6
Configuration Menu

Configuration Menu Summary

The Configuration Menu is used to customize the configuration of the RAID array. The disks on each available SCSI channel can be combined into arrays with one or more logical units. RAID levels 0, 0 + 1, 1, 3, 5, and JBOD are all supported. The menu is organized as follows:

Configuration Menu, Page One

- Get Configuration
- Show Configuration
- Create Array

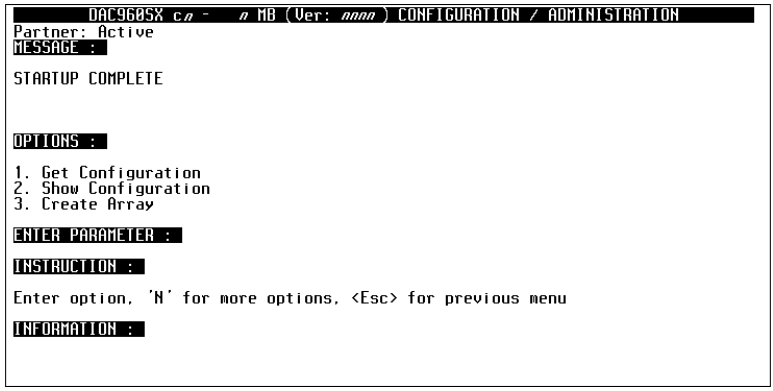
Configuration Menu, Page Two

- Delete Last Array
- Create Standby
- Save Configuration

Configuration Menu, Page Three

- Start Initialization
- Change Write Policy

Configuration Menu, Page One



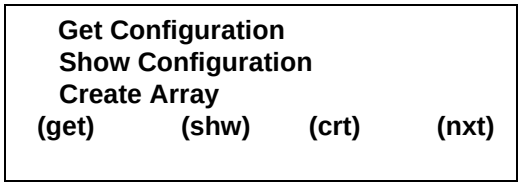


Figure 6-1. Configuration Menu, Page One

Table 6-1. Configuration Menu, Page One Description

Indication/Key		Description
Get Configuration		Function that loads the current saved configuration data into the controller temporary work space
Show Configuration		Menu selection that allows user to review the current configuration data
Create Array		Menu selection that allows user to define the configuration parameters for a new array drive group
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (get)	1	Selects the Get Configuration function
K2 (shw)	2	Selects the Show Configuration function
K3 (crt)	3	Selects the Create Array function
K4 (nxt)	N	Selects the next page of Configuration menu selections
Enter	Enter	Invokes the submenu selection or function indicated by the selection arrow

Get Configuration Screen

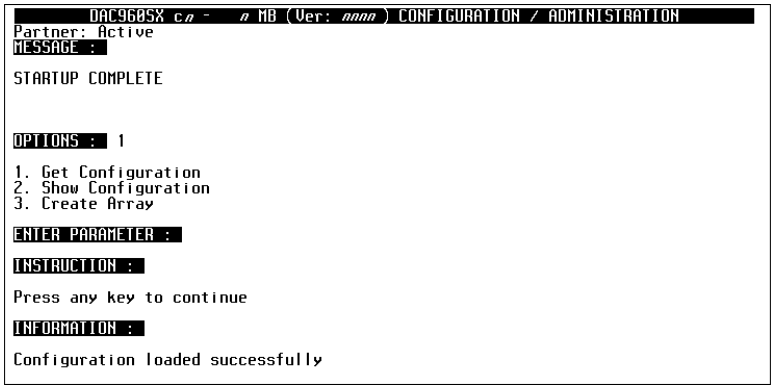


Figure 6-2. Get Configuration Screen

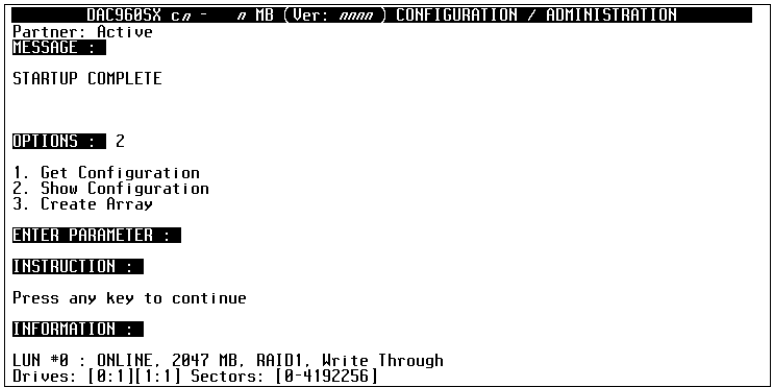
Table 6-2. Get Configuration Description

Indication/Key		Description
Config loaded		Indicates that current data is loaded into the controller's temporary work space
Press any key		Prompt to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous screen

☛ Note

Always invoke the Get Configuration function before performing any array management task from the Configuration submenu. The Get Configuration command ensures that the DAC960SX controller temporary work space contains the current physical configuration data.

Show Configuration, Page One



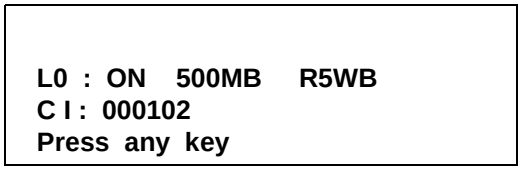
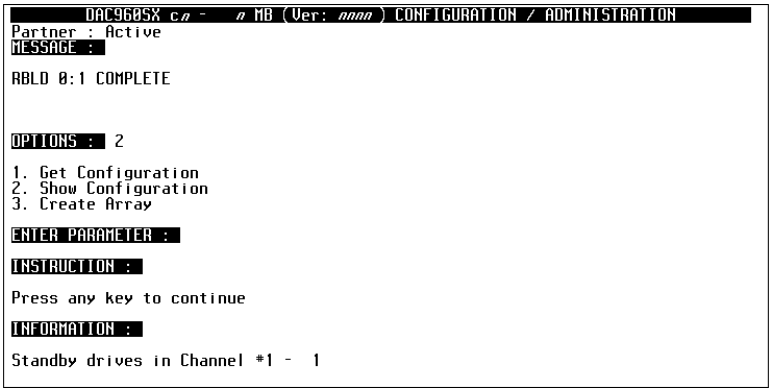


Figure 6-3. Show Configuration, Page One

Table 6-3. Show Configuration, Page One Description

Indication/Key		Description
L *n*		Number indicates the currently displayed logical unit number (LUN)
ON OF CR		Indicates the status of the current logical unit. ON = on-line CR = critical OF = off-line
***n* MB**		Number indicates the capacity (in megabytes) of the currently displayed logical drive
R *n* (0 , 1 , 3 , 5 , 6 , 7)		Number indicates the RAID level of the logical unit
W *x* (WT , WB)		Indicates the setting of the on-board write cache WT = Write Through (write cache disabled) WB = Write Back (write cache enabled)
C I : *nn nn nn* (etc.)		Number pairs indicate the SCSI address of each drive that comprise the logical unit. The first digit in each pair is the SCSI channel number. The second digit in each pair is the SCSI drive identification number (SCSI ID).
Config loaded		Indicates that current data is loaded into the controller's temporary work space
Press any key		Prompt to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen
K1 - K4 , Enter	Any character key	Displays the configuration data for the next logical drive or hot spare until all are shown, then displays the previous menu

Show Standby *(Show Configuration, Page Two)*



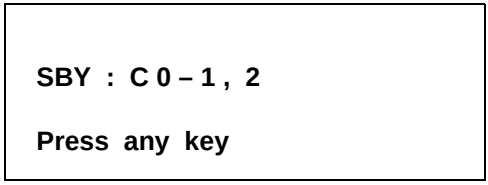


Figure 6-4. Show Configuration, Page Two

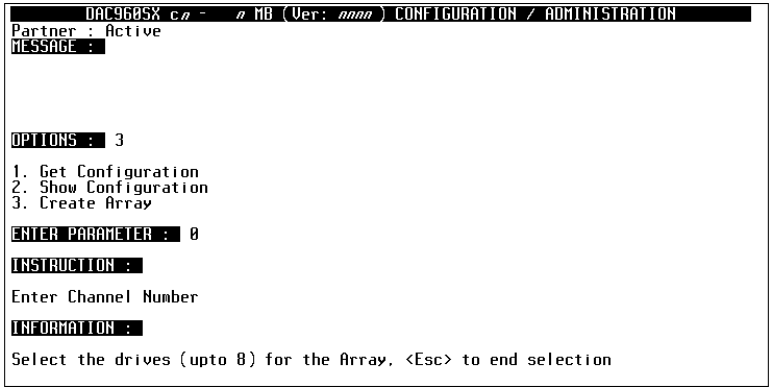
Table 6-4. Show Configuration, Page Two Description

Indication/Key		Description
SBY :		Indicates that information on this screen is for standby (hot spare) drives in the currently displayed configuration
C *n*		Number indicates the SCSI channel number of the standby drives
– *n*, *n*		Number indicates SCSI ID number of each standby drive on this channel
Press any key		Prompt to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K1 - K4 , Enter	Any character key	Displays the configuration data for the next channel with standby drives until all are shown, then displays the previous menu

Create Array Function

The Create Array function combines selected drives into a Drive Group. The Drive Group may be divided into multiple logical units, each with its own RAID level, cache policy, and capacity. Logical units may be added until the maximum capacity of the Drive Group is fully used or eight system drives are defined.

Select SCSI Channel *(Create Array, Page One**)***



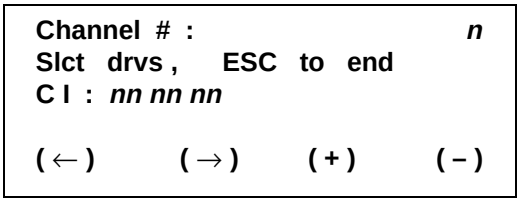
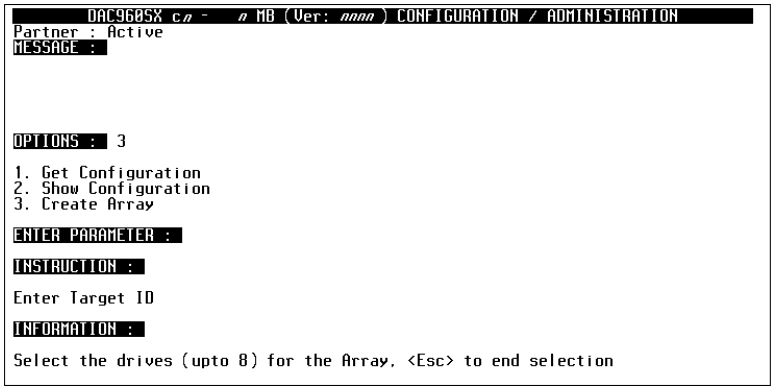


Figure 6-5. Select SCSI Channel; Create Array, Page One

Table 6-5. Create Array, Page One Description

Indication/Key		Description
Channel # *n*		Number indicates the channel identification for the drive to be used in the array
Slct drvs, ESC to end		Prompt indicates user response options
C I : *nn nn nn*		Number pairs indicate the SCSI address of each drive that comprise the array. The first digit in each pair is the SCSI channel number. The second digit in each pair is the SCSI ID number. **Note:** No "CI" information is displayed until the first physical drive is selected.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	1. Cancels the function (no array is created) and displays the previous menu screen when no drives are selected for the array. 2. Completes the SCSI channel selection function and displays the next page
K3 (+)	Num. keypad	Increments channel number
K4 (–)	Num. keypad	Decrements channel number
Enter	Enter	Invokes the channel number selection and displays the next page

Select Drives *(Create Array, Page Two)*



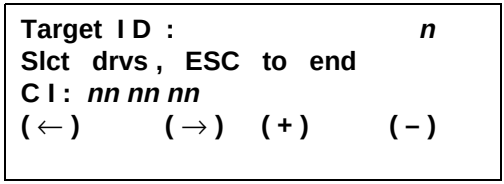


Figure 6-6. Select Drives, Create Array, Page Two

Table 6-6. Create Array, Page Two Description

Indication/Key		Description
Target ID : *n*		Number indicates the SCSI ID of a drive to add to the array being created
Slct drvs, ESC to end		Prompt indicating user response options
C I : *nn nn nn* (etc.)		Number pairs indicate the SCSI address of each drive that comprise the array. The first digit in each pair is the SCSI channel number. The second digit in each pair is the SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Completes the drive selection function and displays the next page
K3 (+)	Num. keypad	Increments Target ID number
K4 (–)	Num. keypad	Decrements Target ID number
Enter	Enter	Checks the drive selected, adds the drive to the array, and displays the prompt for the next selection

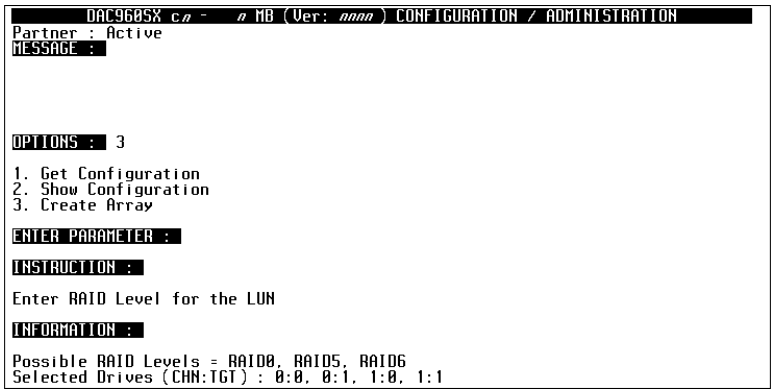
Note

Only unused or hot spare (standby) drives may be selected.

Drives must be physically connected to be used.

If an error message appears, wait 10 seconds for the drive to spin-up, then try again.

RAID Level *(Create Array, Page Three**)***



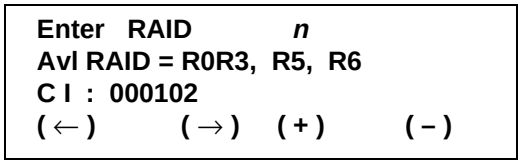
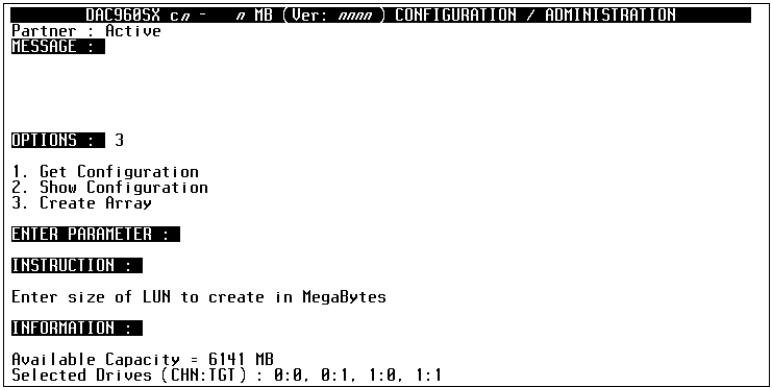


Figure 6-7. RAID Level; Create Array, Page Three

Table 6-7. Create Array, Page Three Description

Indication/Key		Description
Enter RAID *n*		Number indicates the RAID level to be assigned to the array being created. Only numbers for valid RAID levels are accepted
Avl RAID = R*n*		Prompt indicates the possible RAID level(s) that may be assigned to the logical unit
C I : *nn nn nn* (etc.)		Number pairs indicate the SCSI address of each drive that comprise the drive group. The first digit in each pair is the SCSI channel number. The second digit in each pair is the SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Quits the function before the array is created. A prompt screen to Exit or Continue is displayed (see Figure 6-12 and Table 6-13).
K3 (+)	Num. keypad	Increments the RAID level number
K4 (–)	Num. keypad	Decrements the RAID level number
Enter	Enter	Invokes the function and displays the next page

LUN Size *(Create Array, Page Four**)***



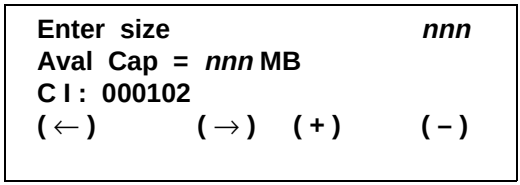


Figure 6-8. LUN Size; Create Array, Page Four

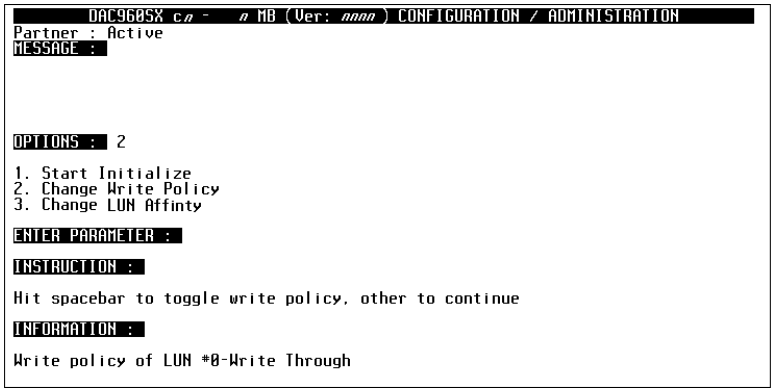
Table 6-8. Create Array, Page Four Description

Indication/Key		Description
Enter size *nnn*		Number sets the usable capacity (in megabytes) for the logical unit being created
Aval Cap = *nnn* MB		Indicates maximum drive capacity (in megabytes) available for the logical unit being created
C I : *nn nn nn* (etc.)		Number pairs indicate the SCSI identification of each drive that comprise the array. The first digit in each pair is the SCSI channel number. The second digit in each pair is the drive SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Quits the function before the array is created. A prompt screen to Exit or Continue is displayed (see Figure 6-12 and Table 6-13).
K1 (←)	←	Moves cursor to the left (below the drive capacity numbers)
K2 (→)	→	Moves cursor to the right (below the drive capacity numbers)
K3 (+)	Num. keypad	Increments number above the cursor position
K4 (–)	Num. keypad	Decrements number above the cursor position
Enter	Enter	Completes the size selection for this LUN and displays the next page

☞ **Note**

All available capacity must be used when configuring the DAC960SX with the LCD panel or VT100 terminal. It is not necessary to initialize unneeded LUNs, however. To define an array *without* configuring all available capacity, use the RAIDfx software utility.

Write Cache Mode *(Create Array, Page Five)*



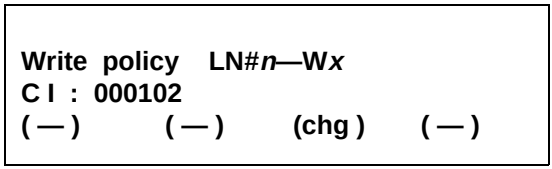
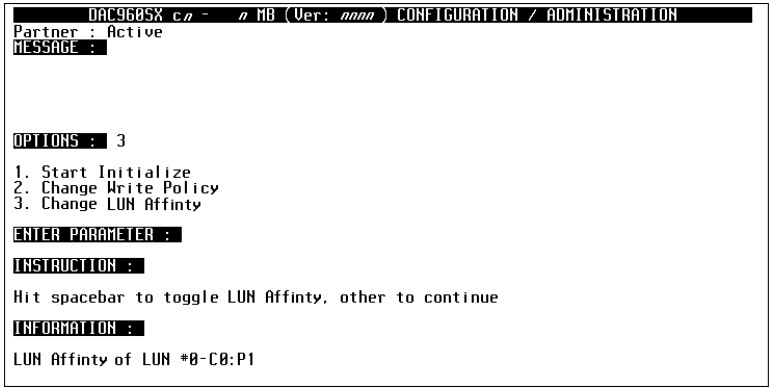


Figure 6-9. Write Cache Mode; Create Array, Page Five

Table 6-9. Create Array, Page Five Description

Indication/Key		Description
Write policy W*x*		Indicates the setting of the on-board write cache for the logical unit being defined WT = Write Through (no write cache) WB = Write Back (write cache enabled)
C I : *nn nn nn*		Number pairs indicate the SCSI address of each drive that comprise the array. The first digit in each pair is the SCSI channel number. The second digit in each pair is the SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
K3 (chg)	Spacebar	Toggles the cache policy mode between WT and WB
ESC, K1, K2, K4, Enter	Any character key	Invokes the cache mode selection and displays the next page

Change LUN Affinity *(Create Array, Page Six)*



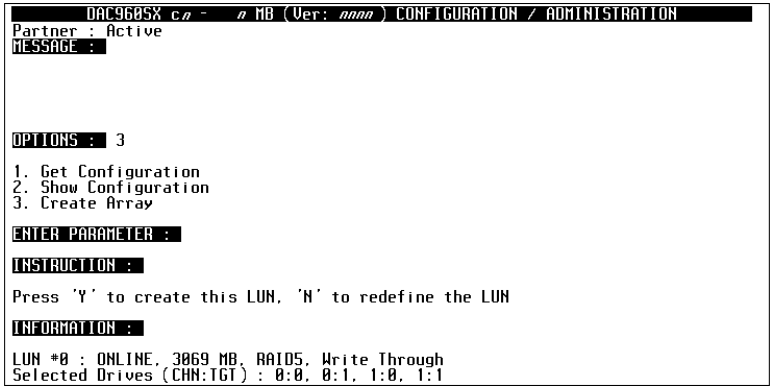
Affinity LUN *#n* - All Aff

(—) (—) (chg) (—)

Table 6-10. Create Array, Page Six Description

Indication/Key		Description
Affinity LUN #*n*		All Aff = Lun affinity set for all controllers and ports C1 : P0 = Controller 1, Port 0 C0 : P0 = Controller 0, Port 0 C1: P1 = Controller 1, Port 1 C0 : P1 = Controller 0, Port 1
LCD Action/Key	**Terminal Action/Key**	
K3 (chg)	Spacebar	Toggles LUN affinity
ESC, K1, K2, K4, Enter	Any character key	Invokes the selection and displays the next page

Confirm Logical Unit *(Create Array, Page Seven)*



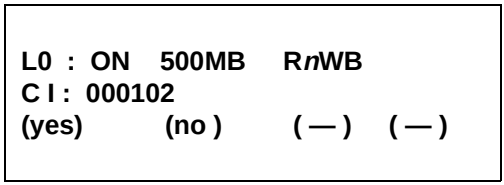


Figure 6-10. Logical Unit Confirmation; Create Array, Page Seven

Table 6-11. Create Array, Page Seven Description

Indication/Key		Description
L *n*		Number indicates the logical unit number (LUN)
ON OF CR		Indicates the status of the logical unit ON = on-line CR = critical OF = off-line
***nnn* MB**		Number indicates the size of the logical unit defined
W *x* (WT , WB)		Indicates the setting of the on-board write cache WT = Write Through (write cache disabled) WB = Write Back (write cache enabled)
Rn		Number indicates the RAID level of the logical unit (RAID 0 , 1 , 3 , 5 , 6 = 0+1, 7 = JBOD)
C I : *nn nn nn* (etc.)		Number pairs indicate the SCSI address of the drives that constitute the array. The first digit in each pair is the SCSI channel address. The second digit is the SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
K1 (yes)	Y	Selection creates a logical unit with the configuration settings shown on this screen. If full capacity is used, the next page displays, otherwise, the RAID level page is displayed for the next logical unit until the full capacity is used.
K2 (no)	N	Selection cancels the creation of this logical unit and abandons the configuration data entered for this LUN (RAID level and LUN size). The user is returned to the screen shown in *Create Array, Page Three*.

Array Configuration *(Create Array, Page Eight)*

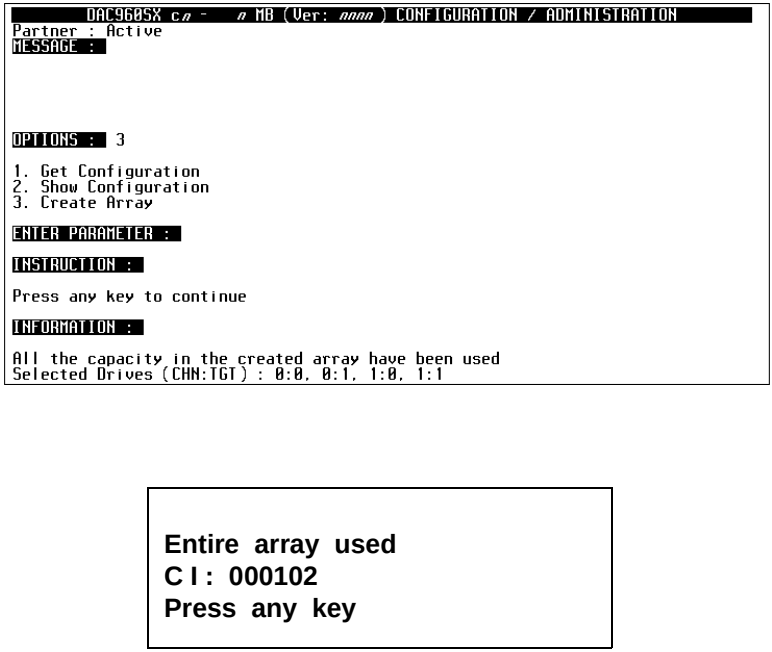


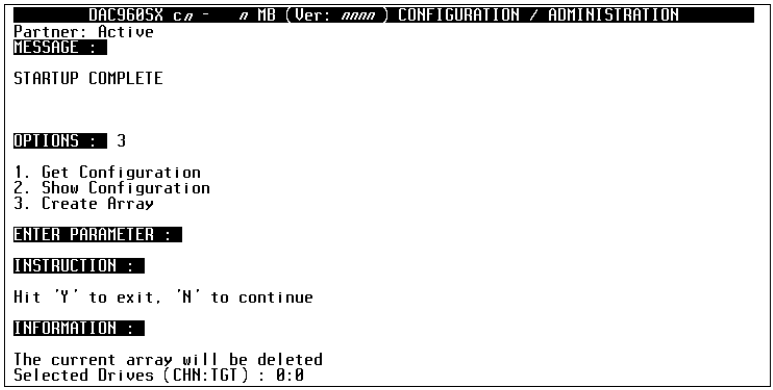
Figure 6-11. Array Configuration; Create Array, Page Eight

Table 6-12. Create Array, Page Eight Description

Indication/Key		Description
Entire array used		Message indicates that all available capacity on the drive group is assigned to one or more logical units
C I : ***nn nn nn***		Number pairs indicate the SCSI identification of the drives that constitute the array. The first digit in each pair is the SCSI channel number. The second digit is the SCSI ID number.
Press any key		Prompt to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Selection clears this message screen and displays the previous menu

Exit/Continue Configuration *(Create Array, Alternate Screen*

The Exit/Continue Configuration Prompt appears if you change your mind after starting to create an array, and then back out of the process before completion using the ESC key.)



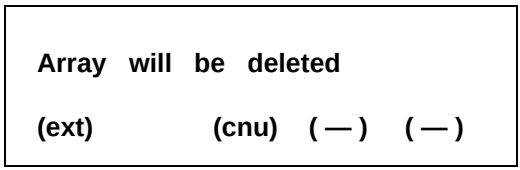
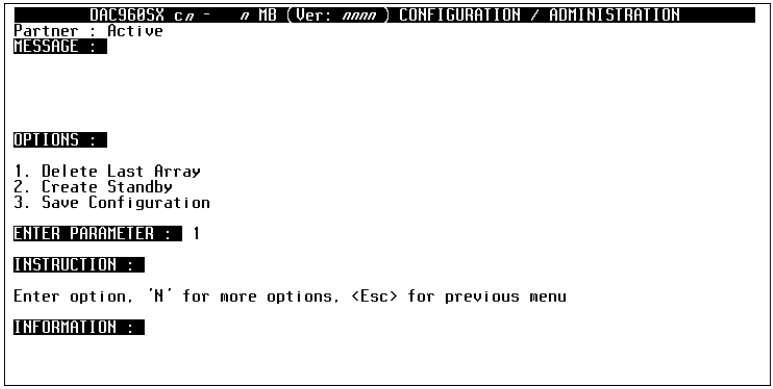


Figure 6-12. Exit/Continue Configuration; Create Array, Alternate Screen

Table 6-13. Exit/Continue, Alternate Screen Description

Indication/Key		Description
Array will be deleted		Message indicates that all target ID, size and RAID level configuration data for all LUNs defined during this *Create Array* session will be deleted if (ext) is selected.
LCD Action/Key	**Terminal Action/Key**	
K1 (ext)	Y	Selection exits the function, deletes the LUNs from this array and displays the previous menu. No array is created.
K1 (cnu)	N	Selection continues the Create Array function so that LUN definitions may be modified or saved

Configuration Menu, Page Two



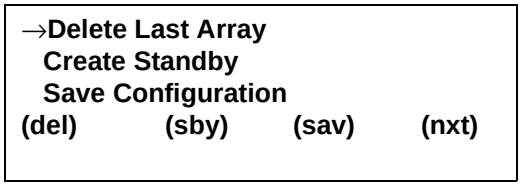


Figure 6-13. Configuration Menu, Page Two

Table 6-14. Configuration Menu, Page Two Description

Indication/Key		Description
Delete Last Array		Menu selection that allows user to remove the last drive group from the configuration
Create Standby		Menu selection that allows user to specify drive that will serve as a “hot spare” or standby drive
Save Configuration		Function saves new or modified configuration data to the controller non-volatile memory
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (del)	1	Selects the Delete Last Array function
K2 (sby)	2	Selects the Create Standby function
K3 (sav)	3	Selects the Save Configuration function
K4 (nxt)	N	Selects the next page of Configuration menu selections
Enter	Enter	Invokes the submenu or function indicated by the arrow

Delete Last Array Function

The Delete Last Array function displays the logical unit numbers comprising the last Drive Group created, and deletes that Drive Group and all of its associated logical units.

WARNING

Data on the drives will be lost when the array is deleted.

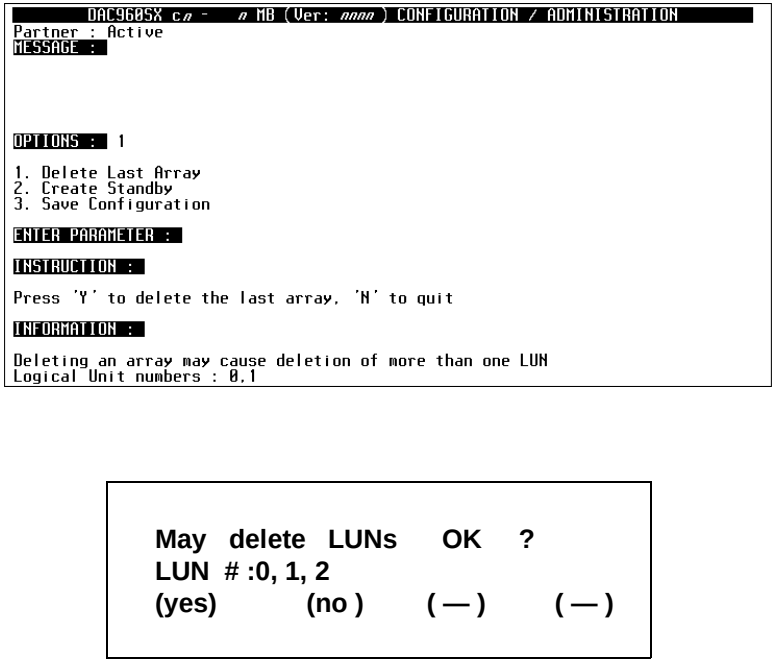


Figure 6-14. Delete Last Array Screen

Table 6-15. Delete Last Array Description

Indication/Key		Description
May delete LUNs OK?		Prompt indicates that the function will delete all logical units of the last Drive Group created
LUN # : *n*		Number identifies the LUNs that make up the last Drive Group created.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no array is deleted) and displays the previous menu screen
K1 (yes)	Y	Selection deletes the last Drive Group created
K2 (no)	N	Cancels the function (no Drive Group is deleted) and displays the previous menu screen

Create Standby Function

The Create Standby function is used to designate a drive that will be a standby replacement or “hot spare” drive for a redundant array (for example, RAID 1, RAID 3, RAID 5, or RAID 0+1).

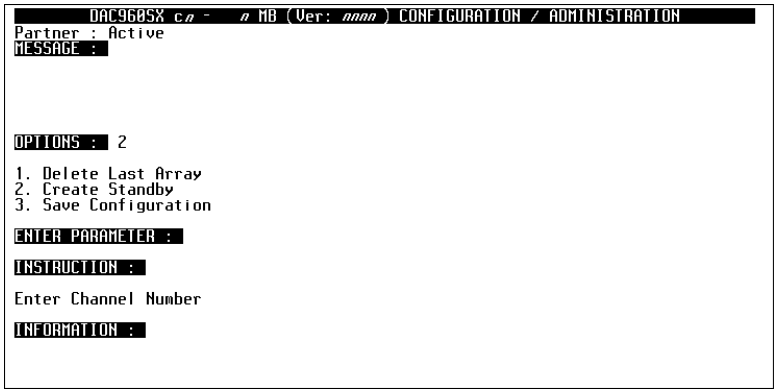
Note

A standby drive must be created for the DAC960SX Automatic Rebuild function to operate properly with a redundant array**.**

Caution

A Standby Drive must have at least as much capacity as the largest drive in the array or the rebuild may not start.

Do not select a standby drive which is currently online as a member of a drive group



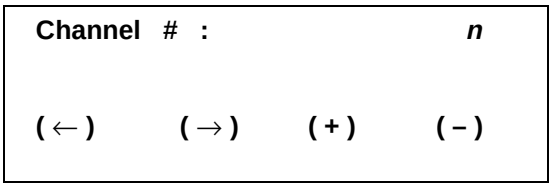
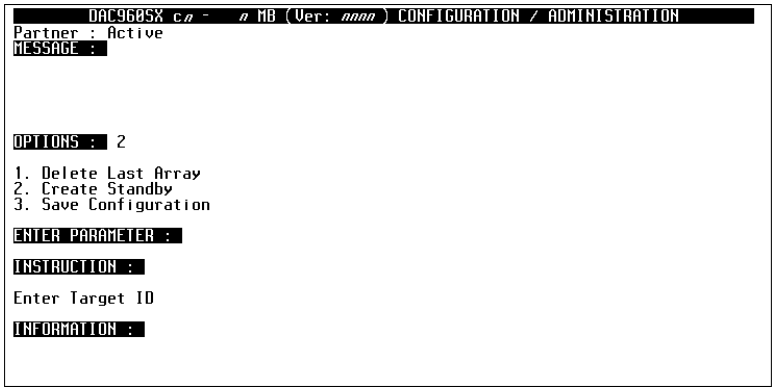


Figure 6-15. Select Channel; Create Standby, Page One

Table 6-16. Create Standby, Page One Description

Indication/Key		Description
Channel # *n*		Number indicates the SCSI channel number of the drive to be made a standby “hot spare”
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no standby drive is created) and displays the previous menu screen
K3 (+)	Num. keypad	Increments channel number
K4 (–)	Num. keypad	Decrements channel number
Enter	Enter	Selects the channel number indicated and displays the next page

Select Drive *(Create Standby, Page Two)*



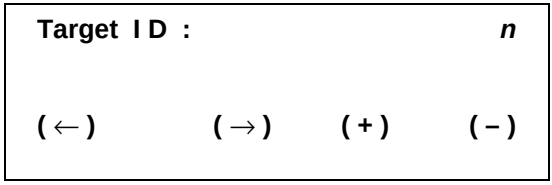


Figure 6-16. Select Drive; Create Standby, Page Two

Table 6-17. Create Standby, Page Two Description

Indication/Key		Description
Target ID : *n*		Number indicates the SCSI identification of a drive to be made a standby “hot spare”
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no standby drive is created) and displays the previous menu screen
K3 (+)	Num. keypad	Increments the Target ID number
K4 (–)	Num. keypad	Decrements the Target ID number
Enter	Enter	Invokes the standby drive selection and displays the next screen

Confirm Standby Drive *(Create Standby, Page Three)*

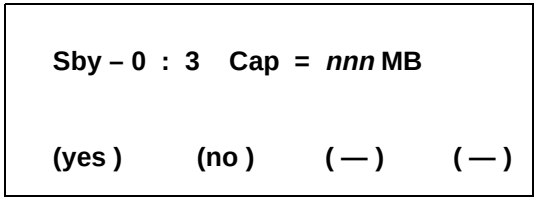


Figure 6-17. Standby Drive Confirmation; Create Standby, Page Three

Table 6-18. Create Standby, Page Three Description

Indication/Key		Description
Sby – *n*		Number indicates the SCSI channel number of the drive to be made a standby “hot spare”
: *n*		Number indicates the SCSI ID of a drive to be made a standby “hot spare”
Cap = *nnn* MB		Indicates maximum drive capacity (in megabytes) available for the standby drive being created
SBY size too small		Prompt notifies the user if the capacity of the standby drive is too small to be used in the existing configuration. If a drive failure were to occur, the Standby drive may not take over
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the drive SCSI channel and Target ID selection and displays the first page of the Create Standby menu
K1 (yes)	Y	Confirms the standby drive selection and displays the previous menu screen
K2 (no)	N	Cancels the drive SCSI channel and Target ID selection and displays the first page of the Create Standby menu

Save Configuration Function

The Save Configuration function must be invoked whenever a configuration is created or changed in order for the configuration parameters to take effect.

> ⚠ ***Caution***
>
> Data may be lost if the configuration is changed on an active array.

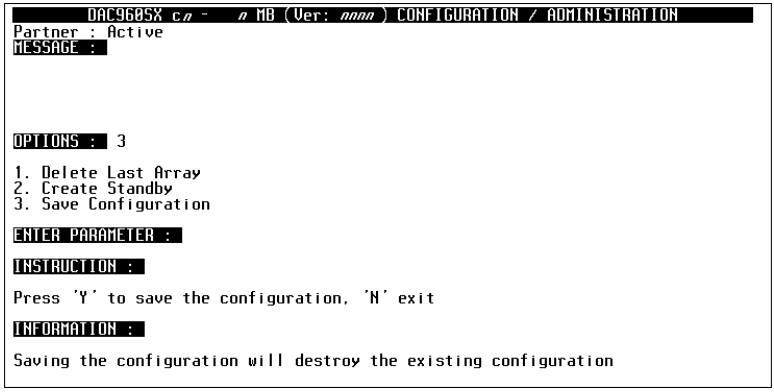
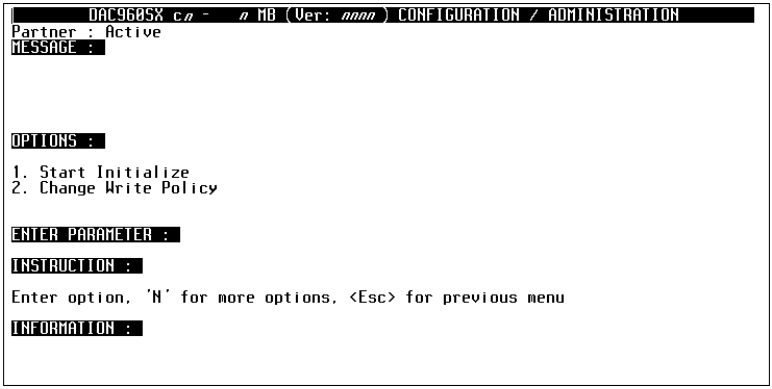


Figure 6-18. Save Configuration Screen

Table 6-19. Save Configuration Description

Indication/Key		Description
Cur cfg will change		Prompt notifies the user that the function will change the current configuration
LCD Action/Key	**Terminal Action/Key**	
K1 (yes)	Y	Selection saves the current configuration and returns the display to the previous menu
K2 (no)	N	Cancels the function (no configuration is saved) and displays the previous menu screen

Configuration Menu, Page Three



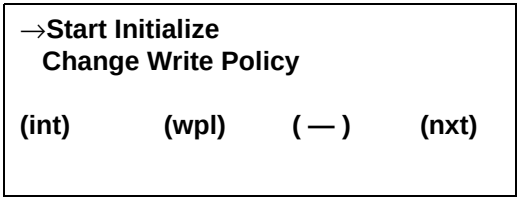


Figure 6-19. Configuration Menu, Page Three

Table 6-20. Configuration Menu, Page Three Description

Indication/Key		Description
Start Initialize		Menu selection that allows user to initialize the logical units
Change Write Policy		Menu selection that allows user to select the cache write policy (Write Through or Write Back) that provides the best performance for the array
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (int)	1	Selects the Start Initialize function
K2 (wpl)	2	Selects the Change Write Policy function
K4 (nxt)	N	Selects the next page of Configuration menu selections
Enter	Enter	Invokes the submenu or function indicated by the arrow

Start Initialize

The Initialize function should be used on all logical units immediately after they are created and before data is written. Initialization clears all data on the logical unit and synchronizes the parity and mirror information with the data.

WARNING

Failure to initialize a newly created logical unit can result in loss of data.

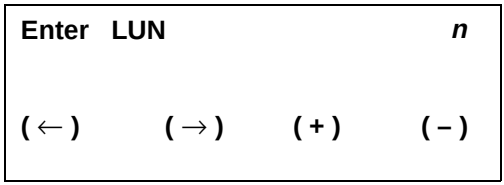


Figure 6-20. Start Initialize, Page One

Table 6-21. Start Initialize, Page One Description

Indication/Key		Description
Enter LUN ***n***		Number indicates the logical unit number of the logical unit to be initialized
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no logical unit is initialized) and displays the previous menu screen
K3 (+)	Num. keypad	Increments the logical unit number
K4 (–)	Num. keypad	Decrements the logical unit number
Enter	Enter	Invokes the Initialization function and displays the prompt for the next message screen

Initialize Confirmation *(Start Initialize, Page Two)*

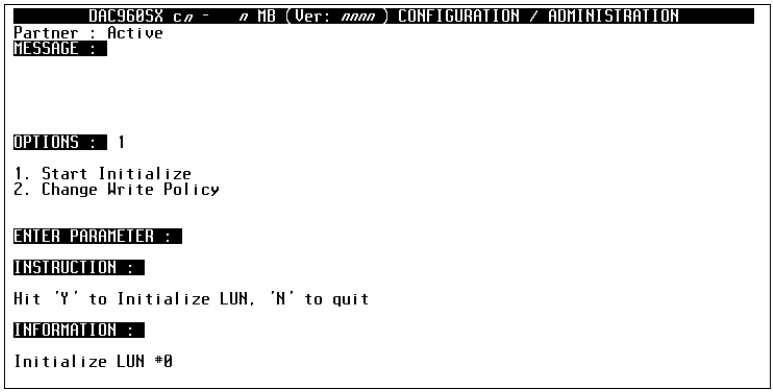


Figure 6-21. Start Initialize, Page Two

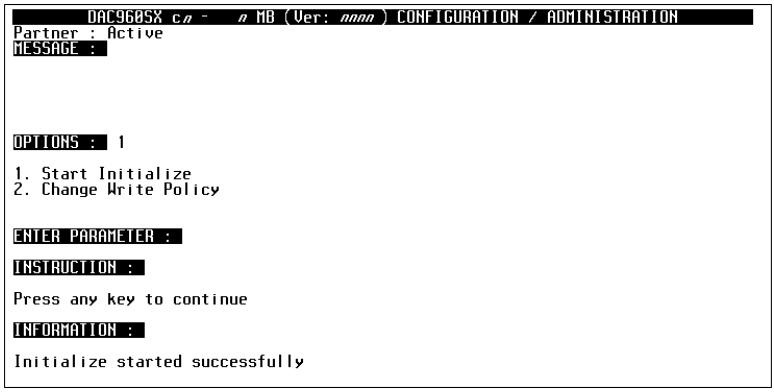
Table 6-22. Start Initialize, Page Two Description

Indication/Key		Description
Initialize LUN # *n*		Prompt notifies the user that the function initializes the LUN identified by the number shown
LCD Action/Key	**Terminal Action/Key**	
K1 (yes)	Y	Selection starts the initialization process and returns the display to the previous menu
K2 (no)	N	Cancels the function (no initialization is performed) and displays the previous menu screen

⚠ *Caution*

Pressing Yes will immediately begin the initialization function. Initializing the wrong logical units will result in data loss.

Initialize Status *(Start Initialize, Page Three)*



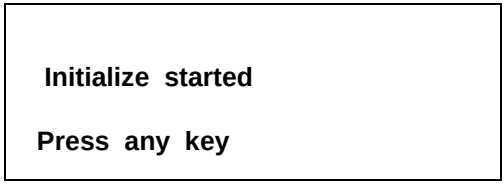


Figure 6-22. Start Initialize, Page Three

Table 6-23. Start Initialize, Page Three Description

Indication/Key		Description
Initialize started		Message indicates the initialization process is started
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu, initialization process continues in background mode until completed

Note

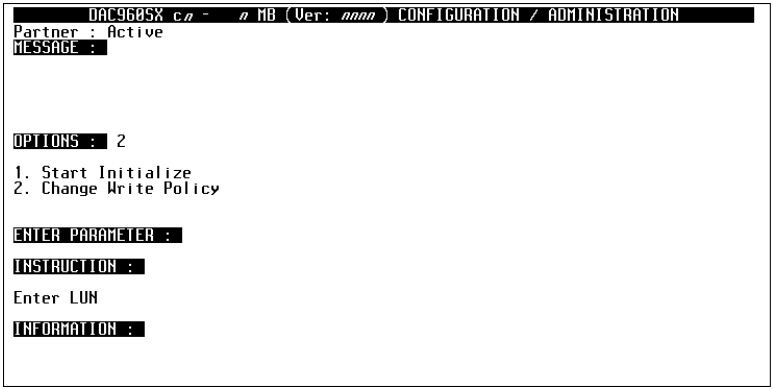
Pressing the **ESC** key several times displays the monitor mode main screen:

An audible alarm (beep) sounds periodically until the initialization process is complete.

Status indication showing the completion percentage of the initialization process displays on the monitor mode main title screen.

Change Write Policy

The Change Write Policy function allows you to reset the write policy to either write-through or write-back.



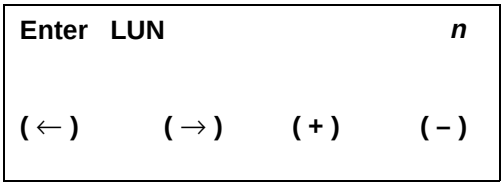
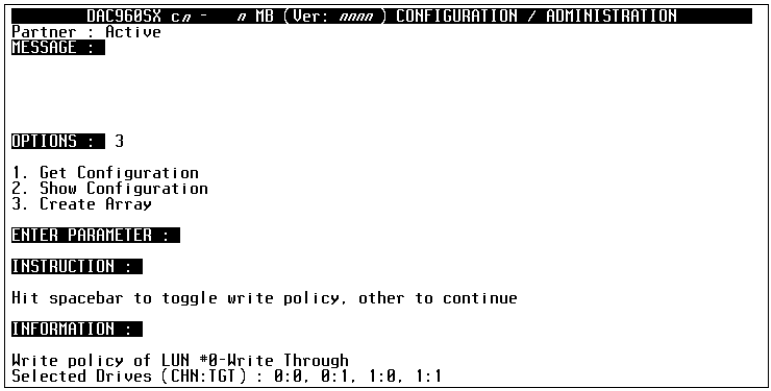


Figure 6-23. Change Write Policy, Page One

Table 6-24. Change Write Policy, Page One Description

Indication/Key		Description
Enter LUN ***n***		Number indicates the logical unit identification of the logical unit on which to Change Write Policy
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no change is made) and displays the previous menu screen
K3 (+)	Num. keypad	Increments the logical unit number
K4 (–)	Num. keypad	Decrements the logical unit number
Enter	Enter	Invokes the Change Write Policy function and displays the prompt for the next message screen

Write Policy Confirmation *(Change Write Policy, Page Two)*



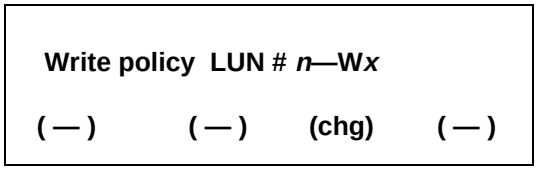


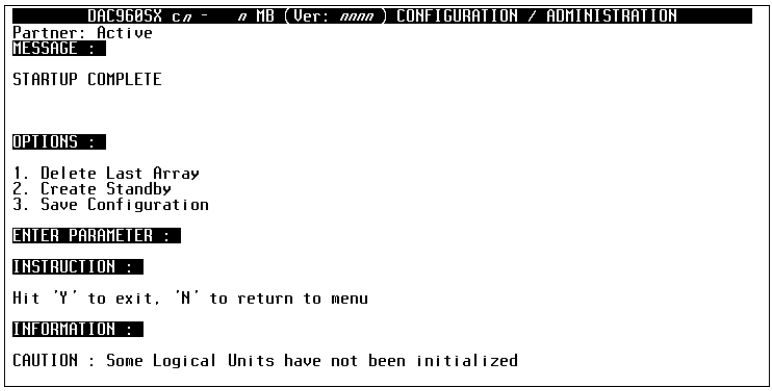
Figure 6-24. Change Write Policy, Page Two

Table 6-25. Change Write Policy, Page Two Description

Indication/Key		Description
Write policy LUN #*n* -W*x*		Prompt notifies the user that the function changes the cache write policy for the LUN identified by the number shown to W*x* (WB or WT)
LCD Action/Key	**Terminal Action/Key**	
K3 (chg)	Spacebar	Selection toggles the write policy between WB (Write Back) and WT (Write Through)
Enter	Enter	Invokes the function (the change is made) and displays a prompt to return to the previous menu

Save Configuration Prompt
(Configuration Menu, Alternate Screen)

The Save Configuration Prompt is displayed if the user has not saved a new or modified configuration before attempting to initialize the array or exit the Configuration Menu.



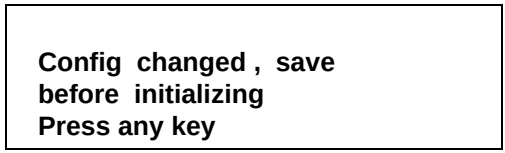


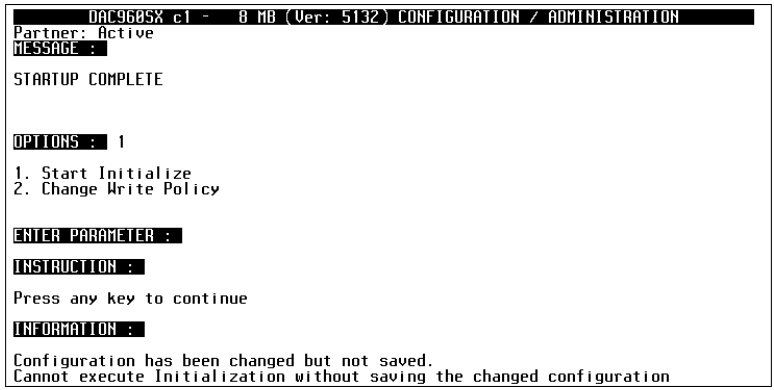
Figure 6-25. Save Configuration Prompt; Configuration Menu, Alternate Screen

Table 6-26. Save Configuration Prompt, Alternate Screen Description

Indication/Key		Description
Config changed. Save before initializing		Prompt notifies the user that a change to the current configuration was made but not saved
Press any key		Prompt to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Selection clears this message screen and displays the previous menu

Initialize Logical Unit Prompt
(Configuration Menu, Alternate Screen)

The Configuration Changed Prompt is displayed if the user has not initialized a new or modified configuration before attempting exit the Configuration Menu.



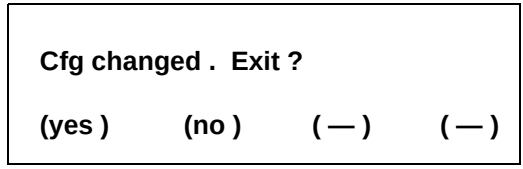


Figure 6-26. Configuration Changed Prompt; Configuration Menu, Alternate Screen

Table 6-27. Initialize LUN Prompt, Alternate Screen Description

Indication/Key		Description
Cfg changed: Exit?		Prompt notifies the user that a change to the current configuration was made and saved but the new logical units are not initialized
LCD Action/Key	**Terminal Action/Key**	
K1 (yes)	Y	Selection exits the Configuration Menu and returns the display to the previous menu. The new or changed configuration is not initialized.
K2 (no)	N	Selection returns the user to the Configuration Menu, where the Start Initialize function may be selected.

Chapter 7
Administration Menu

Administration Menu Summary

The Administration menu is used to monitor, maintain, repair and upgrade physical and logical drives connected to the DAC960SX. The menu is organized as follows:

Administration Menu, Page One

- Rebuild/Check Rate
- Start Rebuild
- Start Parity Check

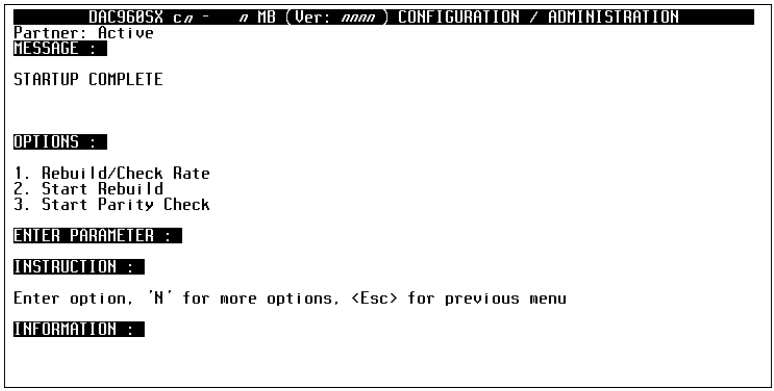
Administration Menu, Page Two

- LUN Statistics
- Enclosure Status
- Relinquish Controller

Administration Menu, Page Three

- Kill Partner

Administration Menu, Page One



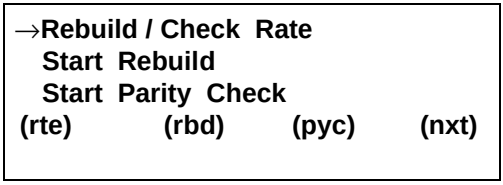
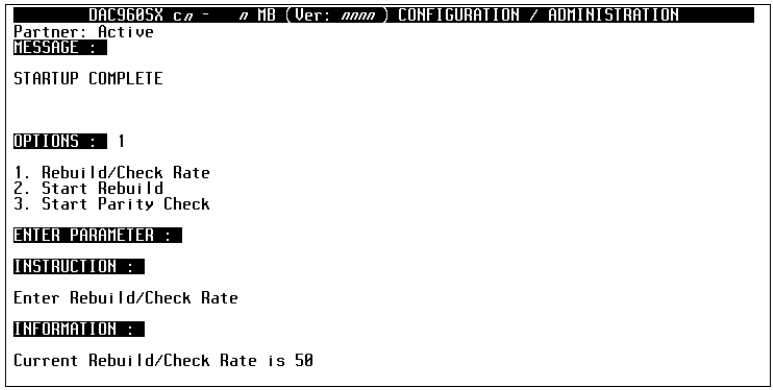


Figure 7-1. Administration Menu, Page One

Table 7-1. Administration Menu, Page One Description

Indication/Key		Description
Rebuild / Check Rate		Menu selection that allows user to specifiy the controller rebuild and parity check priority rate
Start Rebuild		Menu selection that allows user to start a rebuild process
Start Parity Check		Menu selection that allows user to start a parity check on a logical unit
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (rte)	1	Selects the Rebuild / Check Rate function
K2 (rbd)	2	Selects the Start Rebuild function
K3 (pyc)	3	Selects the Start Parity Check function
K4 (nxt)	N	Selects the next page of Administration menu selections
Enter	Enter	Invokes the submenu selection or function indicated by the selection arrow

Rebuild/Check Rate



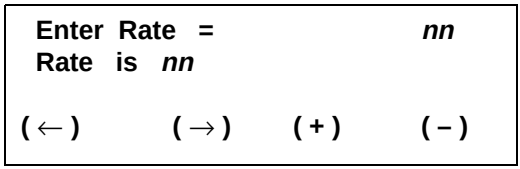


Figure 7-2. Rebuild/Check Rate, Page One

Table 7-2. Rebuild/Check Rate, Page One Description

Indication/Key		Description
Enter Rate = *nn*		Number indicates the amount of background activity the controller allocates to the Rebuild/Parity Check operation Lowest priority setting = 0 Highest priority setting = 50
Rate is *nn*		Number indicates the existing rate setting
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the Rebuild/Parity Check Rate entered on this screen and displays the next page
K1 (←)	←	Moves cursor below number to the left
K2 (→)	→	Moves cursor below number to the right
K3 (+)	Num. keypad	Increments Rate number
K4 (–)	Num. keypad	Decrements Rate number
Enter	Enter	Invokes the selection, sets the working Rebuild/ Parity Check Rate, and displays the next page

Rate Setting *(Rebuild/Check Rate, Page Two)*

```
        DAC960SX c# -   # MB (Ver: ####) CONFIGURATION / ADMINISTRATION
Partner: Active
MESSAGE :

STARTUP COMPLETE



OPTIONS : 1

1. Rebuild/Check Rate
2. Start Rebuild
3. Start Parity Check

ENTER PARAMETER :

INSTRUCTION :

Press any key to continue

INFORMATION :

Rebuild/Check Rate set to 40
```

Rate set to *nn*

Press any key

Figure 7-3. Rate Setting, Rebuild/Check Rate, Page Two

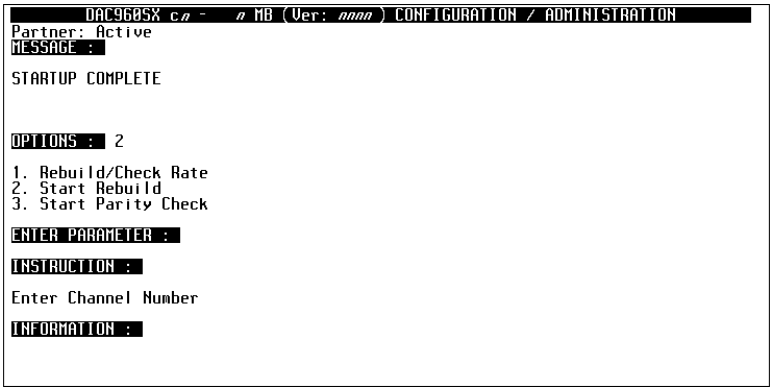
Table 7-3. Rebuild/Check Rate, Page Two Description

Indication/Key		Description
Rate set to *nn*		Indicates the current Rebuild/Parity Check Rate
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

Start Rebuild Function

The Rebuild function is used after a drive fails and is replaced. It restores the original information on a replacement drive.

> **Note**
>
> Rebuilding a drive may impact controller performance. Use the Rebuild Rate function to vary the priority that the controller allocates to the Rebuild process.



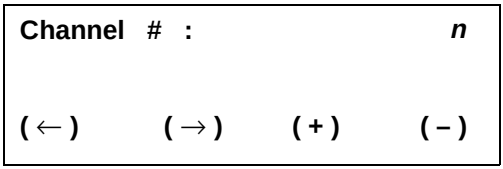


Figure 7-4. Start Rebuild, Page One

Table 7-4. Start Rebuild, Page One Description

Indication/Key		Description
Channel # : ***n***		Number indicates the SCSI channel of the drive to rebuild
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K3 (+)	Num. keypad	Increments channel number
K4 (–)	Num. keypad	Decrements channel number
Enter	Enter	Selects the drive channel for the drive to be rebuilt and displays the next screen

Select Target Drive *(Start Rebuild, Page Two)*

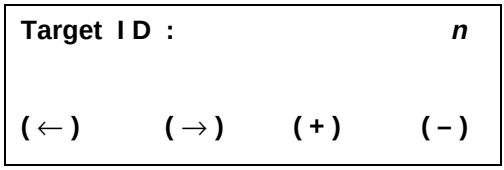


Figure 7-5. Select Target Drive, Start Rebuild, Page Two

Table 7-5. Start Rebuild, Page Two Description

Indication/Key		Description
Target ID : *n*		Number indicates the SCSI ID of the drive to rebuild
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K3 (+)	Num. keypad	Increments the drive SCSI ID number
K4 (–)	Num. keypad	Decrements the drive SCSI ID number
Enter	Enter	Selects the drive to rebuild, invokes the Rebuild process, and displays the next screen

Rebuild Status *(Start Rebuild, Page Three**)***

Figure 7-6. Rebuild Status, Start Rebuild, Page Three

Table 7-6. Start Rebuild, Page Three Description

Indication/Key		Description
Rebuild started		Message indicates that the Rebuild process is started
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu, rebuild process continues in background mode until completed

Note

An audible alarm (beep) sounds periodically until the Rebuild process is complete.

Status indication showing the completion percentage of the Rebuild is displayed on the monitor mode main title screen.

Start Parity Check

The Parity Check function is used to verify the integrity of data on a logical drive (LUN). It verifies that mirror or parity information matches the stored data on the LUNs that are redundant (RAID 1, RAID 3, RAID 5. or RAID 1+0).

If the parity block information is inconsistent with the data blocks, the controller corrects the inconsistencies.

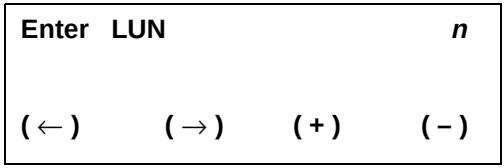


Figure 7-7. Start Parity Check, Page One

Table 7-7. Start Parity Check, Page One Description

Indication/Key		Description
Enter LUN ***n***		Number indicates the logical unit number (LUN) of the logical unit to be checked
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no logical unit is checked) and displays the previous menu screen
K3 (+)	Num. keypad	Increments the logical unit number
K4 (–)	Num. keypad	Decrements the logical unit number
Enter	Enter	Selects the logical unit to check, invokes the Parity Check function, and displays the next message screen

Parity Check Confirmation *(Start Parity Check, Page Two)*

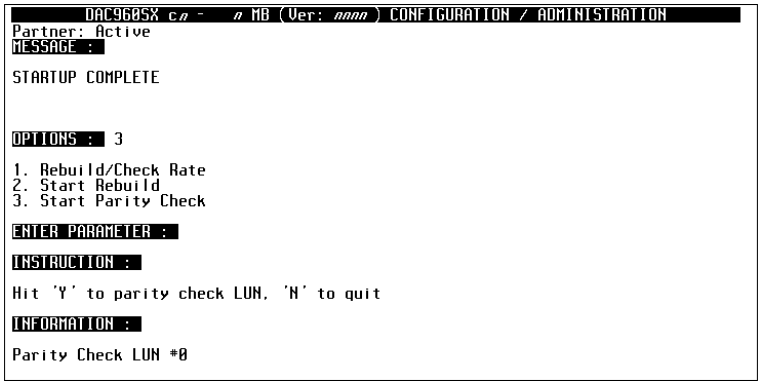
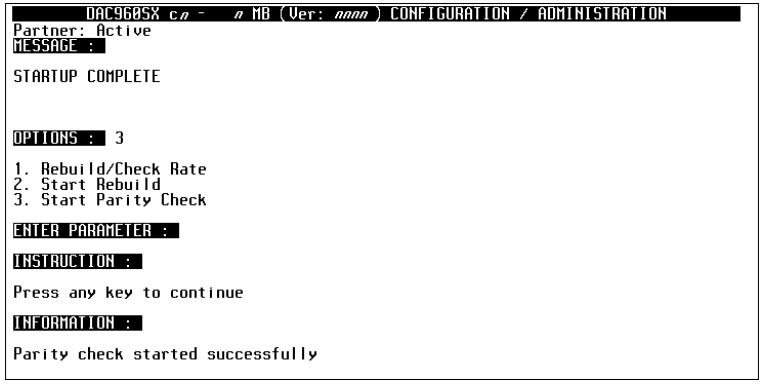


Figure 7-8. Parity Check Confirmation; Start Parity Check, Page Two

Table 7-8. Parity Check Confirmation, Page Two Description

Indication/Key		Description
Parity check LUN # – *n*		Number indicates the logical unit number (LUN) of the logical unit selected to parity check
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the parity check and displays the first page of the Administration menu
K1 (yes)	Y	Invokes the Start Parity Check function and displays the previous menu screen
K2 (no)	N	Cancels the parity check and displays the first page of the Administration menu

Parity Check Status *(Start Parity Check, Page Three)*



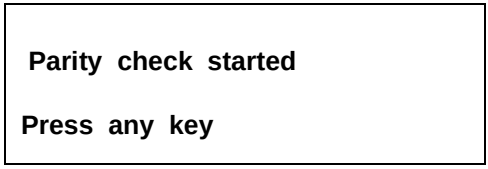


Figure 7-9. Parity Check Status, Start Parity Check, Page Three

Table 7-9. Start Parity Check, Page Three Description

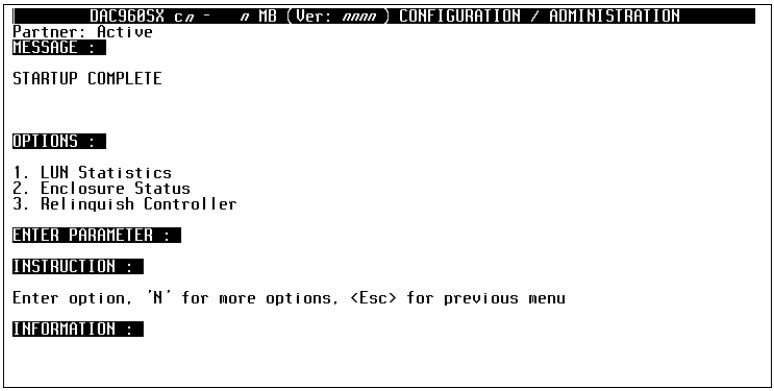
Indication/Key		Description
Parity check started		Message indicates that the Parity Check process is started
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu, parity check process continues in background mode until completed

Note

An audible alarm (beep) sounds periodically until the parity check process is complete.

Status indication showing the completion percentage of the parity check displays on the monitor mode main title screen.

Administration Menu, Page Two



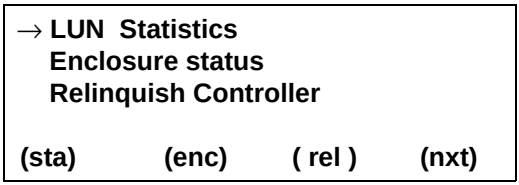


Figure 7-10. Administration Menu, Page Two

Table 7-10. Administration Menu, Page Two Description

Indication/Key		Description
LUN Statistics		Menu selection that provides statistical data about the logical units
Enclosure status		Menu selection that displays status of the fan, power supply, and temperature in an AEMI-compliant array enclosure
Relinquish Controller		Menu selection that initiates a fail-back in a dual-active system, causing both controllers to resume normal dual-active operation.
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (sta)	1	Selects the LUN Statistics function
K2 (enc)	2	Selects the Enclosure Status function
K3 (rel)	3	Selects the Relinquish Controller function
K4 (nxt)	N	Selects the next page of Administration menu selections
Enter	Enter	Invokes the submenu or function indicated by the arrow

LUN Statistics

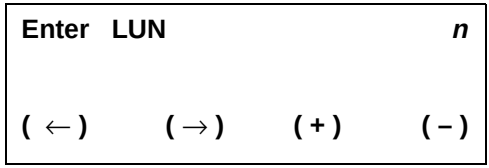
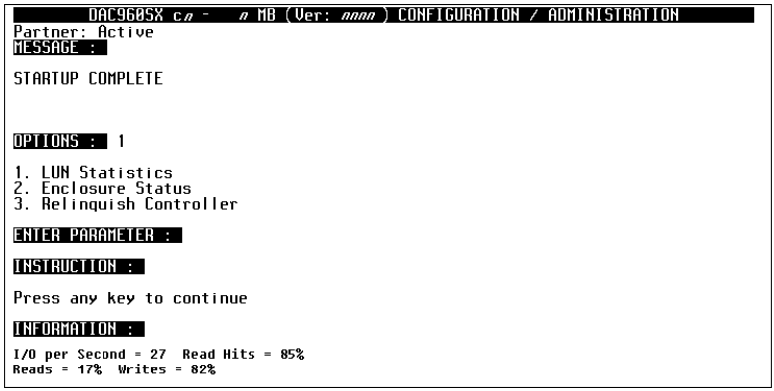


Figure 7-11. LUN Statistics, Page One

Table 7-11. LUN Statistics, Page One Description

Indication/Key		Description
Enter LUN ***n***		Number indicates the logical unit number (LUN) of the logical unit from which to view statistics
LCD Action/Key	**Terminal Action/Key**	
→	(Cursor)	Indicator arrow marks active selection
ESC	Esc	Cancels the function and displays the previous menu screen
K3 (+)	Num. keypad	Increments the logical unit number
K4 (–)	Num. keypad	Decrements the logical unit number
Enter	Enter	Invokes the LUN Statistics function and displays the next page

Statistics Display *(LUN Statistics, Page Two)*



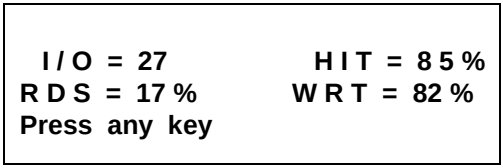


Figure 7-12. LUN Statistics, Page Two

Table 7-12. LUN Statistics, Page Two Description

Indication/Key		Description
I/O = *n*		Number indicates the average I/O transfers per second since the last time this function was invoked
HIT = *n* %		Number indicates percentage of cache read hits since the last time this function was invoked
RDS = *n* %		Number indicates percentage of LUN I/Os that were reads since the last time this function was invoked
WRT = *n* %		Number indicates percentage of LUN I/Os that were writes since the last time this function was invoked
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

☞ **Note**

The 99% total percentage number, achieved by adding I/O reads and I/O writes, is due to the rounding down of the third decimal place of the two numbers.

Enclosure Status

The DAC960SX includes cabinet fault reporting for AEMI-compatible enclosures. Status is reported on up to three fans, three power supply units (PSUs), and one enclosure temperature sensor. The status messages (pass/fail) report only the fault signals input from the enclosure.

```
        DAC960SX c# -   # MB (Ver: ####) CONFIGURATION / ADMINISTRATION
Partner: Active
MESSAGE :

STARTUP COMPLETE


OPTIONS : 2

1. LUN Statistics
2. Enclosure Status
3. Relinquish Controller

ENTER PARAMETER :

INSTRUCTION :

Press any key to continue

INFORMATION :

FAN0 FAN1 FAN2 PWR0 PWR1 PWR2 TEMP0
OKAY OKAY OKAY OKAY OKAY OKAY OKAY
```

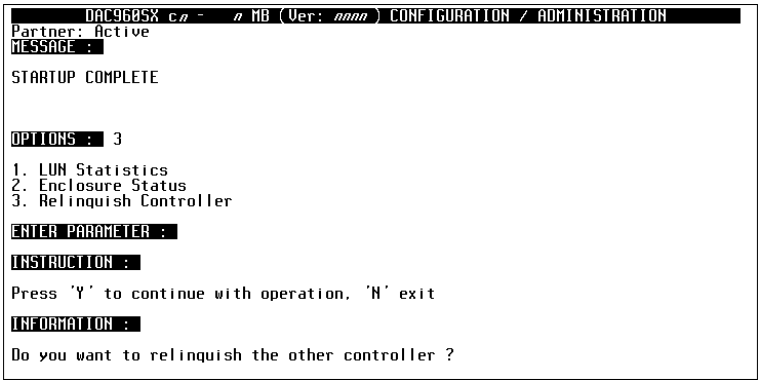
```
F0   F1   F2   P0   P1   P2   T0
OK   OK   OK   OK   OK   OK   OK
Press any key
```

Figure 7-13. Enclosure Status

Table 7-13. Enclosure Status

Indication/Key		Description
F *n* = Fan		Number indicates the enclosure fan identification
P *n* = Power unit		Number indicates the enclosure power supply unit identification
T0 = Temperature		Indicates the enclosure temperature sensor status
message		OK = operating within specified parameters ! F = failure, or operating out of specification
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

Relinquish Controller



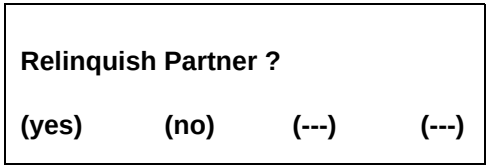


Figure 7-14. Relinquish Controller, Page One

Table 7-14. Relinquish Controller, Page One Description

Indication/Key		Description
Relinquish Partner ?		Prompt to confirm that a fail-back is to be initiated.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the fail-back and displays the first page of the Administration menu.
K1 (yes)	Y	Invokes the fail-back.
K2 (no)	N	Cancels the fail-back.

Relinquish Controller Status *(Relinquish Controller, Page Two)*

```
        DAC960SX c.n - n MB (Ver: nnnn) CONFIGURATION / ADMINISTRATION
Partner: Active
MESSAGE :

STARTUP COMPLETE


OPTIONS : 3

1. LUN Statistics
2. Enclosure Status
3. Relinquish Controller

ENTER PARAMETER :

INSTRUCTION :

Press any key to continue

INFORMATION :

Operation successfull
```

```
Operation successful

Press any key
```

Figure 7-15. Relinquish Controller, Page Two

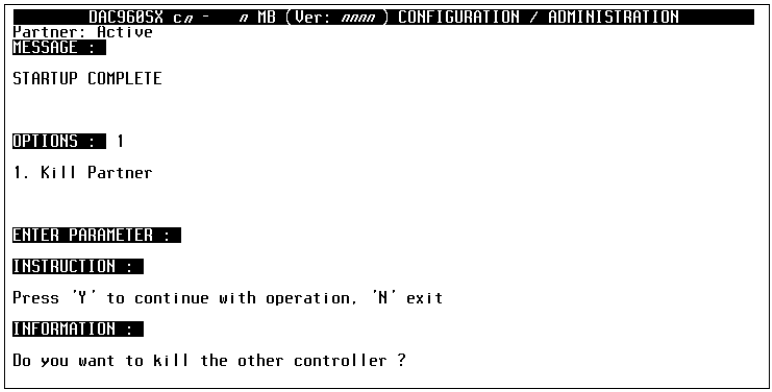
Table 7-15. Relinquish Controller, Page Two Description

Indication/Key		Description
Operation successful		Message indicates that the fail-back operation has started.
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

☛ Note

This menu selection starts a failback operation that, depending on the drive spin up settings, may take up to two minutes. When the failback is complete, a menu message will be displayed.

Administration Menu, Page Three



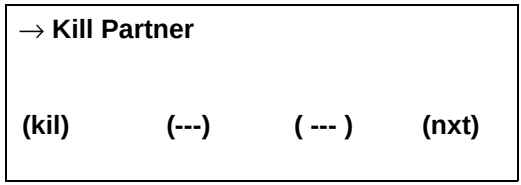


Figure 7-16. Administration Menu, Page Three

Table 7-16. Administration Menu, Page Two Description

Indication/Key		Description
Kill Partner		Menu selection that initiates a fail-over in a dual-active system. The other controller will be disabled and this controller will handle all further I/O processing.
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (kil)	1	Selects the Kill Partner function
K4 (nxt)	N	Selects the next page of Administration menu selections
Enter	Enter	Invokes the submenu or function indicated by the arrow

Kill Partner Status *(Kill Partner, Page Two**)***

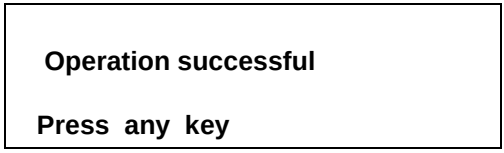


Figure 7-17. Kill Partner, Page Two

Table 7-17. Kill Partner, Page Two Description

Indication/Key		Description
Operation successful		Message indicates that the fail-over operation is completed.
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

Chapter 8
Toolkit Menu

Toolkit Menu Summary

The Toolkit Menu allows monitoring of drive information and drive preparation prior to array configuration. This menu can also be used for diagnostics and maintenance. The Toolkit menu is organized as follows:

Toolkit Menu, Page One

- Show Drives
- Drive Information
- Change Drive State

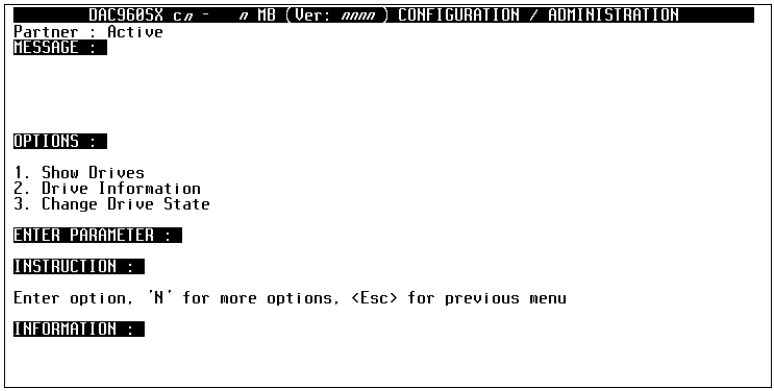
Toolkit Menu, Page Two

- Format Drives
- Controller Parameters
- Controller Diagnostics

Toolkit Menu, Page Three

- AEMI Scan

Toolkit Menu, Page One



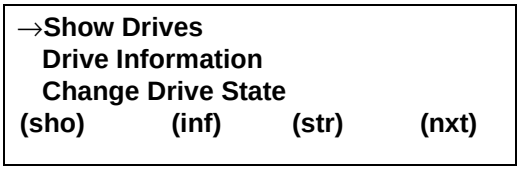


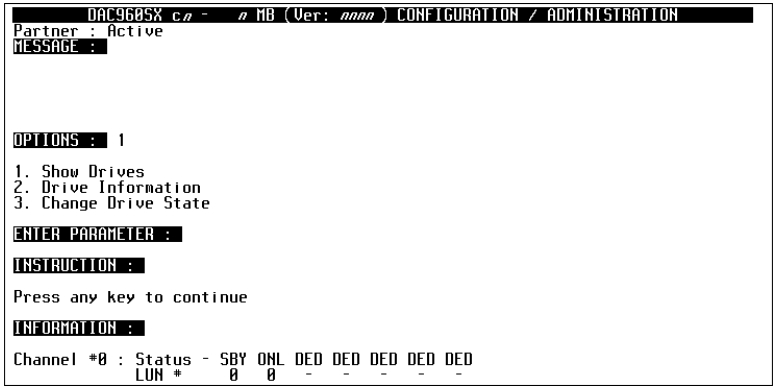
Figure 8-1. Toolkit Menu, Page One

Table 8-1. Toolkit Menu, Page One Description

Indication/Key		Description
Show Drives		Function that displays the operational state of drives in the array (online, dead, standby, write-only), and the first logical unit number associated with each drive
Drive Information		Menu selection that allows the user to get specific information about an individual drive
Change Drive State		Menu selection that allows the user to set a drive operational state to online, dead, or standby
→		Indicator arrow marks active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (sho)	1	Invokes the Show Drives function
K2 (inf)	2	Selects the Drive Information function
K3 (str)	3	Selects the Change Drive State function
K4 (nxt)	N	Selects the next page of Toolkit menu selections
Enter	Enter	Invokes the submenu selection or function indicated by the selection arrow

Show Drives Function

The Show Drives function provides drive status information.



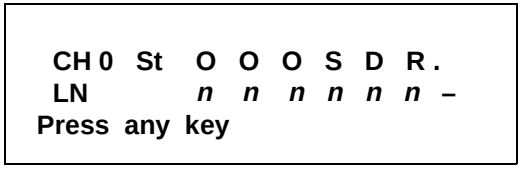


Figure 8-2. Show Drives Screen

Table 8-2. Show Drives Description

Indication/Key		Description
CH *n*		Number indicates which SCSI channel is displayed
St *x x x*		Indication shows the state of each SCSI drive on the channel. SCSI ID 0 = First position SCSI ID 1 = Second position . SCSI ID 6 = Reserved for Controller SCSI ID 7 = Reserved for Controller . SCSI ID 15 = Last position O = Online S = Spare D = Dead R = Rebuilding . = Unconfigured drive
LN *n n n*		Numbers indicate the first logical unit associated with each drive represented directly above
Press any key		Prompt for user action to clear this screen
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen
K1-K4, Enter	Any character key	Displays the screen for the next SCSI channel until all are shown

Drive Information

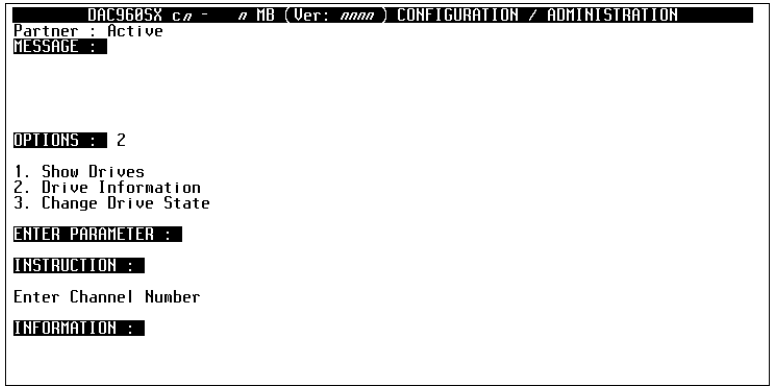
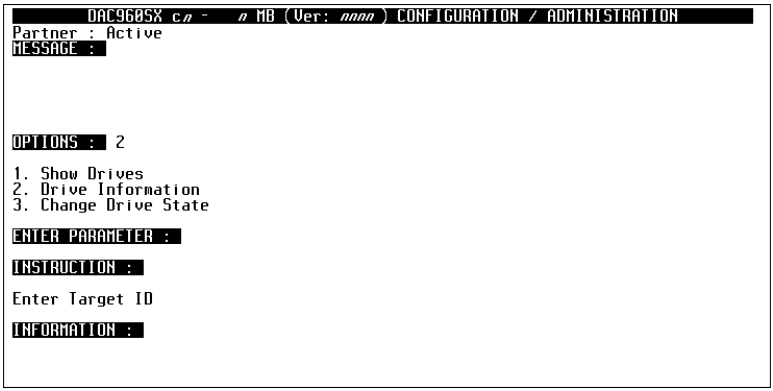


Figure 8-3. Drive Information, Page One

Table 8-3. Drive Information, Page One Description

Indication/Key		Description
Channel # : *n*		Number indicates the SCSI channel of the drive about which to display information
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K3 (+)	Num. Keypad	Increments the channel number
K4 (–)	Num. Keypad	Decrements the channel number
Enter	Enter	Selects the drive channel of the drive about which to display information and displays the next screen

Select Drive *(Drive Information, Page Two)*



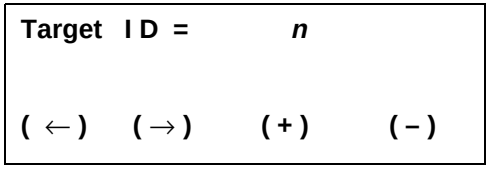
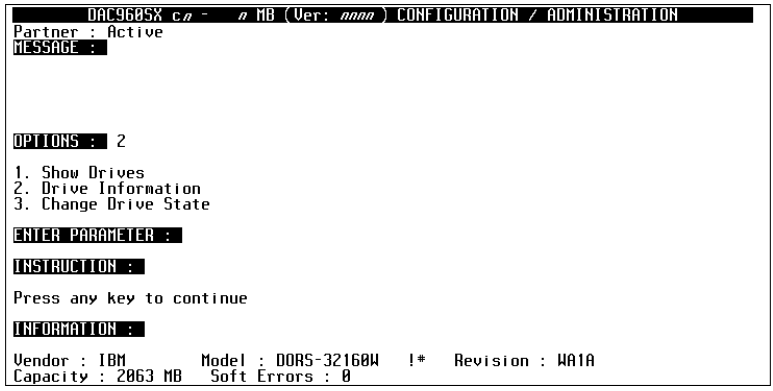


Figure 8-4. Drive Information, Page Two

Table 8-4. Drive Information, Page Two Description

Indication/Key		Description
Target ID = *n*		Number indicates the SCSI ID of the drive about which to show information
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K3 (+)	Num. Keypad	Increments the drive Target ID number
K4 (–)	Num. Keypad	Decrements the drive Target ID number
Enter	Enter	Selects the drive information function and displays the next screen

Information Display *(Drive Information, Page Three)*



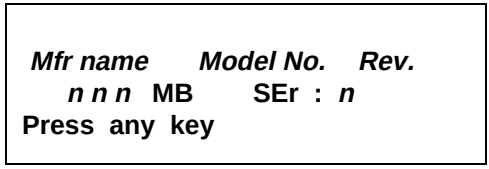


Figure 8-5. Drive Information, Page Three

Table 8-5. Drive Information, Page Three Description

Indication/Key		Description
Mfr name		Name of the drive manufacturer
Model No.		Manufacturer's model number for the drive
Rev.		Manufacturer's revision number for the drive
nnn **MB**		Numbers indicate the capacity (in megabytes) of the drive
Ser : *n*		Number indicates the number of soft errors attributed to this drive
Press any key		Prompt for user action to clear this screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous screen

Change Drive State

The Change Drive State function is used to recover from accidental drive state changes. If a user changes a failed drive to an On-line state by mistake, data integrity may be compromised.

WARNING

Changing the state of a drive can result in data loss.

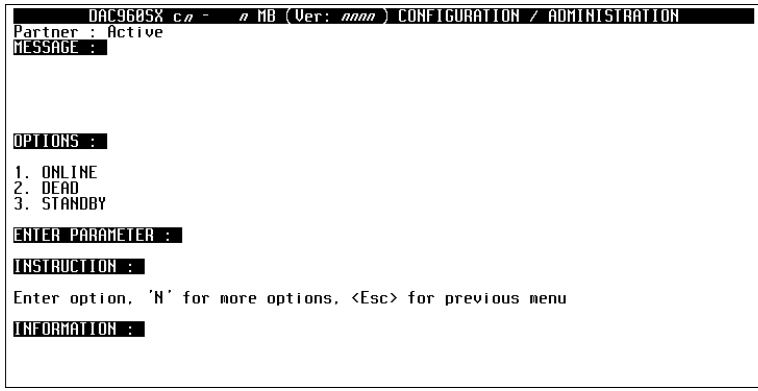


Figure 8-6. Change Drive State, Page One

Table 8-6. Change Drive State Page One Description

Indication/Key		Description
ONLINE		Menu selection that allows the user to change a drive state to Online
DEAD		Menu selection that allows the user to change a drive state to Dead
STANDBY		Menu selection that allows the user to change a drive state to Standby
→		Indicator arrow will appear and mark the active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K1 (onl)	1	Invokes the change drive state function to make the drive Online
K2 (ded)	2	Invokes the change drive state function to make the drive Dead
K3 (sby)	3	Invokes the change drive state function to make the drive Standby
Enter	Enter	Invokes the function indicated by the arrow

Select Channel *(Change Drive State, Page Two)*

Channel # :			***n***
(←)	**(→)**	**(+)**	**(–)**

Table 8-7. Select Channel, Change Drive State, Page Two

Figure 8-7. Select Channel, Change Drive State, Page Two Description

Indication/Key		Description
Channel # : *n*		Number indicates the SCSI channel of the drive that will change state
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous menu screen
K3 (+)	Num. keypad	Increments channel number
K4 (–)	Num. keypad	Decrements channel number
Enter	Enter	Selects the drive channel for the drive that will change state and displays the next screen

Select Target Drive *(Change Drive State, Page Three)*

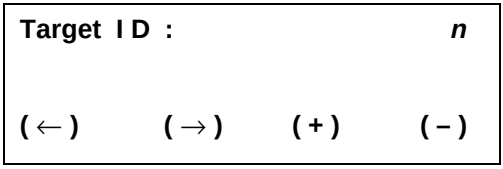


Figure 8-8. Select Drive, Change Drive State, Page Three

Table 8-8. Select Drive Change Drive State, Page Three Description

Indication/Key		Description
Target ID : *n*		Number indicates the SCSI ID of the drive that will change state
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen
K3 (+)	Num. keypad	Increments the drive SCSI ID number
K4 (–)	Num. keypad	Decrements the drive SCSI ID number
Enter	Enter	Selects the drive to change state, invokes the Change Drive State process, and displays the next screen

Status of Change *(Change Drive State, Page Four)*

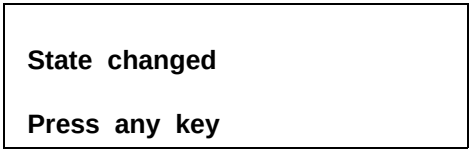


Figure 8-9. Status, Change Drive State, Page Three

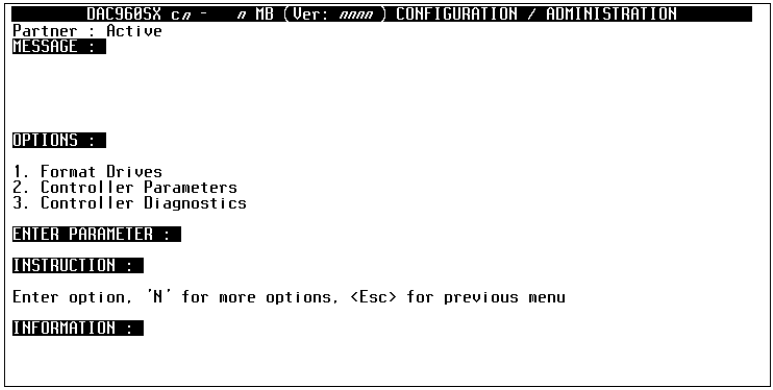
Table 8-9. Status, Change Drive State, Page Three Description

Indication/Key		Description
State changed		Message indicates that the selected drive has changed state
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

☞ Note

An audible alarm sounds when a drive state is changed to Dead.

Toolkit Menu, Page Two



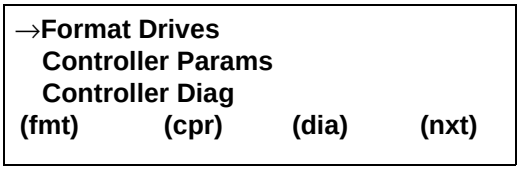


Figure 8-10. Toolkit Menu, Page Two

Table 8-10. Toolkit Menu, Page Two Description

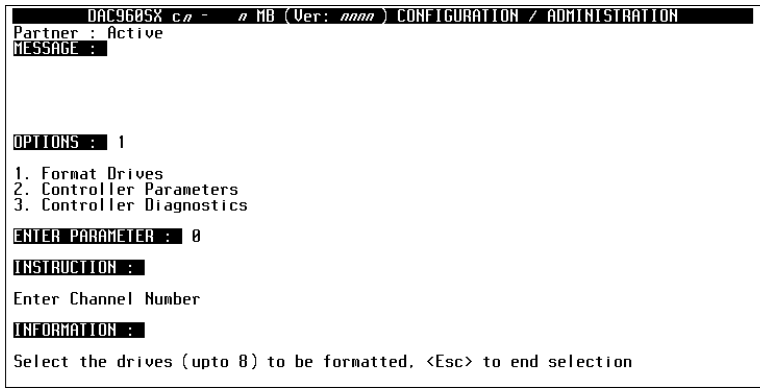
Indication/Key		Description
Format Drives		Menu selection that allows user to perform a low-level format on drives not assigned to a drive group
Controller Params		Menu selection that allows user to change specific operating parameters for the controller, drives, and SCSI channels
Controller Diag		Menu selection that allows user to run a self-test diagnostic on the controller
→		Indicator arrow marks the active selection
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Displays the previous screen (main menu)
K1 (fmt)	1	Selects the Format Drives function
K2 (cpr)	2	Selects the Controller Parameters function
K3 (dia)	3	Selects the Controller Diagnostics function
K4 (nxt)	N	Selects the next page of Toolkit menu selections
Enter	Enter	Invokes the submenu selection or function indicated by the selection arrow

Format Drives Function

The Format Drives function performs a low level format on selected drives.

WARNING

Formatting a drive will result in loss of all data on that drive. Make sure that the correct drives are selected before starting the Format Drives function.



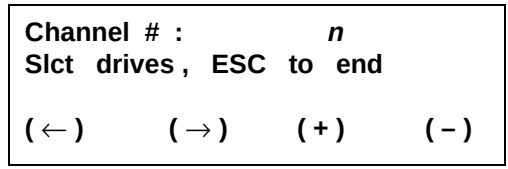


Figure 8-11. Select Channel, Format Drives, Page One

Table 8-11. Select Channel, Format Drives, Page One Description

Indication/Key		Description
Channel # : *n*		Number indicates the SCSI channel of the drive to be formatted
Slct drives, ESC to end		Prompt for user action
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function and displays the previous menu screen if no drive is selected
K3 (+)	Num. keypad	Increments the drive channel number
K4 (–)	Num. keypad	Decrements the drive channel number
Enter	Enter	Selects the drive channel containing the drives to be formatted and displays the next screen

Select Drive *(Format Drives, Page Two)*

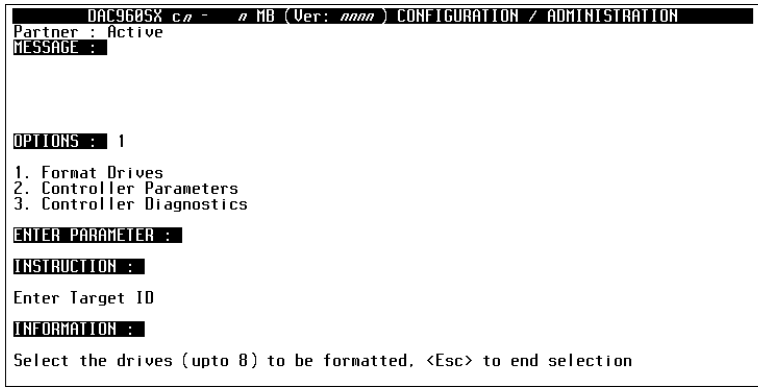
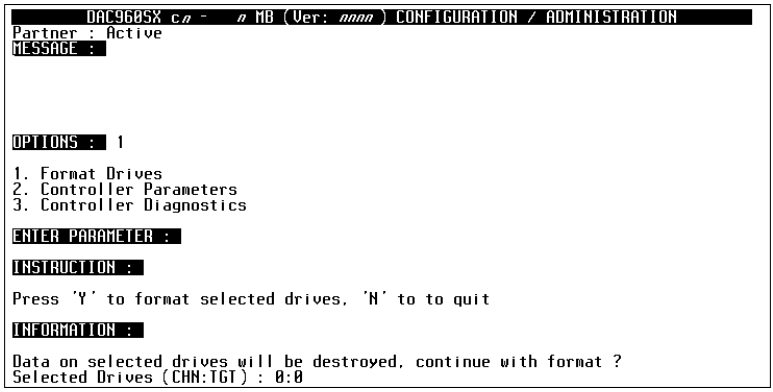


Figure 8-12. Select Drive Screen, Format Drives, Page Two

Table 8-12. Format Drives, Page Two Description

Indication/Key		Description
Target ID : *n*		Number indicates the SCSI ID of the drive to be formatted
Slct drives, ESC to end		Prompt for user action
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	1. Cancels the Format Drives function and displays the previous menu if no drives were selected for formatting by pressing the Enter key. 2. Completes the drive selection function and displays the next page
K3 (+)	Num. keypad	Increments the drive SCSI ID number
K4 (–)	Num. keypad	Decrements the drive SCSI ID number
Enter	Enter	Invokes the Select Drive function and displays another Select Channel page to allow selection of another drive for formatting

Format Confirmation *(Format Drives, Page Three)*



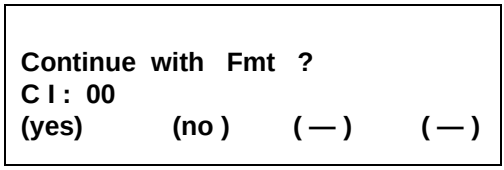


Figure 8-13. Confirm Format, Format Drives, Page Three

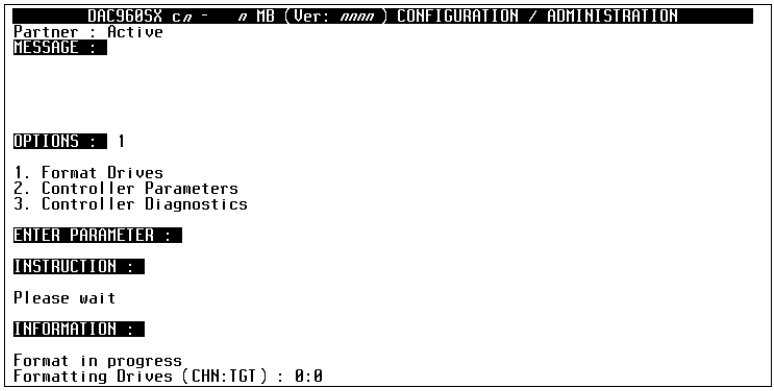
Table 8-13. Format Confirmation, Format Drives, Page Three Description

Indication/Key		Description
Continue with Fmt ?		Prompt indicates that the function will start the Format Drives process on all drives listed on the next line
C I : ***nn nn nn***		Number pairs indicate the SCSI identification of each drive that will be formatted. The first digit in each pair is the SCSI channel number. The second digit is the SCSI ID number.
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function (no drives are formatted) and displays the previous menu screen
K1 (yes)	Y	Selection formats all drives listed
K2 (no)	N	Cancels the function (no drives are formatted) and displays the previous menu screen

WARNING

Selecting YES will immediately start the Format Drives process. ALL DATA WILL BE LOST on the drive(s) being formatted.

Format in Progress *(Format Drives, Page Four)*



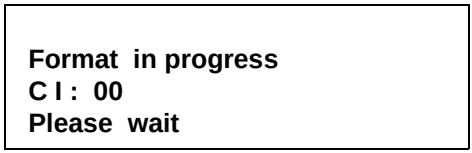
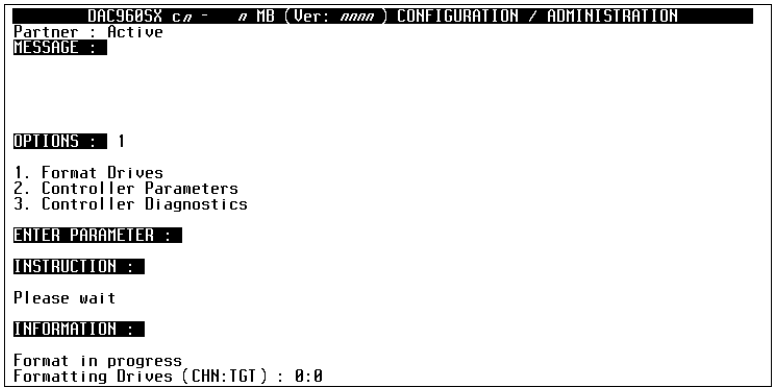


Figure 8-14. Format in Progress Screen, Format Drives, Page Four

Table 8-14. Format Drives, Page Four Description

Indication/Key		Description
Format in progress		Message line indicates that the drive formatting is in process on the selected drive's listed on the next line
C I : ***nn nn nn***		Number pairs indicate the SCSI ID of each drive that is being formatted
Message		Message line will prompt for user action when all drive formatting is complete and it is time to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	No function until drive formatting is complete. Displays previous menu screen after Format Drives process is complete for all selected drives

Format Status *(Format Drives, Page Five)*



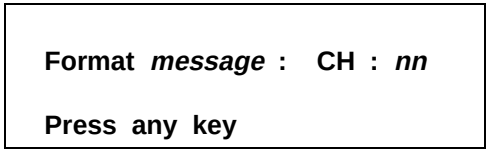


Figure 8-15. Format Status Screen, Format Drives, Page Five

Table 8-15. Format Drives, Page Five Description

Indication/Key		Description
Format *message*		Message indicates the status of the formatting process on the listed drive Format complete = Drive formated successfully Format failed = Drive did not format correctly
C H: *nn*		Number pairs indicate the SCSI ID of the drive about which format status is being reported
Press any key		Prompt for user action to clear this status screen
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Displays the previous menu

Controller Parameters

The Controller Parameters function displays the current state of various controller settings. It allows the user to change these settings with predefined optional settings.

WARNING

Saving parameter changes causes the controller's working parameters to change. This can produce unpredictable results if it occurs during host/drive activity. All activity to the controller should be stopped before saving parameter changes.

```
        DAC960SX c.n -   n MB (Ver: nnnn) CONFIGURATION / ADMINISTRATION
Partner : Active
MESSAGE :




OPTIONS : 2

1. Format Drives
2. Controller Parameters
3. Controller Diagnostics

ENTER PARAMETER :

INSTRUCTION :

Press spacebar to change, <Esc> to quit, <Enter> for next parameter

INFORMATION :

Automatic Rebuild Management : Disabled
```

Prompt message : *variable*

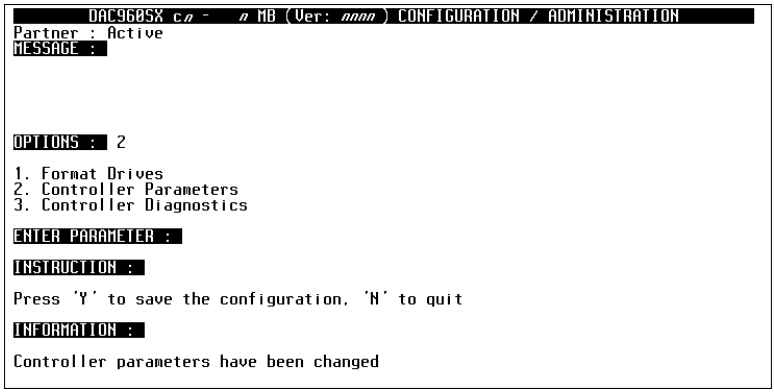
(—) (—) (chg) (—)

Figure 8-16. Controller Parameters Screen

Table 8-16. Controller Parameters Description

Indication/Key		Description
Prompt **:**		Message indicates controller parameter to be displayed
variable		Message indicates the current parameter state
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function. If changes were made, it displays the save parameters screen, otherwise it displays the previous menu screen
K3 (chg)	Spacebar	Changes the current parameter selection
Enter	Enter	Records the current parameter selection to the controller's temporary working space and displays the next parameter until all have been shown

Save Changes *(Controller Parameters)*



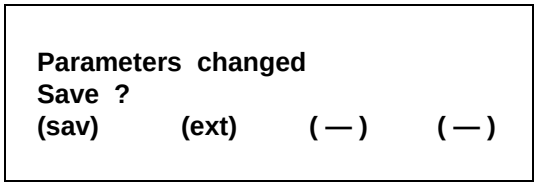


Figure 8-17. Save Controller Parameters

Table 8-17. Save Controller Parameters Description

Indication/Key		Description
Parameters changed		Function that loads the current saved configuration data into the controller temporary work space
Save ?		Menu selection that allows user to review the current configuration data
LCD Action/Key	**Terminal Action/Key**	
K1 (sav)	Y	Selection changes the controller's working parameters and saves the new settings to the controller's non-volatile memory
K2 (ext)	N	Selection exits the function without saving any changes

Controller Parameter Settings

The default settings for the DAC960SX controller parameters are shown in Table 6-18. These settings will provide optimum performance for most applications and usually will not need to be changed. In some applications, it may become necessary to change one or more of the default settings. Before making any changes to the default parameter settings, please read the provided descriptions of the parameter settings and fully understand the implications of the change that is about to be made.

WARNING

Inappropriate changes to the controller parameter settings can result in degraded performance or, possibly, data loss.

Table 8-18. Controller Parameter Settings

Prompt	Description	Selection
Auto Rbld Mgmt	Automatic Rebuild Management function	Enable*/Disable
Fault Mgmt	Fault Management function	Enable* / Disable
SCSI Active Neg	SCSI Active Negation function	Enable/Disable*
Ctl Read Ahd	Controller Read Ahead function	Enable* / Disable
Super Read Ahd	Super Read Ahead function	Enable* / Disable
Cmd Tag, Chn# *n*	Command Tag, channel number	Enable* / Disable
Force 8 Bit, Ch *n*	Fast SCSI mode, channel number	Enable / Disable*
Conserv Cache	Conservative Cache Mode function	Enable/Disable*
Force Simplex	Force Simplex Mode function	Enable/Disable*
Soft Reset	Soft Reset Mode function	Enable/Disable*
Install Abort	Installation Abort function	Enable/Disable*
Broad Reassign	Sparing function	Enable/Disable*
Ctlr Pres/Flt	Controller Present/Fault Signals function	Enable/Disable*
Auto Failback	Automatic Failback function	Enable/Disable*
SCSI Xfr, Chn# *n*	SCSI Transfer rate, channel number	20MB, 10MB*, Asyn, 8MB, 5MB
Spinup	SCSI device spin-up method	Automatic*, On Power, On Command
Stripe Size (KB)	Sequential data (Stripe) transfer size	8*, 16, 32, 64 KB
Blk Size (Bytes)	Block size in bytes	512* (Not changable)
Start Opt		NoChg,NoLunChg, NoLunOff, NoL0Chg,NoL0Off
Rebuild Rate		0 - 50
Serial ChnA		SLP/VT, DEBUG
Ctlr Pres/Flt Sel		A, B
Host Rst Dly		0 - 15

* Indicates default setting

Automatic Rebuild Management

The Automatic Rebuild Management function works in conjunction with

features in AEMI certified disk array enclosures. It detects the removal of a failed drive and performs an automatic rebuild after a replacement drive is installed into a redundant (fault tolerant) array (RAID 1, RAID 3, RAID 5, and RAID 0+1).

Automatic Rebuild Management requires hardware compatibility with disk array enclosures that are certified AEMI (Array Enclosure Management Interface) compliant.

Fault Management

The Fault Management function monitors and reports drive failures, background activity completion status, enclosure events, etc. This function should remain enabled during normal controller operation. Do not disable this function unless specifically instructed to do so as part of a trouble-shooting diagnostic activity.

SCSI Active Negation

The SCSI Active Negation function controls the negation of SCSI signals. When using the faster transfer rates associated with future technologies such as Ultra-SCSI, this feature should be enabled. Active Negation provides faster negation of SCSI signals than negation with pull-up drivers, which is currently the default negation method (Active Negation Disabled).

Controller Read Ahead

The Controller Read Ahead function improves data retrieval performance by allowing the controller to read into cache a full stripe of data at a time. This greatly improves the percentage of cache hits.

For example, if the stripe size is set to 8k and the host requests 1k of data, when this function is enabled the controller will read ahead the full 8k. When the host requests the next 1k block, that data will already be in the controller's cache. This function should remain enabled during normal controller operation.

Super Read Ahead

The Super Read Ahead function increases performance for applications that must access large blocks of sequential data. This function incorporates intelligent data request monitoring to track data requests by the host. With Super Read Ahead enabled, the controller detects requests for data that are stored in sequence on the drives. It reads the data into the cache so that the

cache remains at least one request ahead of the host. This function should remain enabled during normal controller operation.

Command Tag (Drive Channel)

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.

Force 8bit (Drive Channel)

The Force 8bit (Drive Channel) function allows the controller to communicate with Wide SCSI (16 bit) devices connected to it through a Narrow SCSI (8 bit) data cable on the specified drive channel.

The default setting for the Force 8bit function is *disabled*. Enabling this option prevents the controller from negotiating for wide SCSI transfers. This function should be enabled only when connecting Wide SCSI (16 bit) drives or devices to the controller using a Narrow SCSI (8 bit) cable.

Conservative Cache Mode

The Conservative Cache Mode function, when enabled, turns off write-back cache during recovery operations. The normal setting is disabled.

Force Simplex Operations

Enabling Force Simplex Operations forces each controller in the system to operate in simplex (single-controller) mode. Once enabled, each controller must be separately reconfigured to return to a dual-active configuration.

> ⚠ ***Caution***
>
> Do not enable Force Simplex unless it is required. Disabling Force Simplex and returning to a dual-active mode requires that each controller be reconfigured independently of the other controller. This is accomplished by removing one controller from the system, reconfiguring the remaining one, then swapping the controllers and reconfiguring the second controller; then reinstalling the first controller.

Soft Reset

The Soft Reset function determines how the DAC960SX responds to a Host SCSI bus reset. When enabled, this option prevents a hard reset to the controller's microprocessor. Soft Reset is automatically enabled and must remain enabled for dual-active configurations. When disabled, a SCSI bus reset on the host SCSI channel resets the controller's microprocessor. This option should be disabled when the DAC960SX is used in single-controller configurations.

Installation Abort

Installation Abort allows the system to continue operations if a problem occurs during configuration. This parameter is normally disabled.

Broad Reassign (Sparing)

When Broad Reassign is enabled, sparing is enabled; that is, a disk drive failure can result in the drive being reassigned to any other drive slot accessed by that controller. Disabling this option results in the drive being reassigned only to the same slot. The default setting is disabled.

Controller Present/Fault Signals

This function enables the use of back panel signals for sensing the presence of the partner controller. Disable this setting for dual-active configurations.

Automatic Failback

When enabled in a dual-active system, Automatic Failback allows the system to automatically invoke a fail-back when a failed controller is replaced.

SCSI Transfer

The SCSI Transfer function sets the maximum transfer rate for each drive channel. The default setting is 10MB. This setting produces 10 MB/sec transfers for Fast SCSI if 8-bit SCSI drives are used, or 20 MB/sec transfers for Fast and Wide SCSI drives. The 20MB setting allows 20MB/sec transfers for 8-bit Wide Ultra SCSI devices, or 40MB/sec transfers for Ultra Wide devices.

The default setting should be changed only if problems are encountered in communicating with a drive. Do not change the default setting unless you are doing so as part of a trouble-shooting activity.

Note

Problems communicating with a drive can be caused by several conditions; for example, improper termination, wrong drive ID setting, SCSI cable is too long, faulty equipment, and so on.

Spin-up

The Spin-up function controls how the SCSI drives in the array are started (spun-up). There are three different Spin-up modes that may be selected by the user. The default mode setting is Automatic.

Automatic This spin-up mode causes the controller to spin-up all connected drives, two-at-a-time at six second intervals, until every drive in the array is spinning. The controller then interrogates each drive, one-at-a-time at six second intervals, and confirms that the drive is ready for use. The interrogation process repeats until all drives have been verified.

On Power This spin-up mode waits a period of time (default: 70 seconds), assumes that all drives are spinning, and proceeds to interrogate the drives in the same manner as is described for Automatic mode. Any drive that is not ready is marked dead.

On Command This spin-up mode causes the controller to wait for a spin-up command from the host. It then proceeds to spin-up the drives in the same manner as is described for Automatic mode.

Stripe Size

The Stripe Size function is used to tune the controller performance for a specific environment or application. Generally, stripe size optimization is as follows:

- Smaller stripe sizes provide better performance for random I/O (for example, RAID 3 network, RAID 5 network, or OLTP processing)
- Larger stripe sizes provide better performance for sequential transfers (for example, RAID 0, RAID 0+1 or digital video).

The default setting is 8K (optimum random I/O performance and reduced sequential throughput). Changing the stripe size to 16K, 32K, or 64K alters

the way data is written on the drives connected to the DAC960SX controller.

WARNING

DATA LOSS will occur after changing the stripe size on a controller with existing logical units. Always back-up all data before making a stripe size change.

Always initialize the logical units after a new stripe size is saved.

Block Size

The Block Size parameter indicates that the logical block sizes of the LUNs are 512 bytes. This firmware release supports only the default setting of 512 bytes and cannot be changed.

Start Option

The Start Option setting determines whether or not the controller starts up when exiting a Configuration on Disk check.

No Change

No LUN Change

No LUN Offline

No LUN0 Change

No LUN0 Offline

Rebuild Rate

The Rebuild Rate parameter sets the percent of controller resources to be devoted to rebuild operations in the event of a disk failure. Note that this parameter can also be set directly from the Administration menu options.

Serial Channel A

The Serial Channel A parameter sets serial channel A to be used as either the debug port, or the SLP or VT100 port.

Controller Present/Fault Selection

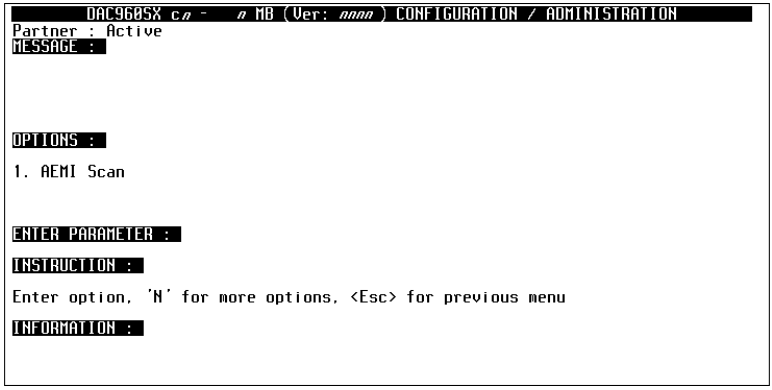
Set this option to the default setting, Disable.

Host Bus Reset Delay

The Host Bus Reset Delay parameter determines how the DAC960SX responds to the host when a failed controller is replaced in a dual active system. When set to a number between 1 and 60, the controller asserts a SCSI bus reset on the host bus after that number of seconds. A zero value results in not host bus reset being issued. Generally, this should be set to 0. If you are using the Solaris™ operating system, set to 5.

Toolkit Menu, Page Three

The AEMI Scan function is a diagnostic utility that is used to scan the SCSI drive channels to detect the removal or insertion of a drive.



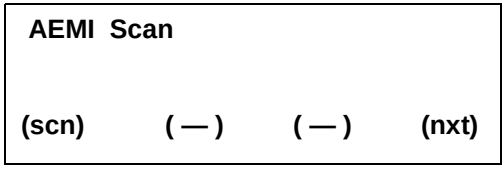


Figure 8-18. AEMI Scan, Page One

Table 8-19. AEMI Scan, Page One Description

Indication/Key		Description
AEMI scan		Function that will start the controller's built-in utility AEMI Scan diagnostic program
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the function, exits the Toolkit Menu and displays the Main Menu screen
K1 (scn)		Selects the AEMI Scan diagnostic program utility
K4 (nxt)		Cancels the function (no scan is run) and displays the previous menu screen
Enter	Enter	Invokes the AEMI Scan function and displays the next screen

Select Channel *(AEMI Scan, Page Two)*

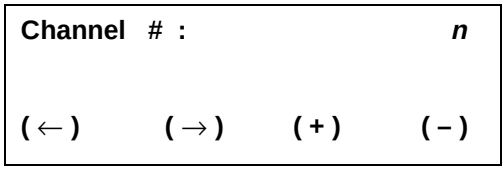


Figure 8-19. Select Channel Screen, AEMI Scan, Page Two

Table 8-20. AEMI Scan, Page Two Description

Indication/Key		Description
Channel # : *n*		Number indicates the SCSI channel to be scanned
LCD Action/Key	**Terminal Action/Key**	
ESC	Esc	Cancels the AEMI Scan function and displays the previous menu
K3 (+)	Num. keypad	Increments the SCSI drive channel number
K4 (–)	Num. keypad	Decrements the SCSI drive channel number
Enter	Enter	Invokes the AEMI Scan function and displays the next screen

AEMI Scan Started *(AEMI Scan, Page Three)*

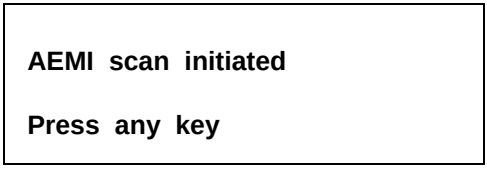


Figure 8-20. AEMI Scan Started, AEMI Scan, Page Three

Table 8-21. AEMI Scan Started, AEMI Scan, Page Three Description

Indication/Key		Description
AEMI scan initiated		Message indicates the AEMI Scan diagnostics program is loaded and ready to be run
Press any key		Prompt for user action to run the scan on the selected SCSI channel
Alarm (Tone)		Audible alarm tone indicates that the AEMI Scan detected a change in the number of drives present on the tested SCSI channel
LCD Action/Key	**Terminal Action/Key**	
Any key	Any character key	Invokes the AEMI Scan function and displays the previous menu

Appendix A
Error Messages

Table A-1. DAC960SX Error Messages

Error Message	Description	Menu/Function
Cannot Format Drive	Invalid choice of drive	Format Drives
Cannot use drive	Invalid choice of drive	Create Array
Controller Busy	Diagnostics could not be run because controller is busy	Controller Diag
Cur cfg will change	Current configuration will change if Save is invoked	Save Configuration
Diagnostics Failed	Controller diagnostics failed	Controller Diag
Entire array used	No space remains in current array to create additional logical units	Create Array
Error Code : *nnnn*	Diagnostics failed, number indicates type of failure	Controller Diag
Fail:Chk/Rbl in Prog	Failure due to a parity check or rebuild already in progress	LUN operation
Failed: Bad EEPROM	Failure in saving the configuration to EPROM	Save Configuration
Failed: Bad NVRAM	Failure in saving the configuration to Non-volatile RAM	Save Configuration
Failed: Channel Busy	Drive channel is busy	Drive Information Change Drive State
Failed: Check in Prog	A parity check is is progress on the addressed LUN	LUN operation
Failed: Disk failed	New disk failure	Start Rebuild
Failed: Drive Dead	Failure due to a dead dependent drive	LUN operation
Failed: Drv Not Ready	Unable to start drive	Drive Information Change Drive State

Table A-2. DAC960SX Error Messages (continued)

Error Message	Description	Menu/Function
Failed: Init in prog	Failed because an initialization is in progress	LUN operation
Failed: Invalid Dev	Failure due to an invalid device	Rebuild Drive Drive Information Change Drive State
Failed: Invalid LUN	Failure due a non-redundant logical unit or because a LUN does not exist	LUN operation
Failed: No Device	Drive or other device not available	Drive Information Change Drive State
Fail: Rbl/Chk in Prog	Rebuild failed because another rebuild or parity check is already in progress	Start Rebuild
Failed: Start failed	Rebuild failed because drive could not start or was Online	Start Rebuild
Failed: State Changed	A change of state has occurred	Save Configuration
Format Failed	Failure on Format function	Format Drives
Invalid drive	Invalid choice of drive	Create Standby
Invalid Device #	Invalid device address	All menus requiring a device address
Invalid Option	A submenu was not selected when required	All menus requiring the selection of a submenu
Max LUNs created	Maximum number of logical units have been created	Create Array
No arrays defined	There are no LUNs to delete	Delete Array
No LUNs defined	Invalid configuration	Create Standby Show Configuration
No Stat Avail	No LUN statistics are available	LUN operation
Saving failed	Unable to save configuration changes to controller parameters	Controller Params
SEr: *n*	The number of drive soft errors	Drive Information
Undefined LUN	Invalid LUN selection	LUN operation

Table A-3. DAC960SX Warning Messages

Warning Message	Description	Menu/Function
Illegal Operation	Operation is illegal because there is no Master/Slave configuration	Release Controller Relinquish Control
Array will be deleted	Attempt to quit before array is created will cause configuration entries made in this Create Array session to be lost	Create Array
Cfg changed. Exit ?	Attempt to exit menu before initializing a LUN that was created	Configuration Menu
SBY size too small	The size of the Standby Drive is too small to use in the existing configuration	Create Standby

Appendix B
Regulatory Information

FC Class B Compliance

THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS:

4. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
5. THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in residential installations. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is not guarantee that interference will not occur in a particular installation.

If this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

1. Reorient or relocate the receiving antenna
2. Move the equipment away from the receiver
3. Plug the equipment into an outlet on a circuit different from that to which the receiver is powered.

If necessary, the user should consult the dealer or an experienced radio/television technician for additional suggestions.

All external connections should be made using shielded cables.

⚠ *Caution*

Only equipment certified to comply with Class B (computer input/output devices, terminals, printers, etc.) should be attached to this equipment.

Any changes or modifications to the equipment by the user not expressly approved by the grantee or manufacturer could void the user's authority to operate such equipment.

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FC Declaration of Conformity

Manufacturer's Name: Mylex Corporation
Manufacturer's Address: 34551 Ardenwood Blvd.
Fremont, CA94555-3607
USA

Declares that the product:

Product Name: 5 Channel RAID Controller
Model Number(s): DAC960SX-5, Fab. 550117 Rev. A3
Year of Manufacture: 1997

Conforms to the following Product Specification(s):

EMC: EN 50081-1:1992/EN 55022:1992 Class B
EN 50082-1:1992 - Generic Immunity

EN 61000-4-2:1995,4kV CD, 8kV AD
EN 50140:1995, 3 V/m, 80 - 1000 MHz, 80%
EN 61000-4-4:1995, 0.5kV I/O, 1kV Power

Supplementary Information:

The product herewith complies with the requirements to the EMC Directive 89/336/EEC

Declaration that the equipment specified above conforms to the above directive(s) and standard(s) is on file and available for inspection at the manufacturer's address cited above.

CE Community of Europe

CE mark is rated for the DAC960SX as follows:

CISPR 22 Radiated Emission

EN55022, EN5082-1 Generic immunity standard for the following:
IEC 801-2 ESD, IEC 801-3 Radiated, and IEC 801-4 EFT/Burst

Warning!

This is a Class B product. In a residential environment this product may cause radio interference, in which case the user may be required to take adequate measures.

Achtung!

Dieses ist ein Gerät der Funkstörgrenzwertklasse B. In Wohnbereichen können bei Betrieb dieses Gerätes Rundfunkstörungen aufreten, in welchen Fällen der Benutzer für entsprechende Gegenmaßnahmen verantwortlich ist.

Avertissement!

Cet appareil est un appareil de Classe B. Dans un environnement résidentiel cet appareil peut provoquer des brouillages radioélectriques. Dans ce cas, il peut être demandé à l'utilisateur de prendre des mésures appropriées.

Glossary

Cache

Controller memory used to speed up data transfer to and from a disk.

Channel

A path for the transfer of data and control information between drives and the drive controller. Disk array controllers often have multiple channels and each channel supports multiple drives.

Data transfer capacity

The amount of data moved between devices. Generally measured in Megabytes/sec.

Disk striping

The practice of dividing data into blocks and writing them across multiple drives for increased performance.

Dual-active

A disk array system with two active controllers handling host I/O requests. Both controllers are capable of taking over the host traffic operations of the other controller in the event of a failure. Also referred to as *duplex*.

Fail-back

A process by which a controller releases its partner controller from reset and allows it to re-assume its duties.

Fail-over

A process by which a controller puts its partner controller in reset and assumes its duties.

Hot plug

Hot plug is the action of removing and inserting a controller while system power is applied. This insertion and removal can occur while the other controller in a dual-active system is active. Hot plug **does not** include the removal of a functioning controller.

Hot spare

A physical drive not part of a logical unit that the controller can use to automatically rebuild a logical unit that goes critical.

I/O

Input/Output. Refers to disk reads and writes.

Logical unit

Disk storage space on one or more physical drives which appears to the computer as one drive. (Sometimes referred to as a system drive or a logical drive.)

RAID levels

The disk array controllers monitored by this utility support four RAID Advisory Board-approved (RAID 0, RAID 1, RAID 3, RAID 5) and two special RAID levels (RAID 0+1, and JBOD).

RAID 0

The controller stripes data across multiple drives.

- Benefits: Very high data throughput, especially for large files.
- Drawbacks: Does not deliver any fault tolerance. All data is lost if any drive in the array fails.
- Uses: Intended for non-critical data requiring high performance.

RAID 1

Disk mirroring—controller duplicates data from one drive to another.

- Benefits: Provides 100% data redundancy. Should one drive fail, the controller simply switches reads and writes to the other drive.
- Drawbacks: Requires two drives for the storage space of one drive. While a controller is rebuilding a drive, users will experience reduced performance if they try to read or write data to the logical unit.
- Uses: When data availability is most important.

RAID 3

Stripes blocks of data across all drives. Maintains parity information which can be used for data recovery.

- Benefits: Uses a fraction of the disk space required by RAID 1 to achieve data redundancy. The array will continue to function normally in the event of either a member disk failure of failure of the path to a member disk. The controller can recreate lost data on a replacement drive without interrupting access by users. The controller will do so automatically if a Hot Spare is available or the administrator can manually initiate a rebuild.
- Drawbacks: Cannot match RAID 0 in write performance because of the processing required to compute and write error-correction data. While the controller is rebuilding a drive, users will experience reduced performance if they try to read or write data to the logical unit.

RAID 5

Stripes blocks of data and parity information across all drives.

- Benefits: Uses a fraction of the disk space required by RAID 1 to achieve data redundancy. Provides good performance for transaction processing applications because each drive can read and write independently. Should a drive fail, the controller continues to allow reads and writes on the failed drive by regenerating the missing information. The controller can recreate lost data on a replacement drive without interrupting access by users. The controller will do so automatically if a Hot Spare is available or the administrator can manually initiate a rebuild.

- Drawbacks: Cannot match RAID 0 in write performance because of the processing required to compute and write error-correction data. While the controller is rebuilding a drive, users will experience reduced performance if they try to read or write data to the logical unit.

RAID 0+1 (Mylex RAID 6)

Combines the benefits of disk mirroring (RAID 1) and data striping (RAID 0).

- Benefits: Optimizes for both fault tolerance and performance. Provides excellent performance for all data needs.
- Drawbacks: Requires half the available disk space for data redundancy just like RAID 1.

JBOD (Mylex RAID 7))

The controller treats a single drive as a stand-alone disk and provides a high-performance cache.

- Benefits: Cache reduces the amount of time the computer has to wait for a disk to get to the right place to read or write data.
- Drawbacks: Does not provide data redundancy and does not use striping for performance enhancements.

Index

Mylex Warranty - Customer Policy

Thank you for purchasing this Mylex product for your computer system. In addition to this high-quality product, your purchase entitles you to the warranty coverage set forth herein. In order to provide this warranty coverage, and to indicate your acceptance of this warranty, we must have the attached Warranty Registration Card completed and returned to us within 15 days of your purchase. Also, in order for us to provide you the highest level of service, we must know where you purchased your MYLEX product.

Three Year Limited Warranty

If at any time during the thirty six month period immediately following the date of original purchase of the MYLEX product enclosed herewith (the "PRODUCT") you discover one or more defects in the material or workmanship, MYLEX will repair, or at MYLEX's sole option, replace the PRODUCT. If the PRODUCT fails to operate at any time within seven days after the date of its original purchase, it will be replaced by MYLEX. Such repair or replacement will be your sole remedy against MYLEX, and MYLEX's only liability to you, for any failure or malfunction of the PRODUCT. The warranty set forth in this paragraph will be void if:

1. The PRODUCT has been installed in an improper manner or in an improper operating environment.
2. The PRODUCT has been modified or repaired by any party other than MYLEX or a MYLEX factory authorized service center.
3. The PRODUCT has been damaged.

Some MYLEX products will have a Warranty Expiration Date label affixed to the product itself. When present, the warranty period will extend through the last day of the month indicated.

This warranty will not apply to, and MYLEX provides no warranty for, any BIOS, software, ROM-based firmware, or any other PRODUCT developed or manufactured by any third party, whether included with this PRODUCT or not. Such warranty or warranties as are provided by third parties, to the extent permitted thereby, shall be made available, and are hereby assigned, by MYLEX to the purchaser of this PRODUCT.

If MYLEX issues a revision to the BIOS, firmware or software included with this PRODUCT within 30 days of your purchase, MYLEX will replace such firmware at no charge except handling fees.

Out of Warranty Service

Mylex products which are ineligible for warranty service may be serviced by MYLEX according to our standard price list, as modified from time to time. A current copy of the standard price list is available from the Technical Support Department.

Limitation of MYLEX Liability

MYLEX's liability arising from the sale, use and disposition of this PRODUCT shall in no event exceed the amount paid to MYLEX for this PRODUCT. MYLEX assumes no liability for damages arising from the use or failure of any MYLEX product. The WARRANY DESCRIBED ABOVE CONSTITUTES THE ONLY WARRANY MADE BY MYLEX. MYLEX EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES OF ANY KIND WHATSOEVER, WHETHER EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHICH ARE HEREBY EXPRESSLY EXCLUDED. IN NO EVENT WILL MYLEX BE LIABLE FOR INCIDENTAL, SPECIAL OR CONSEQUENTIAL DAMAGES (INCLUDING WITHOUT LIMITATION LOSS OF DATA, USE, OR INCOME), EVEN IF ADVISED OF SUCH DAMAGES IN ADVANCE. Your sole remedies shall be as provided herein.

P/N: 772058-05 6-98 Printed in U.S.A.

Returned Merchandise Procedures

If you suspect that there is a defect in the material or workmanship of this PRODUCT, you should contact the person or company from which you purchased it. That person or company may be able to solve the problem and if not, will be able to contact us for technical assistance or repair.

If it is determined that the PRODUCT must be returned to MYLEX for repair or replacement, contact MYLEX's Technical Support Department at 510-608-2400 before it is returned. Each returned item must have a separate Return Merchandise Authorization (RMA) number, provided by MYLEX.

The following rules apply to all returned items:

1. The PRODUCT must be returned either in its original packaging or in other packaging which is appropriate for the PRODUCT and the manner of shipment, and the RMA number must be displayed prominently on the outside of each such package.

2. If a PRODUCT is determined to be ineligible for warranty service, the customer will be notified before any further action is taken with the PRODUCT.

3. MYLEX will not be responsible for any loss or damage to property shipped with the RMA PRODUCT not originally sold by MYLEX (e.g., coprocessor chips, peripheral boards, memory modules, enclosures, power supplies, or any other accessories or attached items).

4. Any item returned to MYLEX without a valid RMA number will be returned to the shipper.

Products shipped to MYLEX must be shipped or mailed at the shipper's risk, freight prepaid, to the address below.

Mylex Corporation
34551 Ardenwood Blvd.
Fremont, California U.S.A.
94555-3607

Mylex will pay for return freight via such carrier as MYLEX shall deem appropriate.

Technical Support

Technical support, to assist you in resolving problems with MYLEX products, is now available through MYLEX's Technical Support Department. In the U.S.A., the Technical Support Department can be reached by telephone at (510) 608-2400, by FAX at (510) 745-7715, or by e-mail at support@mylex.com. Current hours of operation, which are subject to change, are from 6:00 a.m. to 6:00 p.m. Pacific Time, Mondays through Fridays, **excluding U.S.A. national holidays.** Many problems can also be solved using the Mylex Web site (http://www.mylex.com), which has a support area available 24 hours a day for interactive technical support.

Included with the shipment of most MYLEX products is a System Problem Report (SPR) form. When contacting the Technical Support Department for assistance with an installation or compatibility problem, we recommend that this form be completed and sent by facsimile or mail to MYLEX. Completion of this form will allow our Technical Support Department to solve most technical problems expeditiously.

Mylex will make reasonable efforts to address compatibility problems which may arise with respect to third party products, but shall not be responsible for the compatibility of its products with the products of any third party. Customers are advised to verify each product's compatibility with their installation before committing to any particular procurement plan.

MYLEX DAC960 Problem Report

Use the Mylex fax number (510) 745-7715 to transmit this form to the Technical Services Department, or mail to Mylex Corporation, Technical Services Department, 34551 Ardenwood Blvd., Fremont, CA 94555-3607

Customer Identification	DAC960 Identification	
Name:	Date:	Purchase Date:
Company:	Model	
Address:	Invoice Number:	
	Serial Number:	
	Firmware Type, Version, Build:	
Country:	RAM Size:	
	Disk Drives (Make/Model/Sizes):	
Phone Number:		
Fax Number:		
Priority of Problem:		

Configuration Information (Controller Parameter Settings)		
Auto Rebuild Management	Fault Management	SCSI Active Negation
Controller Read Ahead	Super Read Ahead	Command Tag, Chan 0
Command Tag, Channel 1	Command Tag, Channel 2	Command Tag, Channel 3
Command Tag, Channel 4	Force 8 Bit, Channel 0	Force 8 Bit, Channel 1
Force 8 Bit, Channel 2	Force 8 Bit, Channel 3	Force 8 Bit, Channel 4
Conservative Cache	Force Simplex	Soft Reset
Install Abort	Broad Reassign	Controller Present/Fault
Auto Failback	SCSI Transfer, Channel 0	SCSI Transfer, Channel 1
SCSI Transfer, Channel 2	SCSI Transfer, Channel 3	SCSI Transfer, Channel 4
Spinup	Stripe Size	Block Size
Start Option	Rebuild Rate	Serial Channel A
Cntrl. Present/Fault Select	Host Rest Delay	

Array Configuration
For each pack, provide: pack number, SCSI channel and ID of physical drives configured into pack.

System Drive Configuration
For each system drive, provide: system drive number, size, RAID level, write cache policy (WT/WB), SD Affinity:

Host Configuration		
Host type	Host OS level	HBA LUN queue depth
File system type	HBA vendor and model	HBA driver version
Type of I/O (random/sequential, read/ write)		Host OS service packs/ patches installed

Additional Information. Please attach configuration data structures, diagnostic/debug output, and a SCSI bus trace.

Benchmark utility	Affected Mylex documentation	Error codes returned?
Any error messages displayed on the LCD panel?	Is the problem reproduceable?	Affected Direct Commands

Step-by-step instructions to reproduce:

Description of Problem

WARRANTY REGISTRATION CARD

To validate your warranty and receive any future updates concerning your product, you must complete and return this Warranty Registration Card within 10 days of purchase. (Please Print)

NAME: _____ COMPANY: _____

ADDRESS: _____ CITY: _____

STATE: _____ ZIP CODE: _____ COUNTRY: _____

TELEPHONE: _____ FAX NO: _____ E-MAIL: _____

DATE PURCHASED: _____ MODEL NO: _____ SERIAL NO: _____

PURCHASED FROM: _____

ADDRESS: _____ CITY: _____

STATE: _____ ZIP CODE: _____ COUNTRY: _____

In order for Mylex to better serve your needs, please complete the following:

1. How did you first learn about MYLEX products?
   - ❑ Advertisement (Name of Pub)_____
   - ❑ Article Review
   - ❑ Friend
   - ❑ Retailer_____
   - ❑ Salesperson
   - ❑ Other

2. Where will this product be used?
   - ❑ Home
   - ❑ Workplace

3. What other brands, if any, did you consider? _____

4. Please indicate the most common uses of your system:
   - ❑ Personal
   - ❑ Business
   - ❑ Graphics (CAD/CAM or Business Graphics)
   - ❑ Accounting
   - ❑ Digital Video
   - ❑ Data Retrieval
   - ❑ Multi-User
   - ❑ Multi-Tasking
   - ❑ Database

5. Which factor most influenced your purchase?
   - ❑ Company Reputation
   - ❑ Price
   - ❑ Features (List)_____
   - ❑ Performance

6. What does your computer system include? (Please specify brand and model)
   - ❑ System Unit_____
   - ❑ Monitor_____
   - ❑ Peripherals _____
   - ❑ Operating System _____

7. What add-ons or peripherals are you most considering for future purchase? _____

8. What best describes your occupation?
   - ❑ Management/Administration
   - ❑ Sales/Service
   - ❑ Technical-Scientific/Engineering
   - ❑ MIS
   - ❑ Other_____

9. Do you have any comments or suggestions? _____

10. Have you ever purchased Mylex products in the past?
    - ❑ Yes
    - ❑ No

    If yes, which products? _____

11. Who purchased this product?
    - ❑ Individual
    - ❑ Company

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Place
Postage
Here

MYLEX

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