DAC960SX
Ultra SCSI to Ultra SCSI
Disk Array Controller
Installation Guide

Part Number 771990 Rev. A

Greetings

Thank you for purchasing the Mylex DAC960SX.

This manual describes the installation of the Mylex DAC960SX controller.

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About This Manual

This installation guide provides installation and configuration procedures for the DAC960SX Ultra SCSI to Ultra SCSI Disk Array Controller. It assumes that the reader has a strong knowledge of SCSI and RAID technologies. For more detailed information, refer to the *DAC960SX User Guide*.

Related Publications

Other manuals that may be needed during installation include:

- *RAIDfx Manager User Guide* (softcopy in PDF format is available on the distribution media or on the Product Documentation page of the Mylex web site (http://www.mylex.com)
- *DAC960SX Family User Guide* (softcopy in PDF format is vailable on the distribution media or on the Product Documentation page of the Mylex web site (http://www.mylex.com).
- Owner's manuals for SCSI drives, host system, or other components

Conventions

Throughout the manual, the following conventions are used to describe user interaction with the product:

`Bold`	Bold text in this font represents command text to be entered, exactly as shown.
`Regular`	Regular text in this font represents prompts and messages displayed on the screen.
Enter	This typeface represents a specific key, such as **Enter**, or Delete.

Note

Notes contain useful supplementary information.

Caution

Cautions notify when an action can adversely affect equipment operation, performance, or data integrity.

WARNING

Warnings indicate when an action will result in equipment damage, data loss, or personal injury.

Contents

Chapter 1
Introduction

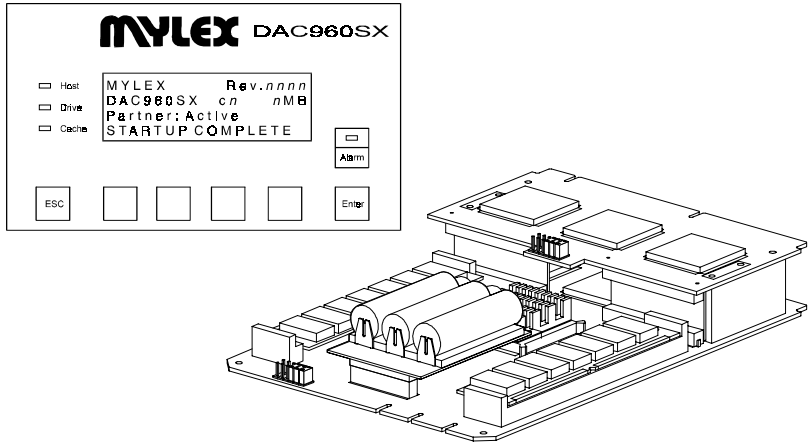

Figure 1-1. DAC960SX Integrator Chassis Front Panel and Mainboard, Daughterboard, Battery Back-up Assembly

The DAC960SX Ultra-SCSI-to-Ultra-SCSI Disk Array Controller brings RAID functionality and high speed Ultra-SCSI data transfer performance to any computing platform equipped with a standard Ultra-SCSI interface. When configured in a Dual-Active configuration, the DAC960SX provides continuous access to data, even through a single controller failure.

The DAC960SX is an intelligent, caching controller that supports industry-standard RAID levels (0, 1, 3, 5, and 0+1) for multiple-drive arrays, and JBOD (Just a Bunch of Disks) for single-drive control functionality. The DAC960SX also supports RAID 10, 30 and 50 in spanned disk arrays.

The information provided in this manual will assist the technician in properly preparing, installing and configuring the DAC960SX for operation in any of the supported RAID applications.

Supported Applications

There are three types of installations that are covered in this manual:

1. Simplex – a single DAC960SX controller connected to a single host bus adapter (HBA).
2. Dual-Active (sometimes called Duplex) – two DAC960SX controllers connected to either a single HBA or to dual HBAs.
3. Dual Host – either a single controller or a Dual-Active configuration connected to two separate hosts, or to two host bus adapters installed in a single host.

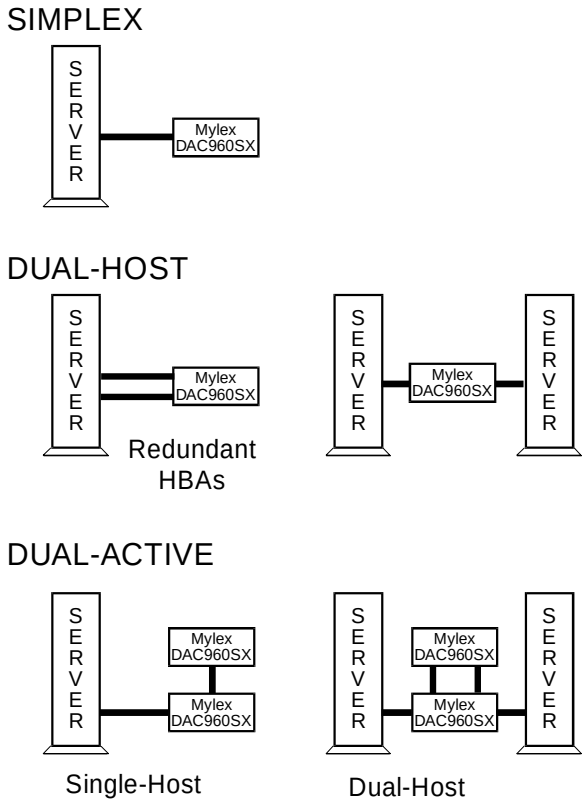

Figure 1-2. DAC960SX Configuration Options

Installation Requirements

User-supplied Items

The following user-supplied items are required to perform this installation:

- Disk array enclosure (or equivalent) that will accommodate the SCSI drives and at least one 5¼-inch full-height device (the DAC960SX)
- External SCSI active negation terminators (recommended) - either single-ended or differential, as required
- SCSI cables to connect the controller and disk drives
- SCSI hard disk drives – for a drive compatibility list, go to the Technical Support page of the Mylex Website (www.mylex.com)
- VT100™ compatible terminal and a null-modem cable (if an LCD control panel is not present).

Unique Requirements for Dual-Active Installations

The hardware requirements for a dual-active configuration are listed below. For more information, see “Selecting the Correct Firmware Option” beginning on page 2-1.

- Both controllers must have the same physical configuration (number of host and SCSI drive channels, amount of memory, distribution board, daughter board, BBU,), and the same firmware revision and type.
- A Dual-Active version of the firmware must be flashed into each controller’s EEPROM.
- A Dual-Active cable (available from Mylex, P/N A750159) for connecting the two controllers’ heartbeat signal.
- All SCSI drive channels on the primary controller (C0) must be connected to the same SCSI drive channels on the partner controller (C1). For example, Drive Channel 0 on Controller 0 must be connected to Drive Channel 0 on Controller 1, and so on.

> ☛ **Note**
>
> All drive channels must be interconnected and terminated, even if they are not being used, or the Dual-Active mode will not work (continued).

If daughter boards are installed, the same rule applies to Drive Channels 2 and 3 on C0 and C1 and optional Host Channel 1/Drive Channel 4 on C0 and C1.

Environmental Requirements

Electrical

Input Power	12V ± 5% @ 100 mA
	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)

Chapter 2
Pre-installation Planning

Mylex RAID controllers are designed to work in a variety of application environments. Prior to installing the DAC960SX, the following must be determined:

- **RAID Level.** The DAC960SX supports RAID level 0, 1, 3, 5, 0+1, 10, 30, and 50. For more information, refer to the *DAC960SX User Guide*.
- **Configuration Type.** The DAC960SX supports single controller, dual controller (Dual-Active) and Dual Host redundant modes. For more information, see "Selecting the Correct Firmware Option", below.
- **SCSI Cabling.** Each configuration type has different cabling requirements. For more information, see "SCSI Cabling Requirements" on page 2-8.
- **Termination.** Each configuration has different termination requirements. To determine how many terminators are needed and where they should be placed, see "Preparing the SCSI Drives" on page 2-10.

Selecting the Correct Firmware Option

The DAC960SX is shipped from the factory with one of two firmware versions loaded depending on the type of distribution board specified at the time of purchase (single-ended or differential). If the configuration to be installed requires a firmware change, the appropriate replacement firmware version must be loaded before proceeding.

> ☞ **Note**
>
> To determine which version of firmware is installed on the controller, refer to Appendix B "Downloading Firmware" for instructions.

The different firmware versions available for the DAC960SX are listed in Table 2-1.

Table 2-1. Firmware Types

Firmware Version	Description	Factory Default with Distribution Board
0*nnn*	Single host, no UNIX support, no dual-active support	—
1*nnn*	Dual-host (daughter board required.), no UNIX support, no dual-active support	—
2*nnn*	Single host, UNIX support, no dual-active support	—
3*nnn*	Dual-host (daughter board required.), UNIX support, no dual-active support	—
4*nnn*	Dual-active support, single host, no UNIX support	DBX960S-6-FWR, DBX960S-3-UDR
5*nnn*	Dual-active support, dual-host (daughter board required.), no UNIX support	DBX960S-6-UDR
6*nnn*	Dual-active support, single host, UNIX support	—
7*nnn*	Dual-active support, dual-host (daughter board required.), UNIX support	—

Selecting the Correct Configuration

All Mylex DAC960 controllers use RAID technology to provide protection against drive failures, since disk drives are typically the weakest link in the data storage chain. Additionally, the DAC960SX supports configurations that employ multiple hosts and redundant controllers for improved fault-tolerance and high-performance data through-put.

Single Controller Configurations

Single Controller / Single Host (Simplex)

The Simplex configuration is the classic configuration supported by all Mylex DAC960 series SCSI-to-SCSI controllers. A single controller connects to a single host bus adapter and all the disk drives in the array. Drives are fault tolerant when a RAID level providing redundancy is used. In the Simplex configuration, however, if the controller or host bus adapter should fail, the data will not be accessible until the failure is corrected.

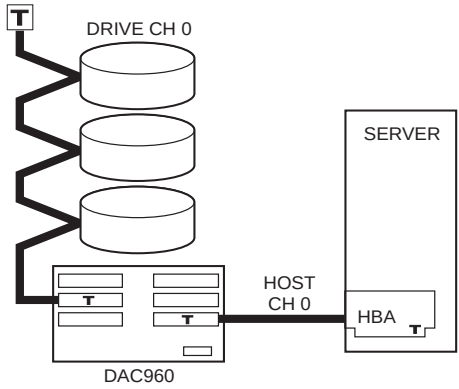

Figure 2-1. Simplex Configuration

Single Controller / Dual Host

The standard DAC960SX has three SCSI channels, one designated as a host channel, and two as disk channels. The optional daughterboard 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.

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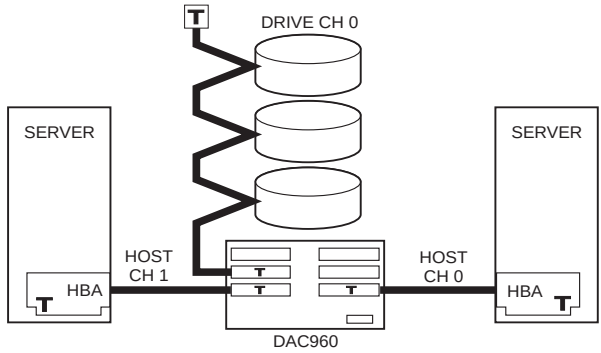


Figure 2-2. Dual-Host Configuration

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.

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 high availability host software (available from the host operating system supplier).

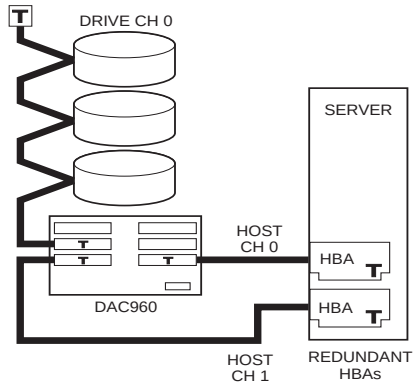


Figure 2-3. Two Host Channels Connected to two HBAs in One System

Dual Controller (Dual-Active) Configurations

The Dual-Active configuration uses two identically configured controllers to ensure that if either controller fails, the other will take over its functions and continue to process system I/O operations. This is know as *failover.* Under normal conditions, when both controllers are functioning (active/active mode), both are actively processing data. Consequentially, this improves overall system performance.

Dual Controller (Dual-Active) / Single Host

In this configuration, two active controllers are connected to a single host using daisy-chain cabling. The two controllers communicate with each other to verify that both are functioning properly through a ping/acknowlegement sequence (heartbeat). Failure to acknowledge the ping triggers failover.

The drive channels also carry signals necessary to the controllers' functions. This requires all drive channels to be connected and terminated even if they do not contain any drives. External termination provides maximum fault-tolerance by preserving the ability to hot-swap failed devices.

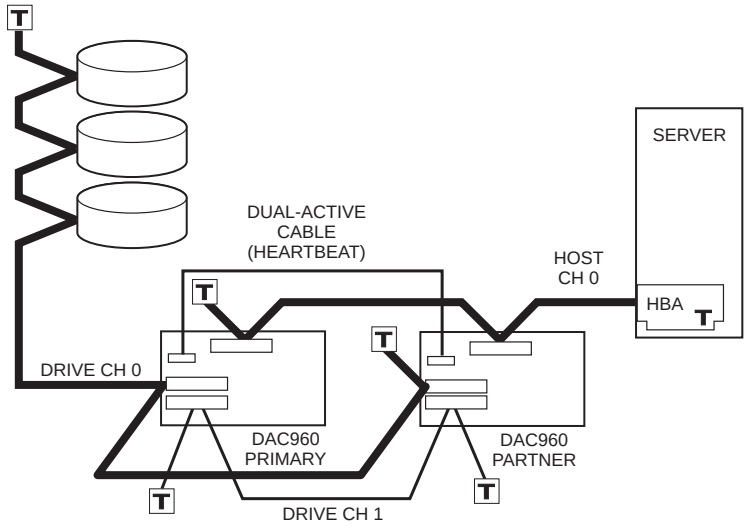


Figure 2-4. Dual-Active Configuration

Dual Controller (Dual-Active) / Dual Host

The Dual-Active / Dual Host configuration offers the advantages of being able to sustain data access in the event of a controller failure. If configured in a cluster or high availability environment, it is also able to sustain data access in the event of the failure of a server or an HBA.

Cabling for Dual Active/Dual Host is similar to the previous example Single Host cabling, except there is more of it. Cables are daisy-chained, with external termination, and all drive channels are connected and terminated.

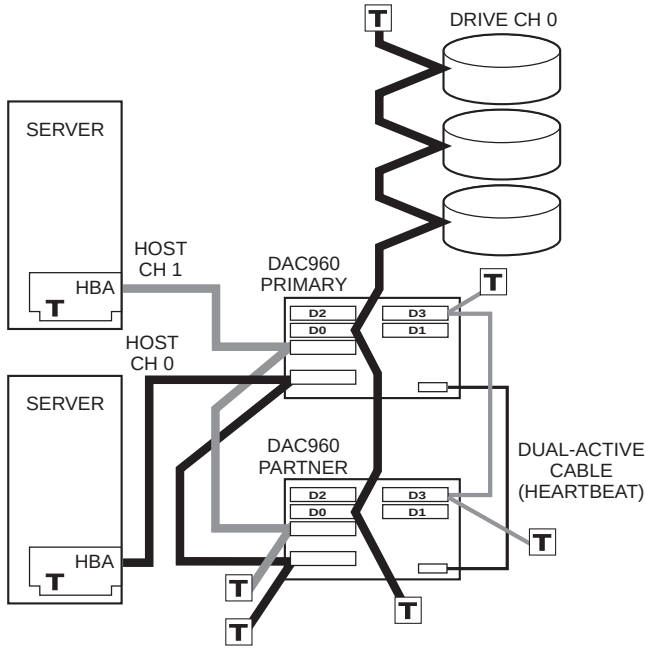


Figure 2-5. Dual Active/Dual Host Configuration

Selecting the Correct 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 each end of each SCSI drive and Host channel, or by terminating the devices closest to each of the two ends of each SCSI 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 swap drives or controllers in Dual-Active configurations to be added or removed without affecting bus termination.

Review the following table for termination guidelines for the configuration being installed.

> ☞ **Note**
>
> Default on-board termination settings for the DAC960SX controller are:
>
> - All drive channels – **Termination Enabled**
> - Host channel, single-ended distribution board (DBX960S-6-FWR) – **Termination Enabled**
> - Host channel(s), differential distribution boards – **Termination Disabled**

Table 2-2. Termination Guidelines

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

SCSI Cabling Requirements

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

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 2-3. 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. Number of 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

Special Rules for Cabling Dual-Active Configurations

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 to the same SCSI drive port on **both** distribution boards; e.g., Drives to Ch 0 on C0 and Ch 0 on C1.
- Host ports on both controllers must be interconnected for transparent failover to take place; that is, Host Port 0 must be connected to Host Port 0, and Host Port 1 must be connected to Host Port 1.
- The Dual-Active communications ports on both controllers must be connected using a Dual-Active cable (Mylex P/N A750159).
- All SCSI drive and host channels must be terminated externally, not on the devices, to ensure access to data in the event of a disk drive or controller failure.
- All drive channels on both controllers must be interconnected and terminated, **even if they are not used**; Ch 1 to Ch1, Ch2 to Ch2, etc.

Preparing the SCSI Drives

Refer to the drive manual for information about its configuration jumpers. Prepare the drives for installation as follows:

- Remove any terminators attached to the drive, or disable drive termination jumpers
- Enable term power on each drive
- Set a unique SCSI ID address on each drive

Note

In a simplex environment, the controller (C 0) uses SCSI ID 7. In a Dual-Active environment, the primary controller (C 0) uses SCSI ID 7; the partner controller (C 1) uses SCSI ID 6 on each drive channel.

The instructions in this manual assume that the disk drives are already formatted. If the drives are not formatted, use the *Format Drives* option under the DAC960SX control panel *Toolkit* menu.

Preparing the Enclosure

The enclosure may require mounting rails for the drives or controller. Refer to the installation instructions provided by the enclosure manufacturer.

Screws (No.6-32, coarse thread) for attaching mounting rails to the controller are provided in the DAC960SX hardware package.

Caution

DO NOT block the fan outlet at the top of the DAC960SX, or equipment malfunction may occur. Allow sufficient space in the enclosure above the controller fan outlet for proper ventilation.

Chapter 3
Installation

Before You Begin

Observe the following instructions for safely starting the installation:

1. Follow the Notes, Cautions, and Warnings in this manual and marked on the equipment.
2. Check the host system for available SCSI IDs and for system resources (e.g., HBA) required for the array controller.
3. Safely power off the chassis where the DAC960SX will be installed. Do not disconnect cables or power cords while system power is on.
4. Confirm all SCSI conventions (cable type, cable length, termination, and IDs) are correct. Duplicate IDs or incorrect termination can cause serious system errors.
5. Verify the site selected will accommodate the enclosure requirements.
6. For a dual-active system configuration, make sure the two controllers have the same amount of memory and the same firmware version level.

Flashing the Firmware

Typically, the DAC960SX is contains one of two firmware versions installed at the factory, as described previously in Chapter 2. If a different firmware version is needed for the configuration being installed, the correct firmware must be loaded onto the controller before proceeding. For more information, see Appendix B “Downloading Firmware”.

Configuring the Distribution Board(s)

Configuring the distribution board(s) includes:

- Setting the Controller ID(s)
- Setting SCSI ID(s) for the host port(s)
- Configuring the serial port
- Setting the termination

The procedures in this section are performed on the DAC960SX distribution board. Refer to Appendix A for illustrations of the three DAC960SX distribution boards and tables that define their jumper settings.

Setting the Controller ID(s)

Controller SCSI IDs are defined by setting Jumper 8 on the J6 jumper block of the distribution board (see Appendix A). Depending on the configuration, set the controller ID(s) based on Table 3-1:

Table 3-1. Controller ID Selection

Configuration Type	Controller Settings
Single Controller	Configure DAC960SX as Controller 0 (default)
Dual-active Controllers	Configure one DAC960SX as Controller 0 (default) and the other as Controller 1.

Setting SCSI IDs for the Host Ports

Set the SCSI ID for each host port (one or two per controller), making sure each ID is unique for the connected SCSI bus. The host port SCSI IDs are set using the J6 jumper block on the distribution board. The SCSI ID is set using jumpers 1 – 4 for Host Port 0 and jumpers 9 –12 for Host Port 1.

> ☞ **Note**
>
> For Dual-Active controllers, set both controllers for the same SCSI ID. During Dual-Active controller operation, the actual SCSI ID may be different than the selected ID. This occurs because each controller in the configuration has a primary and a secondary ID. If a controller fails, the surviving controller responds to both SCSI IDs.

The following table shows jumper settings for each SCSI ID number for host ports 0 and 1. A dark rectangle represents jumpered pins.

Table 3-2. Host Port SCSI ID Settings

Selected SCSI ID	J6 Configuration								Actual SCSI ID		
	Host Port 0				Host Port 1				Single Controller	Dual-active	
	PIN 1	PIN 2	PIN 3	PIN 4	PIN 9	PIN 10	PIN 11	PIN 12		C0	C1
0	o o	o o	o o	o o	o o	o o	o o	o o	0	0	1
1	[o o]	o o	o o	o o	[o o]	o o	o o	o o	1	0	1
2	o o	[o o]	o o	o o	o o	[o o]	o o	o o	2	2	3
3	[o o]	[o o]	o o	o o	[o o]	[o o]	o o	o o	3	2	3
4	o o	o o	[o o]	o o	o o	o o	[o o]	o o	4	4	5
5	[o o]	o o	[o o]	o o	[o o]	o o	[o o]	o o	5	4	5
6	o o	[o o]	[o o]	o o	o o	[o o]	[o o]	o o	6	6	7
7	[o o]	[o o]	[o o]	o o	[o o]	[o o]	[o o]	o o	7	6	7
8	o o	o o	o o	[o o]	o o	o o	o o	[o o]	8	8	9
9	[o o]	o o	o o	[o o]	[o o]	o o	o o	[o o]	9	8	9
10	o o	[o o]	o o	[o o]	o o	[o o]	o o	[o o]	10	10	11
11	[o o]	[o o]	o o	[o o]	[o o]	[o o]	o o	[o o]	11	10	11
12	o o	o o	[o o]	[o o]	o o	o o	[o o]	[o o]	12	12	13
13	[o o]	o o	[o o]	[o o]	[o o]	o o	[o o]	[o o]	13	12	13
14	o o	[o o]	[o o]	[o o]	o o	[o o]	[o o]	[o o]	14	14	15
15	[o o]	[o o]	[o o]	[o o]	[o o]	[o o]	[o o]	[o o]	15	14	15

Configuring the Serial Port

The serial port is used for downloading firmware and utilities through a terminal-emulation program or SLP interface. Serial port settings are defined by jumpers 6 and 7 on the J6 distribution board jumper block.

Table 3-3. Serial Port Settings

Pin	Description	Jumper Installed	Jumper Removed
6	Serial port protocol	Terminal-emulation	SLP (default)*
7	Serial port baud rate	19.2 kilobaud	Reserved—leave at default

* SLP serial mode is supported only for firmware downloads

Terminating the Host and Drive Channels

For information on where termination is required for the configuration being installed, see “Preparing the SCSI Drives” on page 2-10. For jumper locations and settings, see “DAC960SX SCSI-to-SCSI Controller” on page A-5.

Terminating the Host Channels

The DAC960SX controller mainboard and daughter board are shipped with single-ended internal termination enabled for all drive channels and host channel 0 (single-ended host versions only). If external terminators are being used (recommended), or if the host / drive port(s) are not at the end of a SCSI channel, on-board termination for that channel must be disabled.

> **Note**
>
> Differential distribution boards require external termination. To terminate a differential SCSI host port, place a terminator at the end of the host channel bus.

To disable termination for Host Port 0, access the controller mainboard and remove jumper 3 from the J5 jumper block. To disable termination for Host Port 1, remove jumper 3 from the jumper block on the daughter board. For jumper locations, see “DAC960SX SCSI-to-SCSI Controller” on page A-5.

Terminating the Drive Channels

Depending on the configuration, it may be necessary to change termination.

Table 3-4. Mainboard Drive / HostChannel Termination

Jumper and Pins	Description	Jumper Installed	Jumper Removed
J5-1	Termination, Drive Channel 0	Enable (Default)	Disable
J5-2	Termination, Drive Channel 1	Enable (Default)	Disable
J5-3	Termination, Host Channel 0	Enable	Disable

Table 3-5. Daughterboard Drive / Host Channel Termination

Jumper and Pins	Description	Jumper Installed	Jumper Removed
J1-1	Termination, Drive Channel 2	Enable (Default)	Disable
J1-2	Termination, Drive Channel 3	Enable (Default)	Disable
J1-3	Termination, Host Channel 1 or Drive Channel 4	Enable (Default)	Disable

Important Steps When Installing a Dual-Active Configuration

Confirm the Dual-Active Hardware Set-up

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 daughter board is installed, Channel 2 on C0 must be connected to Channel 2 on C1, Channel 3 on C0 to Channel 3 on C1, etc.
- The two controllers must be connected through their Dual-Active Communications ports using the Dual-Active (Heartbeat) cable.

Confirm the Controller Parameter Settings

The *Force Simplex* controller parameter must be disabled in order for Dual-Active mode to work properly. When the DAC960SX is shipped from the factory, *Force Simplex* is enabled by default.

> ☞ **Note**
>
> *Controller Present/Fault Management* and *Automatic Failback* are normally disabled, but should be checked to be sure (described in Step 10 that follows).

To get to these parameters, follow these steps:

1. Make sure all SCSI cables are disconnected from each DAC960SX.
2. Make sure all on-board termination is enabled on each drive channel and single-ended host channel (see Appendix A).
3. Power-on the primary controller and wait until the `STARTUP COMPLETE` message appears on the LCD screen. Refer to Chapter 4 “Configuration” for details on how to use the front panel controls.

4. Press and hold the **Enter** button until the `Password:` prompt appears (the password feature is not enabled in this release).
5. Press and hold the **Enter** button until the main menu appears.
6. Select `Toolkit` from the main menu; press **Enter** and **(nxt)**.
7. Select `Controller Params`.
8. Press **Enter** several times to move through the parameters, until the `Force Simplex` parameter is displayed.
9. If `Ena` is displayed, select **(chg)** to disable *Force Simplex* mode. If `Dis` is displayed for this parameter, continue with Step 10.
10. Press **Enter** a few times more to move through the parameters again. Check the parameters `Ctlr Pres/Flt:` and `Auto Failback` to make sure they are disabled.

    If `Ena` is displayed for either of these parameters, select **(chg)** to disable the parameter.
11. Press **Enter** several times, skipping through the parameters until to display the message `Ctlr params changed`.

    ☞ **Note**

    If the parameters *Force Simplex*, *Automatic Failback*, and *Controller Present/Fault Management* are already disabled, and no other changes have been made to any other controller parameters, the prompt in Step 11 will not appear.
12. Select **(sav)**.
13. Press **Esc** a few times until `Mylex` and the firmware version number appear at the top of the LCD screen.
14. Remove the on-board termination.
15. Repeat Steps 1 through 13 with the partner controller.
16. On the controller selected to be the partner controller (C1), remove the jumper from position 8 on J6 on the distribution board (Refer to Appendix A “Connectors and Jumpers” for details).

The two controllers are now ready to be cabled together to create a Dual-Active mode configuration.

Installing the Controller(s)

The installation procedure is as follows:

1. Install the DAC960SX chassis according to the enclosure vendor's instructions. The mounting holes accept #6-32 coarse-thread screws.
2. Connect the drives and host channels according to the guidelines in "SCSI Cabling Requirements" on page 2-8 and diagrams in "Selecting the Correct Configuration" on page 2-2.

   ☞ **Note**

   Dual-active Only Connect the dual-active cable to the dual-active communications port of both controllers. For the location of the dual-active communications port, see "Connectors and Jumpers" on page A-1. For information on the dual-active cable, see "Dual Active Cable" on page A-7.
3. Terminate the Drive Channels. After the cables are connected, the drive channels can be terminated either at the disk drives or externally at cable ends (recommended). For more information, refer to the illustrations in "Selecting the Correct Termination" on page 2-7.
4. Connect the power supply cables to the controller power connector. For the connector location(s), see "Connectors and Jumpers" starting on page A-1.

   ☞ **Note**

   For Dual-active configurations, connect only one controller (Controller 0) at this time.
5. Safety check the Installation

- Make sure all cables are securely fastened.
- Make sure the SCSI buses are properly terminated.
- Make sure SCSI IDs are correctly set.
- Make sure power is properly connected.

Powering on the Controller(s)

If this is a Simplex configuration, power on the enclosure. If this is a Dual-Active configuration, complete the following procedure:

1. Power on the enclosure. After Controller 0 has successfully booted, the LCD displays the message `Partner : Failed`.
2. Apply power to the second controller (Controller 1). Controller 1 will be held in reset (because the Auto Failback parameter has been disabled).

Confirming "STARTUP COMPLETE"

Booting the system normally takes a few minutes. If the message "Startup Complete" appears on the LCD panel, the controller has successfully booted and the system configuration can begin (proceed to the next chapter).

> ☞ **Note**
>
> I**Dual-Active only** The LCD on Controller 0 will continue to indicate `Partner : Failed`; the LCD on Controller 1 will continue in a reset state until the configuration steps in Chapter 4 are completed.

If problems are encountered, see the "Troubleshooting Checklist", below.

Troubleshooting Checklist

- Make sure the correct firmware is loaded. See Appendix B "Downloading Firmware" for more information.
- Check the SCSI cabling for loose connections, pin mismatches (make sure Pin 1 matches Pin 1), bent pins, and damaged or crossed cables.
- Check termination.
- Refer to "LCD Messages" on page C-1.
- Make sure the BBU is properly seated on the controller.

Chapter 4
Configuration

The procedures described in this chapter are performed from the LCD panel of the DAC960SX. The procedures can also be performed using a terminal-emulation interface (see “Terminal-Emulation Interface” on page D-1) or the RAIDfx Utility (see *RAIDfx Manager User’s Guide)*, which is included with the controller.

> **Note**
>
> The LCD panel and terminal-emulation interface *cannot* be in menu mode at the same time. The controller allows only one device at a time to access menus.
>
> **Dual-active only.** Perform all configuration procedures from Controller 0.

Using the Front Panel Controls

The DAC960SX front panel is shown in Figure 4-1.

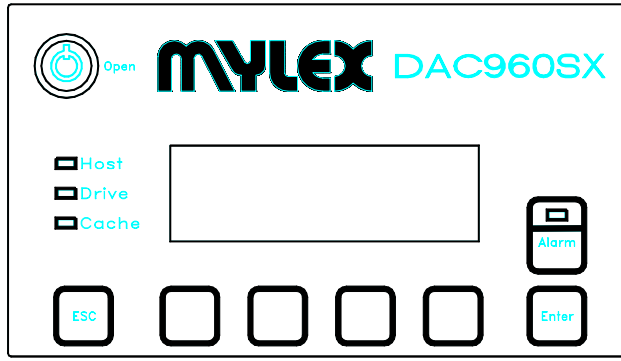


Figure 4-1. DAC960SX Front Panel

Menu Structure

The LCD menu structure is shown Figure 4-2.

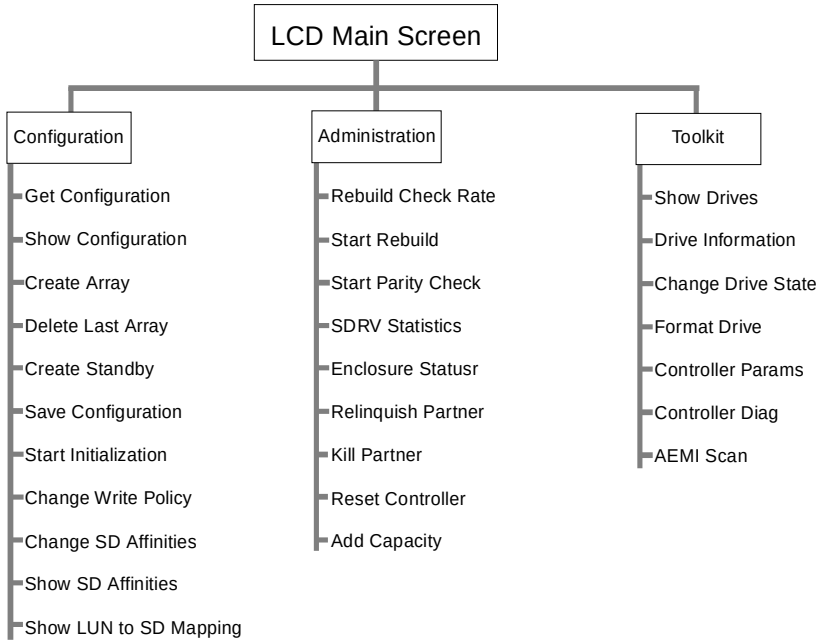


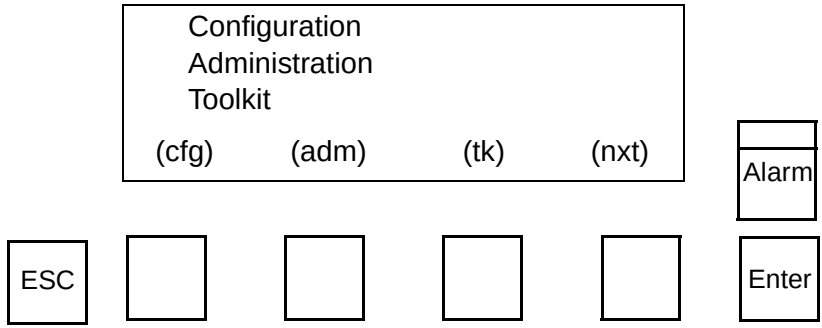
Figure 4-2. LCD Menu Structure

Function Keys

- **ESC** – Allows the user to go back to the previous screen.
- **Alarm** – Resets the audible alarm.
- **Enter** – Executes the selected functions.
- The four unlabeled keys have different meanings depending on where they are used in the menu system. The fourth line of the LCD serves as the current label for the four keys.
- The **(nxt)** key displays additional menu options on the same menu, if applicable.
- Pressing a plus/minus key causes a number to increment or decrement. Pressing an arrow key moves the cursor left and right.

(←) (→) (+) (–)

Shown below is the main menu of the LCD. When a menu item is selected, an arrow appears next to the item.



Access the LCD menu

After the DAC960SX power-on sequence is complete, indicated by STARTUP COMPLETE on the LCD, the controller is operating in the monitor mode. To enter the configuration mode:

1. Press the **Enter** key for up to four seconds until the LCD prompts for a password. The password feature is not supported in this release.
2. Press **Enter** again to access the main menu (see page 4-2 for the menu structure).

Configure Controller Parameters

If the controller parameters need to be modified, see “Controller Parameters” in the *DAC960SX User Manual*. For instructions on using the LCD panel, see “Using the Front Panel Controls” on page 4-1.

To view and change controller parameter settings:

1. Select Toolkit from the Main Menu by pressing **(tk)**. Press `Enter`.
2. Press **(nxt)**.
3. Select Controller Parameters by pressing **(cpr)**. Press **Enter**.
4. Press **Enter** to scroll through Controller Parameter options. Define the settings as required. Press **(chg)** to toggle between enabled or disabled.
5. Press **ESC** when finished. The system prompt to save or exit will appear. Select **(sav)**.

> ☞ **Note**
>
> Changes to the controller parameter settings take effect after the controller is rebooted.

Dual-active Parameters

Set controller parameters on both controllers as follows:

- Force Simplex disabled on both controllers
- 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 require this parameter to be disabled.

- Ctlr Pres/Flt Sel (Controller Present/Fault Select) configured the same on both controllers (A or B, as required)
- Auto Failback disabled on both controllers (if this feature will be needed by the application, enable it later in the installation process)

Note

When controllers are configured as a dual-active pair, the parameter settings are automatically synchronized between both controllers.

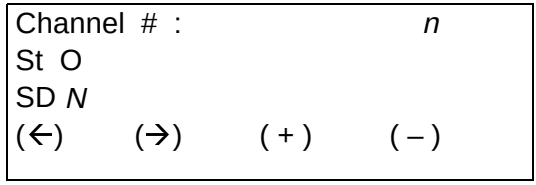
Show Drives

Before beginning the configuration process, make sure the controller sees all of the installed drives. To do so, use the Show Drives function under the Toolkit menu.

1. Select Toolkit from the Main Menu by pressing **(tk)**. Press **Enter**.
2. Select Show Drives by pressing **(sho)**. Press **Enter**. The system displays information about the drives on the first channel, including the drive state (St) and system drive ID (SD). The default state for all drives is Standby. Drive states are:

   S= Standby
   O = Online
   D = Dead
   X = Offline
   R = Rebuild

   E = Empty (Some enclosures have a slot location that will not accept a disk, but the location takes up an address.
3. To display another channel, press **Enter**.



For dual-active configurations, use Show Drives on both controllers and make sure they see the same drives.

Create Array

1. Select Configuration from the Main Menu by pressing **(cfg)**. Press **Enter**.
2. Select the Get Configuration function by pressing **(get)**. Press **Enter** to load the latest configuration data into the temporary workspace.

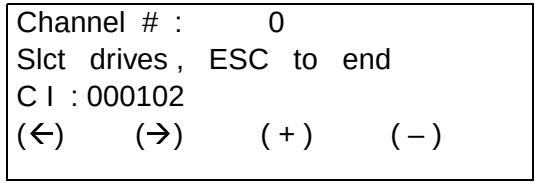
   A message displays confirming that the configuration is loaded.
3. Press any key to return to the Configuration Menu. Select the Create Array function by pressing the key under **(crt)**. Press **Enter**.
4. Select the drive channel that contains the drive you want to add to the array and press **Enter**. The system prompts for the Target ID.
5. Select the SCSI ID of the drive you want to add and press **Enter** .

   The display confirms the selection with a line similar to the following:

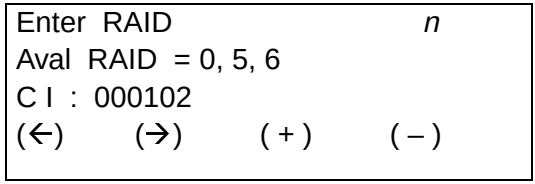
   ```
   C I  :  01
   ```

   Where `C I` is the channel and SCSI target ID, `0` is the SCSI channel number, and `1` is the SCSI ID of the selected drive.
6. Repeat the channel and drive selection steps for each drive.

   The display adds each drive to the screen as it is selected:

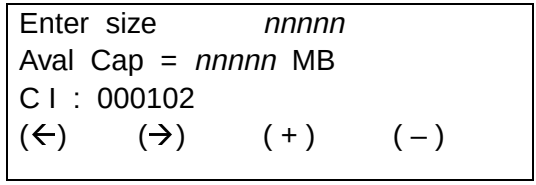


7. Press **ESC** when finished. The system prompts for the RAID level.



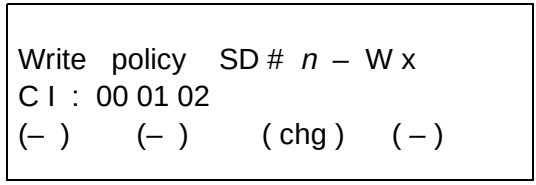
Confirm that the SCSI channel and drive selections for the system drive being created are correct. If not, press **ESC** and repeat the process. If they are correct, use the +/- keys to select a RAID level, and press **Enter**.

8. The display prompts for the size of the system drive, displaying the maximum size as a default.

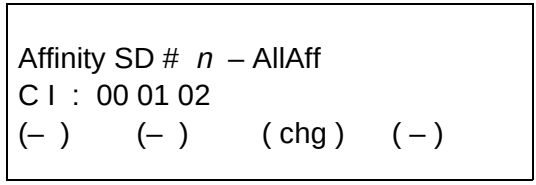


Use the left or right arrow keys to move the cursor under each digit in the size field. Use the +/- keys to change the selected digit.

9. When the system drive size is set to the desired size, press **Enter**. The screen prompts for the cache-write policy. Set the cache-write policy to T (write-through) or B (write-back), by pressing **(chg)**. Press **Enter**.



10. The system prompts for a system drive affinity settings. System drive affinity defines which SCSI host port(s) on which controller(s) a particular system drive may be accessed through. System drives are presented as SCSI LUNs. Set the system drive affinity for this system drive by pressing `(chg)`. Press `Enter`.



The LCD screen displays the selected configuration settings. In the example below:

- S*N* is the system drive number (0 to 7)
- ON indicates that the system drive status is on-line
- 500MB is the system drive size
- R5 indicates RAID level 5
- B indicates a write-back cache policy
- aa indicates all affinity (no particular system drive affinity)
- C I along with the numbers that follow indicate the SCSI channel number and the SCSI ID of the drives that constitute the system drive.

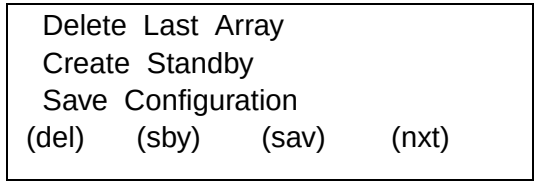
11. Select **yes** to create the system drive. Select **no** to cancel the selections.

    Repeat Steps 3 – 11 to create additional arrays.

> ⚠ ***Caution***
>
> Do not escape the Configuration menu without first saving the configuration using the Save Configuration option (see below).

Save Configuration

1. From the Configuration Menu, press **(nxt)**.



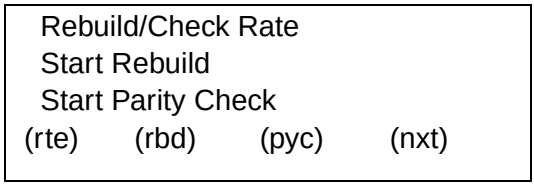
2. Select Save Configuration by pressing **(sav)**. Press **Enter**.

   A message displays to notify you that the current configuration is about to change.

3. Select **yes** to save the configuration. Select **no** to cancel the selections.

Relinquish Partner (Dual-active only)

1. From the Main menu, press `(adm)`. Press `Enter`.

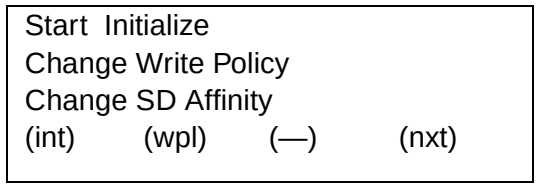


2. Press **(nxt)** to display the next page of options.
3. Press **(rel)** to select Relinquish Partner. The system prompts for a confirmation.
4. Press `yes` to confirm. The system displays the message: `Operation complete, press any key.`
5. Make sure the LCD on both controllers shows `Partner : Active`.
6. One at a time, select Show Configuration on both controllers to make sure they show the same configuration.

Initialize System Drives

> ☞ **Note**
>
> **Dual-active only.** If a system drive has been assigned a system drive affinity other than “all” (see page 4-8), the system drive must be initialized from the controller it has been assigned to.

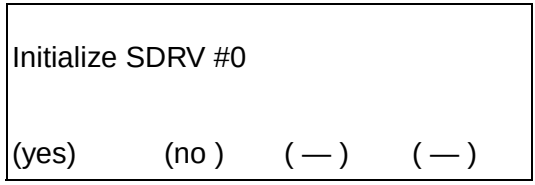
1. From the Main menu, select Configuration by pressing **(cfg)**. Press **Enter** .
2. Press **(nxt)** until the following page is displayed.



Select Start Initialize by pressing **(int)**. Press `Enter`. The system prompts for a SDRV (system drive ID).

3. Select the system drive ID to be initialized, and press `Enter`.

   The following confirmation screen is displayed:



4. Verify that the selection is correct, and press **yes**. Press **no** to cancel the selection.

   The following message is displayed:

   ```
   Initialize  started
   ```

5. Press any key to return to the previous Configuration Menu screen.

   If necessary, select the Start Initialize function again to initialize more system drives.

   ⚠ ***Caution***

   Do not exit the Configuration menu without first initializing all the new system drives that were created.

6. Press **ESC** twice to return to the Main screen, which displays a progress report for the initialization. When the process is complete, the system displays the message:

   ```
   INIT SDRV COMPLETE
   ```

The array is now ready.

Note

For best performance, do not leave a menu displayed during normal operation. Since the controller checks the keypad at a much higher rate when the menus are on screen, this can degrade performance. Press the **ESC** key several times to return to the monitor mode Main screen.

Appendix A
Connectors and Jumpers

This appendix shows the three distribution boards supported by the DAC960SX, along with the main controller board and the daughterboard. Figure A-1 shows the three variations of the J6 jumper block. Table A-1 shows the pinout information for the J6 jumper block on all distribution boards. This jumper block is used to define SCSI IDs and serial port settings.

Note

References to Host Channel 1 in the following table do not apply to the 3 channel distribution board.

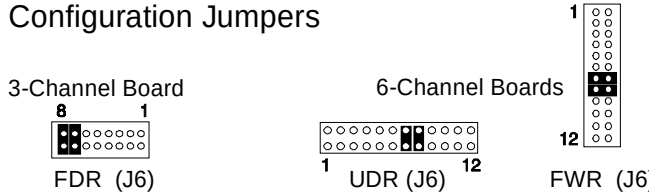


Figure A-1. The three variations of the J6 Jumper Block

Table A-1. J6 Pinout Information

J6#	Description	Jumper Installed	Jumper Removed
1	Host Channel 0, SCSI ID bit 0	Sets Bit 0	Clears Bit 0 (Default)
2	Host Channel 0, SCSI ID bit 1	Sets Bit 1	Clears Bit 1 (Default)
3	Host Channel 0, SCSI ID bit 2	Sets Bit 2	Clears Bit 2 (Default)
4	Host Channel 0, SCSI ID bit 3	Sets Bit 3	Clears Bit 3 (Default)
5	Reserved - Leave at Default	N/A	(Default)
6	Serial Port Protocol	VT100	SLP1 (Default)
7	Serial Port Baud Rate	19.2K Baud (Default)	Reserved—Leave at Default
8	Controller ID	Sets controller as Controller 0 (default)	Sets controller as Controller 1
9	Host Channel 1, SCSI ID bit 0	Sets Bit 0	Clears Bit 0 (Default)
10	Host Channel 1, SCSI ID bit 1	Sets Bit 1	Clears Bit 1 (Default)
11	Host Channel 1, SCSI ID bit 2	Sets Bit 2	Clears Bit 2 (Default)
12	Host Channel 1, SCSI ID bit 3	Sets Bit 3	Clears Bit 3 (Default)

Set = jumper present
Clear = no jumper present

6-Channel Wide, Single-Ended Host

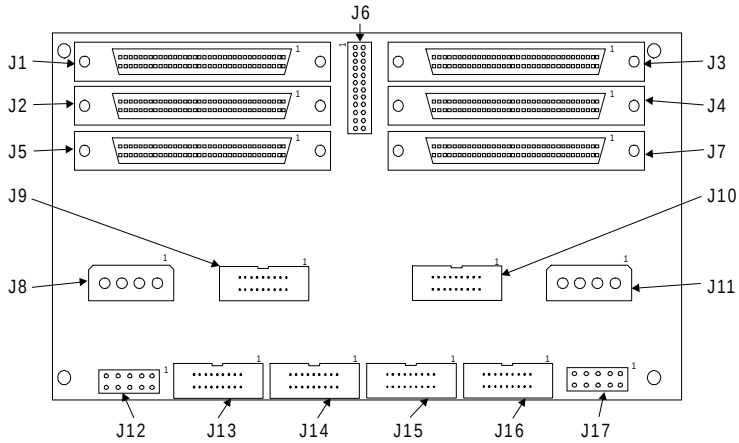


Figure A-2. DBX960S-6-FWR Wide SCSI Distribution Board

Table A-2.* DBX960S-6-FWR *Connectors and Jumper Block

Connector	Description
J1	Drive channel 2 connector
J2	Drive channel 0 connector
J3	Drive channel 3 connector
J4	Drive channel 1 connector
J5	Host channel 1/drive channel 4 connector
J6	SCSI ID and configuration jumpers
J7	Host channel 0 connector
J8	Power connector
J9	Drive channel 4 fault indication
J10	AEMI (Array Enclosure Management Interface) port
J11	Power connector
J12	Serial port
J13	Drive channel 1 fault indication
J14	Drive channel 0 fault indication
J15	Drive channel 2 fault indication
J16	Drive channel 3 fault indication
J17	Dual-active communications port

6-Channel Wide, Differential Host

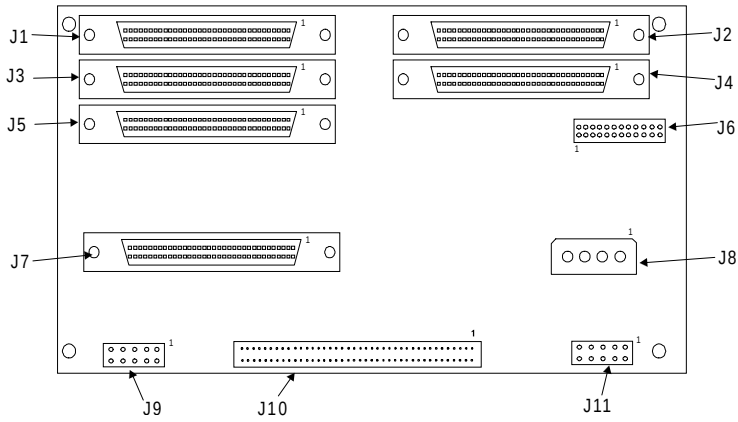


Figure A-3. DBX960S-6-UDR Fast, Wide, Dual Differential Distribution Board

Table A-3. DBX960S-6-UDR Connectors and Jumper Block

Connector	Description
J1	Drive channel 2 connector
J2	Drive channel 3 connector
J3	Drive channel 0 connector
J4	Drive channel 1 connector
J5	Host channel 1/Drive channel 4 connector
J6	SCSI ID and configuration jumpers
J7	Host channel 0 connector
J8	Power connector
J9	Serial port
J10	AEMI (Array Enclosure Management Interface) port
J11	Dual-active communications port

3-Channel Wide, Differential Host

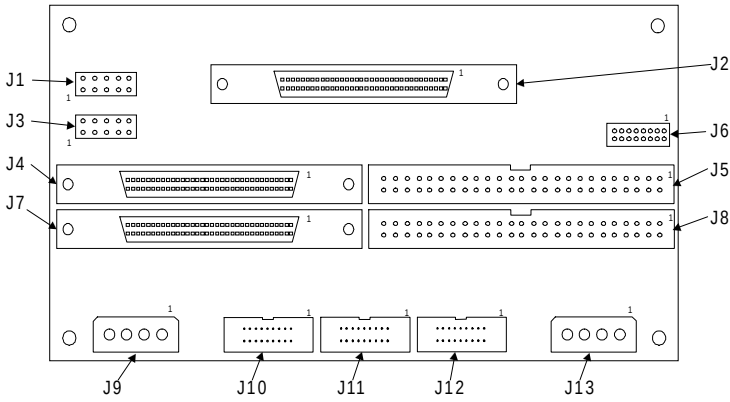


Figure A-4. DBX960S-3-UDR Differential SCSI Distribution Board

Table A-4. DBX960S-3-UDR Connectors and Jumper Block

Connector	Description
J1	Serial Port
J2	Fast/Wide Differential SCSI connector, Host channel 0
J3	Dual-Active Communications Port
J4	Fast/Wide SCSI connector, 68-pin, Drive channel 0
J5	Fast (Narrow) SCSI connector, 50-pin, Drive channel 0
J6	Jumpers, SCSI ID and Configuration
J7	Fast/Wide SCSI connector, 68-pin, Drive channel 1
J8	Fast (Narrow) SCSI connector, 50-pin, Drive channel 1
J9	Power connector
J10	Fault indication, Drive channel 1
J11	Fault indication, Drive channel 0
J12	AEMI (Array Enclosure Management Interface) Port
J13	Power connector
RP1, RP2, RP3	Differential termination resistor packs, Host channel 0 (Installed = Termination Enabled; Removed = Termination Disabled)

DAC960SX SCSI-to-SCSI Controller

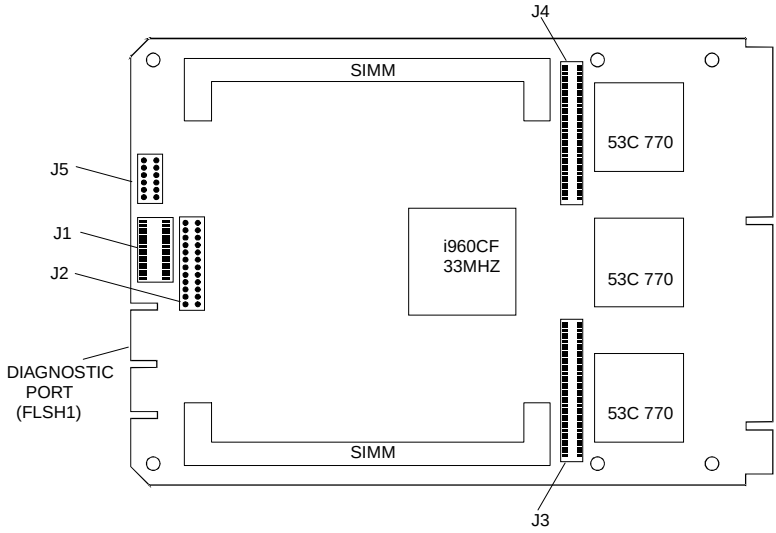


Figure A-5. DAC960SX SCSI-to-SCSI Controller

Table A-5. DAC960SX Connectors and Jumpers

Jumper and Pins	Description	Jumper Installed	Jumper Removed
J1	LCD/Keypad connector	N/A	
J2	BBU connector		
J3	Daughter board connector		
J4	Daughter board connector		
J5-1	Termination, Disk Channel 0	Enable (Default)	Disable
J5-2	Termination, Disk Channel 1	Enable (Default)	Disable
J5-3	Termination, Host Channel 0	Enable (Default)	Disable
J5-4	Reserved - Leave at Default	N/A	(Default)
J5-5	Reserved - Leave at Default	N/A	(Default)
J5-6	Reserved - Leave at Default	N/A	(Default)

3-Channel Daughter Board

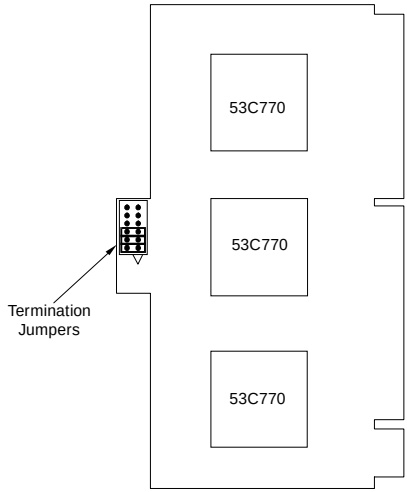


Figure A-6. DBI960SX Daughter Board

Figure A-7. DBI960SX Termination Jumper Block

Table A-6. DBI960SX Termination Jumpers

Jumper and Pins	DBI960SX On-board Termination	Jumper Installed	Jumper Removed
J1-1	Termination on Disk Channel 2	Enable (Default)	Disable
J1-2	Termination on Disk Channel 3	Enable (Default)	Disable
J1-3	Termination on Disk Channel 4 or Host Channel 1*	Enable (Default)	Disable
J1-4, 5, 6	Reserved - Do not Jumper	—	—

* Dual Host configurations only

Dual Active Cable

The dual-active cable (Mylex P/N A750159) is a 10-wire ribbon cable with 10-pin dual row header connectors. Pins 3 and 5 are crossed on one end. Pinout information is shown below:

Dual-active Cable pinouts	
1	1
2	2
3	5
4	4
5	3
6	6
7	7
8	8
9	9
10	10

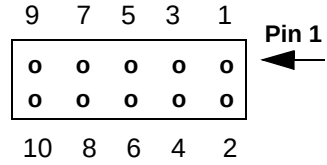


Figure A-8. Dual-active Cable and Connector Pinouts

Appendix B
Downloading Firmware

This appendix describes how to download different firmware to the DAC960SX controller through the serial port or the SCSI bus. Both methods require a host PC capable of running MS-DOS™ Version 6.22 or later and the RAIDfx configuration and firmware download utility (available on the provided distribution media).

Table B-1. Firmware Table

Version	Filename	Description
0*nnn*	FWSCS.*nnn*	Single host, no UNIX support, no dual-active support,
1*nnn*	FWSCS_DH.*nnn*	Dual-host (daughter board required.), no UNIX support, no dual-active support
2*nnn*	FWSCS_U.*nnn*	Single host, UNIX support, no dual-active support
3*nnn*	FWSCS_UD.*nnn*	Dual-host (daughter board required.), UNIX support, no dual-active support
4*nnn*	FWSCD.*nnn*	Dual-active support, single host, no UNIX support
5*nnn*	FWSCD_DH.*nnn*	Dual-active support, dual-host (daughter board required.), no UNIX support
6*nnn*	FWSCD_U.*nnn*	Dual-active support, single host, UNIX support
7*nnn*	FWSCD_UD.*nnn*	Dual-active support, dual-host (daughter board required.), UNIX support

Using the Serial Port

To upgrade firmware over the serial port, a 9-pin to 10-pin double row serial cable with a null modem adapter is needed. (This cable is also needed to use the terminal emulation interface to configure the controllers.) The cable must be a 9-pin 'D' to 10-pin double row serial cable. The 9-pin connector must be connected to a null modem adapter on the host side.

Figure B-1 shows cable and serial port pinouts.

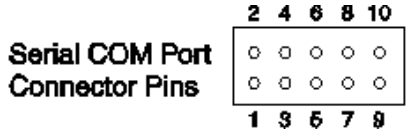


Figure B-1. Serial Port Pinouts

Table B-2. Serial Port Pin Assignments

Pin	Signal	Description
1	DCD	Data carrier detect
2	DSR	Data set ready
3	RXD	Receive data
4	RTS	Request to send
5	TXD	Transmit data
6	CTS	Clear to send
7	DTR	Data terminal ready
8	N/C	No connection
9	GND	Ground
10	N/C	No connection

Physical Setup

1. Connect the 9-pin end of the serial cable to COM1 on the PC that will operate in terminal mode; connect the 10-pin end of the cable to the serial port on the DAC960SX distribution board. Refer to "Connectors and Jumpers" on page A-1 for the location of the serial port.
2. Check to make sure the drive channels are terminated.

   ☞ **Note**

   The DAC960SX is shipped from the factory with on-board termination of the drive channels enabled on the main controller board and the daughter board (if present). When a differential connection to the host is being used, the single-ended termination for host SCSI ports must remain disabled (see "Terminating the Host Channels" on page 3-4).
3. Make sure the jumper *is removed* from J6-6 (Pin 6 on the J6 jumper block) on the distribution board. This setting defines SLP (serial line protocol) mode for the serial port, and is the factory default. (Refer to "Connectors and Jumpers" on page A-1 for a complete description of the J6 jumper block on distribution boards).
4. Make sure a jumper *is* installed on J6-7 (Pin 7 on the J6 jumper block). This defines the baud rate as 19200, and is the factory default.
5. Make sure a jumper *is* installed on J6-8 (Pin 8 on the J6 jumper block). This defines the controller as Controller 0, and is the factory default.
6. Connect the DAC960SX to a power supply.
7. Power on the system. Make sure the LCD displays the message STARTUP COMPLETE.

Download firmware

1. Follow the instructions in Chapter 2 to set up the controller using the default firmware configuration (skip Step 1, “Download Firmware”). Bring the controller to STARTUP COMPLETE.
2. From the DOS command line, create a directory for RAIDfx.
3. Copy the two files (RAIDFX*NNN*.EXE, where *NNN* is the version number, and INSTALL.EXE) into the directory.
4. Run INSTALL.EXE to extract the program files.
5. Type:

   `RAIDFX -slp`

6. The program opens at the *Select Controller* menu. Use the up and down arrow keys to highlight a DAC960SX shown on the list. It will appear similarly to this:

   `DAC960SX 00 c0 t`*`n`* `v`*`n.nn-nn`*

   Where *c* is the controller number (0 or 1), *t* is the firmware type, and *v* is the version number.
7. Press **Enter**.
8. From the *Main Menu*, highlight `Tools` and press **Enter**.
9. From the *Tools Menu*, highlight `Firmware` and press **Enter**.
10. From the *Firmware Menu*, highlight `Download` and press **Enter**.
11. From the *Download Menu*, highlight `Select Download File` and press **Enter**.
12. From *Download File Menu*, highlight the line with the heading `File:` and press **Enter**.
13. The names of all available files that can be downloaded to the DAC960SX will be displayed. Highlight the file with the desired type and version (refer to Table B-1) and press **Enter**.
14. The line with the heading `File:` will be highlighted. Press **Enter**.
15. From the *Download Menu*, highlight `Download` and press **Enter**.
16. The program will prompt for a verification. Highlight `YES` and press **Enter.** The program will confirm that the firmware is being sent

17. There will be a similar prompt for a verification to actually download the firmware. Highlight `YES` and press **Enter.**
18. The program will resopond with `Programming`. There will be a delay for approximately 1 minute.Then RAIDfx will display `Programming Complete`. Press **Enter**.
19. A prompt box with `Reset Controllers?` will appear. Highlight `YES` and press **Enter**.
20. Press **Esc** until you reach the prompt `Exit Utility?` Select `YES` and press **Enter**.
21. Restart RAIDfx. When the *Select Controller* Menu appears, verify that the controller is loaded with the type, version, and build that you flashed.

Using the SCSI Bus

The RAIDfx utility runs under DOS 6.22 and Windows NT™ 4.0. If running under DOS, RAIDfx requires a DOS ASPI driver for the SCSI host adapter. The process for downloading firmware over the SCSI bus is outlined below:

1. Follow the instructions in Chapter 2 to set up the controller using the default firmware configuration (skip Step 1, “Download Firmware”). Bring the controller to STARTUP COMPLETE.
2. From the DOS command line, create a directory for RAIDFX.
3. Copy the two files (RAIDFX*NNN*.EXE, where *NNN* is the version number, and INSTALL.EXE) into the directory.
4. Run INSTALL.EXE to extract the program files.
5. Type:

   `RAIDFX`

6. The program opens at the *Select Controller* menu. Use the up and down arrow keys to highlight a DAC960SX shown on the list. It will appear similarly to this:

   `DAC960SX 00 c0 t`*`n`* `v`*`n.nn-nn`*

   Where *c* is the controller number (0 or 1), *t* is the firmware type, and *v* is the version number.
7. Press **Enter**.
8. From the *Main Menu*, highlight `Tools` and press **Enter**.
9. From the *Tools Menu*, highlight `Firmware` and press **Enter**.
10. From the *Firmware Menu*, highlight `Download` and press **Enter**.
11. From the *Download Menu*, highlight `Select Download File` and press **Enter**.
12. From *Download File Menu*, highlight the line with the heading `File:` and press **Enter**.
13. The names of all available files that can be downloaded to the DAC960SX will be displayed. Highlight the file with the desired type and version (refer to Table B-1) and press **Enter**.
14. The line with the heading `File:` will be highlighted. Press **Enter**.

15. From the *Download Menu*, highlight `Download` and press **Enter**.
16. The program will prompt for a verification. Highlight `YES` and press **Enter.** The program will confirm that the firmware is being sent
17. There will be a similar prompt for a verification to actually download the firmware. Highlight `YES` and press **Enter.**
18. The program will resopond with `Programming`. There will be a delay for approximately 1 minute.Then RAIDfx will display `Programming Complete`. Press **Enter**.
19. A prompt box with `Reset Controllers?` will appear. Highlight `YES` and press **Enter**.
20. Press **Esc** until you reach the prompt `Exit Utility?` Select `YES` and press **Enter**.
21. Restart RAIDfx. When the *Select Controller* Menu appears, verify that the controller(s) are loaded with the type, version, and build that you flashed.

> ☛ **Note**
>
> If this is an upgrade of an existing Dual-Active configuration, both controllers will be flashed at one time.

Appendix C
LCD Messages

Message	Description
Array will be deleted	Quitting before array is created causes session changes to be lost
Cannot Format Drive	Invalid choice of drive
Cannot use drive	Invalid choice of drive
Cfg changed. Exit ?	You have created system drive(s) without initializing them
Config changed, save before initializing	You need to save your configuration before initializing
Controller Busy	Diagnostics could not be run because controller is busy
Cur cfg will change	Current configuration will change if Save is invoked
Diagnostics Failed	Controller diagnostics failed
Entire array used	No space to create additional system drives in array
Error Code : *nnnn*	Diagnostics failed, number indicates type of failure
Fail:Chk/Rbl in Prog	Failure due to a parity check or rebuild already in progress
Failed: Bad EEPROM	Failure saving the configuration to EPROM
Failed: Bad NVRAM	Failure saving the configuration to non-volatile RAM
Failed: Channel Busy	Drive channel is busy
Failed: Check in Prog	A parity check is is progress on the addressed system drive
Failed: Disk failed	New disk failure
Failed: Drive Dead	Failure due to a dead dependent drive
Failed: Drv Not Ready	Unable to start drive
Failed: Init in prog	Failed because an initialization is in progress
Failed: Invalid Dev	Failure due to an invalid device
Failed: Invalid SDRV	Failure due to a non-redundant or non-existent system drive
Failed: No Device	Drive or other device not available
Fail: Rbl/Chk in Prog	Rebuild failed; another rebuild or parity check is in progress
Failed: Start failed	Rebuild failed; drive could not start or is online
Failed: Unknown SDRV	System drive operation failed; affinity is not assigned to this controller
Failed: State Changed	A change of state has occurred
Format Failed	Failure on Format function
Illegal Operation	Operation is illegal; there is no Master/Slave configuration
Invalid drive	Invalid choice of drive
Invalid Device #	Invalid device address
Invalid Option	A submenu was not selected when required
Max SDRVs created	Maximum number of logical units have been created
May delete SDs, OK?	The system is prompting for consent to delete an array

Message	Description
No arrays defined	There are no system drives to delete
No SDRVs defined	Invalid configuration
No Stat Avail	No system drive statistics are available
Partner : booting	From power-up
	Partner is replacement controller
Partner : active	Controller-Controller nexus
	Partner is survivor
Partner : failed 0	Ping Time-out
Partner : failed 1	Negotiation - get chunk failure
Partner : failed 2	Negotiation - SCSI communication failed or cables are wrong
Partner : failed 3	Negotiation - host ID mismatch
Partner : failed 4	Negotiation - SLIP/DIFFL/FBR mismatch
Partner : failed 5	Negotiation - disk channels available mismatch
Partner : failed 6	Negotiation - host channels available mismatch
Partner : failed 7	Negotiation - firmware version mismatch
Partner : failed 8	Negotiation - firmware type mismatch
Partner : failed 9	Negotiation - memory size mismatch
Partner : failed 10	Negotiation - memory read of partner failed
Partner : failed 11	Negotiation - MS_INTNEG command to partner failed
Partner : failed 12	Kill Partner command received
Partner : failed 13	Partner failed during failback TID handover
Partner : failed 14	Partner didn't enter nexus after negotiation complete
Partner : failed 15	Partner failed for unknown reason
Partner : failed 16	Write Back Synchronization Failed on Channel 0
Partner : failed 17	Write Back Synchronization Failed on Channel 1
Partner : failed 18	Write Back Synchronization Failed on Channel 2
Partner : failed 19	Write Back Synchronization Failed on Channel 3
Partner : failed 20	Write Back Synchronization Failed on Channel 4
Partner : failed 32	Hot pull of partner detected while nexus active
Partner : failed 33	Partner absent at boot
Partner : failed 34	Power failed before failover finished
Partner : removed	Partner is removed
Partner : inserted	Partner is inserted
Saving failed	Unable to save changes to controller parameters
SBY size too small	Standby Drive is too small for the existing configuration
SD not inited: exit?	Initialize system drive before exiting the Configuration menu
SEr: *n*	The number of drive soft errors
Undefined SDRV	Invalid system drive selection

Appendix D
Terminal-Emulation Interface

You can perform the configuration functions described in Chapter 3 from a terminal-emulation (VT100 compatible) interface. To configure the serial port for terminal emulation, install a jumper on Pin 6 on the J6 jumper block of the distribution board.

Configure the host settings to the values shown below to ensure proper communications between the terminal and the DAC960SX.

Table D-1. Terminal Interface Requirements and Settings

Terminal	Requirement
Connection	Null-modem cable
Protocol	Asynchronous, RS232
Baud rate	19,200
Data bits	8
Stop bits	2
Parity	None
Flow control	None

The DAC960SX built-in utility screens are accessed by sending a Break character from the VT100 terminal keyboard. On some terminals, this is achieved by pressing `Ctrl-Break`; 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).

The Break command will cause 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 `Enter` or `Return` to display the DAC960SX main monitor mode screen.

Press `Enter` or `Return` again to display the Menu Mode screen.

Menu Overview

The menu structure for the terminal interface is the same as the LCD menu structure (see “Menu Structure” on page 4-2). Select items by typing the associated number and pressing Enter.

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

The information below the INSTRUCTIONS: prompt shows an abbreviated list of other functions and the corresponding key to press for accessing each one.

The ESC key goes back to the previous screen.

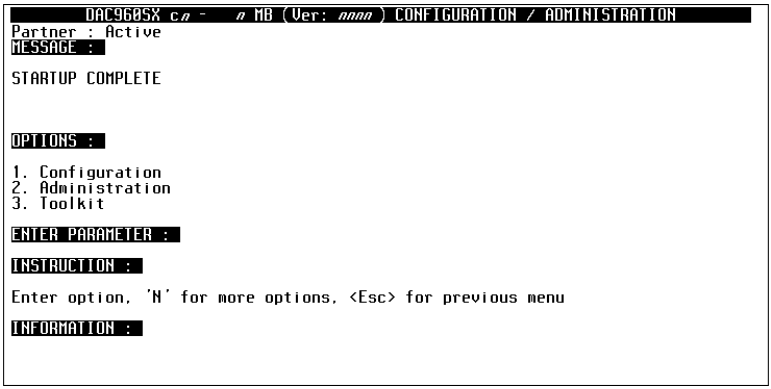


Figure D-1. VT-100 Screen Display at Start-up

Appendix E
Regulatory Information

FC Class B Compliance

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

22. THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND
23. 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.

Finally, 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.

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 Installation Guide, 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 EMC Directive 89/336/EEC

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

CE Community of Europe

CE mark is rated for the DAC960SX Installation Guide 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.

Index

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.

P/N: 772159-D01

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

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.

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_____ ❑ Peripherals _____
   - ❑ Monitor_____ ❑ 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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