

Exabyte™ M10 Mirroring Controller

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# Product Specification and SCSI Reference

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## Revision History

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Revision	Date	Description
000	November 1997	Preliminary
001	April 1998	Initial release

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1685 38th Street  
Boulder, Colorado 80301  
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325680-001

## Product Warranty Caution

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The Exabyte® M10 Mirroring Controller is warranted to be free from defects in materials, parts, and workmanship and will conform to the current product specification upon delivery. **For the specific details of your warranty, refer to your sales contract or contact the company from which the controller was purchased.**

The warranty for the controller shall not apply to failures of any unit when:

- The controller is repaired or modified by anyone other than Exabyte's personnel or approved agent.
- The controller is physically abused or used in a manner that is inconsistent with the operating instructions or product specification defined by Exabyte.
- The controller fails because of accident, misuse, abuse, neglect, mishandling, misapplication, alteration, faulty installation, modification, or service by anyone other than the factory service center or its approved agent.
- The controller is repaired by anyone, including an approved agent, in a manner that is contrary to the maintenance or installation instructions supplied by Exabyte.
- Exabyte's serial number tag is removed.
- The controller is damaged because of improper packaging on return.

### **CAUTION**

Returning the controller in unauthorized packaging may damage the unit and void the warranty. If you are returning the controller for repair, package it in its original packaging (or in replacement packaging obtained from your vendor).

If problems with the controller occur, contact your vendor; do not void the product warranty by allowing untrained or unauthorized personnel to attempt repairs.

# Notes

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# Notes

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# About This Specification

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This product specification describes the functional, performance, and environmental specifications for the Exabyte® M10 Mirroring Controller. It also provides information about the SCSI commands you can send to the controller.

This specification is intended for engineering, purchasing, and marketing personnel who want to evaluate the controller to determine the feasibility of integrating it into product lines.

## Contents of This Specification

This specification contains the following information:

- **Chapter 1** describes general features, configurations, and physical components of the controller.
- **Chapter 2** describes the requirements for installing, configuring, and operating the controller.
- **Chapter 3** provides functional specifications for the controller, including performance, power, and environmental specifications. This chapter also provides information about the controller's size, weight, and shipping specifications, and safety and regulatory agency standards.
- **Chapter 4** describes SCSI specifications for the controller, including an overview of SCSI communications, SCSI configuration requirements, and SCSI commands used by the controller.

## Related Publications

### Exabyte M10 Mirroring Controller

- *Exabyte M10 Mirroring Controller Installation and Operation, 325681*

### Standards

- *ANSI Small Computer System Interface-2 (SCSI-2), X3.131-1994*

## Contacting Exabyte

You can contact Exabyte using any of the following methods:

<b>For technical support:</b>	
Exabyte Technical Support	1-800-445-7736
	1-303-417-7792
	1-303-417-7160 (fax)
	support@exabyte.com (e-mail)
EXAfacts™ Fax-on-Demand	1-800-445-7736
	1-303-417-7792
	http://www.exabyte.com (Internet)
Bulletin Board (BBS)	1-303-417-7100 Connect at up to 28,800 baud with 8 data bits, 1 stop bit, and no parity. Turn on hardware (RTS/CTS) flow control.
<b>To order supplies and accessories:</b>	
Exabyte Express	1-800-EXATAPE (1-800-392-8273)
	1-972-481-4221
	1-972-406-9081 (fax)
	sales@exabyte.com (e-mail)
<b>To return equipment for service:</b>	
Exabyte Service	1-800-EXATAPE (1-800-392-8273)
	1-303-442-4333
	Scotland: + 44-1-324-564564
	service@exabyte.com (e-mail)

**Note:** If it is more convenient to your location, contact Exabyte Technical Support in Europe at the following numbers:

Phone: +31-30-254-8890  
 Fax: +31-30-258-1582  
 BBS: +31-30-258-1617

## Conventions Used in This Specification

This specification uses special conventions to highlight notes, important information, and cautions. These conventions are explained below.

**Note:** Notes provide additional information or suggestions about the topic or procedure being discussed.

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➤ **Important** Information next to the word “Important” helps you complete a procedure or avoid additional steps.

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### **CAUTION**

Boxed text under the word “CAUTION” provides information you must know to avoid damaging the controller or losing data.

## Notes

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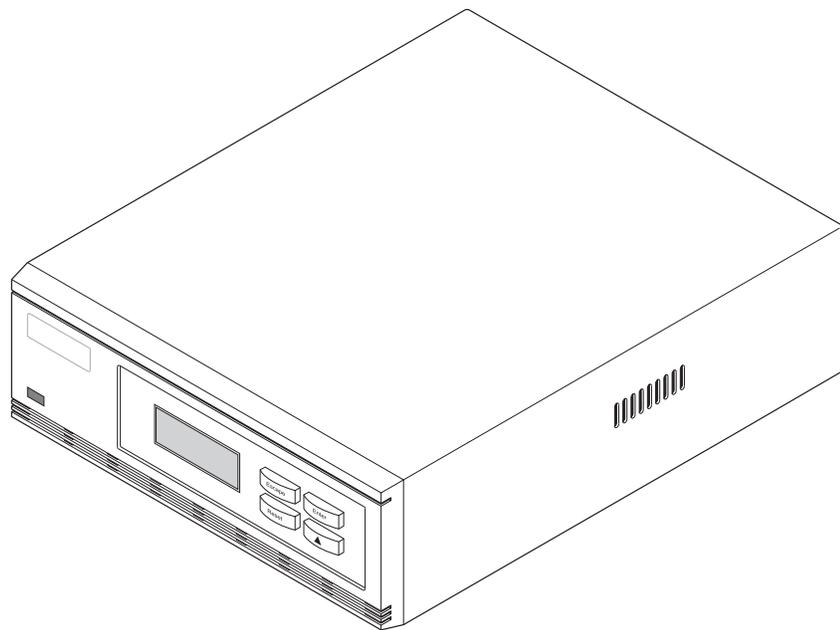
# 1 Features and Physical Description

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This chapter provides an overview of the Exabyte® M10 Mirroring Controller. It includes information about the following topics:

- Controller features
- Controller configuration
- Physical description

The controller is available in a compact desktop enclosure, as shown in [Figure 1-1](#).



**Figure 1-1** Exabyte M10 Mirroring Controller

# Controller Features

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The Exabyte M10 Mirroring Controller is an intermediary SCSI device that you can use with any host operating system or software. With the controller, you can:

- Write two identical tape copies of the same data at the same time (data mirroring)
- Restore data from or write data to individual tape drives (data pass thru)
- Copy an Exabyte 8mm tape written in one format to an Exabyte 8mm tape in another format (tape copy)
- Compare the data on two tapes to verify that they contain identical information (tape copy)

Using the controller has no effect on tape drive speed or performance.

## Data Mirroring

Data mirroring allows you to make two identical copies of a backup at the same time. When you select data mirroring, the host sends data to the controller, where it is copied (mirrored) and then transferred to the two tape drives. Data mirroring gives you the security of an extra backup copy that can be stored offsite.

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➤ **Important** When mirroring data, you must use identical tape drive models. Also, use data cartridges of the same length and format for your mirroring backup. Using different tape drive models or data cartridge types may result in an incomplete backup.

---

The controller can perform data mirroring with two independent tape drives or two tape drives contained within a library.

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► **Important** To perform data mirroring within a library, the library must support dual sequential mode, and it must contain at least four SCSI connectors. See [page 2-3](#) for detailed SCSI connector specifications.

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## Data Pass Thru

Data pass thru allows you to communicate with each tape drive individually. Using data pass thru, you can:

- Restore data after a mirroring operation
- Write data to one drive
- Read data from one drive

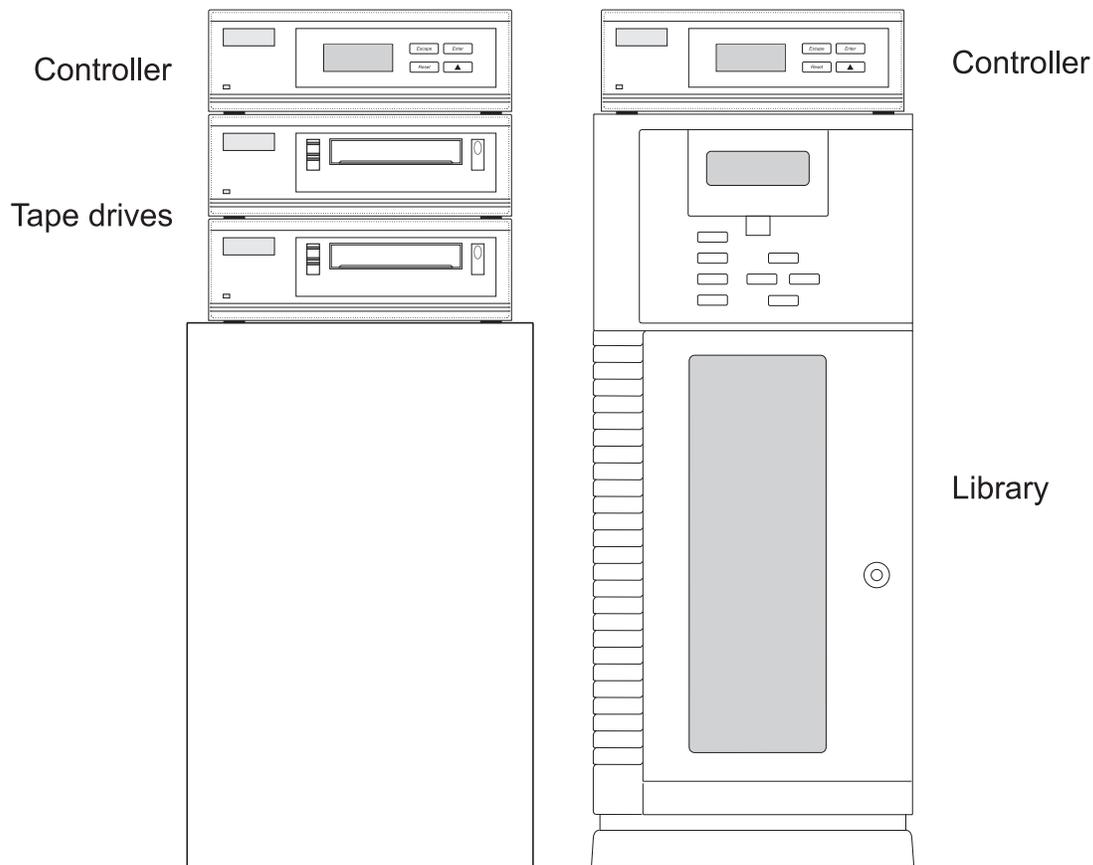
## Tape Copy

Tape copy allows you to copy a tape created in a previous backup to a blank tape. You can use the controller's tape copy feature to make a second copy of a tape or to convert from one 8mm tape format to another. For example, you can convert an 8500c format MP tape to a Mammoth format AME tape.

You can also use the tape copy feature to verify that two tapes contain identical information. You can verify while copying from one tape to another or compare two tapes created during a mirroring operation.

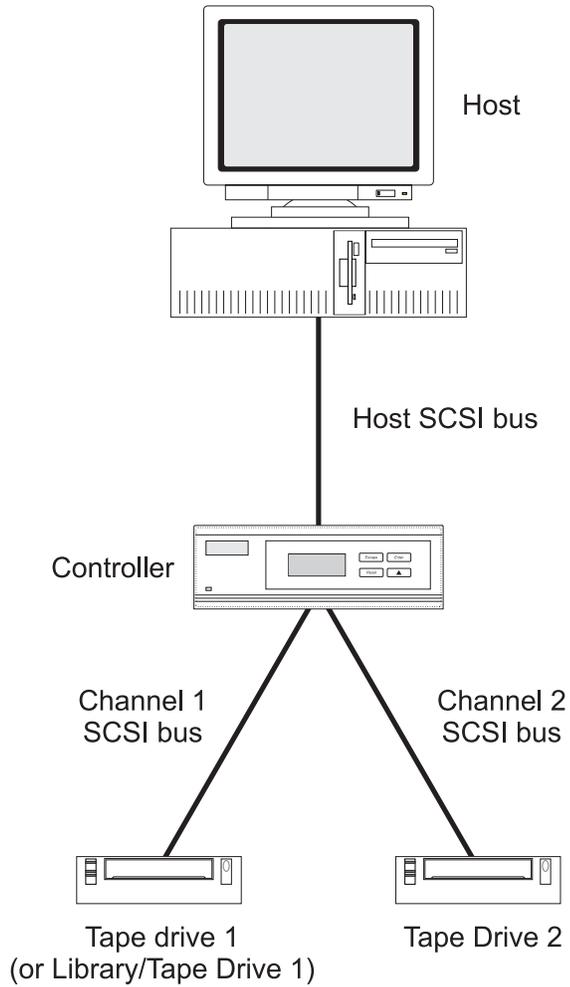
# Controller Configuration

The M10 Mirroring Controller can be connected to two independent tape drives or to a library that contains two tape drives, as shown in [Figure 1-2](#).



**Figure 1-2** M10 controller configurations

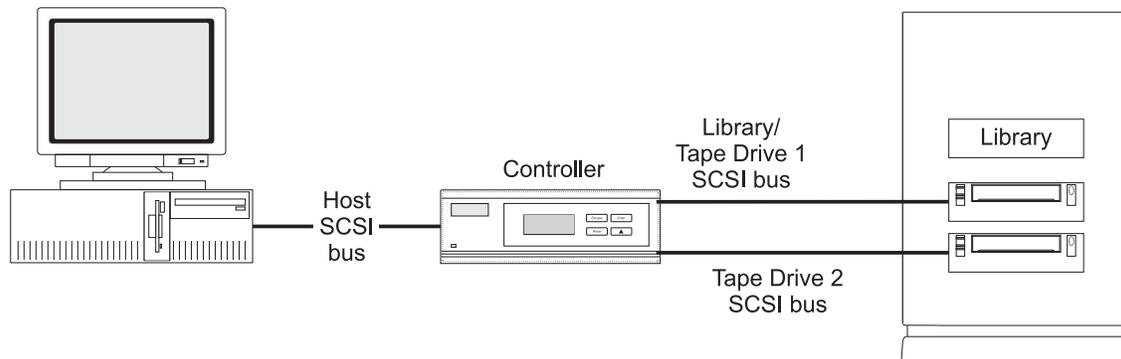
The controller is typically positioned between a host computer and two tape drives. The SCSI cables extending from the controller represent a total of three separate SCSI buses, as shown in [Figure 1-3](#).



**Figure 1-3** Controller position on the SCSI bus

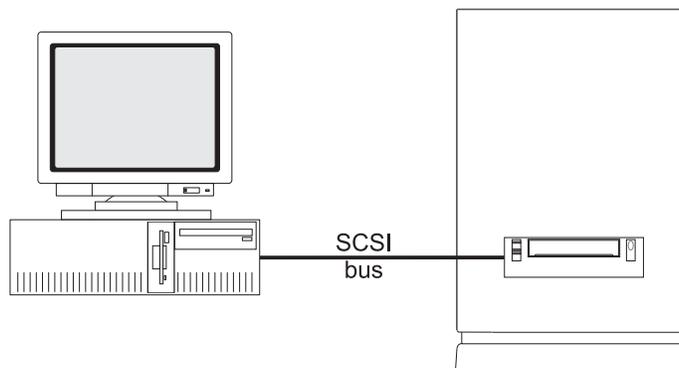
## Configuration in Mirroring Mode

The actual SCSI configuration for a controller in mirroring mode with tape drives in a library is shown in [Figure 1-4](#).



**Figure 1-4** Actual configuration in mirroring mode

Although the controller is physically positioned between the host and a library or two tape drives, the host does not perceive the controller as a target ID and “sees” only one tape drive on the SCSI bus, as shown in [Figure 1-5](#).

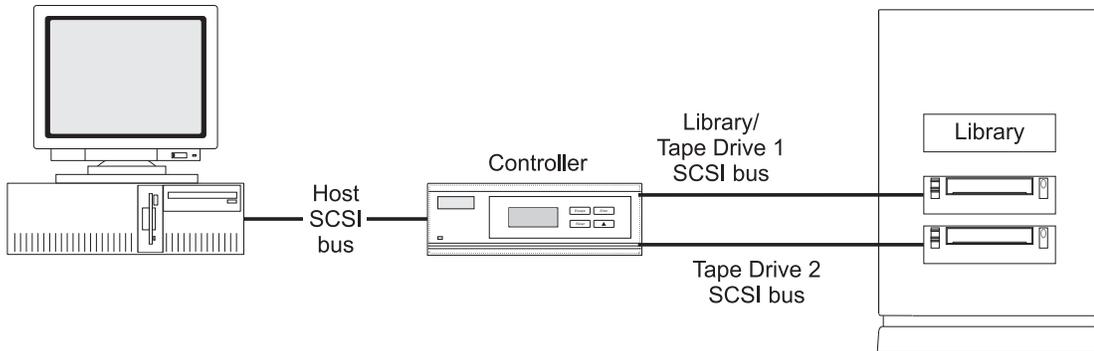


**Figure 1-5** Configuration “seen” by the host in mirroring mode

Since the host recognizes only one tape drive, the library must be set to dual sequential mode so that the robot automatically moves cartridges between the data cartridge slots and both tape drives. In dual sequential mode, half of the data cartridges are processed in tape drive 1 and half in tape drive 2.

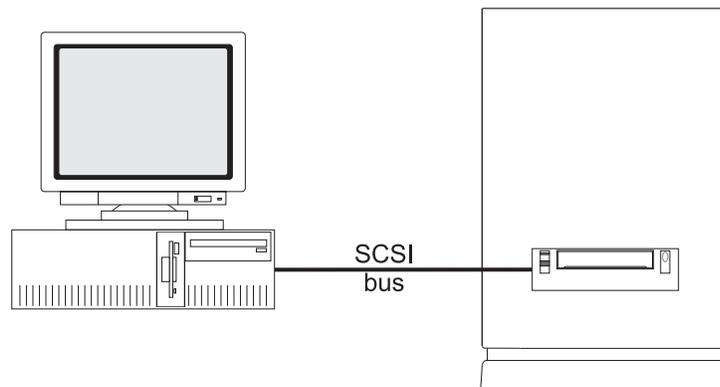
## Configuration in Pass Thru Mode

The actual SCSI configuration for a controller in pass thru mode with tape drives in a library is shown in [Figure 1-6](#).



**Figure 1-6** Actual configuration in pass thru mode

Although the controller is physically positioned between the host and a library or two tape drives, the host does not perceive the controller as a target ID and “sees” only one tape drive on the SCSI bus, as shown in [Figure 1-7](#).



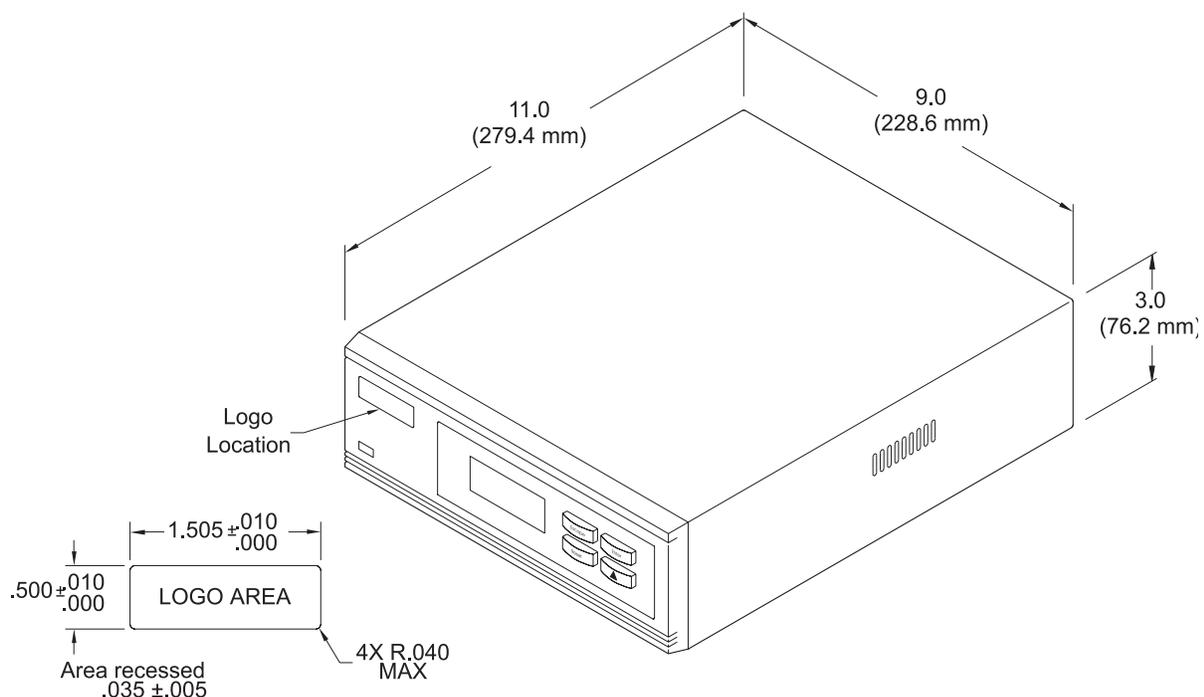
**Figure 1-7** Configuration “seen” by the host in pass thru mode

# Physical Description

The Exabyte M10 Mirroring Controller is housed in a compact desktop enclosure, complete with power supply and cooling fan.

## Size and Weight

The dimensions of the controller are shown in [Figure 1-8](#). The controller weighs 7.5 pounds (3.4 kg).



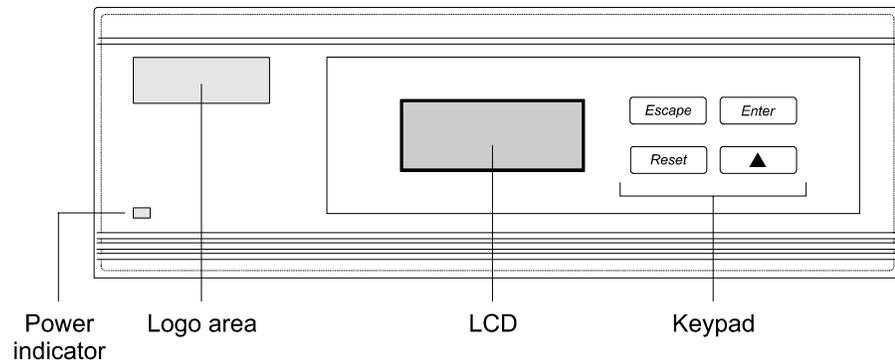
**Figure 1-8** Dimensions of the M10 controller

## Color

The standard controller enclosure is pearl white. For custom color information, contact your Exabyte account manager.

## Front Panel Components

Figure 1-9 shows the main components of the controller's front panel.



**Figure 1-9** Front panel components

### Power Indicator

When you turn on the controller's power, the green power-on LED on the lower left corner lights up. When power is off or disconnected, the LED goes off.

### Logo Area

The front panel of the controller provides a recessed area in the upper left corner for a company logo. For custom label information, contact your Exabyte account manager.

### Operator Panel (LCD and Keypad)

The operator panel consists of the liquid crystal display (LCD) and the keypad. The LCD displays four lines of text, each 20 characters long. The keypad contains four push button switches that are used to navigate through LCD menu options.

## Back Panel Components

Figure 1-10 shows the back panel of the controller.

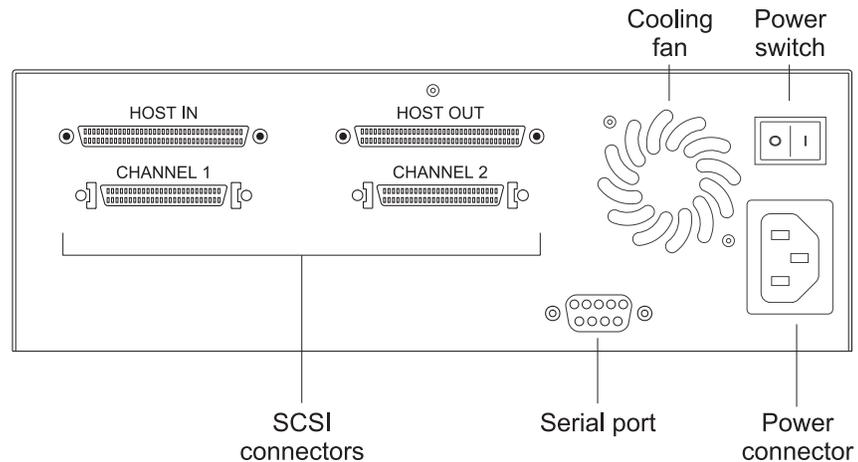


Figure 1-10 Back panel components

### SCSI Connectors

The controller contains four SCSI connectors: two host SCSI connectors and two tape drive SCSI connectors.

**Host SCSI connectors** The two uppermost SCSI connectors enable you to connect the controller to a host computer. These SCSI connectors are wide (68-pin) and are labeled “Host In” and “Host Out.”

**Note:** The controller is available in either a single-ended or differential host SCSI configuration. The controller’s host SCSI connectors must match the SCSI configuration of your host computer. For example, if your host computer contains a differential SCSI bus adapter card, you need a controller with differential host SCSI configuration.

**Tape drive SCSI connectors** Two additional SCSI connectors enable you to connect the controller to two independent tape drives or a library containing two tape drives. These connectors are narrow (50-pin) and use a single-ended SCSI configuration. They are labeled “Channel 1” and “Channel 2.”

## **Cooling Fan**

The cooling fan increases air ventilation in the controller enclosure. The fan automatically powers on when the controller power switch is turned on.

## **Power Switch**

The power switch is a rocker switch located on the back panel of the controller.

## **Power Connector**

The power connector provides the AC line voltage input to the internal power supply for the controller. See [page 3-3](#) for power cord specifications.

## **Serial Port**

Exabyte use only.

## Notes

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# 2 Installation and Operation

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This chapter describes the requirements for installing and using the M10 Mirroring Controller, including information about:

- Installation
- Configuration
- Operation

## Installation Requirements

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Installing the controller involves the following steps:

- Obtaining the necessary equipment and accessories
- Connecting the controller to the SCSI bus
- Connecting the power cord

This section describes the requirements for these steps. For detailed installation instructions, refer to *Exabyte M10 Mirroring Controller Installation and Operation*.

## Obtaining Equipment and Accessories

The controller is equipped with a power cord, a host SCSI cable, and an external SCSI terminator. [Table 2-1](#) describes all the equipment and accessories necessary for controller operation.

**Table 2-1** Required equipment and accessories

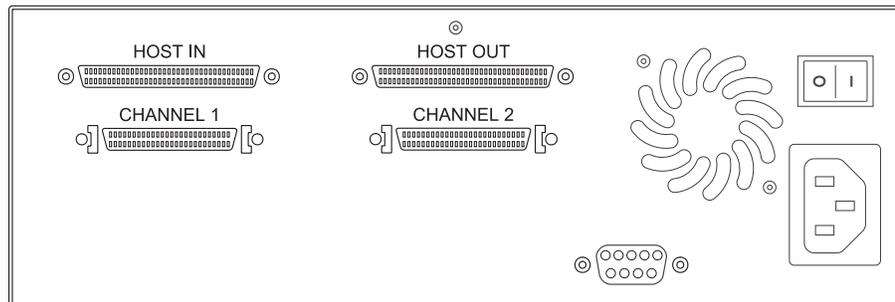
Equipment/ Accessories	Requirements
Power cord	A 120 VAC power cord is included with the controller. See <a href="#">page 3-3</a> if you are using a different input voltage.
SCSI cables	One wide (single-ended or differential) host SCSI cable is included with the controller. You must obtain two additional SCSI cables for the tape drives. See <a href="#">page 4-3</a> for SCSI cable requirements.
SCSI terminators	One external wide (single-ended or differential) SCSI terminator is included with the controller. You may need additional terminators for the host and tape drives. See <a href="#">page 4-6</a> for SCSI terminator requirements.
SCSI adapters	You may need one or more SCSI adapters. See <a href="#">page 4-3</a> for SCSI adapter requirements.

## Connecting the Controller to the SCSI Bus

You need a total of three SCSI cables to connect the controller to the SCSI bus. One cable connects the controller to the host computer. Two cables connect the controller to two independent tape drives or a library containing two tape drives.

## SCSI Connectors

The controller contains four SCSI connectors: two host SCSI connectors and two tape drive SCSI connectors, as shown in [Figure 2-1](#). The host SCSI connectors use a different configuration than the tape drive SCSI connectors.



**Figure 2-1** Controller SCSI connectors

**Host SCSI connectors** The host SCSI connectors, labeled “HOST IN” and “HOST OUT,” are wide (68-pin) and are available in either a single-ended or differential SCSI configuration. If you have a narrow (50-pin) host, you can connect to the controller by using an adapter. You cannot, however, mix SCSI configurations between the controller and the host. For example, if your host contains a single-ended SCSI bus adapter card, the controller must also use a single-ended configuration. (See [page 4-3](#) for SCSI cable and adapter requirements.)

**Tape drive SCSI connectors** The tape drive SCSI connectors, labeled “CHANNEL 1” and “CHANNEL 2,” are available in a narrow (50-pin), single-ended SCSI configuration. If you have a wide tape drive, you can connect to the controller by using an adapter. You cannot, however, connect the controller to tape drives with a differential SCSI configuration. (See [page 4-3](#) for SCSI cable and adapter requirements.)

## SCSI IDs

You can set the SCSI ID for the controller using the Configuration menu (0 to 7 for a narrow host, 0 to 15 for a wide host). See [page 2-6](#) for Configuration menu options.

You must set the SCSI ID for each tape drive to 0. Since the tape drives occupy separate SCSI buses from the host, this setting will not interfere with the SCSI ID for other devices you attach to the host SCSI bus.

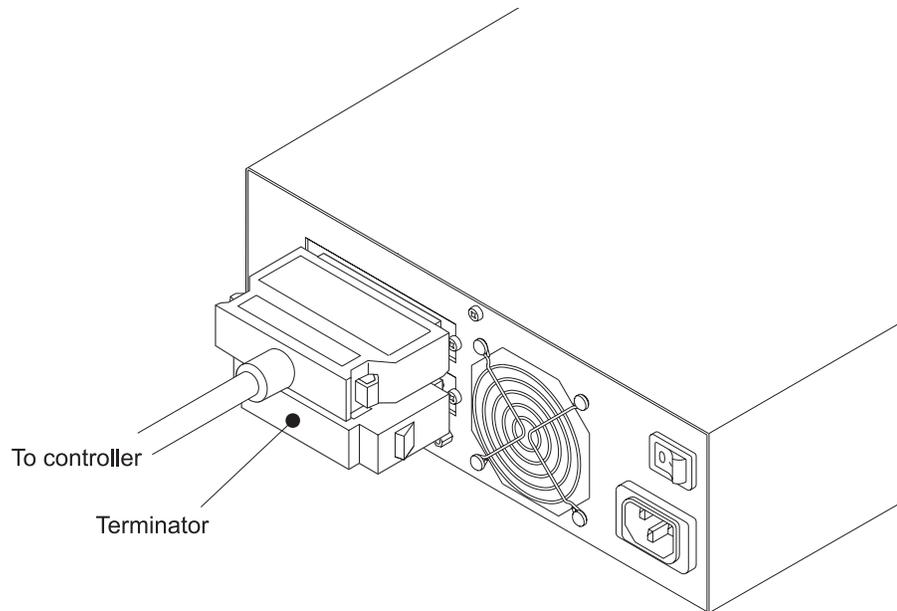
## Connecting the Controller to a Tape Drive

You can connect the controller to a tape drive by extending a SCSI cable from the CHANNEL 1 or the CHANNEL 2 connector on the back of the controller to the back of a tape drive, as shown in [Figure 2-2](#).

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► **Important** Make sure you terminate the tape drive if it is the last device on the SCSI bus.

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**Figure 2-2** Tape drive connected to the controller

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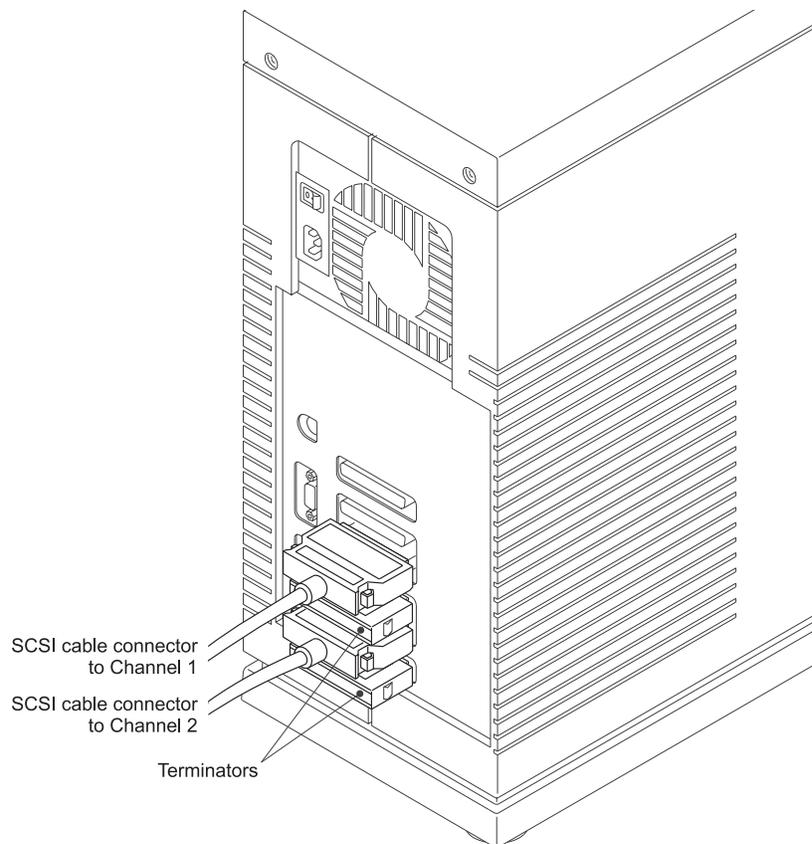
► **Important** The SCSI ID for each tape drive must be set to 0. (Refer to your tape drive documentation for instructions.)

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## Connecting the Controller to a Library

You can connect the controller to a library by extending the CHANNEL 1 and CHANNEL 2 cables from the controller to the tape drive connectors on the back of a library. [Figure 2-3](#) shows a library with six SCSI connectors: two for the library, two for Tape Drive 1, and two for Tape Drive 2.

**Note:** With the library set to dual sequential mode, you do not need to attach a SCSI cable to the library SCSI connectors. In dual sequential mode, the host and controller are communicating only with the tape drives, not the library's robot.



**Figure 2-3** Library connected to the controller

---

➤ **Important** The SCSI ID for each tape drive must be set to 0. (Refer to your library documentation for instructions.) Also, make sure you terminate each tape drive if it is the last device on the SCSI bus.

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## Connecting the Power Cord

The M10 controller includes a 120 VAC three-conductor power cord for use in the United States and Canada. You must supply power cords for other input voltages or when using the controller outside of the United States and Canada. For more information on power cord specifications, see [page 3-3](#).

## Configuration

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After you install the controller, you can power it on and configure it for operation. Using the Configuration menu, you can select the following options:

- Host computer SCSI configuration (narrow or wide)
- SCSI ID for the controller (0 through 7 for a narrow host; 0 through 15 for a wide host)

## Operation

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Using the controller's keypad and LCD, you can access online and offline operations. Online operations involve data transfer between the host, the controller, and the tape drives. Offline operations do not require host involvement.

Online operations include mirroring and pass thru. Offline operations include diagnostics and tape copying.

## Menu Options

The controller's menu options can be viewed from the LCD. Using the keypad, you can access the menu structure and the following menu screens:

- Status screen
- Summary screen

Figure 2-4 shows an overview of the menu structure.

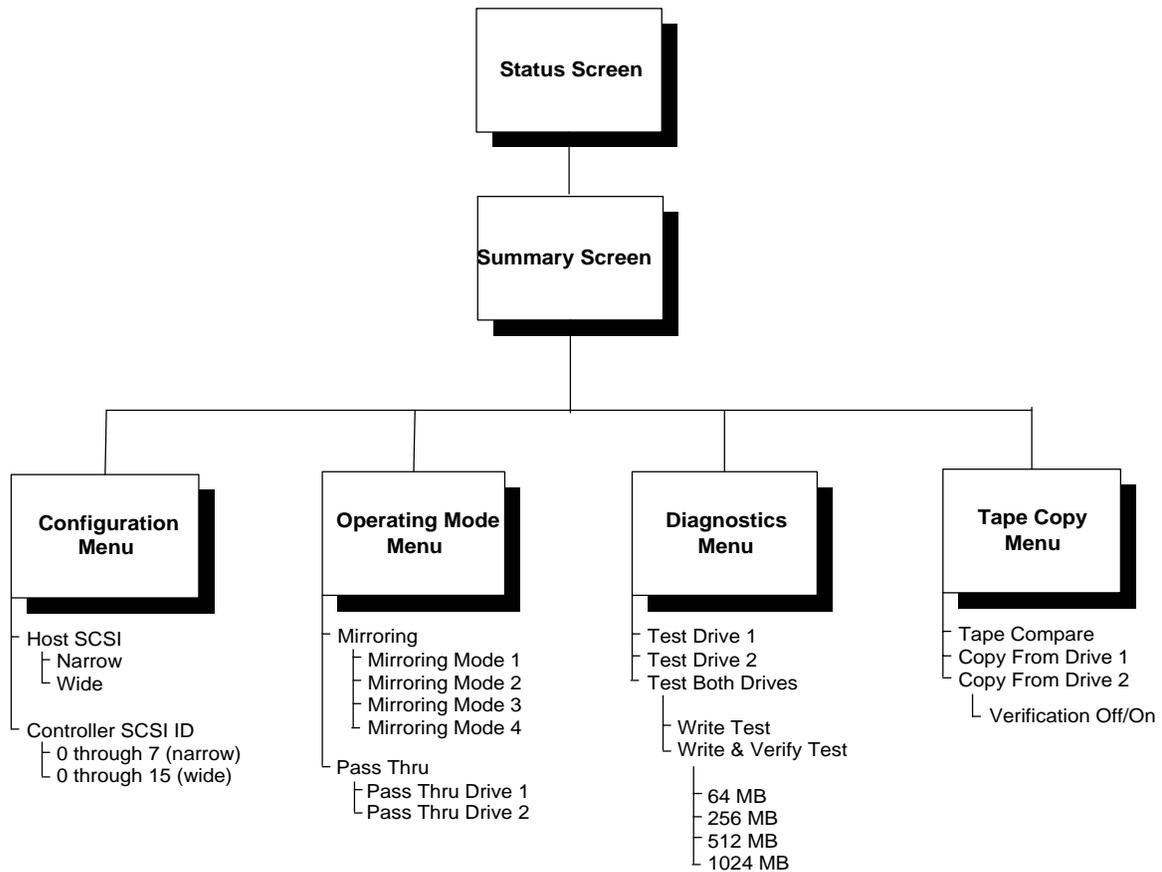


Figure 2-4 Controller menu structure

You can select options from the menu by using the keypad, as described in Table 2-2.

Table 2-2 Controller keypad options

Key	Description
	Exits from the current screen and displays the previous menu.
	Selects the menu or option currently displayed.
	Resets the controller and tape drives.
	Advances to the next menu option.

## Status Screen

After the controller is powered on, the Status screen appears on the LCD. The Status screen includes the following information:

- Line 1 – Current operating mode (*n* represents a number between 1 and 4; see [page 2-10](#) for a description of mirroring modes)
- Line 2 – The tape drives that the controller can detect after completing its power-on self-test
- Line 3 – The tape drives that the controller is communicating with in the current operating mode
- Line 4 – The key to press (⌘) so that you can view the Summary screen

An example of the Status screen is shown below.

M	i	r	r	o	r	i	n	g	M	o	d	e	n		
D	r	i	v	e	s	P	r	e	s	e	n	t	1	&	2
A	c	t	i	v	e	D	r	i	v	e	s		1	&	2
(	⌘	)	S	u	m	m	a	r	y	S	c	r	e	e	n

If the controller cannot detect one of the tape drives, the Drives Present line displays “X” in place of the drive number.

If an error occurs during a mirroring operation, the Active Drives line displays “C,” “E,” or “M” in place of the drive number. See [Table 2-5 on page 2-12](#) for information about these mirroring error codes.

## Summary Screen

From the Status screen, you can access the Summary screen. The Summary screen includes the following information:

- Line 1 – The SCSI ID of the controller and the SCSI configuration of the host computer (narrow or wide)
- Line 2 – The SCSI configuration of the controller (single-ended or differential)
- Line 3 – The revision number of the firmware
- Line 4 – The key to press (⌘) so that you can view the next menu

An example of the Summary screen is shown below.

S	C	S	I	I	D	n			W	I	D	E		
											D	I	F	F
R	E	V		M	-	i	x	x						
(	^	)		N	e	x	t	M	e	n	u			

## Online Operations

You can select the following online operations by using the Operating Mode menu:

- Mirroring
- Pass thru

### Mirroring

When you select mirroring, data is sent from the host, copied (mirrored) at the controller, and passed simultaneously to both tape drives.

---

➤ **Important** If you want to mirror data within a library, the library must support dual sequential mode.

To operate in dual sequential mode, the library must contain a controller card with at least four SCSI connectors. See your library's installation and operation manual for details about using dual sequential mode.

---

Four options are available within the Mirroring menu: Mirroring Mode 1 through Mirroring Mode 4. These options allow you to choose whether you want a mirroring operation to continue despite a media or tape drive failure.

The features of each mirroring mode are described in [Table 2-3](#).

**Table 2-3** Mirroring mode backup and restore features

	<b>Mirroring Mode 1</b>	<b>Mirroring Mode 2</b>	<b>Mirroring Mode 3</b>	<b>Mirroring Mode 4</b>
<b>Backup</b>	The backup stops if any errors occur. You either have two valid backup copies or none at all.		The backup continues even if an error occurs on one tape drive. You are assured of at least one good backup copy.	
<b>Restore</b>	The restore requires both tapes from the mirrored set to be present.	The restore requires only one tape from the mirrored set, giving you the freedom to store the other tape off site.	The restore requires only one tape from the mirrored set, giving you the freedom to store the other tape off site.	The restore requires both tapes from the mirrored set to be present.

[Table 2-4](#) describes whether a mirroring operation will continue or stop if an error occurs during backup or restore.

**Table 2-4** Mirroring mode error responses

	<b>Mirroring Mode 1</b>	<b>Mirroring Mode 2</b>	<b>Mirroring Mode 3</b>	<b>Mirroring Mode 4</b>
<b>Backup Error</b>	An error on either tape drive causes the backup to stop.		An error on one tape drive does not stop the backup. It continues with the remaining drive.	
<b>Restore Error</b>	An error on either tape drive causes the restore to stop.	An error on the drive from which the data is being read causes the restore to stop.	An error on the drive from which the data is being read causes the restore to stop.	An error on one tape drive does not stop the restore. It continues with the remaining drive.

If you are using Mirroring Modes 3 or 4 and an error occurs on one tape drive during a backup, you can use the offline tape copy feature to create a second copy from the good backup tape. See [page 2-13](#) for information about the Tape Copy menu.

If an error occurs during mirroring, three types of error codes can appear on the Active Drives line of the controller's LCD. These errors are reported to the controller as C, E, or M, as described in [Table 2-5](#).

**Table 2-5** Mirroring error codes

Error	Description
C	<p>In Mirroring Modes 3 and 4, C indicates a drive that has been disabled because of an error. However, a C error does not cause the operation to stop; the backup or restore continues with the other drive.</p> <p>To clear a C error, you must reset the controller manually or through SCSI.</p>
E	<p>In all mirroring modes, E indicates which drive is causing the error. Some E errors (for example, hardware errors) cause the mirroring operation to stop.</p> <p>To clear an E error that has caused the mirroring operation to stop, you must reset the controller manually or through SCSI.</p>
M	<p>In Mirroring Mode 4, M indicates that the tapes do not contain identical information. The controller returns a Media Error to the host (sense key = 3h, ASC = 30h, ASCQ = 1h). The mirroring backup or restore operation does not begin.</p> <p>To clear an M error and continue the backup, you can instruct the application software to overwrite the tapes. To clear an M error and continue the restore, you can switch to pass thru mode or obtain matching tapes from the mirrored backup set. (To determine whether the tapes contain identical data, you can use the tape compare feature in the Tape Copy menu. See <a href="#">page 2-13</a> for information about this feature.)</p>

## Pass Thru

When you select Pass Thru as a menu option, the host communicates with each tape drive individually. You can use pass thru to restore data from individual tapes following a mirroring operation. You can also use pass thru to write to or read from one tape at a time.

**Note:** When you use pass thru mode, you can restore data from a mirroring tape created in any of the mirroring modes.

## Offline Operations

You can select the following offline operations by using the menu selections on the controller's LCD:

- Diagnostics
- Tape Copy

### Diagnostics

Diagnostics is an offline operation that allows you to test the performance of tape drives attached to the controller. You can test one tape drive at a time or both tape drives simultaneously. When you select options within the Diagnostics menu, you can write data to tape, read data from tape, and verify that write and read operations have been performed successfully. Any write, read, or verify errors that occur are displayed on the controller's LCD.

### Tape Copy

Tape copy is an offline operation that allows you to copy data, compare data, or convert data from one 8mm format to another. Using the Tape Copy menu, you can:

- Copy data from a valid backup tape to a blank tape.
- Verify after a mirroring operation that both tapes contain identical information.
- Transfer data from one Exabyte 8mm tape format to another. For example, you can convert data from 8500c tape format to Exabyte Mammoth format.

The Tape Copy menu contains three menu options:

- **Tape Compare** – allows you to compare two tapes (both containing data) to ensure that they contain identical data.
- **Verification Off** – allows you to copy from a tape containing data to a blank tape without verifying that the source data matches the target data.
- **Verification On** – allows you to copy from a tape containing data to a blank tape and verify that the source data matches the target data.

## Resetting the Controller

You can reset the controller from the keypad on the operator panel. Resetting the controller causes the controller and the tape drives to perform their power-on self-tests.

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# 3 Functional Specifications

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This chapter includes specifications for the Exabyte M10 Mirroring Controller, including specifications for performance, power, environment, and shipping. This chapter also includes information about safety and agency standards.

## Performance Specifications

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The controller supports normal, fast, and Ultra SCSI data transfer speeds to the host. The controller supports normal and fast narrow SCSI data transfer speeds to the tape drives.

The controller does not affect tape drive performance and does not limit backup time, data transfer speeds, search speed, or data capacity. Refer to your library or tape drive documentation for specific performance specifications.

## Power Specifications

---

This section describes the power specifications for the controller, including:

- AC input voltages
- AC input power
- AC power consumption

## AC Input Voltages

The controller includes an internal power supply that is capable of accepting 100 to 240 VAC at 50 to 60 Hz. The controller has automatic AC input voltage selection.

## AC Input Power

The controller is capable of continuous operation when the AC power experiences intermittent operation, voltage surges, or voltage spikes. The controller includes an AC line filter to reduce conducted emissions.

[Table 3-1](#) contains the AC power characteristics for the controller.

**Table 3-1** AC power characteristics

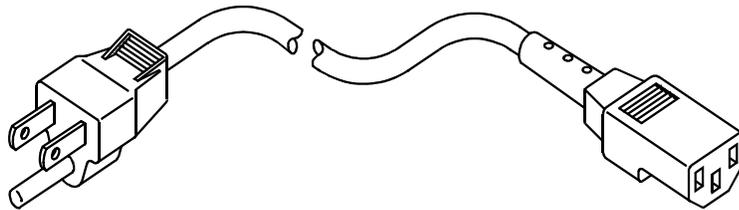
<b>Intermittent operation</b>	100% line dropout for 0.5 cycle at nominal line voltage 50% line reduction for 1.5 cycles at nominal line voltage 20% line reduction for 2.5 cycles at nominal line voltage
<b>Line discontinuities: voltage surges</b>	±500 volts at nominal line voltage Pulse Width: 100 ns Rise Time: 5 ns Repetition Rate: 1 Hz Common and differential mode, positive and negative polarity
<b>Line discontinuities: voltage spikes</b>	±1.5 KV at nominal line voltage Pulse Width: 1 μs Rise Time: 25 ns Repetition Rate: 1 Hz Common and differential mode, positive and negative polarity

## AC Power Consumption

The power consumption varies depending on the functions being performed by the controller and the tape drives. The controller consumes a minimum of 19.9 watts and a maximum of 21.1 watts (AC true power). Based on the AC true power consumption, the controller generates between 68 and 72 BTU/hour.

## AC Power Cord

The controller is shipped with a 7-foot (2.1-meter), three-conductor, 18 AWG power cord for 120 volt use in the United States and Canada. As shown in [Figure 3-1](#), the power cord has a molded NEMA 5-15P male connector on one end and a molded IEC 320 female connector on the other end. The power cord is UL Listed and CSA Certified.



**Figure 3-1** 120 VAC power cord for the United States and Canada

The controller can operate from 100 to 240 VAC, with a frequency of 50 or 60 Hz, without manual intervention. If you plan to use other input voltages or use the controller outside of the United States or Canada, you must supply a power cord that meets the following specifications.

### United States and Canada 220 VAC power cord

- The power cord must have a molded NEMA 6-15P attachment plug on one end.
- The power cord must have a molded IEC 320 female connector on the other end.
- The cordage must be an SJT or SVT type, 3-conductor, 18 AWG minimum.
- The power cord must comply with local electrical code.

### International 230 VAC power cord

- The power cord must have a grounded attachment plug of the proper type, rating, and safety approval for the intended country.
- The power cord must have an IEC 320 female connector on one end.
- The cord must be harmonized to CENELEC publication HD-21. The electrical characteristics and rating must be minimum H05VVF3G0.75 (6 A).

# Environmental Specifications

Environmental specifications include the following:

- Operating environment
- Acoustic noise limits
- Shock and vibration

Table 3-2 summarizes the environmental specifications for operating, storing, and shipping the controller.

**Table 3-2** Environmental specifications

	Operating	In storage <sup>a</sup> or not operating <sup>b</sup>	Being shipped <sup>a</sup>
<b>Temperature range</b>	5°C to 45°C (+ 41°F to 104°F)	-40°C to + 60°C (-40°F to + 140°F)	-40°C to + 60°C (-40°F to 140°F)
<b>Temperature variation<sup>c</sup></b>	10° C per hour, maximum (18° F per hour, maximum)	20° C per hour, maximum (36° F per hour, maximum)	
<b>Relative humidity<sup>a</sup></b>	20% to 80% Non-condensing	10% to 90% Non-condensing	10% to 90% Non-condensing
<b>Wet bulb temperature</b>	26° C (79° F) max	29° C (84° F) max	29° C (84° F) max
<b>Altitude</b>	-304.8 m to + 3,048 m (-1,000 ft to + 10,000 ft)	-304.8 m to + 3,048 m (-1,000ft to+ 40,000 ft)	-304.8 m to + 12,192 m (-1,000ft to + 40,000 ft)

<sup>a</sup> The controller is in its original packaging.

<sup>b</sup> The controller is unpacked but not powered on.

<sup>c</sup> The controller's temperature and humidity must be allowed to stabilize in the specified ambient environment for 24 hours.

# Operating Environments

Figure 3-2 is a psychrometric chart that indicates the operating temperature and humidity ranges for the controller. The dotted line represents the operating environment limits. Table 3-3 defines the temperature and humidity points shown in Figure 3-2.

Table 3-3 Temperature and humidity points for psychrometric chart

Point	Temperature	Humidity
A	5° C	80%
B	29° C	80%
C	45° C	22%
D	45° C	20%
E	5° C	20%

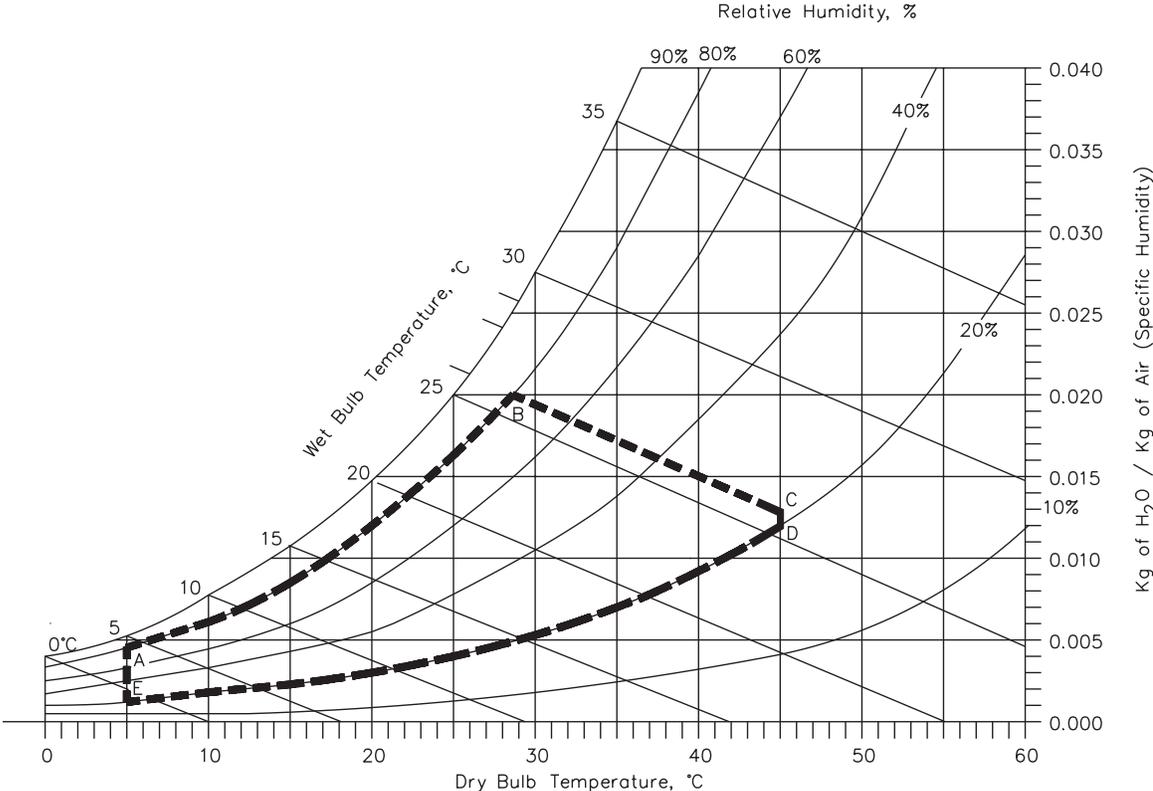


Figure 3-2 Temperature and humidity ranges for operation

## Shock Specifications

Table 3-4 lists the shock specifications for the controller. The operating shock levels indicate how much shock the controller can withstand while it is performing online and offline operations. The non-operating and storage shock levels indicate how much shock it can withstand when it is not operating. After withstanding this amount of shock, the controller will operate normally.

**Table 3-4** Shock specifications

Operating (reading and writing)	Storage (in original packaging) <sup>a</sup> or not operating (unpacked, no power applied) <sup>b</sup>	Transportation (shipped in original packaging) <sup>a</sup>	Handling
3 g 5 ms <sup>c</sup>	45 g at a velocity change of 167 in/sec <sup>d</sup>	ISTA Procedure 1A	Drop and Topple per IEC 68-2-31

<sup>a</sup> The controller has not been unpacked.

<sup>b</sup> The controller has been unpacked, but no power has been applied.

<sup>c</sup> A minimum of 20 shock pulses are applied to each of the six sides. The shock pulses are half-sine waves and are applied at a rate not exceeding one shock per second.

<sup>d</sup> A minimum of three trapezoidal shock pulses of 45 g are applied to each of the controller's six sides.

## Vibration Specifications

**Table 3-5** lists the vibration specifications for the controller during operation, non-operation, storage, and transportation. The operating specifications listed in this table indicate the amount of vibration that the controller can withstand while performing online and offline operations.

**Table 3-5** Vibration specifications

<b>Random vibration<sup>a</sup> applied during operation (reading and writing)</b>	
1 Hz	PSD= 0.0000040 g <sup>2</sup> /Hz
5 Hz	PSD= 0.0000270 g <sup>2</sup> /Hz
10 to 150 Hz	PSD= 0.0004048 g <sup>2</sup> /Hz
200 to 400 Hz	PSD= 0.0001079 g <sup>2</sup> /Hz
<b>Random vibration<sup>b</sup> applied during non-operation (unpacked) and storage (in original packaging)</b>	
1 Hz	PSD= 0.0003 g <sup>2</sup> /Hz
3 Hz	PSD= 0.00055 g <sup>2</sup> /Hz
12 to 100 Hz	PSD= 0.01 g <sup>2</sup> /Hz
400 Hz	PSD= 0.000003 g <sup>2</sup> /Hz
<b>Vibration applied during shipping (in original packaging)</b>	
ISTA Procedure 1A	
<b>Swept sine applied during operation<sup>c</sup>, and non-operation and storage<sup>d</sup></b>	
5 to 500 to 5 Hz	

<sup>a</sup> A 30 G RMS random vibration spectrum is applied to each of three orthogonal axes for a minimum of 20 minutes per axis.

<sup>b</sup> A 1.06 G RMS random vibration spectrum is applied to each of three orthogonal axes for a minimum of 20 minutes per axis.

<sup>c</sup> Three sweeps at one octave per minute are applied to each axis at 0.3 g (peak) input.

<sup>d</sup> Three sweeps at one octave per minute are applied to each axis at 0.75 g (peak) input.

## Acoustic Noise Limits

The overall, averaged A-weighted sound pressure level (in decibels) for the controller does not exceed 45 dBA in all operating modes.

**Note:** The A-weighted sound pressure level is measured over the following frequency range: 5 Hz to 12.5 KHz.

# Shipping Specifications

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This section describes the shipping requirements for the controller.

## Shipping Carton

The controller is sealed in a static protection bag and is shipped with one controller per carton. [Table 3-6](#) shows the dimensions and weight of the carton.

**Table 3-6** Shipping dimensions and weights

Dimensions	Weight
20.00 inches long 16.25 inches wide 10.38 inches high (51 × 41 × 26 cm)	10.5 pounds (5.6 kg)

The shipping carton and internal packing materials are designed so that the enclosed controller does not receive a shock greater than 45 g when the carton is dropped on any surface, corner, or edge from a height of 36 inches (91.5 cm) at a velocity change of 167 inches per second.

The shipping carton passes the tests described in the International Safe Transit Association (ISTA) Procedure 1A for packaged products weighing less than 100 pounds.

## Packing Materials

The packing materials are unbleached, reusable, recyclable, and environmentally safe. The materials contain no chlorofluorocarbons (CFCs) or heavy metals.

To avoid damaging the controller, use the original shipping carton and packing materials (or replacement packaging obtained from your vendor) when repacking and shipping it. The shipping carton and packing materials are not intended to be used for shipping items other than the Exabyte M10 controller.

# Safety and Regulatory Agency Compliance

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This section describes safety and regulatory agency requirements met for the Exabyte M10 Mirroring Controller.

When installed in a manner consistent with Exabyte's installation instructions, the controller can be expected to maintain its compliance with the standards listed below. It is the responsibility of the system integrator to certify and/or verify the final product to the relevant standards.

## Safety

- UL1950: 3rd Edition, Information Technology Equipment Including Electrical Business Equipment.
- CSA-C22.2 No. 950-M95, Safety of Information Technology Equipment including Electrical Business Equipment.
- EN60950/IEC950: Safety of Information Technology Equipment including Electrical Business Equipment.

## Electromagnetic Interference (EMI)

- FCC Class A: FCC Rules and Regulations, Part 15 - Radio Frequency Devices: Subpart B, Unintentional Radiators Class A.
- Industry Canada Notice ICES-003: Class A digital apparatus.
- EN 55022: CISPR 22 (1985) Class A.

## Electromagnetic Compatibility (EM C)

- EN 61000-4-2: Immunity to Electrostatic Discharge (ESD) for Information Technology Equipment (ITE)—Contact discharges: Level 2; Air-gap discharges: Level 3.
- EN 61000-4-3: First Edition 1984 Electromagnetic compatibility for industrial-process measurement and control equipment. Part 3: Radiated electromagnetic field requirements—Susceptibility: Level 2.
- EN 61000-4-4: First Edition 1988 Electromagnetic compatibility for industrial-process measurement and control equipment. Part 4: Electrical fast transient/burst requirements—EFT/N: Level 2.
- EN 61000-4-5: Draft Edition January 1993 Electromagnetic compatibility for industrial-process measurement and control equipment. Part 5: Surge immunity requirements—A.C. mains: Level 3; D.C. ports: Level 2.

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# 4 SCSI Specifications

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This chapter provides Small Computer System Interface (SCSI) specifications for the Exabyte M10 Mirroring Controller, including information about the following:

- General information about SCSI
- Controller SCSI configuration
- MODE SELECT (15h) command
- MODE SENSE (1Ah) command

**Note:** The controller and the tape drives are independent SCSI devices. This chapter provides information about how the controller supports SCSI communications. For information about how the library or tape drives support SCSI communications, refer to your library or tape drive documentation.

## General Information About SCSI

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SCSI is a standard that enables host computers and peripheral equipment, such as the controller and a tape drive or the library, to communicate. The physical components in a SCSI system consist of the following:

- **Initiator.** A SCSI bus adapter card installed in a host computer allows the computer to act as the *initiator* of SCSI operations. The initiator (host) can send commands, messages, and data across the SCSI bus to targets such as libraries or tape drives. The initiator can also receive data, messages, and status from the targets.

- **Targets.** The tape drives are independent *targets* capable of receiving commands from the initiator. The initiator (host) sends commands through the controller to the target devices. The controller is essentially transparent to the host, which means that during normal operation it is not perceived by the host as a target device.

**SCSI bus.** The *SCSI bus* provides a pathway for passing information between the initiator and the targets. As described on [page 1-5](#), the controller is typically positioned between the host computer and two independent tape drives or a library containing two tape drives. The three SCSI cables extending from the controller represent three separate SCSI buses.

Up to eight devices (including one or more initiators) can be cabled together to form a narrow SCSI bus. Wide SCSI buses can include up to 16 devices. Devices at each end of an individual SCSI bus are terminated with SCSI terminators.

Each device attached to a SCSI bus has a unique SCSI ID that identifies it during communication. The SCSI ID of the controller can range from 0 to 7 if the host computer contains a narrow host bus adapter card; the controller's SCSI ID can range from 0 to 15 if the host computer contains a wide host bus adapter card. The SCSI ID for each tape drive must be set to 0.

# Controller SCSI Configuration

This section provides information about SCSI configuration requirements for the controller, including information about the following:

- SCSI cable and adapter requirements
- SCSI terminator requirements

## SCSI Cable and Adapter Requirements

[Table 4-1](#) describes SCSI cable and adapter requirements for the three SCSI buses: the host SCSI bus (connecting the controller to the host), and the Channel 1 and Channel 2 SCSI buses (connecting the controller to the tape drives). The controller is shipped with a wide (68-pin) host SCSI cable; all other cables and adapters referred to in the following table are available from Exabyte.

**Table 4-1** SCSI cable and adapter requirements

SCSI cable	Controller SCSI configuration...	Connecting to...	You will need...
<b>Host SCSI cable</b>	Wide, single-ended	Wide, single-ended host	Wide, single-ended SCSI cable (shipped with controller)
		Narrow, single-ended host	Wide, single-ended SCSI cable (shipped with controller) plus adapter
	Wide, differential	Wide, differential host	Wide, differential SCSI cable (shipped with controller)
		Narrow, differential host	Wide, differential SCSI cable (shipped with controller) plus adapter
<b>Channel 1 and Channel 2 SCSI cables</b>	Narrow, single-ended	Narrow, single-ended library or tape drives	Narrow, single-ended SCSI cable
		Wide, single-ended library or tape drives	Narrow or wide, single-ended SCSI cable plus narrow-to-wide or wide-to-narrow adapter

## Wide SCSI Cable Specifications

If you use a host SCSI cable other than the wide (68-pin) cable provided with your controller, your cable must conform to the SCSI-3 specifications listed in [Table 4-2](#).

**Table 4-2** Wide SCSI cable specifications

Characteristic	Single-ended	Differential
Connector type	68-pin, high-density, shielded, male external connector	68-pin, high-density, shielded, male external connector
Cable impedance (in Ohms) <sup>a</sup>	Max 96 Nom 90 Min 84	Max 160 Nom 122 Min 115
Impedance difference between any two signals on the same cable <sup>b</sup>	12 Ohms	20 Ohms
Conductor size <sup>b</sup>	# 30 AWG min	
Cable skew delay <sup>c</sup>	4 nS	
Propagation delay	5.4 nS/meter max	
Pair-to-pair propagation delta delay	0.15 nS/meter max	
Signal attenuation	0.095 db max/meter @ 5 MHz <sup>d</sup>	

<sup>a</sup> Excluding TERMPWR conductors

<sup>b</sup> Recommended specification

<sup>c</sup> The maximum difference in propagation time allowed between any two SCSI bus signals measured between any two SCSI devices

<sup>d</sup> Measured differentially

## Narrow SCSI Cable Specifications

To connect the controller to the tape drives, use SCSI cables that conform to the specifications listed in [Table 4-3](#).

**Table 4-3** Narrow SCSI cable specifications

Cable Feature	Requirement
Connector Type	50-pin high-density, shielded, male, external SCSI-2 connector
Impedance	88 Ohms $\pm$ 8 Ohms
Standard Construction	50 conductors (25 twisted pairs)
Conductor Size	Gauge: # 28 AWG minimum stranded (7/34) annealed, tinned copper
	Insulation: Polypropylene 0.010 inch nominal
Shielding	80% minimum tinned copper braid over aluminum/mylar foil
Voltage Rating	30 VAC
Grounding	Case to case grounding

## SCSI Cable Length

The maximum length of the SCSI cable (including internal and external cables) depends on whether you are using a single-ended or differential SCSI configuration, as follows:

- For single-ended SCSI configurations:** If your host is able to accommodate a data transfer rate of more than 10 MB per second, the maximum allowable bus length is 1.5 meters (4.9 feet). If your host is able to accommodate a data transfer rate between 5 MB and 10 MB per second, the maximum allowable bus length is 3 meters (9.8 feet). If your host limits data transfers to 5 MB per second or less, the maximum allowable bus length is 6 meters (19.7 feet).
- For differential SCSI configurations:** If your host contains a differential SCSI configuration, the maximum allowable bus length is 25 meters (82 feet).

To determine the cable length of each bus, measure the lengths of the SCSI cables connecting each device for that bus and add those lengths together. That is the total length of external cable.

To that sum, add the following SCSI cable lengths *for each bus*:

**Host bus** For the host bus, add 35.6 cm (14.0 in) for the controller, plus the internal SCSI cable length specified in your host computer documentation.

**Tape drive buses** For each cable connecting to a tape drive from the controller, add 15.2 cm (6.0 in) for the controller, plus the internal SCSI cable length specified in your library or tape drive documentation.

### SCSI Adapter Specifications

To ensure proper performance of the controller and tape drives, the following narrow (50-pin) to wide (68-pin) adapters are recommended and are available from Exabyte:

- Single-ended (50-pin male to 68-pin female), 320224
- Differential (50-pin male to 68-pin female), 320225

**Note:** All Exabyte narrow-to-wide adapters provide high-end data bit termination so that high data bits do not continue to the narrow device. You can either place the narrow device last on the SCSI bus, or make sure it is followed by other narrow devices.

The following wide (68-pin) to narrow (50-pin) adapter is available from Exabyte:

- Single-ended (68-pin male to 50-pin female), 325785

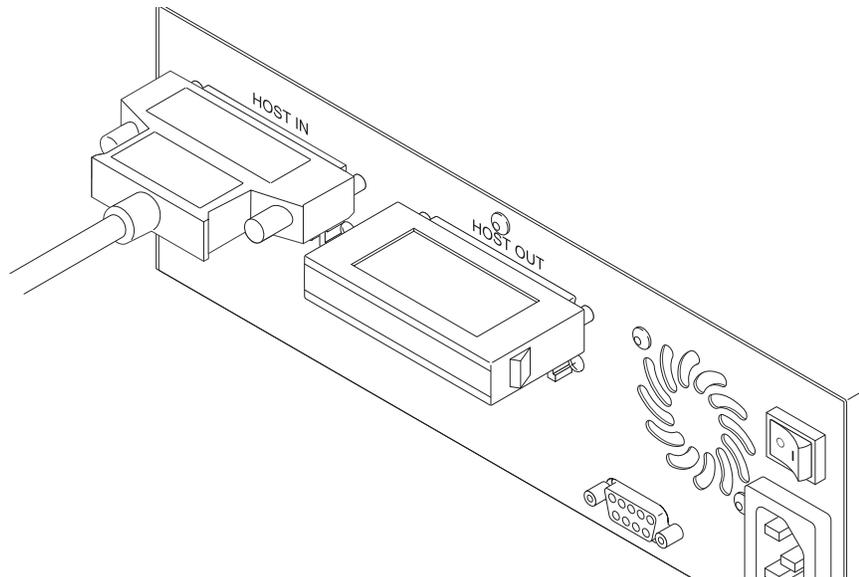
## SCSI Terminator Requirements

Each of the three SCSI buses connecting the controller to other devices must be terminated. Termination can be active or passive. If your host can transfer data at more than 5 MB per second, use active termination. If your host limits data transfer to 5 MB per second or less, use either active or passive termination. For best results on a single-ended bus, use active termination.

### Host SCSI Bus Termination

The host SCSI bus must be terminated at the host computer. The host SCSI bus must also be terminated at the controller, unless the controller is not the last device on the host SCSI bus.

To terminate the host computer, refer to the instructions in your computer installation manual. To terminate the controller, place the external terminator (shipped with the controller) over the “Host Out” connector, as shown in [Figure 4-1](#).



**Figure 4-1** Termination of the host SCSI bus at the controller

## Tape Drive SCSI Bus Termination

You do not need to install an external terminator for the controller on either tape drive bus because the controller already has internal termination at each tape drive SCSI connector. To terminate the tape drives connected to the controller (if they are the last devices on the SCSI buses), refer to the instructions in your tape drive installation manual.

Exabyte recommends the following external terminators for SCSI devices connected to the controller:

- AMP™ Amplimite™ 750381-1 (narrow, single-ended)
- Methode Electronics, Inc. dataMate® DM2000-02-R (narrow, single-ended)
- AMP Amplimite 869516-1 (wide, single-ended)

## MODE SELECT (15h)

The MODE SELECT command allows the initiator to set controller parameters. MODE SELECT parameters are sent to the controller in *page format* (SCSI-2 format). The parameters are transferred in the following order:

- Parameter List Header
- One page of related parameters

The Exabyte M10 Mirroring Controller supports vendor-unique MODE SELECT pages only, as described in [Table 4-4](#).

**Table 4-4** Supported MODE SELECT pages

25h	<b>Set Configuration page.</b> Specifies configuration parameters for the controller.
30h	<b>Offline Operation page.</b> Specifies offline operations for the controller.
31h	<b>Abort Operation page.</b> Aborts controller operations.
32h	<b>Subsystem Reset page.</b> Resets the controller.

## MODE SELECT Command Descriptor Block

The MODE SELECT command descriptor block is shown below.

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	0	1
01	Logical Unit Number			PF	Reserved			SP
02 – 03	Reserved							
04	Parameter List Length							
05	Vendor Unique		Reserved				0	0

### Byte 01, Bit 4 – PF (Page Format)

This bit is always set to 1 (page format).

### Byte 01, Bit 0 – SP (Saved Page)

Not supported.

## Byte 04 – Parameter List Length

This byte indicates the length of the parameter list that will be transferred from the initiator to the controller during the Data Out phase. The value for this byte must represent the total number of bytes to be transferred to the controller.

The value of the Parameter List Length byte depends on which page is being transferred. The following table shows the number of bytes that you should specify if you want to transfer the various types of MODE SELECT parameters.

To transfer these parameters:	Designate this amount:
Parameter List Header	04h
Set Configuration page	+ 16h
Offline Operation page	+ 5h
Abort Operation page	+ 2h
Subsystem Reset page	+ 3h

## Parameter List Header for MODE SELECT

The Parameter List Header is shown below.

Bit Byte	7	6	5	4	3	2	1	0
00 – 02	Reserved							
03	Block Descriptor Length (00h)							

## Byte 03 – Block Descriptor Length

This byte contains the length of the Block Descriptor in bytes. The controller does not send a Block Descriptor so this byte must be 0.

## Set Configuration Page (Page Code= 25h)

The Set Configuration page specifies configuration parameters for the controller.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code					
01	Page Length							
02	Reserved				Width	Reserved		
03	SCSI ID				Reserved			
04 – 07	Reserved							
08	Operating Mode				Reserved			
09	MB 0	Reserved						
10	MB 1	Reserved						
11 – 21	Reserved							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 25h (Set Configuration page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Set Configuration page that follow this byte. The valid value is 14h.

### Byte 02, Bit 3 – Width

This bit indicates the host bus width, as follows:

- 0 – Narrow.
- 1 – Wide.

### Byte 03, Bits 7 through 4 – SCSI ID

This field specifies the SCSI ID of the controller. (Bit 7 is the most significant number.)

### Byte 08, Bits 7 through 4 – Operating Mode

This field specifies the controller's operating mode, as follows:

- 0 – Pass thru, Drive 1.
- 1 – Pass thru, Drive 2.
- 3 – Two-drive mirroring.

### Bytes 09 and 10, Bit 7 – MB 0 and MB 1

These bits specify the mirroring mode, as follows:

For Mirroring Mode...	Set MB 0 to...	Set MB 1 to...
1	0	0
2	0	1
3	1	0
4	1	1

See [Table 2-3](#) and [Table 2-4](#) on [page 2-11](#) for more information about these modes.

## Offline Operation Page (Page Code= 30h)

The Offline Operation page specifies offline operations for the controller.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code					
01	Page Length							
02	Operation Code							
03	Reserved						SRC Bit Mask	
04	Reserved						DST Bit Mask	

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 30h (Offline Operation page).

### **Byte 01 – Page Length**

The Page Length byte indicates the number of bytes in the Offline Operation page that follow this byte. The valid value is 3h.

### **Byte 02, Bits 3 through 0 – Operation Code**

This field indicates the type of offline operation you want the controller to perform, as follows:

- 0 – Illegal value.
- 1 – Copy.
- 2 – Copy and verify.
- 3 – Tape compare.
- 4 – Reserved.
- 5 – Write only.
- 6 – Illegal value.
- 7 – Write and verify.

### **Byte 03, Bits 1 and 0 – SRC Bit Mask**

This field specifies the source tape drive for a copy operation and the test tape drive for a diagnostics operation. Bit 0 corresponds to the drive connected to Channel 1; bit 1 corresponds to the drive connected to Channel 2.

### **Byte 04, Bits 1 and 0 – DST Bit Mask**

This field specifies the target tape drive for a copy operation and the block size you want to test for a diagnostics operation, as follows:

- 0 – Write test 64 MB.
- 1 – Write test 256 MB.
- 2 – Write test 512 MB.
- 3 – Write test 1,024 MB.

Bit 0 corresponds to the drive connected to Channel 1; bit 1 corresponds to the drive connected to Channel 2.

## Abort Operation Page (Page Code= 31h)

The Abort Operation page aborts controller operations.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved			Page Code				
01	Page Length							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 31h (Abort Operation page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Abort Operation page that follow this byte. The valid value is 0h.

## Subsystem Reset Page (Page Code= 32h)

The Subsystem Reset page resets the controller.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved			Page Code				
01	Page Length							
02	Reset Code							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 32h (Subsystem Reset page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Subsystem Reset page that follow this byte. The valid value is 1h.

## Byte 02 – Reset Code

The Reset Code byte indicates what kind of reset you want the controller to perform, as follows:

- 0 – Soft reset.
- 1 – Hard reset.

## MODE SENSE (1Ah)

---

The MODE SENSE command enables the controller to report parameters to the initiator. MODE SENSE parameters are returned by the controller in *page format* (SCSI-2 format). The parameters are transferred in the following order:

- Parameter List Header
- One page of related parameters

The Exabyte M10 Mirroring Controller supports vendor-unique MODE SENSE pages only, as described in [Table 4-5](#).

**Table 4-5** Supported MODE SENSE pages

25h	<b>Report Configuration page.</b> Reports the configuration parameters for the controller.
26h	<b>Report Offline Operation Status page.</b> Reports the status of the controller's offline operations.
27h	<b>Controller Report page.</b> Reports the status of the controller.
28h	<b>FRU Sense Code Retrieval page.</b> Returns sense data from the controller and tape drives.
29h	<b>FRU Data Configuration page.</b> Reports configuration information for the controller and tape drives.

## MODE SENSE Command Descriptor Block

The MODE SENSE command descriptor block is shown below.

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	0	1	0
01	Logical Unit Number			RSVD	DBD	Reserved		
02	Page Control		Page Code					
03	Reserved							
04	Allocation Length							
05	Vendor Unique		Reserved				0	0

### Byte 01, Bit 3 – DBD (Disable Block Descriptor)

The controller ignores the DBD bit and assumes it is set to 1 (do not send the 8-byte Block Descriptor).

### Byte 02, Bits 7 and 6 – Page Control

The Page Control field indicates the type of MODE SENSE parameter data to be returned. This field must be 0 (return current values).

### Byte 02, Bits 5 through 0 – Page Code

This field indicates which MODE SENSE parameter page the initiator is requesting, as follows:

- 25h – Report Configuration page
- 26h – Report Offline Operation Status page
- 27h – Controller Report page
- 28h – FRU Sense Code Retrieval page
- 29h – FRU Data Configuration page

## Byte 04 – Allocation Length

The Allocation Length byte indicates the amount of memory in bytes that the initiator has allocated for the return of the MODE SENSE parameters. The value for the Allocation Length byte depends on which parameter page is being returned.

The table below shows the minimum values you can specify for the Allocation Length. The values include the length of the Parameter List Header.

To return this page:	Specify at least this amount:
Report Configuration	1Ah
Report Offline Operation Status	0Dh
Controller Report	2Dh
FRU Sense Code Retrieval	18h
FRU Data Configuration	F6h

## Parameter List Header for MODE SENSE

The Parameter List Header is shown below.

Bit Byte	7	6	5	4	3	2	1	0
00	Mode Data Length							
01 – 02	Reserved							
03	Block Descriptor Length (0h)							

### Byte 00 – Mode Data Length

The Mode Data Length byte indicates how many bytes of MODE SENSE data are available to be transferred, excluding this byte. The value returned for this field is the remaining number of bytes in the Parameter List Header (03h) plus the number of bytes of data to be returned based on the Page Code specified in the CDB.

### Byte 03 – Block Descriptor Length

This byte contains the length of the Block Descriptor in bytes. The controller does not send a Block Description so this byte must be 0.

## Report Configuration Page (Page Code= 25h)

The Report Configuration page reports configuration parameters for the controller.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code					
01	Page Length							
02	Reserved			Width		Bus Speed		RSVD
03	SCSI ID			Reserved				
04 – 07	Reserved							
08	Operating Mode			Reserved				
09	MB 0	Reserved				WDSB Bit Mask		
10	MB 1	Reserved				RDSB Bit Mask		
11 – 21	Reserved							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 25h (Report Configuration page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Report Configuration page that follow this byte. The valid value is 14h.

### Byte 02, Bits 2 through 1 – Bus Speed

This field indicates the current negotiated host SCSI bus speed, as follows:

- 0 – Asynchronous.
- 1 – 5 MHz synchronous.
- 2 – 10 MHz synchronous.
- 3 – 20 MHz synchronous.

### Byte 02, Bit 3 – Width

This bit indicates the host bus width, as follows:

- 0 – Narrow.
- 1 – Wide.

**Byte 03, Bits 7 through 4 – SCSI ID**

This field indicates the SCSI ID of the controller. (Bit 7 is the most significant number.)

**Byte 08, Bits 7 through 4 – Operating Mode**

This field indicates the controller's operating mode, as follows:

- 0 – Pass thru, Drive 1.
- 1 – Pass thru, Drive 2.
- 3 – Two-drive mirroring.

**Bytes 09 and 10, Bit 7 – MB 0 and MB 1**

These bits indicate the current mirroring mode, as follows:

For Mirroring Mode...	MB 0 is set to...	MB 1 is set to...
1	0	0
2	0	1
3	1	0
4	1	1

See [Table 2-3](#) and [Table 2-4](#) on [page 2-11](#) for more information about these modes.

**Byte 09, Bits 1 and 0 – WDSB Bit Mask**

These bits indicate whether a tape drive became disabled during a mirroring write operation, as follows:

- 0 – Status is normal.
- 1 – The tape drive encountered an error while writing.

Bit 0 indicates the status of the drive connected to Channel 1; bit 1 indicates the status of the drive connected to Channel 2.

### Byte 10, Bits 1 and 0 – RDSB Bit Mask

These bits indicate whether a tape drive became disabled during a mirroring read operation, as follows:

0 – Status is normal.

1 – The tape drive encountered an error while reading.

Bit 0 indicates the status of the drive connected to Channel 1; bit 1 indicates the status of the drive connected to Channel 2.

## Report Offline Operation Status Page (Page Code= 26h)

The Report Offline Operation Status page reports the offline status of the controller.

Bit Byte	7	6	5	4	3	2	1	0								
00	Reserved		Page Code													
01	Page Length															
02	Status Code															
03	Reserved				Operation Code											
04	(MSB) Elapsed Time (LSB)															
05																
06																
07																
08	Progress Indicator															

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 26h (Report Offline Operation Status Page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Report Offline Operation Status page that follow this byte. The valid value is 7h.

### **Byte 02 – Status Code**

This field indicates the status of the offline operation, as follows:

- 0 – The operation was successful.
- 1 – Busy; operation in progress; no error.
- 2 – Error; operation failed.
- 3 – Aborted operation.

### **Byte 03 – Operation Code**

If an extended operation is in progress, this field specifies the operation code, as follows:

- 0 – Illegal value.
- 1 – Copy.
- 2 – Copy and verify.
- 3 – Tape compare.
- 4 – Reserved.
- 5 – Write only.
- 6 – Illegal value.
- 7 – Write and verify.

### **Bytes 04 through 06 – Elapsed Time**

These fields specify a 32-bit binary number that indicates the elapsed time in seconds, since the most recent operation began or ended. If no operation has been initiated, the elapsed time is -1.

### **Byte 08 – Progress Indicator**

This byte indicates the amount of progress made on an extended operation. Values range from 0 to 255, with 0 indicating no operation is in progress and 255 indicating progress is complete.

## Controller Report Page (Page Code= 27h)

The Controller Report page reports the status of the controller. (This page is ignored for the MODE SELECT command, and there are no defaults or changeable fields.)

Bit Byte	7	6	5	4	3	2	1	0								
00	Reserved		Page Code													
01	Page Length															
02 – 05	OEM Model Number															
06	Reserved															
07	(MSB)															
08									Microcode Revision							
09																
10 – 41	Reserved															
42 – 49	Controller Model Number															
50 – 53	Reserved															
54 – 65	Controller Card Serial Number															
66 – 73	Manufacturing Date															
74 – 81	Reserved															
82 – 101	OEM Serial Number															

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 27h (Controller Report page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the Controller Report page that follow this byte. The valid value is 26h.

### Bytes 02 through 05 – OEM Model Number

This field indicates the 4-byte alphanumeric OEM model number of the M10.

### Bytes 07 through 09 – Microcode Revision

This field indicates the three-byte alphanumeric microcode revision level.

### **Bytes 42 through 49 – M10 Model Number**

This field indicates the 8-byte alphanumeric manufacturer model number of the M10.

### **Bytes 54 through 65 – Controller Card Serial Number**

This field indicates the 12-byte manufacturer serial number of the M10's controller card.

### **Bytes 66 through 73 – Manufacturing Date**

This field indicates the 8-byte manufacturing date (MMDDYYYY).

### **Bytes 82 through 101 – OEM Serial Number**

This field indicates the 20-byte OEM serial number of the M10.

## FRU Sense Code Retrieval Page (Page Code= 28h)

When a controller or tape drive error occurs, you can use the FRU Sense Code Retrieval page to return sense data from the FRU (field replaceable unit), which can be either the controller or one of the tape drives.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved			Page Code				
01	Page Length							
02	RSVD	Error Code						
03	Reserved							
04	Sense Key							
05	Sense Key Information Byte 0							
06	Sense Key Information Byte 1							
07	Reserved							
08	FRU Type							
09	Additional Length							
10–13	Command-Specific Information Bytes 0-3							
14	Additional Sense Code							
15	Additional Sense Code Qualifier							
16	Reserved						FRU Number	
17	Reserved							
18–20	Information Byte 0							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 28h (FRU Sense Code Retrieval page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the FRU Sense Code Retrieval page that follow this byte. The valid value is 12h.

## Byte 02, Bits 6 through 0 – Error Code

This field indicates the type of sense data, as follows:

0 – The data in the information bytes is undefined. The remaining fields on the page are 0.

71 – The sense data is for a deferred error condition and is associated with an earlier command.

If the sense data is in 71h, the controller returns the following information for bytes 04 through 20, depending on whether the error occurred with the controller or one of the tape drives. (See byte 16, FRU Number, to determine which FRU is reporting the error.)

**Note:** For additional information about tape drive errors, refer to the SCSI reference manual for your tape drive.

Byte	For this field ...	Tape drive reports ...	Controller reports ...
04	Sense key	Sense key specific byte	6h (Unit Attention)
05	Sense Key Information Byte 0	0Bh	0Ah
06	Sense Key Information Byte 1	Appropriate sense key	Controller panic code (non-FRU hardware failures 00h to FFh)
08	Sense Key Information Byte 2	06h (tape drive FRU type)	07h (controller FRU type)
09	Additional Length	0Bh	0Bh
10 – 13	Command-Specific Information Bytes	Sense key specific bytes (Request sense bytes 08–11)	0h
14	Additional Sense Code	Appropriate sense code (Request sense byte 12)	0h
15	Additional Sense Code Qualifier	Appropriate sense code qualifier (Request sense byte 13)	0h
16	Field Replaceable Unit Number	01h – Drive 1 02h – Drive 2	0h
18 – 19	Information Byte 0	Sense key specific bytes (Request sense bytes 16-18)	0h
20			Drive x. See “Byte 20, Bit 1 and 0 – Drive x” on page 4-25.

### Byte 20, Bit 1 and 0 – Drive x

This bit specifies whether the controller detects a tape drive connected to a channel, as follows:

- 0 – No tape drive is detected.
- 1 – A tape drive is detected.

Bit 0 indicates the status of the drive connected to Channel 1; bit 1 indicates the status of the drive connected to Channel 2.

## FRU Data Configuration Page (Page Code= 29h)

The FRU Data Configuration page reports configuration information for the three FRUs, which include the controller and the two tape drives.

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved		Page Code					
01	Page Length							
02	Maximum FRU Number							
03 – 172	FRU Descriptors							

### Byte 00, Bits 5 through 0 – Page Code

The Page Code identifies the page being transferred. The valid value is 29h (FRU Data Configuration page).

### Byte 01 – Page Length

The Page Length byte indicates the number of bytes in the FRU Data Configuration page that follow this byte. The valid value is EFh.

### Byte 02 – Maximum FRU Number

This field specifies the maximum FRU number. There are five FRUs defined, numbered 0 through 4.

## Bytes 03 through 240 – FRU Descriptors

Each possible FRU returns a FRU descriptor, which has the following format:

Bit Byte	7	6	5	4	3	2	1	0
00	FRU Number							
01	FRU Type							
02	FRU State							
03	Position 0							
04 - 05	Reserved							
06 – 13	Vendor ID							
14 – 29	Product ID							
30 – 33	Firmware Revision							

### Byte 00 – FRU Number

The number of the FRU, as follows:

- 0 – Controller.
- 1 – Tape drive 1.
- 2 – Tape drive 2.
- 3 – Reserved.
- 4 – Reserved.

### Byte 01 – FRU Type

This field specifies the type of FRU, as follows:

- 06h – Tape drive.
- 07h – Controller.
- 08h – Reserved.

### Byte 02 – FRU State

This field indicates the state of the FRU, as follows:

- 0 – Not present.
- 1 – Present.
- 6 – Unknown.

**Byte 03 – Position 0**

For the controller, this field specifies the host SCSI ID. For tape drives, this field specifies the drive number.

**Bytes 06 through 13 – Vendor ID**

For the controller, this field specifies 0h. For tape drives, this field specifies the tape vendor ID.

**Bytes 14 through 29 – Product ID**

For the controller, this field specifies 0h. For tape drives, this field specifies the tape drive product ID.

**Bytes 30 through 33 – FW Revision**

This field specifies the firmware version of the FRU.

## Notes

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