**EXABYTE®**

# EXB-8700 8mm Tape Drive

# Product
# Specification

## Copyright

## Disclaimer

## Trademark Notices

## Revision History

| Revision | Date | Description |
| --- | --- | --- |
| 000 | June 1995 | Beta draft |
| 001 | July 1995 | Initial release |

# Product Warranty Caution

The EXABYTE® EXB-8700 8mm Tape Drive 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 tape drive was purchased.**

The warranty for the tape drive shall not apply to failures caused by:

■ Physical abuse or use not consistent with the operating instructions or product specifications provided by Exabyte's personnel or agent for the applicable equipment.

■ Use of any type of cleaning material other than an Exabyte 8mm Cleaning Cartridge (or an Exabyte-approved cleaning cartridge).

■ Modifications by other than Exabyte's personnel or agent in any way other than those approved by Exabyte, provided the warranty shall not be voided by the repair or replacement of parts or the attachment of items in the manner described in maintenance or installation instructions provided by Exabyte.

■ Repair by other than Exabyte's personnel or agent in a manner contrary to the maintenance instructions provided by Exabyte.

■ Removal of the Exabyte serial number tag.

■ Physical abuse due to improper packaging of returns.

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### CAUTION

Returning the tape drive in unauthorized packaging may damage the unit and void the warranty.

If you are returning the tape drive for repair, package it in its original packaging (or in replacement packaging obtained from your vendor). Refer to the packing instructions in *EXB-8700 8mm Tape Drive Installation and Operation*.

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

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# About This Manual

This product specification describes the functional, performance, and environmental specifications for the EXABYTE® EXB-8700 8mm Tape Drive.

## How This Manual is Organized

This manual contains the following chapters:

- **Chapter 1** describes the features of the tape drive and includes information about its compatibility with other Exabyte tape drives, data compression, and tape capacities.

- **Chapter 2** provides an overview for installing and operating the tape drive.

- **Chapter 3** describes how the tape drive implements the Small Computer System Interface (SCSI) and includes an overview of SCSI messages and commands.

- **Chapter 4** lists performance, reliability, power, and environmental specifications. This chapter also lists the regulatory and safety agency standards for the tape drive.

## Related Publications

The following publications list additional information about installing and operating the tape drive, and about implementing SCSI commands:

- *EXB-8700 8mm Tape Drive Installation and Operation,* 312604
- *EXB-8700 8mm Tape Drive SCSI Reference,* 312605

### Standards

For information about the standards used for the tape drive, refer to the following publications:

- ANSI *Small Computer System Interface (SCSI),* X3.131 - 1989

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

- ANSI/ISO/IEC 11319-1992 and ECMA-145, *Information Technology — 8mm Wide Magnetic Tape Cartridge for Information Interchange*, July 1992

- ISO/IEC 12246 and ECMA-169, *Information Technology — 8mm Wide Magnetic Tape Cartridge Dual Azimuth Format for Information Interchange, Helical Scan Recording*

# Conventions Used in This Specification

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

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

► **Important** Read *Important* text to learn crucial information about the topic or procedure being discussed.

# 1 Features and Physical Description

This chapter provides an overview of the EXABYTE® EXB-8700 8mm tape drive.

## Features

The EXB-8700 offers high capacity and high performance for all your data storage and archiving needs. With data compression enabled, the tape drive can store 14 gigabytes of data on a single 160m XL tape and can transfer data at 1 megabyte per second. The tape drive operates as a single-ended device on the SCSI bus and can be attached directly to a host computer or to another device in a daisy chain.

Housed in a desktop enclosure, the tape drive can sit conveniently next to your workstation. It features an external power supply, a top-loading mechanism, and three LEDs for reporting the tape drive's operating state.

# Physical Features

This section describes the tape drive's physical features.

## Enclosure and Door

The tape drive's enclosure protects its internal components from external dust and other contaminants. A label located on the bottom indicates the serial number and regulatory agency information.

The tape drive door incorporates a top-loading mechanism, which can be opened and closed with the press of a button.

## Controls and Indicators

The tape drive includes the following controls and indicators:
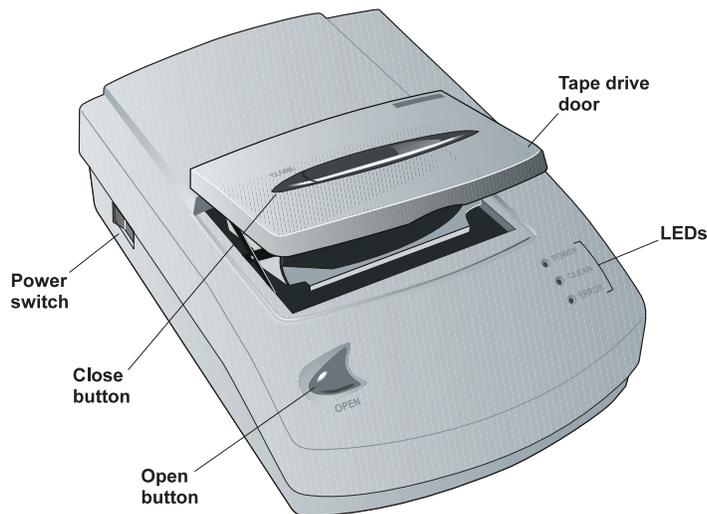


**Power switch**   This switch turns the tape drive on or off.

**Close button**   This button closes and latches the tape drive door.

**Open button**   This button opens the tape drive door.

**LEDs (three)**   The green, yellow, and amber LEDs indicate the status of tape drive operations.

For more information about controls and indicators, see Chapter 2.

# Components

The tape drive includes the following components:

SCSI connectors      Fan

SCSI ID switch      Power connector
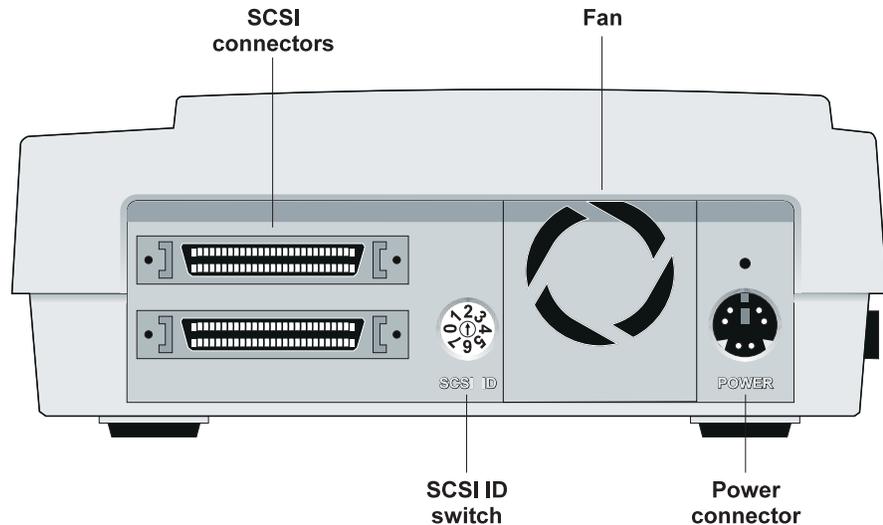
**SCSI connectors**  The two SCSI connectors are 50-pin, female, high-density connectors that allow the tape drive to be connected to a single-ended SCSI bus.

**SCSI ID switch**  This rotary switch is used to set the tape drive's ID on the SCSI bus.

**Fan**  The fan is a 12 VDC brushless fan.

**Power connector**  The power connector is a 6-pin mini DIN connector.

**Power supply (external)**  The universal, self-switching power supply (shown below) automatically adjusts for changes in voltage and frequency within the specified range. You do not need to change any input settings. See page 4-2 for power supply specifications.
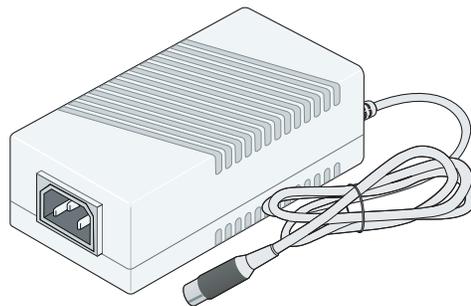
# Read and Write Features

This section describes some of the tape drive's read and write features.

## Compatibility with Other Exabyte Drives

**Read compatibility**   The EXB-8700 can read tapes written by other Exabyte 8mm tape drives, providing that the data on those tapes is written in 8200, 8500, or 8500c format.

**Write compatibility**   The EXB-8700 can write data in 8500 or 8500c format. This allows you to interchange data cartridges with the Exabyte EXB-8500, EXB-8500c, EXB-8505, and EXB-8505XL 8mm tape drives.

**Drive compatibility**   The EXB-8700 functions similarly to the EXB-8505 and is designed to be compatible with device drivers written for the EXB-8505.

## Helical-Scan Technology

To achieve a high data storage capacity on the tape, the tape drive writes data using advanced helical-scan recording. In this recording method, the tape drive's drum writes narrow tracks at an acute angle to the edge of the tape, as shown in the figure. This recording method results in a very high number of tracks per inch.
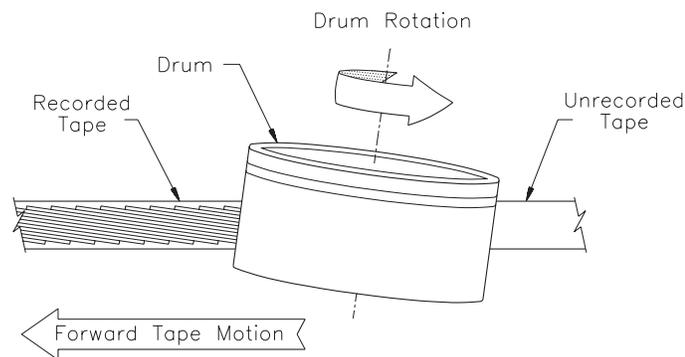
# Data Compression

To achieve an even higher storage capacity on the tape, the tape drive can compress data at an average ratio of 2:1 (depending on the type of data being compressed). When compression is enabled, the capacity of a single 160m XL tape increases from 7 gigabytes to 14 gigabytes, on average.

To compress data, the tape drive uses the established Improved Data Recording Capability (IDRC) algorithm, licensed from IBM. The tape drive also uses the Exabyte Compression Integrity Check™ feature to ensure that data is accurately compressed and decompressed into the original form.

# Storage Capacity

The table below lists the approximate storage capacities the EXB-8700 can achieve. The storage capacity depends on the tape format and the length of tape.

| Length of tape | Approximate capacity in gigabytes | |
|---|---|---|
| | with compression* | without compression |
| 15m | 1.2 | 0.6 |
| 54m | 4.7 | 2.3 |
| 112m | 10.0 | 5.0 |
| 160m XL | 14.0 | 7.0 |

* Assumes an average compression ratio of 2:1.

# Error Detection and Recovery Procedures

As the tape drive writes data to tape, it integrates error correction code (ECC) and physical-block cyclic redundancy check (CRC) bytes with each physical block of data. After it writes blocks of data, the tape drive uses the ECC and CRC to perform a read-after-write check to ensure data reliability. By using read-after-write error checking and sophisticated error correction procedures, the tape drive offers a non-recoverable error rate of less than one bit in $10^{17}$ bits read.

# Notes

# 2 Installation and Operation

This chapter provides an overview for installing and operating the EXB-8700. Detailed instructions are provided in *EXB-8700 8mm Tape Drive Installation and Operation*, which is included with the tape drive.

## Installing the Tape Drive

Installing the tape drive involves these quick and easy steps:

1.  If necessary, set the SCSI ID.

2.  Connect the SCSI cables (or cable and terminator, if the tape drive is the last device on the SCSI bus).

3.  Connect the power supply and power cord.

4.  Power on the tape drive and computer.
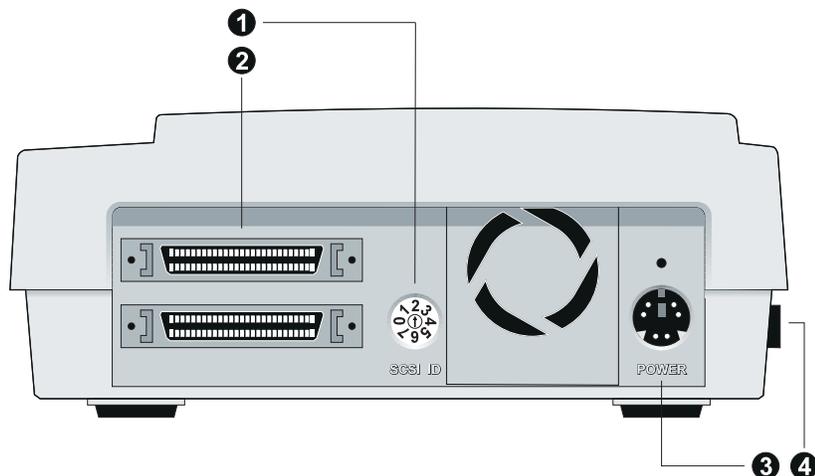
# Power Cord, SCSI Cable, and Terminator

When you install the EXB-8700, make sure the power cord, SCSI cable, and terminator meet the specifications listed below.

## Power Cord Requirements

**United States and Canada**  Use a three-conductor, 18 AWG power cord for 120-volt use. The power cord must also have a molded NEMA 5-15P male connector on one end and a molded IEC type CEE-22 female connector on the other end. It should be UL Listed and CSA Certified.

**Outside the United States and Canada**  When using the tape drive outside the United States and Canada, make certain the power cord has an attachment plug of the proper type, rating, and safety approval for the intended country; a female connector on one end, IEC type CEE-22; and electrical cable, type HD21.

## SCSI Cable Requirements

The SCSI cable used with the tape drive must be a shielded SCSI-2 cable, with a high-density, 50-pin connector.

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▶ **Important**  One of the SCSI cables attached to the tape drive must have a ferrite bead installed on it. Do not use a cable without a ferrite bead.

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## SCSI Terminator Requirements

The SCSI bus terminator must be an active, single-ended, external terminator, with a high-density, 50-pin connector. Exabyte recommends Thomas & Betts TRM 050 FPVR.

# Operating the Tape Drive

Tape drive operation involves these simple procedures:

- Loading and unloading data cartridges for read and write operations

- Monitoring the LEDs for drive activity, required cleaning, and error conditions

- Cleaning the tape drive with a cleaning cartridge

- Resetting the tape drive, if an error occurs

The figure below shows the controls and indicators for operating the tape drive:
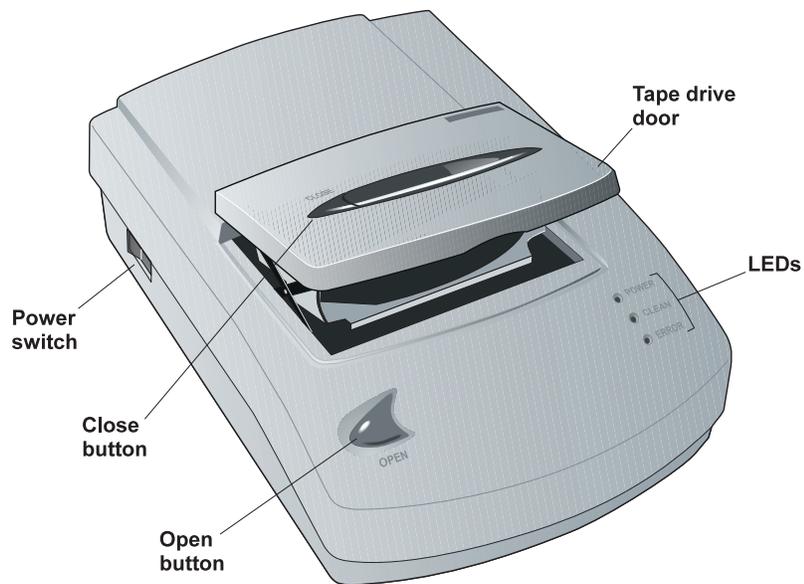


## Loading a Data Cartridge

To load a data cartridge, press the Open button to open the drive door, slide the data cartridge into the tape drive, then press the Close button to latch the door. The tape drive automatically loads the tape and positions it to the logical beginning of tape (LBOT) within 45 seconds, assuming the data cartridge has been rewound. (For more information about the time required for rewind operations, see page 4-2.)

### Using New Cartridges

When using a new data cartridge, use only EXATAPE™ 8mm Data Cartridges to ensure optimum data reliability and tape durability.



You can contact Exabyte to order EXATAPE cartridges, which are available in four lengths: 15m, 54m, 112m, and 160m XL. These cartridges meet the most stringent specifications in the industry for data-grade media and are recommended for use in all Exabyte products.

**Note**: When purchasing 160m tapes, make sure they have the RS logo.

### Overwriting Data on Used Cartridges

The tape drive can overwrite data on previously used data cartridges, providing that the data is written in 8500, 8500c, or 8200c format. The tape drive cannot overwrite data in 8200 format, because it cannot erase the servo zones written in this format.

### Reading 8200 Format Cartridges

The EXB-8700 can read data previously written in 8200 format, providing that the cartridge is write-protected. The EXB-8700 cannot write data in 8200 format.

# Unloading a Data Cartridge

To unload a data cartridge, press the Open button. The tape drive completes the current operation, writes any buffered data to tape, and rewinds the tape. (For more information about the time required for rewind operations, see page 4-2.) Once the tape is rewound, the tape drive unloads the tape from the tape path and ejects the cartridge.

# Monitoring the LEDs

Different LED combinations indicate the tape drive's operating state:

| Power (green) LED | on | The tape drive is powered on. |
|---|---|---|
| | flashing | Tape is moving. |
| Clean (yellow) LED | on | The tape drive needs to be cleaned. |
| Error (amber) LED | flashing | The tape drive has an error. |

During the tape drive's power-on self-test, all three LEDs light briefly (for two to three seconds).

# Cleaning the Tape Drive

Whenever the Clean LED turns on (automatically after every 30 tape motion hours), use an Exabyte 8mm Cleaning Cartridge or an Exabyte-approved cleaning cartridge to clean the tape drive.

You can contact Exabyte to order cleaning cartridges, which are available in two sizes: 12c and 3c. This cleaning cartridge contains a shed-free fabric tape that traps and removes debris from tape drive heads and tape paths. By using this cleaning cartridge on a regular basis, you help maintain data integrity and improve reliability of the tape drive.

# Resetting the Tape Drive

If the Error LED is flashing, you can reset the tape drive by pressing the Open button. If this does not clear the error, turn the power switch off, then on again.

When you issue a reset, the tape drive rewinds the tape (if a cartridge is loaded) and positions it to the beginning after the reset is complete. The total time required for the reset may be as long as 6.5 minutes if a 160m XL tape is loaded and is positioned near the end. (For more information about the time required for rewind operations, see page 4-2.)

*Notes*

# 3 Interface Specifications

This chapter describes the Small Computer System Interface (SCSI) characteristics for the EXB-8700, including the commands, messages, and status information supported by the tape drive. For detailed information about SCSI communications, refer to the *EXB-8700 8mm Tape Drive SCSI Reference.*

## General Information About SCSI

SCSI-2 is a standard specification that enables host computers and peripheral equipment, such as the tape drive, to communicate. The physical components of 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 the tape drive. The initiator can also receive data, messages, and status from the targets.

- **Targets**. The tape drive is an independent *target* capable of receiving commands from the initiator.

- **SCSI bus.** The SCSI cables, which connect the SCSI adapter card to the tape drive and other devices, form the *SCSI bus* and provide a pathway for passing information between the initiator and the targets. Up to eight devices (including one or more initiators) can be cabled together to form a SCSI bus. The two devices at the ends of the bus are terminated with SCSI terminators. Each device attached to a SCSI bus has a unique SCSI ID that identifies it during communication. SCSI IDs range from 0 to 7 for each bus.

# SCSI Communication

This section describes the SCSI messages and commands supported by the tape drive.

## SCSI Messages

The initiator and the tape drive use the message system to manage the physical path. These messages include management of error detection, data transfer retries, and the data path.

The table below lists the SCSI messages supported by tape drive.

| Message | Hex Value | In (Tape drive to initiator) | Out (Initiator to tape drive) |
|---|---|---|---|
| Command Complete | 00h | ✔ | |
| Extended Message (Synchronous Data Transfer Request) | 01h | ✔ | ✔ |
| Save Data Pointers | 02h | ✔ | |
| Restore Pointers | 03h | ✔ | |
| Disconnect | 04h | ✔ | |
| Initiator Detected Error | 05h | | ✔ |
| Abort | 06h | | ✔ |
| Message Reject | 07h | ✔ | ✔ |
| No Operation | 08h | | ✔ |
| Message Parity Error | 09h | | ✔ |
| Bus Device Reset | 0Ch | | ✔ |
| Identify | 80h or C0h | ✔ | ✔ |

# SCSI Commands

The initiator sends commands to the tape drive to request an operation. A command is a sequence of bytes, called a command descriptor block (CDB), that contains information the tape drive needs to perform the request. The table below describes the supported commands.

| Command | Description |
|---|---|
| ERASE (19h) | Causes the tape drive to erase all tape from the current tape position to the physical end of tape. **Note**: The tape drive cannot erase 8200 format tapes. |
| INQUIRY (12h) | Requests that information about the tape drive parameters be sent to the initiator. **Note**: The Product ID field in the Inquiry data for the EXB-8700 is the same as for the EXB-8505. |
| LOAD/UNLOAD (1Bh) | Causes the tape drive to load, or rewind and unload the data cartridge. |
| LOCATE (2Bh) | Allows you to position the tape at a specified logical block address. Used in conjunction with the READ POSITION command. |
| LOG SELECT (4Ch) | Allows you to manage the counters that the tape drive maintains about its write and read error recovery operations. |
| LOG SENSE (4Dh) | Allows you to retrieve statistical information about the tape drive's read and write error recovery operations. |
| MODE SELECT (15h) | Allows you to specify medium, logical unit, and device parameters. |
| MODE SENSE (1Ah) | Enables the tape drive to report medium, logical unit, or device parameters. |
| PREVENT/ALLOW MEDIUM REMOVAL (1Eh) | Allows or disallows the removal of the data cartridge from the tape drive. |
| READ (08h) | Transfers one or more bytes or blocks of data from the tape to the initiator. |
| READ BLOCK LIMITS (05h) | Requests that the tape drive return data identifying the maximum and minimum logical block lengths supported. |
| READ BUFFER (3Ch) | Copies the tape drive's microcode across the SCSI bus to the initiator. Used in conjunction with the WRITE BUFFER command. |

| Command | Description |
|---------|-------------|
| READ POSITION (34h) | Reports the tape drive's current logical position but does not cause tape motion to occur. Used in conjunction with the LOCATE command. |
| RECEIVE DIAGNOSTIC RESULTS (1Ch) | Reports the results of the tests requested by a previous SEND DIAGNOSTIC command or to obtain a trace of SCSI and servo command activity for the tape drive. |
| RELEASE UNIT (17h) | Releases a tape drive from an initiator's exclusive use, or if third-party reservations are in effect, from another SCSI device's use. Used in conjunction with the RESERVE UNIT command. |
| REQUEST SENSE (03h) | Requests that the tape drive transfer sense data to the initiator. |
| RESERVE UNIT (16h) | Reserves the tape drive for an initiator's exclusive use, or if third-party reservations are in effect, for another SCSI device's use. Used in conjunction with the RELEASE UNIT command. |
| REWIND (01h) | Causes the tape drive to rewind the tape to the logical beginning of tape. |
| SEND DIAGNOSTICS (1Dh) | Causes the tape drive to perform certain self-diagnostic tests. |
| SPACE (11h) | Enables the tape drive to perform forward or backward searches. |
| TEST UNIT READY (00h) | Allows you to determine if the tape drive is ready to accept an appropriate medium access command. |
| VERIFY (13h) | Enables the tape drive to verify one or more logical blocks of data on the tape. |
| WRITE (0Ah) | Transfers one or more bytes or blocks of data from the initiator to the tape drive. |
| WRITE BUFFER (3Bh) | Allows you to load new microcode from the SCSI bus into the tape drive's control memories. Used in conjunction with the READ BUFFER command. |
| WRITE FILEMARKS (10h) | Causes the tape drive to write filemarks or setmarks (8500c format) to tape. |

# 4 Specifications and Standards

This chapter provides the specifications for the EXB-8700, including the technical specifications, environmental specifications, physical dimensions, and safety and agency standards.

## Technical Specifications

The following tables provide technical specifications for the tape drive.

| Data handling | |
|---|---|
| Tape lengths supported | 15m, 54m, 112m, 160m XL |
| Write formats supported | 8500c (compressed)<br>8500 |
| Read formats supported | 8500c (compressed)<br>8500<br>8200 |
| Compression method | IDRC, average 2:1 ratio |
| Data transfer rate (sustained) | 500 KB/sec.<br>1 MB/sec. (compressed)* |
| Burst transfer rate | 2.5 MB/sec. asynchronous<br>5.0 MB/sec. synchronous |

* Assumes an average compression ratio of 2:1.

| Maximum data capacity (8500c format)* | |
|---|---|
| 15m tape | 1.2 gigabytes |
| 54m tape | 4.7 gigabytes |
| 112m tape | 10.0 gigabytes |
| 160m XL tape | 14.0 gigabytes |

\*  Assumes an average compression ratio of 2:1

| Tape control (8500 and 8500c formats) | |
|---|---|
| Tape speed (read and write operations) | 11.079 mm/sec. (0.436 inch/sec) |
| Forward search and rewind speed | 443 mm/sec (17.4 inch/sec) (40 times normal tape speed)* |
| Rewind time | 160m XL tape:    5 minutes, 17 seconds |
| | 112m tape:        4 minutes, 20 seconds |
| | 54m tape:         2 minutes, 10 seconds |
| | 15m tape:         44 seconds |

\* For 8200 format, the forward search and rewind speed is 10 times the normal tape speed.

| Reliability | |
|---|---|
| Drive reliability | 160,000 hours mean time between failures |
| Data reliability | $1.0 \times 10^{-17}$ bit error rate |
| Error correction | Reed-Solomon |

| Power supply (external) | |
|---|---|
| Type | Universal, self-switching, 5-volt and 12-volt User selection not required |
| Input voltages | 90 to 240 VAC |
| Frequency | 50 to 60 Hz |
| Switching frequency | >25 KHz |
| Power consumption | 28 watts continuous |
| Power dissipation | 12 watts average |

# Environmental Specifications

The following tables provide environmental specifications for the tape drive.

| Operating | |
|---|---|
| Temperature | 50° to 104°F (10° to 40°C) |
| Relative humidity | 20 to 80% (max. wet bulb 26°C; 79°F) |
| Shock | 3 g for 5 msec. |
| Vibration | 0 to 400 Hz, 0.3 g RMS |

| Non-operating and storage* | |
|---|---|
| Temperature | −40° to +140°F (−40° to +60° C) |
| Humidity | 10% to 90%, non-condensing |
| Shock | 45 g at a velocity change of 180 inches per second |
| Vibration | 0 to 400 Hz, 1.06 g RMS |
| Transportation | ISTA 1A |

* When packaged in the Exabyte shipping box.

# Physical Specifications

The following tables provide the physical specifications for the tape drive and for the tape drive in its shipping container.

| Dimensions and weight of tape drive | |
|---|---|
| Height | 2.5 inches (63 mm) |
| Length | 9.75 inches (243 mm) |
| Width | 6.25 inches (159 mm) |
| Weight | 1.9 pounds (0.85 kg) |

| Dimensions and weight of the tape drive in shipping box* | |
|---|---|
| Height | 8.1 inches (20.57 centimeters) |
| Length | 13.4 inches (34.03 centimeters) |
| Width | 10.5 inches (26.67 centimeters) |
| Weight | 6.5 pounds (2.9 kilograms) |

\* These weights and dimensions include all the tape drive accessories.
  The shipping carton passes the tests described in the International Safe Transit
  Association (ISTA) Project 1A for packaged products weighing less than
  100 pounds.

# Safety and Regulatory Agency Compliance

The tape drive meets the following safety and regulatory agency standards:

| | |
|---|---|
| Safety agency approvals | ▪ UL Standard 1950, 2nd Edition, Information Technology Equipment<br><br>▪ CAN/CSA Standard C22.2 No. 950-M89, Safety of Information Technology Equipment<br><br>▪ IEC 950/EN60950/DIN VDE 0805/5.9, Safety of Information Technology Equipment including Electrical Business Equipment |
| Electrostatic Discharge (ESD)* | The tape drive can withstand discharges of the following:<br><br>▪ Up to 8 kilovolts air gap<br>▪ Up to 4 kilovolts contact/direct |
| Electromagnetic Interference (EMI)* | ▪ FCC Rules, Part 15, Class B Computing Devices<br><br>▪ Canadian Department of Communications, Radio Interference Regulation for Digital Apparatus, Class B<br><br>▪ CISPR Publication 22, 1985, Class B |
| Radiated susceptibility* | IEC Publication 801-3, severity level 2 (3 volts/meter) |
| Electrical Fast Transients (EFT)* | IEC Publication 801-4, severity level 2 |
| Surge* | IEC Publication 801-5, severity level 2 |

\* Assumes the tape drive is properly installed according to *EXB-8700 8mm Tape Drive Installation and Operation*.

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