EXB-8200
8mm Cartridge Tape Subsystem

Product Specification

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Revision History

Rev No.	Date	Revision Information
003	November 1988	Entire document updated.
004	October 1989	Entire document reformatted and updated.
005	January 1990	Environmental specifications updated.
006	October 1990	Document updated to reflect the following changes: ■ The particulate contamination specification has been changed from an individual point measurement to a cumulative measurement. This has not materially changed the specification. ■ The default standard single-ended SCSI card assembly is now the DR or DB card, and the default standard differential SCSI card assembly is now the DS3 card. ■ The sheetmetal has the provision for a self-tapping lug hole for grounding purposes if the user has need for it. For 2600-level MX code and above, the following changes also apply: ■ The RESERVE UNIT and RELEASE UNIT multi-host commands have been added to the supported SCSI command set.

Contents

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1. General Information

This manual describes the function and performance specifications of the EXABYTE® EXB-8200 8mm Cartridge Tape Subsystem (EXB-8200). This manual is for engineering, purchasing, or marketing personnel who want to evaluate the EXB-8200 to determine the feasibility of integrating it into their product line.

1.1. About This Manual

This manual includes the following sections:

- Section 1 provides general information about the EXB-8200 and this manual.
- Section 2 contains a physical description of the EXB-8200 and describes its features. It provides general information about the EXB-8200's operations, including an explanation of helical scan recording, recorded track format, tape formatting, read-after-write, error correction code (ECC), and tape transport.
- Section 3 describes the EXB-8200's performance specifications, including write and read access time, tape speed, reposition time, drum rotation period, and data transfer rate.
- Section 4 describes the physical and logical recording format of the EXB-8200.
- Section 5 provides information about EXB-8200 service life, data reliability, and machine reliability.
- Section 6 describes the EXB-8200's power specifications, including information about voltages, the power connector, power dissipation, and safety considerations.
- Section 7 describes environmental specifications for operation, storage, and transport of the EXB-8200.
- Section 8 contains information about the Small Computer System Interface (SCSI) characteristics, physical path, command set, and message system.
- Section 9 contains guidelines for installing the EXB-8200, including how to unpack the unit, how to connect it to the power supply, how to set the SCSI ID, and how to mount the unit.

- Section 10 discusses EXB-8200 operation and describes the EXB-8200's controls and indicators, switches, the data cartridge write protect tab, and the data cartridge load and unload procedures.

- Section 11 discusses procedures for cleaning the EXB-8200's tape head/path.

1.2. Proprietary Information

This manual does not contain any proprietary information. It describes areas covered by proprietary data and patentable designs in general terms to allow the reader to understand the basic operations and functions of the EXB-8200.

1.3. Function and Capability Descriptions

The functions and capabilities of the EXB-8200 described in this manual are specified conservatively and are limited to the requirements of the marketplace.

1.4. Related Documents

The following documents provide more information about the EXB-8200 and the standards used:

- *EXB-8200 8mm Cartridge Tape Subsystem User's Manual,* Part Number 510006-006

- *ANSI Small Computer System Interface (SCSI),* X3.131-1986

- *Western Digital WD33C92 and WD33C92A SCSI Bus Interface Controller*

- *Western Digital WD33C93 and WD33C93A SCSI Bus Interface Controller*

1.5. Regulatory Agency Standards

The EXB-8200 complies with the following regulatory agency standards:

- UL Standard 1950, 1st Edition, Information Technology Equipment

- UL Standard 478, 4th Edition, Electronic Data Processing Units and Systems

- UL Standard 478, 5th Edition, Information Processing and Business Equipment (by October 1990)

- CSA Standard C22.2 No. 220-M1986, Information Processing and Busir Equipment

- FCC Rules, Part 15, Subpart J, Class B Computing Devices
- EN60950, Safety of Information Technology Equipment including Electrical Business Equipment (TUV)
- VDE 0806/08.81
- National Safe Transit Specification, Project 1A

Notes:

2. Product Description

The EXB-8200 is a high-performance, high-capacity 8mm cartridge tape subsystem that includes an integral Small Computer System Interface (SCSI) device. The EXB-8200 uses advanced helical scan technology, which affords high areal recording density and data storage capacity. It uses the industry standard 8mm data cartridge, which is removable and rewritable, and which can store up to 2.5 GBytes of formatted user data. The EXB-8200 conforms to the dimensions of the industry standard 5.25-inch form factor and is available in two SCSI alternatives: single-ended and differential.

The primary features of the EXB-8200 are the following:

- Writes data using advanced helical-scan recording technology.
- Uses industry-standard removable, rewritable 8mm metal-particle data cartridges that require no preformatting or other media conditioning prior to use. Exabyte data cartridges are available in three sizes: EXATAPE™ 15m (287 MB), EXATAPE 54m (1,146 MB), and EXATAPE 112m (2,413 MB).
- Uses the industry-standard 5.25-inch form factor.
- Contains an integrated SCSI controller and formatter electronics and provides configurable host SCSI bus parity check.
- Provides full disconnect, arbitration, and reconnect support.
- Features a non-recoverable error rate of less than one bit in 10^{13} bits read. Employs read-after-write error checking and automatic rewrite using a powerful onboard Error Correction Code (ECC). Error recovery procedures are implemented in the EXB-8200 controller.
- Provides high-performance read/write access times and high-performance asynchronous SCSI bus data transfer rates of up to 1.5 Mbytes/second.
- Contains an integrated 256-KByte speed-matching buffer.
- Features an effective head-to-tape speed of 3.76 meters/second (148 inches/second).

2.1. Physical Description

The EXB-8200 (shown in Figure 2-1), consists of an 8mm tape transport mechanism and recording channel, servo, data formatter (data buffer and data flow electronics), controller, interface electronics, software, and package parts designed and produced by EXABYTE. The product is a true digital data storage device, derived from 8mm video recording technology, with performance improvements and the additional functions necessary for data processing purposes.

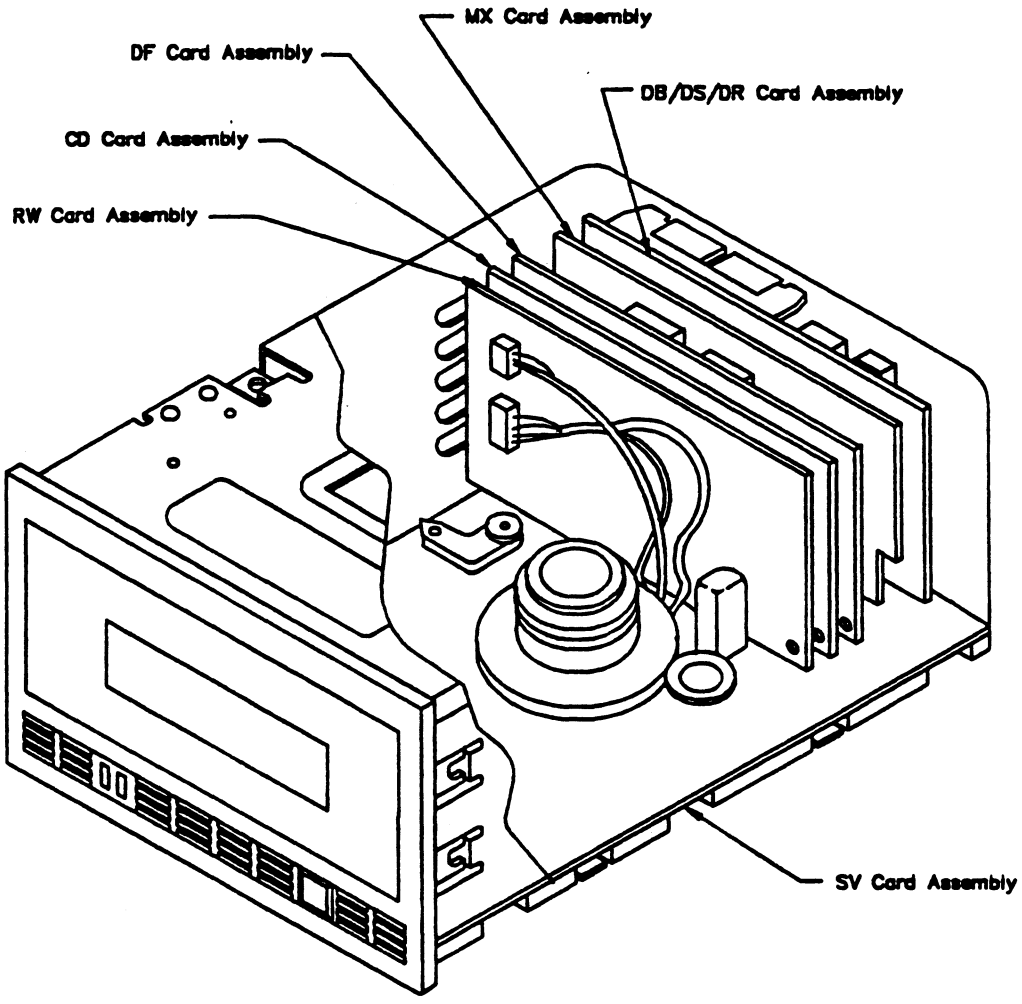

Figure 2-1
EXB-8200 Cartridge Tape Subsystem

2.1.1. Appearance

Standard drives are supplied with a front bezel and door with no company logo. Drives are available in the following standard colors: Black, Pearl White, Pebble Gray, Platinum, and Gray. Custom color changes can be provided at additional cost.

2.1.2. Weight

The EXB-8200 weighs 2.045 kilograms (4.5 pounds).

2.2. EXB-8200 Features

The following sections describe these features of the EXB-8200:

- Helical scan recording
- Recorded track format
- Read-after-write checking
- Error correction code
- Read interchange
- System interface and control
- Data formatter
- Write, read, and erase electronics
- Motion control system
- Tape transport mechanism
- Start/stop and streaming operations

2.2.1. Helical Scan Recording

Helical scan recorders write very narrow tracks at an acute angle to the edge of the tape. This recording method creates a track length that is several times longer than the width of the tape. Tracks can be accurately positioned by the geometry of the tape path to very precise minimal tolerances, resulting in a very high number of tracks per inch. When combined with a high linear flux density, very high areal density results.

Read, write, and servo heads are mounted on a drum that rotates constantly at 1800 rpm, resulting in an effective head-to-tape speed of approximately 3.76 meters per second (148 inches per second). Actual tape movement is 10.89 millimeters per second (0.5 inches per second). Forces acting upon the tape and various component mechanisms are correspondingly low, resulting in long life for both media and tape transport.

The combination of the helical wrap of the tape around the drum, the rotational motion of the head/drum assembly, and the linear motion of the tape causes the heads to trace a path (or track) across the tape that is 77.1 millimeters (3.037 inches) long, at an acute angle of approximately 5 degrees to the bottom edge of tape. See Figure 2-2 for an illustration of the position of the recorded tracks on the tape.

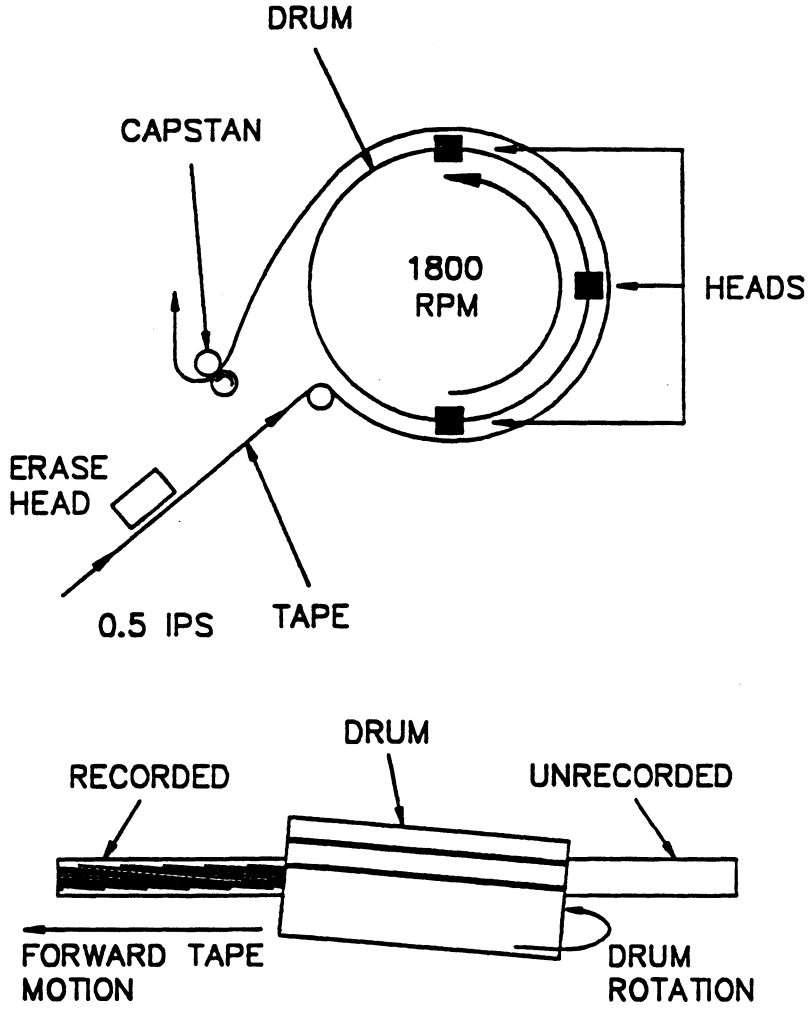

Figure 2-2
EXB-8200 Helical Scan Recording

2.2.2. Recorded Track Format

Figure 2-3 illustrates the recorded track format. Each recorded track consists of eight fixed length data blocks and a servo zone. Each data block contains up to 1,024 bytes of user data. Additional bytes consisting of address, ECC, and cyclic redundancy check (CRC) information are appended to each block by the EXB-8200's data formatter. The address, ECC, and CRC bytes do not affect tape capacity.

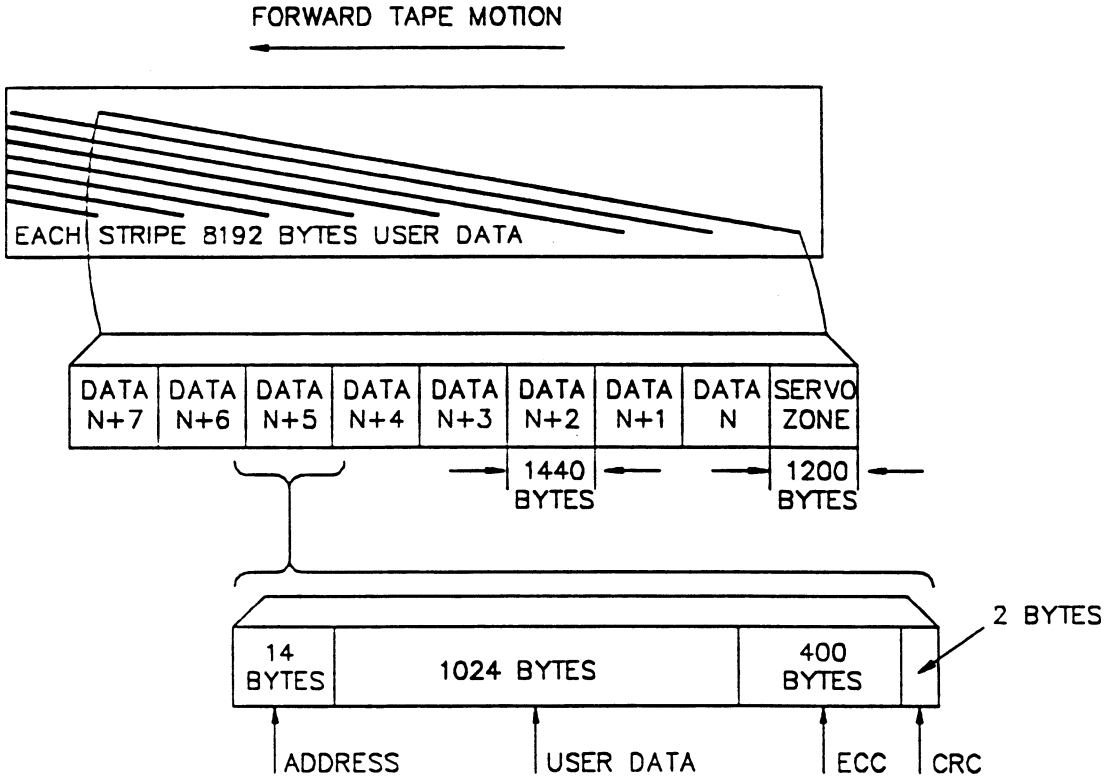

Figure 2-3
EXB-8200 Recorded Track Format

2.2.3. Read-After-Write Checking

During write operations, the EXB-8200 records servo information and formatted user data blocks on the same track and performs a read-after-write check of the recorded user data. If an error is detected during this read-back check, error recovery procedures are performed without host intervention and without

repositioning of the tape. See Figure 2-4 for an illustration of the read-after-write procedure.

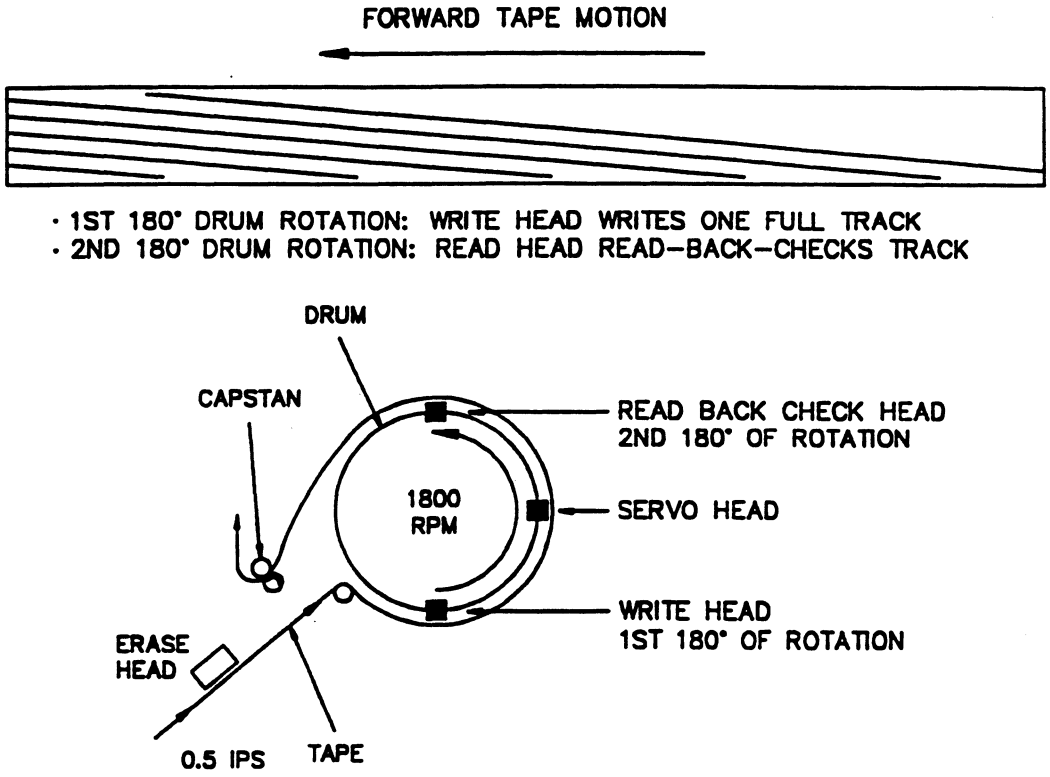

Figure 2-4
EXB-8200 Read After Write

2.2.4. Error Correction Code

The EXB-8200 employs a powerful Error Correction Code (ECC) to ensure data reliability. The Reed/Solomon ECC algorithm can correct a burst as long as 264 consecutive bytes in error and as many as 80 additional random errors in each data block. The ECC is capable of multiple burst and random error corrections. It has been designed to be extremely effective against the types of error patterns characteristic of cartridge tape subsystems.

2.2.5. Read Interchangeability

Data cartridges recorded on an EXB-8200 are readable on any other EXB-8200. This "read interchangeability" is accomplished through use of a proprietary, track-following servo technique that ensures proper head-to-track alignment. During read operations, the EXB-8200 samples servo information recorded in adjacent tracks. It uses this servo information to control linear tape velocity, resulting in accurate positioning of the read head over each track.

2.2.6. System Interface and Control

Users access the EXB-8200 through the SCSI bus. The EXB-8200 is operated as a sequential access device and responds to appropriate SCSI commands as listed in Section 8.3. In general, the EXB-8200 supports most of the commands and sequences supported by devices operated as nine-track tape systems. Error recovery procedures are controlled by the EXB-8200 in a manner that is transparent to the host system; complete error statistics are retained for all operations and are available through the REQUEST SENSE command.

2.2.7. Data Formatter

The data formatter consists of the 256-Kbyte data buffer and the data flow electronics.

Data Buffer: The data buffer consists of 256 KBytes of DRAM that is organized as a nine-bit wide, dual-port, circular memory. Data transfers for SCSI and the data flow electronics take place to and from the data buffer asynchronously.

Logical user data blocks are formatted into physical blocks in the data buffer for recording to tape. Initiation of data buffer transfer operations and management of buffer storage space is performed in firmware.

Data Flow Electronics: The data flow electronics consist of the write encoder and read decoder.

The write encoder receives data blocks from the data buffer and converts the data from parallel to serial. It appends ECC information, inserts synchronization markers, and performs interleave sequencing of bytes through the modulation encoder and bit serializer. Tag and address information is appended to each data block. The bit stream is then sent to the write head driver circuit.

The read decoder receives a serial data bit stream and clock from the clocking and detection circuit. It detects synchronization markers and determines alignment to data, demodulates data bytes, assembles data blocks, and corrects them if necessary.

2.2.8. Write, Read, and Erase Electronics

The write electronics consist of a write compensation circuit and the write head driver circuit.

The read electronics consist of preamplifier and equalization circuits for the read and servo channels and circuits for data detection and recovery and alignment of the data clock.

The erase electronics consist of a frequency generator and current driver for the erase head. The erase electronics are used simultaneously with the write electronics; that is, during a write operation, tape is always erased before it reaches the write head.

2.2.9. Motion Control System

The motion control system is operated by EXABYTE-developed firmware through a dedicated microprocessor located on the servo card. The motion control system consists of the following:

- Drum and capstan servos
- Circuits to drive the reel motor, load motor, mode change motor, and control solenoid
- Sensor interface circuits for the drum, capstan, and reel tachometers
- Sensor interface circuits for the load and mode states
- Sensor interface circuits for physical beginning of tape (PBOT), physical end of tape (PEOT), tape length and type, and write protect and door closed states.

2.2.10. Tape Transport Mechanism

The tape transport mechanism is manufactured to EXABYTE specifications to allow operation of the EXB-8200 as a digital cartridge tape subsystem. Video recording channel or servo electronics are not included in the drive. These functions are replaced entirely by EXABYTE designs that incorporate important performance improvements and capabilities.

The tape transport mechanism is compatible with standard 8mm cartridges in all respects. No mechanical alterations are made to the design other than the rotary drum assembly and erase head.

2.2.11. Start/Stop and Streaming Operations

The EXB-8200 can operate as either a start/stop or streaming tape device. The mode of operation depends on the initiator's ability to transfer data to the EXB-8200 at a high enough rate to sustain operation in the streaming mode. To sustain operation in the streaming mode, the initiator must be able to transfer data to the EXB-8200 at a minimum of 246 Kbytes per second, asynchronously. If the initiator cannot maintain the necessary transfer rate, starting and stopping occurs automatically based upon the data buffer motion and reconnect thresholds.

Notes:

3. Performance Specifications

This section describes the performance specifications for the following EXB-8200 functions:

- Write access time
- Read access time
- Tape speed
- Reposition time
- Drum rotation period
- Data transfer rate

3.1. Write Access Time

Write access time is the time from the EXB-8200's receipt of the last byte of the WRITE command to the return of REQ requesting that the initiator transfer the first bytes of data across the SCSI bus. Write access time is a maximum of 950 microseconds.

3.2. Read Access Time

Read access time is the time from the EXB-8200's receipt of the last byte of the READ command to the return of REQ to the initiator indicating that the EXB-8200 is ready to transfer the first data bytes across the SCSI bus. If there is read data in the data buffer when the READ command is received, read access time is a maximum of 900 microseconds.

3.3. Tape Speed

The nominal tape speed at which data may be recorded and read is 10.89 mm/second (0.429 inch/second). Short term speed variation is limited to +/- 3% of nominal over any 66.6 millisecond period synchronized to drum rotation. Long term speed variation is +/- 0.5%.

File search tape speed: File search operations are performed at 10 times the nominal tape speed to allow for quick access (108.9 mm/second or 4.29 inches/second).

Rewind tape speed: Rewind tape speed averages 75 times the nominal tape speed (816.7 mm/second or 32.2 inches/second).

Rewind times for P6 and P5 cartridges are shown in Table 3-1. The rewind times are calculated as follows:

Rewind Time in Seconds = Length in Meters • 1.224

Typically, the actual time is slightly longer than the calculated number. Factors that affect the rewind times include the following:

- Friction within the data cartridge
- Friction within the drive
- The actual length of the tape (normally greater than the listed length)
- Acceleration and deceleration factors.

These factors have the greatest effect on the smaller cartridge sizes.

Table 3-1
Rewind Time By Cartridge Size

Data Cartridge	Length (meters)	EXATAPE*	Time (min:sec)
P6-15	14.7	15m	0:18
P6-30	27.7		0:34
P6-60	53.6	54m	1:06
P6-90	77.9		1:35
P6-120	105.5		2:09
P5-15	20.6		0:25
P5-30	38.7		0:47
P5-60	75.0		1:32
P5-90	111.2	112m	2:16

* These data cartridges are currently available for purchase through EXABYTE and are recommended for use with all EXABYTE products.

3.4. Reposition Time

Reposition time is the time elapsed from issuance of a stop command to the EXB-8200's motion control system until the tape is repositioned at nominal speed such that the next byte of data may be transferred (independent of any interface delays). Reposition time ranges from 1,082 milliseconds to 1,115 milliseconds.

3.5. Drum Rotation Period

The drum rotation period is 33.3 milliseconds (1800 RPM) +/- 0.1%. The nominal effective head-to-tape speed is 3.76 meters per second (148.0 inches per second).

3.6. Data Transfer Rate

The maximum burst data transfer rate is limited by the performance of the SCSI host adaptor, the Western Digital WD33C93 or WD33C93A for single-ended SCSI, the WD33C92 or WD33C92A for differential SCSI, and the EXB-8200 buffer control hardware. The maximum burst asynchronous data transfer rate does not exceed 1.5 MBytes/sec.

Typical burst performance is approximately 1.2 MBytes/sec. This level of performance has been measured with the EXB-8200 attached to an Adaptec SCSI development system.

The EXB-8200 has a sustained asynchronous data transfer rate of 246 KBytes/sec.

Notes:

4. Recording Format

The recording format defines the arrangement of information recorded on the tape, such as user data, filemarks, and the indicator for logical beginning of tape (LBOT). The recording format takes two forms:

- A physical format that is relative to the functions of the EXB-8200 data path, recording channel, and motion control system.
- A logical format that is relative to the host software. User data, filemarks, and LBOT are written in a format understood by the host.

4.1. Recording Parameters

The recording parameters used by the EXB-8200 are shown in Table 4-1.

Table 4-1
EXB-8200 Recording Parameters

Parameter	Value
Linear recording density:	
Flux	2,126 FR/mm (54,000 FR/in.)
Bit	1,701 bits/mm (43,200 bits/in.)
Track width	0.025 mm (0.00098 in.)
Track pitch	0.031 mm (0.00122 in.)
Track density	32.26 tracks/mm (819.35 tracks/in.)
Areal recording density:	
Flux	68.6 KFR/mm^2 (44.2 MFR/in.^{2})
Bit	54.9 Kbits/mm^2 (35.4 Mbits/in.^{2})
Track angle (reference angle)	4.9 degrees
Wrap angle	221 degrees
Edge guard band	1.0025 mm (0.039 in.)
Recorded track length	77.1 mm (3.037 in.)

4.2. Physical Format

The following definitions explain the physical format of the tape and the information recorded on the tape.

4.2.1. Physical Beginning of Tape (PBOT)

The physical beginning of tape (PBOT) is the point at which the translucent leader material is attached to the media with all of the tape on the supply reel. This position is detected by an optical sensor in the tape transport mechanism.

4.2.2. Physical End of Tape (PEOT)

The physical end of tape (PEOT) is the point at which the translucent leader material is attached to the media with all of the tape on the take-up reel. This position is detected by an optical sensor in the tape transport mechanism and is reported by the controller to the host.

4.2.3. Physical Blocks and Physical Tracks

Data transferred to the EXB-8200 is recorded to tape in physical blocks of 1,0[illegible] bytes each. The EXB-8200 can use multiple physical blocks to record a logi block of data that exceeds 1,024 bytes. To each physical block, the EXB-8200 appends 400 bytes of ECC information, 2 bytes of cyclic redundancy check (CRC) code, and 14 bytes of header/identification data. These additional bytes do not affect tape capacity.

A physical track contains eight physical blocks of data, representing a maximum capacity of 8,192 bytes of user data per track.

4.2.4. Data Zone

The data zone of a track consists of a preamble, data segments, and a postamble. The preamble is a string of bits consisting of all 1's. The data segments consist of encoded data, ECC, CRC, and ID information. The postamble is a string of bits consisting of all 1's. Composition of the data zone is the same regardless of the types of blocks recorded in the track.

4.2.5. Servo Information for Track-Following Servo Electronics

Each data track contains servo information that is used by track-following servo electronics to optimize tracking. This ensures reliable data interchange between the EXB-8200 and the host and read-interchangeability of tapes recorded on oth EXB-8200s. The servo information contains a signal that is written to tape duri

each write operation. During a read operation, the signal is sampled by the servo head. The servo head runs between adjacent tracks, comparing the servo information on both tracks. If the signal amplitudes from both tracks are not equal, tape speed is adjusted to equalize them. This ensures proper alignment of the read and write heads.

4.3. Logical Format

The following definitions explain the logical characteristics of the information recorded on the tape.

4.3.1. Logical Blocks

A logical block is a block of data transferred from a host to the EXB-8200. The length of a logical block can be from 1 byte to 240 KBytes. Logical blocks can be fixed or variable in length. Logical blocks that exceed 1,024 bytes are divided into 1,024 byte segments for recording in physical blocks on the tape.

4.3.2. Gap Bytes

If a logical block transferred from the host contains less than 1,024 bytes or cannot be equally divided by 1,024, gap bytes are added to the end of the data to make each incomplete physical block equal to 1,024 bytes. This operation is performed automatically by the EXB-8200.

4.3.3. Gap Blocks

Each track of data written to tape consists of eight physical blocks of user data. Whenever the last track of data written to tape contains less than eight physical blocks, the EXB-8200 adds gap blocks to the track to make it equal to eight blocks. Gap blocks cannot be accessed by a WRITE, READ, or any other command available to the user. The gap blocks are recorded only at the discretion of the EXB-8200.

4.3.4. Gap Tracks

When the drive stops at the end of a write operation, a single gap track consisting of eight gap blocks is written following the last track containing data blocks. The gap track provides the track orientation required to append data. When a subsequent write operation begins, the controller repositions the tape and records the data on the next track adjacent to the gap track.

4.3.5. Filemarks

The EXB-8200 uses filemarks to quickly locate particular blocks of data during a search. Two types of filemarks are provided: long and short. A long filemark is 270 tracks long. A short filemark is 60 tracks long.

Each filemark consists of an erased length of tape (erase gap) followed by an analog tape mark (ATM) and a digital tape mark (DTM). An ATM consists of 11 identical tracks of servo data containing a 184 KHz signal that is recognized by the EXB-8200 during a search. A DTM consists of 10 identical tracks of servo data and information identifying the filemark's number on the tape. For long filemarks the erase gap is 249 tracks long. For short filemarks, the erase gap is 39 tracks long.

A long filemark can be erased by an ERASE or WRITE command. A short filemark is erasable only when writing from logical beginning of tape (LBOT) or from a preceding long filemark. The information contained in filemarks is defined by the EXB-8200 and cannot be accessed or changed by the user.

4.3.6. Logical Beginning of Tape (LBOT)

LBOT is recorded on the tape by a write operation at a point approximately inches from physical beginning of tape (PBOT).

LBOT consists of an erased length of tape followed by a series of tracks that are used to indicate the LBOT's location and to perform initial automatic calibration of the servo system. The first track containing data blocks is recorded directly after the last track containing LBOT information. The information contained in the LBOT tracks is defined by the EXB-8200 and cannot be accessed or changed by the user.

The tape can be repositioned and a write operation can be performed that erases the LBOT and records a new LBOT in the same space. This process normally occurs when a write operation at LBOT is performed and when the tape has been previously recorded.

If an error occurs while the EXB-8200 is writing a LBOT, it attempts to rewrite the LBOT once before indicating an error.

4.3.7. Logical End of Tape (LEOT)

The logical end of tape (LEOT) is determined by the number of recorded blocks that occur after LBOT. For this purpose, lengths of erased segments are converted into an equivalent number of blocks. The number of blocks betwe LBOT and LEOT is different for each size and type of tape. The EXB-82

supports the domestic P6 cartridge type, the European P5 cartridge type, and the international operating mode. Tape size is determined by the EXB-8200's tape autosizing feature and the cartridge type specified through the MODE SELECT command. Refer to the *EXB-8200 8mm Cartridge Tape Subsystem User's Manual* for information about tape types and the autosizing feature. The user's manual also provides tables indicating the number of blocks between LBOT and LEOT and the approximate number of blocks between LEOT and PEOT.

Notes:

5. Reliability Specifications

This section lists the reliability specifications for the EXB-8200, including:

- Service life
- Data reliability
- Machine reliability

5.1. Service Life

The EXB-8200 has been designed to exceed a useful service life of five years, during which time all performance and reliability specifications are applicable.

5.2. Data Reliability

The EXB-8200 writes and reads fixed length physical blocks containing up to 1,024 bytes of user data. Data reliability is specified as a bit error rate based on 1,024 user data bytes per block. The bit error rate is the number of errors occurring per total number of bits transferred to the host. A block error rate in units of 1 error per total number of blocks transferred to the host is also provided.

Conditions under which data reliability specifications apply: The conditions under which the specifications for data reliability apply are as follows:

- The 8mm data cartridges used with the EXB-8200 must conform to the industry standards for metal-particle tape.
- Data cartridges must be written and read on an EXB-8200 that is in good operating condition and properly grounded.
- Environmental conditions for the EXB-8200 and 8mm cartridges must be maintained as specified in Section 7.
- The EXB-8200 must be cleaned in accordance with the preventive maintenance procedures described in Section 11.

Restrictions: The following types of errors are not included in the determination of data reliability:

- Errors caused by a failure of the EXB-8200
- Errors caused by faulty or damaged cartridges or media

- Errors caused by failure to comply with input power and grounding requirements, interference from external sources, or incorrect system operation or failure
- Errors that are corrected by the EXB-8200 ECC
- Errors that occur in blocks other than blocks containing user data
- Errors in user data blocks that comply with the criteria for read-back check. (These errors are not counted as write errors because the read-back criteria may allow some minimal error level.)

5.2.1. Write Reliability

Write reliability is determined by the rate of permanent write errors. During a write operation, the EXB-8200 uses read-back checking to determine whether data blocks are correctly written to tape. When a read-back check detects an error in a data block, the EXB-8200 rewrites the block. The EXB-8200 keeps track of the number of times blocks are rewritten and stores this number in a counter available through the REQUEST SENSE command. If a data block can be correctly rewritten, the error is considered a temporary write error and does not affect write reliability. If a data block cannot be correctly written after a maximum of eleven rewrite attempts (twelve write attempts total), the error is a permanent write error. When a permanent write error occurs, the EXB-8200 returns Check Condition status and stops writing data to tape.

The rates for permanent write errors are:

Bit Error Rate (Data Interchange Mode)	1.0×10^{-12}
Block Error Rate	8.2×10^{-9}

5.2.2. Read Reliability

Read reliability is determined by the rate of permanent read errors. During a read operation, when the EXB-8200 cannot read a block that has been correctly written, it attempts to reread the block. The EXB-8200 keeps track of the number of times it attempts to reread a block and stores this number in a counter available through the REQUEST SENSE command. If a data block can be correctly reread, the error is considered a temporary read error and does not affect read reliability. If a data block cannot be correctly read after a maximum of nine reread attempts (ten read attempts total), the error is a permanent read error. When a permanent read error occurs, the EXB-8200 returns Check Condition status and stops reading data from tape.

The rates for permanent read errors are:

Bit Error Rate (Data Interchange Mode)	1.0×10^{-13}
Block Error Rate	8.2×10^{-10}

5.3. Machine Reliability: Mean Time Between Failures (MTBF)

The Mean Time Between Failures (MTBF) for the EXB-8200 is 40,000 hours for units manufactured after November 1, 1990.

MTBF is defined as:

$$\text{MTBF} = \frac{\text{Total Power-on Hours}}{\text{Number of Relevant Equipment Failures}}$$

where:

Total Power-on Hours =
The total time the EXB-8200 is drawing current from the input power supply system.

Relevant Equipment Failures =
Those failures that cannot be corrected by operating personnel and require the intervention of maintenance personnel.

Test Conditions: MTBF is determined under the following conditions:

- A minimum of 32 units installed for 5,000 hours each are tested.
- MTBF is specified for a maximum duty cycle of 10%. Duty cycle is defined as:

$$\text{Duty Cycle} = \frac{\text{Total Hours of Mechanical Operation}}{\text{Total Power-on Hours}} \times 100\%$$

- Testing is run at ambient temperatures and humidity of:

  23° C +/- 2° C
  50% RH +/- 10% (non-condensing)

- Units are operated in accordance with operational specifications.

Conditions under which MTBF Applies: The conditions under which MTBF apply are as follows:

- The 8mm data cartridges used must conform to the industry standards for this type of tape.
- Environmental conditions for the EXB-8200 and 8mm cartridges must be maintained as specified in Section 7.
- The EXB-8200 must be cleaned in accordance with the preventive maintenance procedures described in Section 11.

Restrictions: The following types of failures are excluded from the calculation of MTBF:

- Failures arising from incorrect operating procedures.
- Cable failures, power supply failures, or other failures not caused by equipment.
- Failures caused by incorrect grounding procedures or by interference from external sources.
- Media failures, or any failures or degraded performance caused by use of faulty or damaged media.
- New failures that arise from continued use of a failed, misaligned, or damaged EXB-8200.
- Failures caused by incorrect maintenance procedures, and all failures that occur within the first 40 power-on hours of any maintenance activity that includes the modification, adjustment, or replacement of any EXB-8200 assembly.
- Failures of new units that occur within the first 40 power-on hours.

6. Power Specifications

6.1. Voltages

The EXB-8200 operates from the standard DC supply voltages: +5 volts and +12 volts. Table 6-1 shows the power specifications for the EXB-8200. All specified voltages are DC; no AC power is used by the EXB-8200. The EXB-8200 does not provide any over-voltage or over-current protection.

Table 6-1
EXB-8200 Power Specifications at +5 and +12 Volts DC

Description	+5 Volts Input	+12 Volts Input
Nominal Tolerance	+/- 5%	+/- 5%
Regulation (overload range)	+/- 0.8%	+/- 0.8%
Ripple and Noise (60 Hz to 20 Mhz)	125 mVpp, max.	125 mVpp, max.
Load current		
Minimum	1.2 A	170 mA
Maximum	2.8 A	400 mA

Table 6-2 lists the typical power consumption at +5 Volts DC and +12 Volts DC for the most commonly performed SCSI functions.

Table 6-2
Typical Power Consumption for Common SCSI Functions at +5 and +12 Volts DC

+5 Volts DC

Function	Baseline Current	Peak Current	Average Current	Surge Spikes	Watts
Power-up	1.6 A	2.6 A	2.31 A	2.6 A 40 µSec	11.55
Load Tape	1.5 A	2.6 A	2.28 A	2.6 A 40 µSec	11.40
Unload Tape	1.5 A	2.6 A	2.28 A	2.6 A 40 µSec	11.40
Write Tape	1.6 A	2.2 A	2.02 A		10.10
Read Tape	1.8 A	2.2 A	2.08 A		10.40
Rewind	1.5 A	2.2 A	1.99 A	2.6 A 40µSec	9.95
Search	1.5 A	2.2 A	1.99 A		9.95
Stopped	1.5 A	1.8 A	1.71 A		8.55

+12 Volts DC

Function	Baseline Current	Peak Current	Average Current	Surge Spikes	Watts
Power-up	240 mA	410 mA	360 mA	1.1 A 40 µSec	4.32
Load Tape	240 mA	420 mA	361 mA	1.1 A 40 µSec	4.33
Unload Tape	220 mA	400 mA	347 mA	1.0 A 40 µSec	4.16
Write Tape	220 mA	500 mA	418 mA		5.02
Read Tape	240 mA	380 mA	339 mA		4.07
Rewind	200 mA	650 mA	518 mA	880 mA 40 µSec	6.22
Search	240 mA	400 mA	353 mA		4.24
Stopped	230 mA	310 mA	287 mA		3.44

Average Wattage: The average wattage for +5 volts DC = 10.41 watts. The average wattage for +12 volts DC = 4.48 watts. The average wattage total for the EXB-8200 is 14.89 watts.

6.2. Safety Agency Considerations

Safety agency certification requires that the supplied voltages be from the following:

- A Safety Extra-Low Voltage source (per IEC950).
- A Class 2 transformer rated at 30 volts rms sinusoidal or less.
- An isolating transformer, or a power supply that includes an isolating transformer, with open-circuit potential or no-load output of not more than 42.4 volts peak or 60 VDC. The energy available is limited so that the current under any condition of load, including short circuit, is not more than 8 amps after one minute of operation.

6.3. Power Connector

The power connector used in the EXB-8200 is compatible with the power connector used for standard 5.25-inch devices. The EXB-8200's P1 Power Connector (AMP No. 641737-1; EXABYTE No. 004008) has the pin assignments shown in Table 6-3.

Table 6-3
P1 DC Power Pin Assignments

P1 Pin No.	Assignment
1	+12 V
2	Ground, 12 V return
3	Ground, 5 V return
4	+5 V

6.4. Power Dissipation

The maximum average power dissipation is specified as 15 watts (+/- 1 watt).

Notes:

7. Environmental Specifications

Table 7-1 lists the general environmental specifications for the EXB-8200.

Table 7-1
EXB-8200 Environmental Specifications

Item	EXB-8200 Operating[1]	EXB-8200 in Storage[2] or Not Operating[3]	EXB-8200 being Transported[4]
Temp. Range	+5°C to +40°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)
Temp. Variation[5]	1°C per minute Max 10°C per hour (2°F per minute Max 18°F per hour)	1°C per minute Max 20°C per hour (2°F per minute Max 36°F per hour)	1°C per minute Max 20°C per hour (2°F per minute Max 36°F per hour)
Rel. Humidity[5]	20% to 80% Non-condensing	10% to 90% Non-condensing	10% to 90% Non-condensing
Wet Bulb	26°C Max (79°F Max)		
Altitude	-304.8 m to +3,048 m (-1,000 ft. to +10,000 ft.)	-304.8 m to +3,048 m (-1,000 ft. to +10,000 ft.)	-304.8 m to +12,192 m (-1,000 ft. to +40,000 ft.)

1. All operating measurements include a standard EXATAPE data cartridge.
2. The EXB-8200 has not been unpacked, a data cartridge is not packed with the drive, and the storage period does not exceed three years.
3. The EXB-8200 has been unpacked but is not operating, and a data cartridge is not inserted.
4. The EXB-8200 has not been unpacked, and a data cartridge is not packed with the drive.
5. The data cartridge's temperature and humidity must be allowed to stabilize in the specified ambient environment for 24 hours.

7.1. Operating Environment

The psychrometric chart shown in Figure 7-1 contains the operating temperature and humidity environments for the EXB-8200. The dotted line represents the operating environment.

The temperature and humidity measurements at points A through E in the psychrometric chart are indicated in Table 7-2.

Table 7-2
Temperature and Humidity Measurements for Figure 7-1

Point	Temperature	Humidity
A	5° C	80%
B	29° C	80%
C	40° C	34%
D	40° C	20%
E	5° C	20%

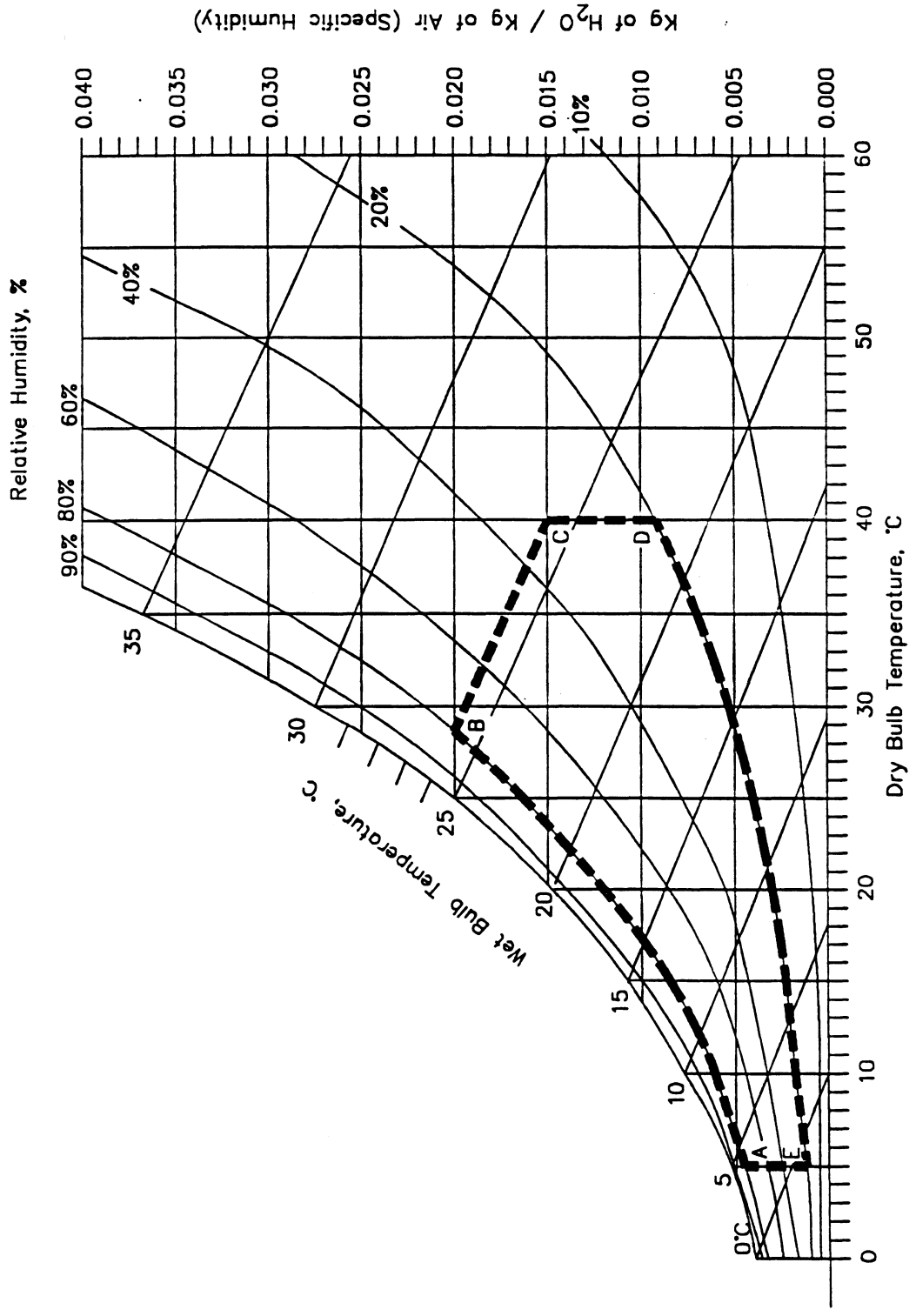

Figure 7-1
Psychrometric Chart Showing Temperature and Humidity Limits for the EXB-8200

7.2. Air Flow Requirements

Adequate air flow must be provided through the vents in the rear of the EXB-8200 to dissipate heat resulting from 15 watts of power consumption. The air flow around the entire drive must be sufficient to prevent the tape path temperature from exceeding 40° C (104° F). However, due to the high recording density on the media, the passage of air through the tape path may cause particulate contamination that can result in data errors. To avoid this, air flow within the enclosure must not force air into the tape path.

7.3. Particulate Contamination Limits

Particulate contamination should not exceed the counts shown in Table 7-3.

Table 7-3
EXB-8200 Particulate Contamination Limits

Particle Size (microns)	Number of Particles ≥ Particle Size Per Cubic Meter	Number of Particles ≥ Particle Size Per Cubic Foot
0.1	8.8×10^7	2.5×10^6
0.5	3.5×10^7	1.0×10^6
5.0	2.5×10^5	7.0×10^3

Figure 7-2 shows the particulate contamination profile of a typical office compared to the specifications for the EXB-8200. Individual office area contamination profiles vary.

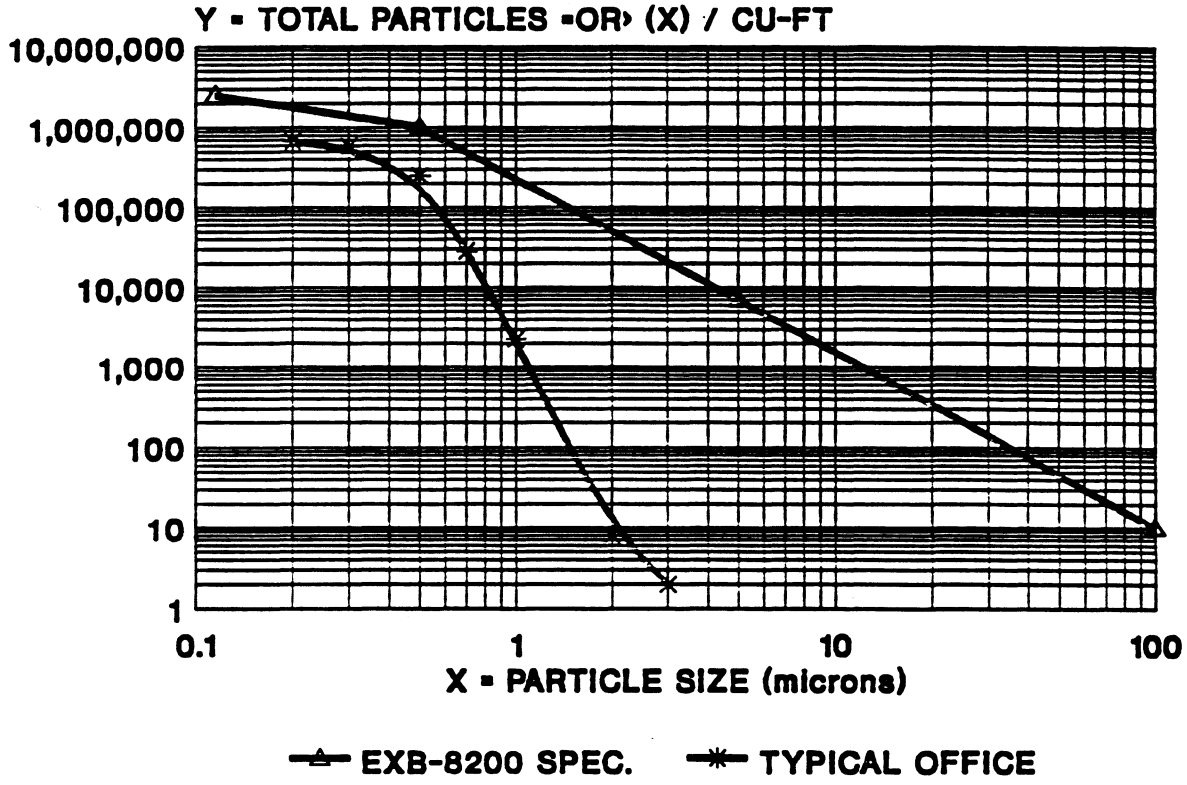

Figure 7-2
EXB-8200 Particulate Contamination Specification vs. Typical Office

7.4. Shock and Vibration

The EXB-8200 meets the following shock and vibration specifications.

7.4.1. Shock Specifications

The EXB-8200 is capable of withstanding the shock levels listed in Table 7-4. The operating shock levels indicate the amount of shock that the EXB-8200 is capable of withstanding while reading and writing data. The shock pulses are half-sine waves applied to any of the six sides of the EXB-8200.

Table 7-4
EXB-8200 Shock Limits

Operating	Non-operating[1]/Storage[2]/Transporting[2]
3 g for 5 ms 2 g for 11 ms 1 g for 20 ms	40 g for 11 ms 45 g for 30 ms

1. The EXB-8200 has been unpacked, but no tape motion is occurring.
2. The EXB-8200 has not been unpacked.

7.4.2. Vibration Specifications

The EXB-8200 is capable of withstanding the vibrations levels listed in Table 7-5. The operating vibration levels indicate the amount of vibration the EXB-8200 is capable of withstanding while reading and writing data.

Table 7-5
EXB-8200 Vibration Limits

Random Vibration[1] (Operating):	
5-350 Hz	PSD = 0.00020 g^2/Hz
350-500 Hz	Slope = -6 Db/Oct
500 Hz	PSD = 0.0001 g^2/Hz
Random Vibration[2] (Storage[3] and Non-operating[4]):	
5-100 Hz	PSD = 0.020g^2/Hz
100-137 Hz	Slope = -6 Db/Oct
137-350 Hz	PSD = 0.0107 g^2/Hz
350-500 Hz	Slope = -6 Db/Oct
500 Hz	PSD = 0.0052 g^2/Hz

1. A 0.03 g RMS random vibration spectrum is applied to each of three orthogonal axes for a minimum of 10 minutes per axis.
2. A 2.41 g RMS random vibration spectrum is applied to each of three orthogonal axes for a minimum of 10 minutes per axis.
3. The EXB-8200 has not been unpacked.
4. The EXB-8200 has been unpacked, but no tape motion is occurring.

7.5. Electrostatic Discharge (ESD)

When properly installed with shielded cabinet, shielded cables, and adequate grounding of the SCSI bus and input power, the EXB-8200 can withstand discharges applied to those points accessible during normal use as follows:

- 10,000 volts without affecting the permanent read error rate or requiring operator intervention
- 15,000 volts without sustaining permanent damage
- 20,000 volts from a charged cartridge inserted into the drive without sustaining damage or errors

7.6. Acoustic Noise

When the EXB-8200 is operating in streaming mode for a read or write operation, the octave band (Hz) A-weighted sound power levels (Bels) do not exceed the upper limits specified in Table 7-6. The EXB-8200 has an NC rating of 50 or better.

Table 7-6
EXB-8200 Acoustic Noise Limits

Octave Band Center Frequencies (Hz)							
125	250	500	1000	2000	4000	8000	L_{WA}*
5.3	4.8	4.7	4.7	4.7	4.5	4.0	5.3

* L_{WA} = average A-weighted sound power level.

7.7. Electromagnetic Interference (EMI) Susceptibility

When properly installed (using a shielded cabinet, shielded cables, etc.), the EXB-8200 meets the requirements for susceptibility to moderate levels of electromagnetic radiation defined by VDE Vfq 1046/1984, Class B; FCC Rules, Part 15, Subpart J, Class B Computing Devices; and CSA Regulation SOR/88-475, 3862 01 Data Processing Equipment, Class B.

7.8. Radiated Emission Susceptibility (RES)

When properly installed (using a shielded cabinet, shielded cables, etc.), the EXB-8200 meets the requirements for radiated emission susceptibility defined by VDE Vfq 1046/1984, Class B: FCC Rules, Part 15, Subpart J, Class B Computing Devices; and CSA Regulation SOR/88-475, 3862 01 Data Processing Equipment, Class B.

8. Small Computer System Interface (SCSI) Specification

The Small Computer System Interface (SCSI) implemented for the EXB-8200 conforms to the ANSI SCSI specification X3.131-1986, Revision 17B, Conformance Level 2, for a sequential access device. For additional information about SCSI as it is implemented in the EXB-8200, see the *EXB-8200 8mm Cartridge Tape Subsystem User's Manual.*

For single-ended SCSI configurations, the EXB-8200 uses the Western Digital WD33C93 or WD33C93A SCSI Bus Interface Controller. For differential SCSI configurations, the EXB-8200 uses the Western Digital WD33C92 or WD33C92A SCSI Bus Interface Controller. Implementation characteristics of the SCSI controller include the following:

- SCSI bus parity checking configurable through MODE SELECT command
- Asynchronous data transfer support
- Single-ended or differential SCSI
- Standard, non-shielded 50-pin ribbon cable connector
- Multiple initiator configuration support

In addition, the SCSI controller implements the Disconnect/Reconnect/Arbitration feature. This feature releases the drive to operate under its own internal intelligence system, enabling the SCSI bus to perform other I/O requests.

For detailed information about interface timings, refer to the documentation for the WD33C93 and WD33C93A controller or the WD33C92 and WD33C92A controller.

8.1. Physical Path

The SCSI physical path definition is implemented by the EXB-8200 using an eight-port, daisy-chained bus that includes the following features:

- Single or multiple host computer system
- Bus contention handled by distributed arbitration on a prioritized basis
- Accommodation of multiple peripheral device types
- Asynchronous communication of up to 1.5 MBytes/sec (12 Mbits/sec)
- Multiple overlap of peripheral device operations
- Orientation toward intelligent peripheral devices
- Enhanced operation with buffered devices

8.2. SCSI Message System

Eleven SCSI messages provide a comprehensive method of physical path management. Table 8-1 lists the messages supported by the EXB-8200. The EXB-8200 does not support the extended message format or the use of linked commands; therefore, these messages are not included.

Table 8-1
SCSI Messages Supported by the EXB-8200

Hex Value	Message	Direction*	
00H	Command Complete	In	
02H	Save Data Pointer	In	
03H	Restore Pointers	In	
04H	Disconnect	In	
05H	Initiator Detected Error		Out
06H	Abort		Out
07H	Message Reject	In	Out
08H	No Operation		Out
09H	Message Parity Error		Out
0CH	Bus Device Reset		Out
80H to FFH	Identify	In	Out

* In: Target to Host
Out: Host to Target

8.3. SCSI Command Set

The EXB-8200 SCSI command set consists of 18 commands from the Group 0 sequential access device command set. These commands are listed in Table 8-2.

Table 8-2
SCSI Commands Supported by the EXB-8200

Command	OP Code	SCSI (ANSI)*
ERASE	19H	O
INQUIRY	12H	E
LOAD/UNLOAD	1BH	O
MODE SELECT	15H	O
MODE SENSE	1AH	O
PREVENT/ALLOW MEDIA REMOVAL	1EH	O
READ	08H	M
READ BLOCK LIMITS	05H	M
RECEIVE DIAGNOSTIC RESULTS	1CH	O
RELEASE UNIT**	17H	O
REQUEST SENSE	03H	M
RESERVE UNIT**	16H	O
REWIND	01H	M
SEND DIAGNOSTICS	1DH	O
SPACE	11H	O
TEST UNIT READY	00H	O
WRITE	0AH	M
WRITE FILEMARKS	10H	M

* E = Extended
O = Optional
M = Mandatory

**This command is available with 2600-level MX code and above only.

Notes:

9. Installation

This section provides general information about the following installation tasks:

- Unpacking the EXB-8200
- Connecting the EXB-8200
- Setting the SCSI ID
- Mounting the EXB-8200

9.1. Unpacking the EXB-8200

The EXB-8200 is shipped in a protective container that meets the National Safe Transit Association specification (Project 1A). Unpack the EXB-8200 using the following procedure:

1. Place the shipping carton on a flat, level surface.

2. Remove the adhesive tape from the top of the carton and open the carton flaps.

3. Carefully remove the packing material from the top of the EXB-8200.

4. Holding the bottom edges of the EXB-8200, lift it out of the carton and place it on a flat, level surface.

5. Check the contents of the carton against the packing list and inspect the EXB-8200 for possible damage. If a part is missing or damage has occurred, notify the carrier and your vendor immediately.

Important: If you plan to re-use the EXB-8200 packaging to ship the drive, you must not modify the packaging in any way. Modifications may prevent the packaging from meeting the specifications discussed in Chapter 7.

9.2. Connecting the EXB-8200

Requirements for connecting the EXB-8200 to the power supply and the SCSI bus are provided below.

9.2.1. Power Connector Requirements

The system power cable connector should be an AMP No. 1-480424-0 female connector. Figure 9-1 shows the location of the power connector P1 on the rear of the EXB-8200.

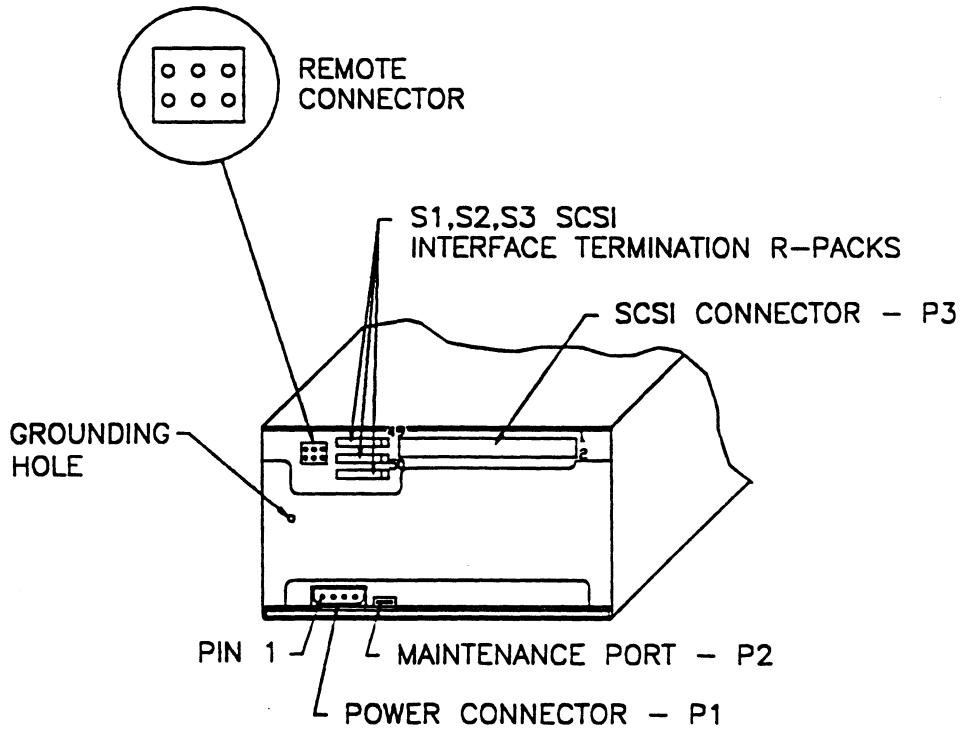

Figure 9-1
EXB-8200 Rear Panel Connectors and Controls (DR card)

Table 9-1 lists the P1 DC power connector pin assignments.

Table 9-1
P1 DC Power Connector Pin Assignments

P1 Pin No.	Assignment
1	+12V
2	Ground, 12V return
3	Ground, 5V return
4	+5V

A grounding hole, as shown in Figure 9-1, is provided for mounting a grounding screw.

9.2.2. SCSI Connector Requirements

The SCSI connector P3 is located at the rear of the unit, as shown in Figure 9-1.

The P3 SCSI connector is a keyed 50-pin male ribbon cable connector, as described in ANSI SCSI specification, X3.131-1986. The system cable connector must be a 50-pin female ribbon cable connector (AMP No. 1-499575-2 or equivalent). For P3 SCSI connector pin-out assignments and dimensions, see the *EXB-8200 Cartridge Tape Subsystem User's Manual.*

9.3. Setting the SCSI ID

For the EXB-8200, the SCSI ID can be selected from 0 through 7. The SCSI ID is sensed on power-up, SCSI bus reset, and device reset. The drive's device LUN is hard wired as LUN 0.

Depending on the type of card you have, you can use either a remote connector or DIP switches to set the SCSI ID.

DR Card: With the DR card, you can use a remote connector, as shown in Figure 9-2. The remote connector (Molex® 14-57-3065 or equivalent) can be attached to the card, or jumpers can be placed on the appropriate pins. The DR card is supplied with jumpers installed.

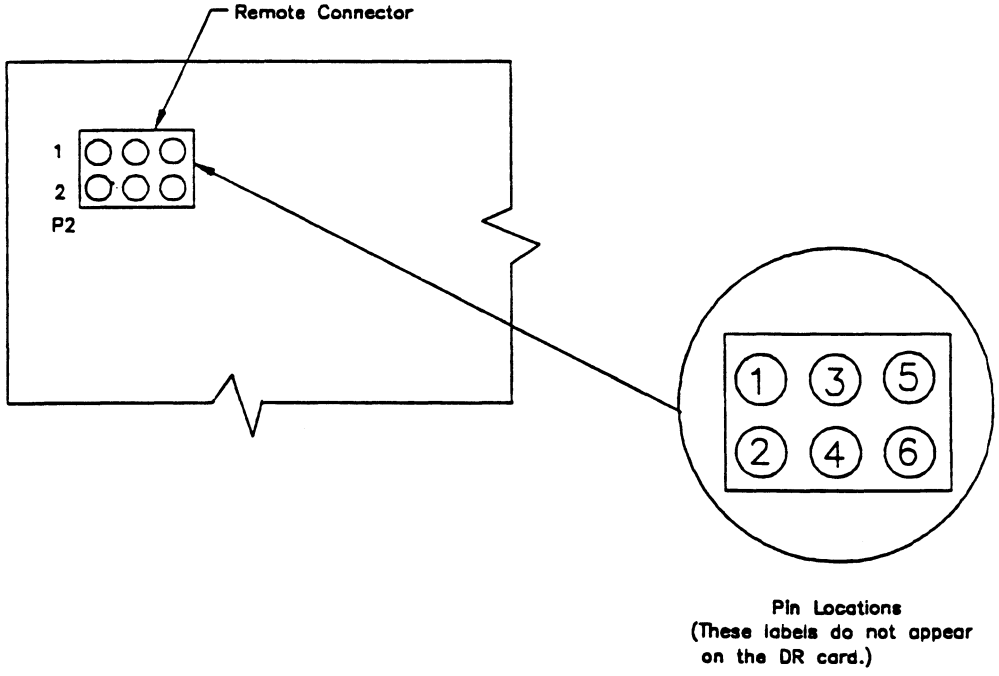

Figure 9-2
Remote Connector on the DR Card

Table 9-2 lists the pin assignments for the remote connector.

Table 9-2
Remote Connector Pin Assignments

Pin	Signal
1	SCSI ID Bit 2 (MSB)
2	Ground
3	SCSI ID Bit 1
4	Ground
5	SCSI ID Bit 0 (LSB)
6	Ground

Figure 9-3 shows the jumper connections and corresponding SCSI IDs for the DR card.

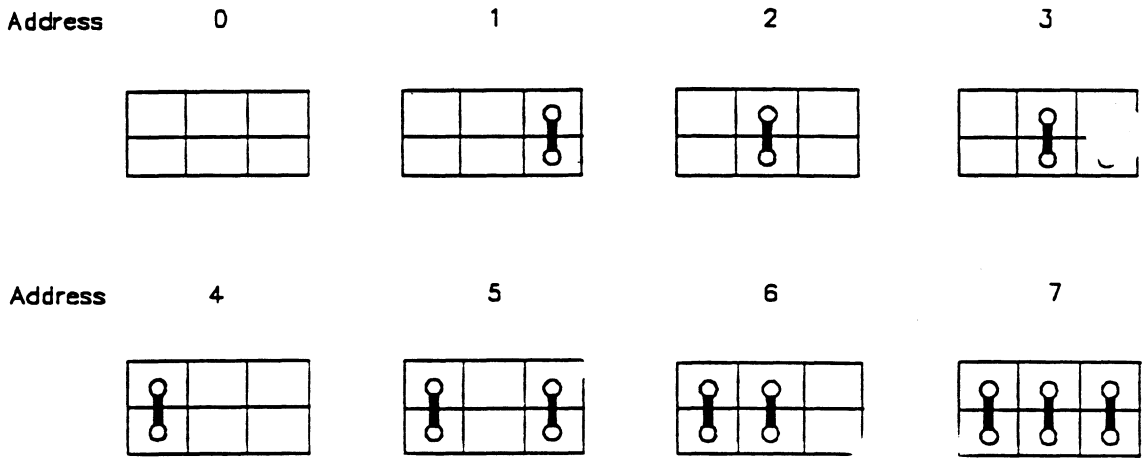

Figure 9-3
SCSI ID Jumper Connections for the DR Card

DS3 Card: With the DS3 card, you can use a remote connector or DIP switches to set the SCSI ID. Figure 9-4 shows the remote connector and DIP switches at the rear of the unit for the DS3 card. The pin assignments for the remote connector are the same as for the DR card (see Table 9-2).

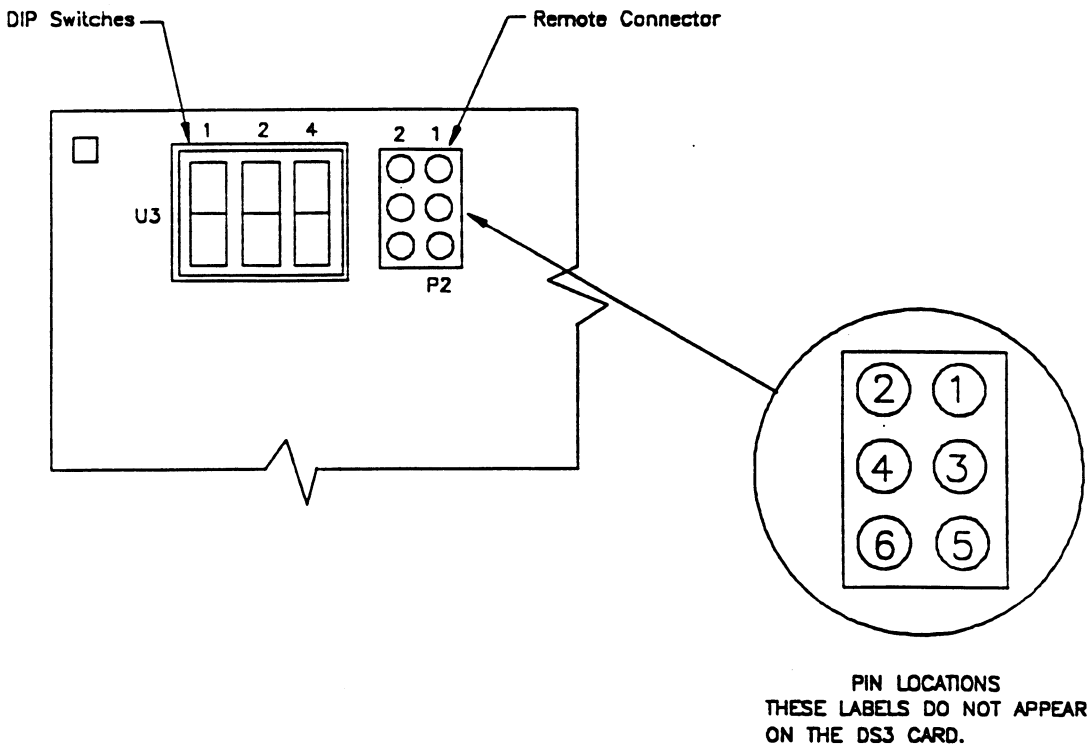

Figure 9-4
DIP Switches and Remote Connector on DS3 Card (Note: DB card DIP switches are in same location as DS3 card DIP switches)

Figure 9-5 shows the DIP switch settings and the corresponding SCSI IDs for the DS3 (and DB) card.

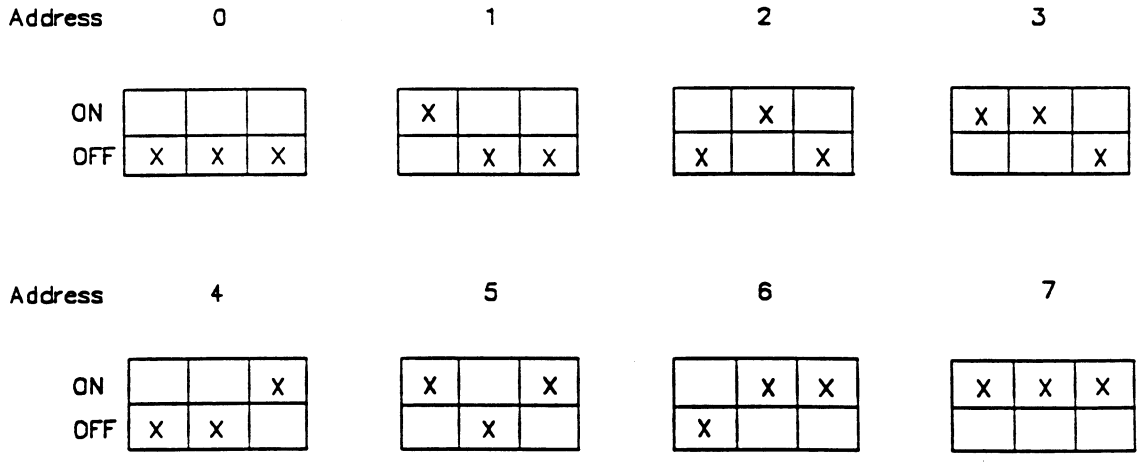

Figure 9-5
SCSI ID DIP Switch Settings for the DS3 and DB Cards

Figure 9-6 shows the jumper connections and the corresponding SCSI IDs for the DS3 card.

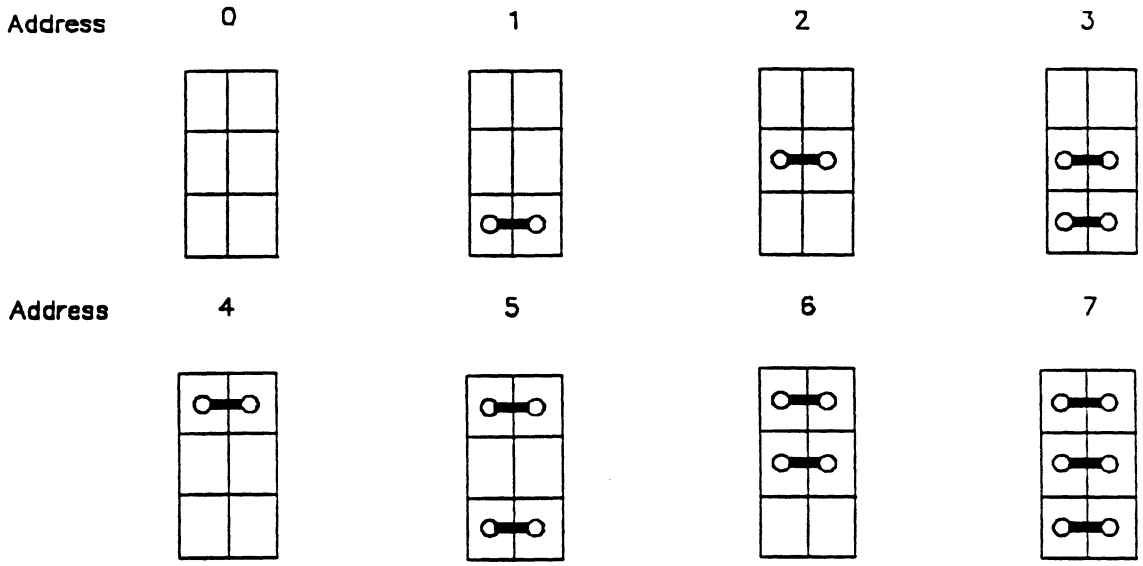

Figure 9-6
SCSI ID Jumper Connections for the DS3 Card

Note: If you use a remote switch or jumpers to set the SCSI ID for the DS3 card, the DIP switches must be set at address 0. Similarly, if you use the DIP switches to set the SCSI ID, the remote switch or jumpers must be set at address 0 or removed.

DB Card: With the DB card, you can use DIP switches to set the SCSI ID. The DIP switch settings are the same as for the DS3 card. These settings are shown in Figure 9-5.

9.4. Mounting the EXB-8200

Side mounting holes, as shown in Figure 9-7, allow a variety of mounting methods. These mounting holes are designed for the standard 5.25-inch form factor mounting requirements. The user can install the EXB-8200 in other units with larger form factors by using a mounting frame suitable for the specific system. The EXB-8200 can be mounted either stationary or sliding, and either horizontally or vertically. In the horizontal configuration, the drive door opens down from the top of the unit. In the vertical configuration, the drive may be mounted so that the door opens to either the right or left.

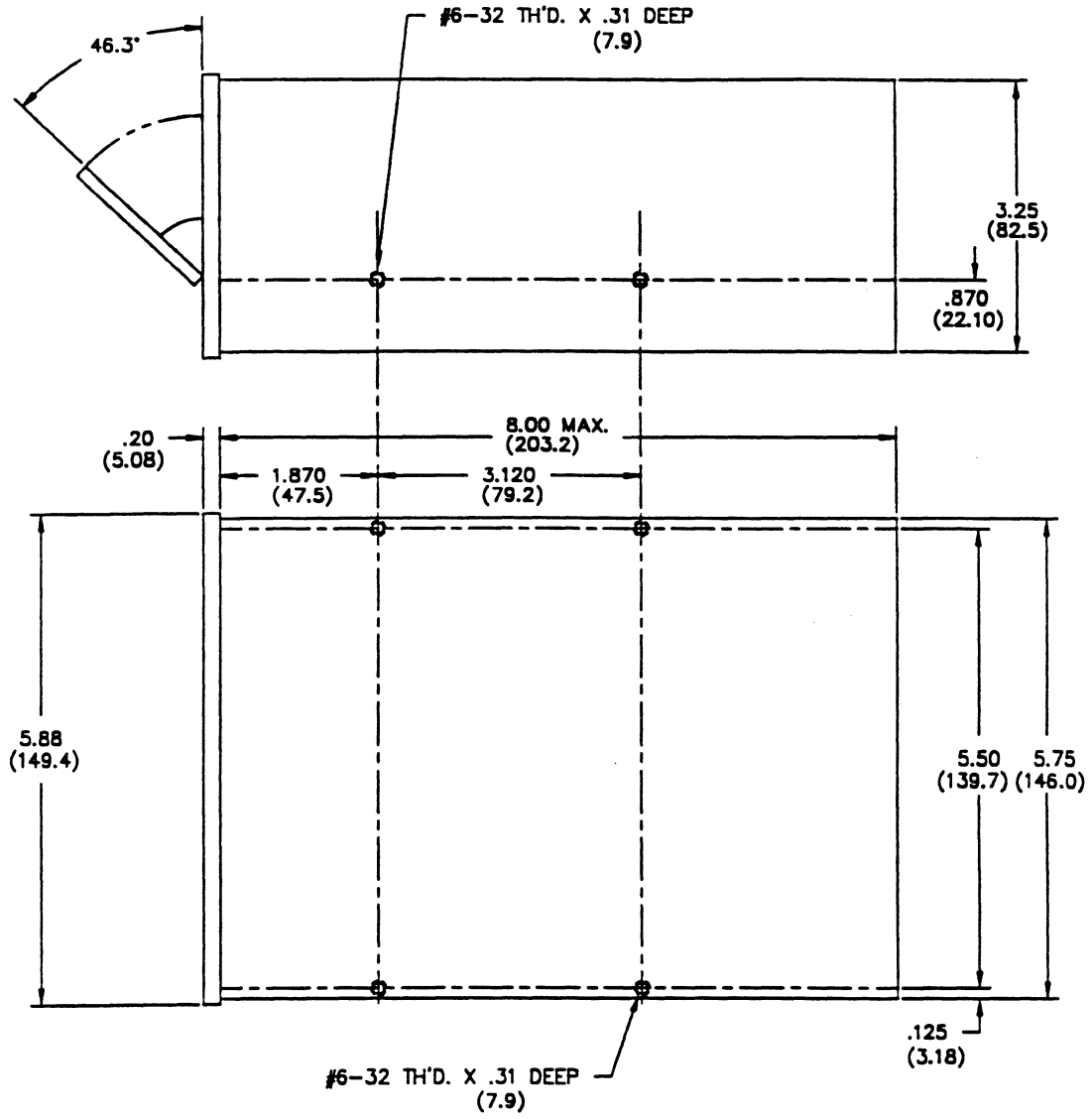

Figure 9-7
EXB-8200 Envelope and Mounting Hole Dimensions in Inches (and Millimeters)

Notes:

10. EXB-8200 Operation

10.1. Controls and Indicators

All operator controls and indicators are located on the front panel of the EXB-8200, as shown in Figure 10-1.

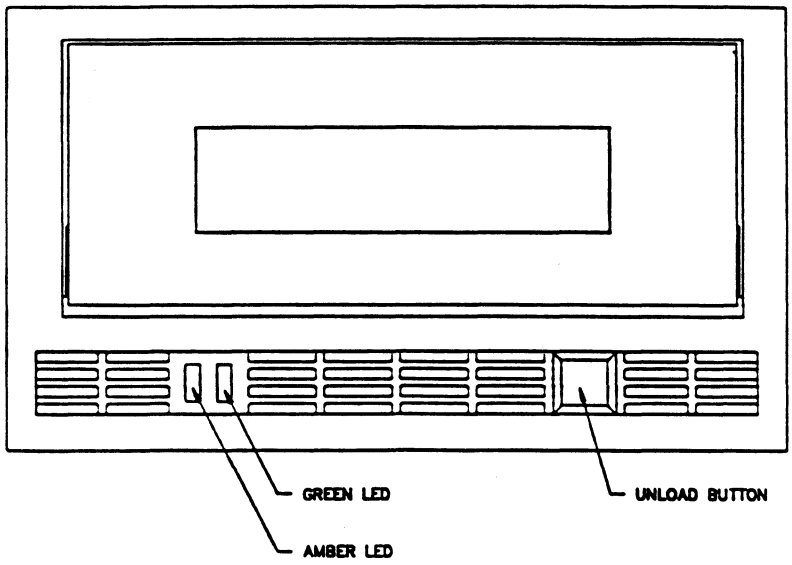

Figure 10-1
EXB-8200 Front Panel Controls and Indicators

10.1.1. Unload Button/Servo Error Reset Button

The unload button is a push-button switch that can be used to rewind, unload, and eject the data cartridge. If a data cartridge is not currently loaded, the unload button opens the front door of the EXB-8200. This button can also be used to reset the EXB-8200 after a servo error has occurred.

10.1.2. Power-up Initialization Indicators

During power-up initialization for a properly terminated drive, both the amber and green LEDs are on, indicating that the EXB-8200 is performing power-on self-test diagnostics. The time required to complete self-test diagnostics and

initialization routines is 65 seconds maximum. When the diagnostics are complete, both LEDs are turned off.

10.1.3. Power-on Indicator

Upon completion of the self-test diagnostics, the green LED indicates the status of the EXB-8200. When the green LED is on, a data cartridge is loaded and the EXB-8200 is ready.

10.1.4. SCSI Activity Indicator

Variable blinking of the amber LED when the EXB-8200 is ready indicates activity on the SCSI bus between the host and the EXB-8200. Interface activity can occur any time after the EXB-8200 is powered on.

10.2. Data Cartridge Write-Protect Tab

The 8mm data cartridge is equipped with a write-protect tab to prevent unintentional overwriting of data on the tape. To set the write-protect tab, remove the data cartridge from the drive. You can use a ballpoint pen or other suitable instrument to move the write-protect tab.

Move the write protect tab to the desired position, as shown in Figure 10-2. If the red tab in the recessed area at the bottom of the cartridge is visible, the data cartridge is write-protected and cannot be written to or erased. Conversely, if the red tab is not visible, the data cartridge is write-enabled and can be written to or erased.

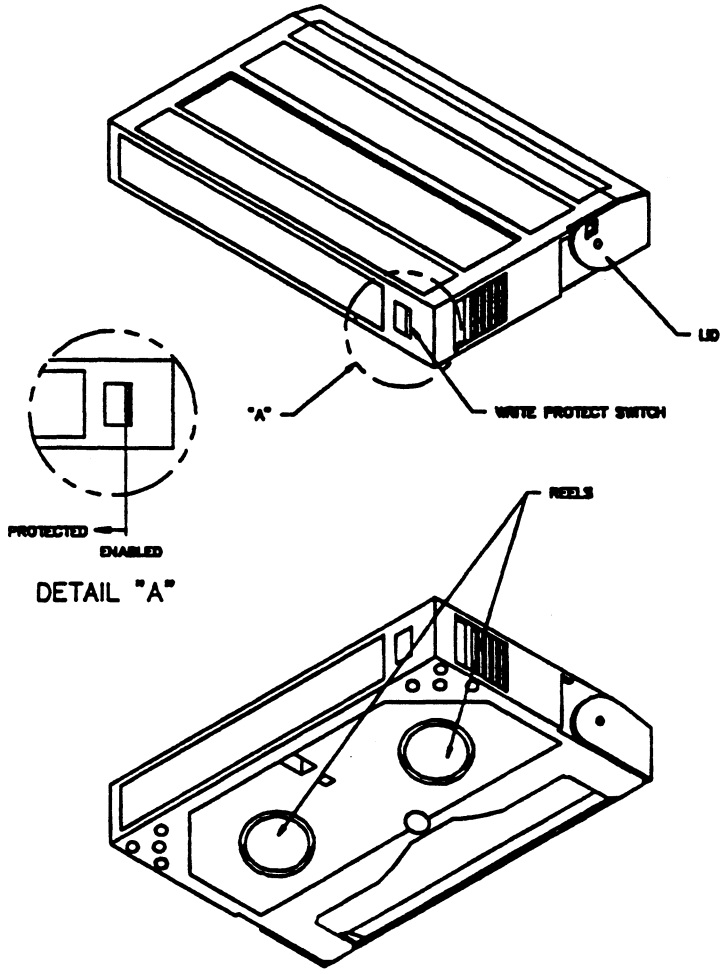

Figure 10-2
8mm Data Cartridge

10.3. Data Cartridge Load Procedure

To load the data cartridge into the drive, follow these steps:

1. Make sure that the write-protect tab on the data cartridge has been set correctly for the desired operation.

2. If the tape access door is closed, press the unload button to open the drive door. Figure 10-1 shows the location of the unload button.

3. Insert the data cartridge, label side up, with the write-protect tab facing yo...

4. Gently close the drive door. The data cartridge is automatically loaded.

10.4. Data Cartridge Unload Procedure

To unload the data cartridge from the drive, press the unload button located on the front panel of the drive or issue the UNLOAD command. The green LED is turned off as the unload operation begins.

The EXB-8200 rewinds the tape, then unloads and ejects the cartridge unless one of the following conditions exist:

- The EXB-8200 is not powered up.
- The EXB-8200 is not in an idle state.
- There is a contingent connection to or from the host.
- The PREVENT/ALLOW MEDIUM REMOVAL command has been issued by the host. If you press the unload button, nothing happens. If you issue the UNLOAD command, the tape is rewound and unloaded but not ejecte
- Data remains in the EXB-8200 buffer from a previous write operation. If you press the unload button, nothing happens. If you issue the UNLOAD command, the data is written to the tape and the tape is rewound, unloaded, and ejected.

11. Tape Head/Path Cleaning Procedure

The EXB-8200 tape head/path requires cleaning once a month or after 30 gigabytes of data transfer, whichever occurs first. For planning purposes, 1 gigabyte of data is transferred for every hour of continuous streaming operation.

To clean the tape head/path, use the EXABYTE 8mm Cartridge Tape Subsystem Cleaning Kit (Part Number 727113).

Important: Do not use any cleaning method other than the one described in this section to clean the EXB-8200 tape head/path. Use of a different method will void the EXB-8200's warranty and may damage the drive.

Follow these steps to use the EXABYTE 8mm Cartridge Tape Subsystem Cleaning Kit:

1. Prepare the EXB-8200 to be cleaned by applying power to the unit. When the power-up cycle is complete, open the door by pressing the unload button. If a data cartridge is in the unit, remove the cartridge. Leave the door open.

2. Place the cleaning cartridge into the EXB-8200 and close the door.

3. The EXB-8200 automatically senses the introduction of a cleaning cartridge and performs the cleaning process. When the process is complete, the cleaning cartridge is automatically unloaded and ejected. The average cleaning cycle is 15 seconds.

   If the cleaning cartridge is ejected from the EXB-8200 without completing the 15 second cleaning cycle, the cleaning cartridge has reached the end of its useful life and should be replaced

   Note: Do not rewind and re-use the cleaning cartridge.

4. After the cleaning cycle is complete, remove the cleaning cartridge and record the date the cleaning was performed on the cartridge label.

5. Store the cleaning cartridge for future use, or discard it if it has been used three times.

If you have any questions about the cleaning procedure, contact:

EXABYTE Corporation - Technical Support
Phone (U.S.): (800) 445-7736 / (303) 442-4333
Phone (Europe): (31) 3403-51347

Notes:

Glossary

This glossary includes definitions of the terms, abbreviations, and acronyms used in this manual.

*n*H	Numbers followed by a capital H are hexadecimal values. All other numbers are decimal values.
ATM	Analog tape mark.
block	The amount of data to be transferred. The EXB-8200 can accommodate block sizes from one byte to 240 KBytes.
bus address	A unique address assigned to each device or subsystem.
bus devices	Initiator or target devices connected to the SCSI bus.
byte	Eight bits, one character.
C	Centigrade (Celsius).
CDB	Command descriptor block.
command status	Information sent from the target to the initiator upon completion of one command.
CRC	Cyclic redundancy check.
DRAM	Dynamic random access memory.
DTM	Digital tape mark.
ECC	Error correction code.
EOD	End of data.
EOM	End of medium.
EXB-8200	The EXB-8200 8mm Cartridge Tape Subsystem.
F	Fahrenheit.
GBytes	Gigabytes, one billion bytes.

host	The computer system that acts as the initiator of an operation.
HEX or H	Hexadecimal (base 16) numbering system.
Hz	Hertz.
ID	Identification.
initiator	Usually a host system that requests an operation to be performed by the target.
KBytes	Kilobytes, one thousand bytes.
KHz	Kilohertz.
LBOT	Logical beginning of tape. The LBOT is the load point at which the tape is positioned following a load or rewind operation.
LED	Light emitting diode
LEOT	Logical end of tape. The LEOT is a point on the tape prior to PEOT where an EOM warning is issued to the initiator during write or write filemark operations.
LUN	Logical unit number.
mA	Milliamps.
Mbits	Megabits, one million bits.
MBytes	Megabytes, one million bytes.
mm	Millimeter, (0.03937 inches).
ms	Millisecond.
µs	Microsecond.
MTBF	Mean time between failures.
mVpp	Millivolts peak-to-peak.
ns	Nanosecond.

NSTA	National Safe Transit Association.
PBOT	Physical beginning of tape. The PBOT is the point at which the tape joins with the clear leader with all tape wound on the supply reel.
PEOT	Physical end of tape. The PEOT is the point at which the tape joins with the clear leader with all tape wound on the takeup reel.
RPM	Revolutions per minute.
SCSI	Small Computer System Interface.
status	Information sent from the target to the initiator upon completion of a command.
target	A bus device (usually a controller) that performs an operation requested by an initiator. The EXB-8200 is a target.
VDC	Volts DC.

Reader's Comment Form

EXB-8200 8mm Cartridge Tape Subsystem Product Specification
Part Number 510005-006

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