

EXB-8200 8mm Tape Drive

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# User's Manual

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## Revision History

Previous revisions of this manual include the following:

<b>Revision</b>	<b>Date</b>
005	November 1989
006	October 1990
007	October 1991

For information about the changes and enhancements to this revision, refer to page iv.

# 1 General Information

This manual provides instructions for using the EXABYTE® EXB-8200 8mm Cartridge Tape Subsystem (EXB-8200). It provides information about cable and connector requirements and instructions for developing the software to support applications. It contains a description of the EXB-8200's Small Computer System Interface (SCSI) and definitions of the SCSI commands.

**Note:** This manual applies to EXB-8200s containing 2600-level MX code and above. If you are working with a pre-2600-level EXB-8200, refer to page iv for information about features that may not be supported.

## 1.1 About the EXB-8200

The EXB-8200 is a high-performance, high-capacity 8mm cartridge tape subsystem that incorporates an integral Small Computer System Interface (SCSI). The EXB-8200 uses advanced helical-scan recording technology, which allows a high areal recording density and data storage capacity. It uses the industry standard 8mm tape cartridge, which is removable and rewritable and which can store up to 2.5 GBytes of formatted user data.

The EXB-8200 is available in a single-ended or differential SCSI configuration.

For detailed information about EXB-8200 specifications, refer to the *EXB-8200 8mm Cartridge Tape Subsystem Product Specification* (510005).

## 1.2 About This Manual

This manual includes the following chapters:

- n Chapter 1 provides general information about the EXB-8200, related publications, and the EXB-8200's compliance with regulatory and safety agency standards.
- n Chapter 2 describes SCSI cable and connector requirements. It also lists single-ended and differential characteristics and cable pin assignments.
- n Chapter 3 defines SCSI messages supported by the EXB-8200. It discusses SCSI bus error recovery and describes the results of general error and message processing.
- n Chapter 4 contains a list of the SCSI commands supported by the EXB-8200, the command format, field definitions of the command descriptor block, command format errors, and status byte explanations.

- n Chapter 5 through 22 contain the individual command descriptions in alphabetical order. Each command starts on a new page, and the command title is included in the header for easy reference.
- n Chapter 23 contains additional information about the operations and features of the EXB-8200, such as EXB-8200 initialization, buffered operation, tape tension release, and push-button servo reset.
- n Chapter 24 discusses how the EXB-8200 responds to various tape motion commands based on tape position.
- n The Appendix provides information for setting defaults for EXB-8200s that contain the Level 1 MX card.
- n A glossary, index, and reader's comment form are included at the back of this manual.

### **Intended Audience**

This manual is intended for any EXB-8200 user who is responsible for operating the EXB-8200 and writing device drivers.

Before reading this manual, you should be familiar with the specifications for the EXB-8200 as described in the *EXB-8200 8mm Cartridge Tape Subsystem Product Specification* (510005). You should also be familiar with basic SCSI terminology and concepts.

## **1.3 Related Publications**

The following publications provide additional information about the EXB-8200.

### **EXB-8200**

For information about the EXB-8200's functional, performance, and environmental specifications, refer to the following publication:

- n *EXB-8200 8mm Cartridge Tape Subsystem Product Specification*, 510005.

### **Monitor**

For information about installing the Monitor program for the EXB-8200, refer to the following publication:

- n *EXB-8200 Monitor Installation and Operation*, 510012

**Standards**

For information about the standards used for the EXB-8200, refer to the following publications:

- n *ANSI Small Computer System Interface (SCSI)*, X3.131-1986.
- n *ANSI Helical-Scan Digital Computer Tape Cartridge*, X3B5/89-136, Rev. 6.
- n *Western Digital WD33C92 and WD33C92A SCSI Bus Interface Controller*
- n *Western Digital WD33C93 and WD33C93A SCSI Bus Interface Controller*

**EXB-8200SX**

For information about the EXB-8200SX 8mm Cartridge Tape Subsystem, refer to the following publication:

- n *EXB-8200SX 8mm Cartridge Tape Subsystem Product Specification and User's Manual*, 510011

## 1.4 Safety Agency and Regulatory Standards

**Safety Standards**

When purchased from EXABYTE Corporation, the EXB-8200 is certified as a component by the following domestic and international product safety standards:

- n UL Standard 1950, 1st Edition, Safety of Information Technology Equipment
- n UL Standard 478, 4th Edition, Electronic Data Processing Units and Systems
- n CSA Standard C22.2 No. 220-M1986, Information Processing and Business Equipment
- n CAN/CSA Standard C22.2 No. 950-M89, Safety of Information Technology Equipment
- n IEC 950/EN60950, Safety of Information Technology Equipment, including Electrical Business Equipment (TUV)

### **EMC Standards**

When properly installed with shielded cables and adequate grounding of the SCSI bus and the input power, the EXB-8200 meets the requirements for radiated and conducted emissions as defined by the following standards:

- n FCC Rules, Part 15, Class B Computing Devices
- n Canadian Department of Communications, Radio Interference Regulation, Digital Apparatus, Class B
- n VDE Vfg 1046/1984, Class B
- n CISPR Publication 22, 1985, Class A

### **EMI Standards**

When properly installed with shielded cables and adequate grounding of the SCSI bus and the input power, the EXB-8200 will continue to operate without error when subjected to moderate levels of electromagnetic energy as defined by the following standard:

- n IEC Publication 801-3, Severity Level 3

### **Other Test Standards**

When shipped, the EXB-8200 is packaged in a manner that complies with the testing criteria defined by the following standard:

- n National Safe Transit Association (NSTA) Project 1.

## 2 SCSI Physical Description

SCSI devices are daisy-chained together using a common cable. Both ends of the cable are terminated. All signals are common between all bus devices.

Two driver/receiver alternatives are available:

- n Single-ended drivers and receivers, which allow a maximum cable length of 6 meters (19.68 feet).
- n Differential drivers and receivers, which allow a maximum cable length of 25 meters (82.02 feet).

### 2.1 Cable Requirements

Ideally, to match the cable terminators, the cable should have a characteristic impedance of 132 ohms (single-ended) or 122 ohms (differential). However, since cables with this high of a characteristic impedance are not generally available, somewhat lower impedances are acceptable. A characteristic impedance of 100 ohms  $\pm 10\%$  is recommended for unshielded flat or twisted pair ribbon cable. A characteristic impedance greater than 90 ohms is recommended for shielded cables.

**Note:** To minimize discontinuities and signal reflections, ensure that cables used on the same bus have the same impedances.

A minimum conductor size of 28 AWG is recommended to minimize noise effects and to ensure proper distribution of terminator power.

#### Single-Ended Cable

Use a 50-conductor flat cable or 25-signal twisted-pair cable. The cable must be no longer than 6.0 meters (19.68 feet). A stub length of no more than 0.1 meter (4 inches) is permitted off the mainline interconnection within any connected equipment.

The EXB-8200 provides internal, socketed single-ended bus terminations for easy system configuration. See Figure 2-1 for typical single-ended cable configurations.

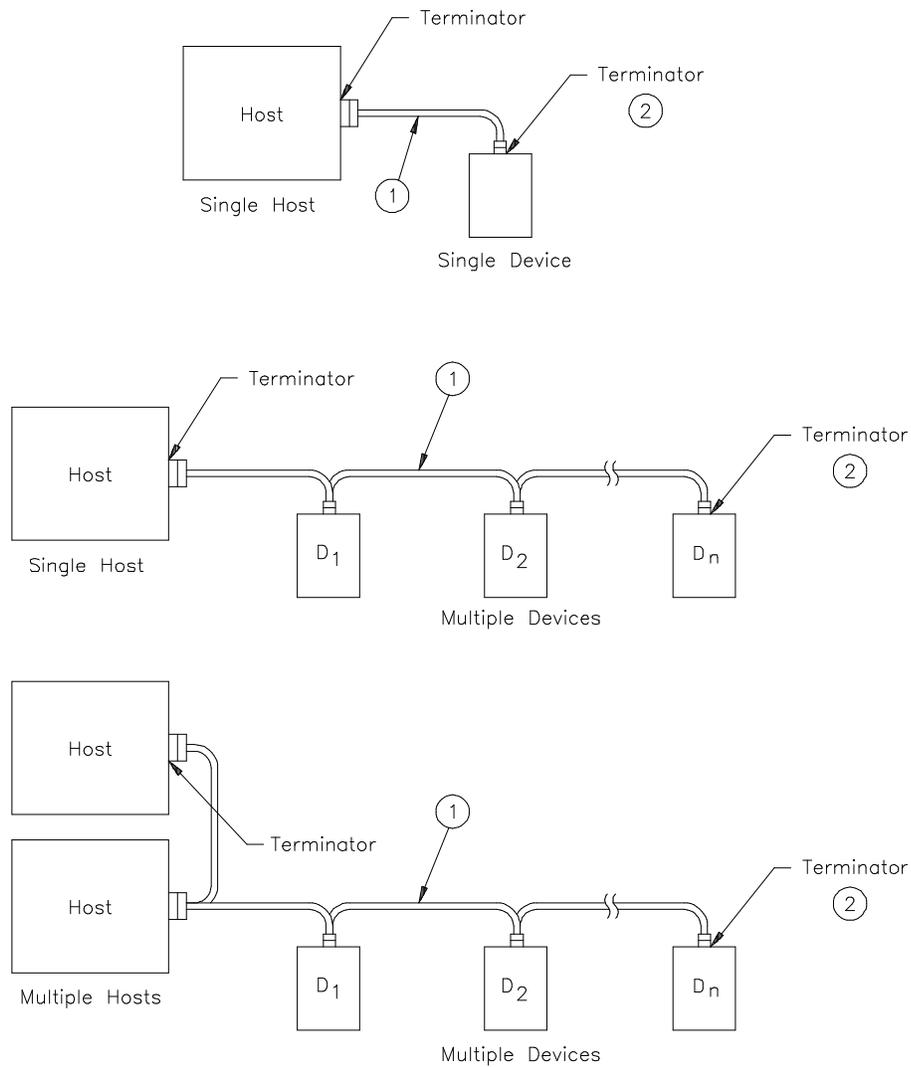
#### Differential Cable

Use a 50-conductor flat cable or 25-signal twisted-pair cable. The cable must be no longer than 25.0 meters (82.02 feet). A stub length of no more than 0.2 meter (8 inches) is permitted off the mainline interconnection within any connected equipment.

The differential configuration of the EXB-8200 must be terminated externally. Either of the following external terminators is recommended:

- n Methode Electronics, Inc. dataMate® DM800-08-0
- n Amphenol® 200-2S000-02000-00000

Figure 2-1 shows typical differential cable configurations.



NOTES:

- ① Total length of cable not to exceed: Single-ended – 6 Meters  
Differential – 25 Meters
- ② Termination to be on the last device in the string even if the cable itself extends past the last device.
- 3. Only one set (each end) of terminators is to be used. Each end must be terminated.

**Figure 2-1** Typical Configurations for Single-Ended and Differential Cable

## 2.2 Connector Requirements

A non-shielded keyed SCSI connector is provided with the EXB-8200. The connector is a 50-conductor connector consisting of two rows of 25 pins with adjacent pins 2.54 mm (0.1 inch) apart. The connector pin assignments for single-ended drivers are shown in Table 2-1. The connector pin assignments for differential drivers are shown in Table 2-2.

**Table 2-1** Single-Ended Driver Cable Pin Assignments

Signal	Pin Number*
-DB(0)	2
-DB(1)	4
-DB(2)	6
-DB(3)	8
-DB(4)	10
-DB(5)	12
-DB(6)	14
-DB(7)	16
-DB(P)	18
GROUND	20
GROUND	22
GROUND	24
TERMPWR	26
GROUND	28
GROUND	30
-ATN	32
GROUND	34
-BSY	36
-ACK	38
-RST	40
-MSG	42
-SEL	44
-C/D	46
-REQ	48
-I/O	50

\*All odd-numbered pins except pin 25 are connected to ground. Pin 25 is left open.

**Table 2-2** Differential Driver Cable Pin Assignments

Signal	Pin Number		Signal
SHIELD GROUND	1	2	GROUND
+DB(0)	3	4	-DB(0)
+DB(1)	5	6	-DB(1)
+DB(2)	7	8	-DB(2)
+DB(3)	9	10	-DB(3)
+DB(4)	11	12	-DB(4)
+DB(5)	13	14	-DB(5)
+DB(6)	15	16	-DB(6)
+DB(7)	17	18	-DB(7)
+DB(P)	19	20	-DB(P)
DIFFSENS	21	22	GROUND
GROUND	23	24	GROUND
TERMPWR	25	26	TERMPWR
GROUND	27	28	GROUND
+ATN	29	30	-ATN
GROUND	31	32	GROUND
+BSY	33	34	-BSY
+ACK	35	36	-ACK
+RST	37	38	-RST
+MSG	39	40	-MSG
+SEL	41	42	-SEL
+C/D	43	44	-C/D
+REQ	45	46	-REQ
+I/O	47	48	-I/O
GROUND	49	50	GROUND

## 2.3 Single-Ended SCSI Electrical Characteristics

**Note:** For the measurements given in this section, bus termination is assumed to be provided.

All assigned signals are terminated with 220 ohms to +5 volts (nominal) and 330 ohms to ground at each end of the cable.

The EXB-8200 does not provide power outside of the drive. However, the subsystem will use externally provided termination power if an EXB-8200 power loss occurs.

All signals use open collector or three-state drivers.

Each signal driven by the EXB-8200 has the following output characteristics when measured at the SCSI connection:

- n Signal Assertion: 0.0 VDC to 0.4 VDC
- n Minimum Drive Output Capability: 48 mA (sinking) @ 0.5 VDC
- n Signal Negation: 2.5 VDC to 5.25 VDC

Each signal received by the EXB-8200 has the following input characteristics when measured at the SCSI connection:

- n Signal True: 0.0 VDC to 0.8 VDC
- n Maximum Total Input Load: -0.4 mA @ 0.4 VDC
- n Signal False: 2.0 VDC to 5.25 VDC
- n Minimum Input Hysteresis: 0.2 VDC

### Important

Do not install the SCSI cable into the EXB-8200 with the power applied to the drive because a SCSI bus reset may occur.

## 2.4 Differential SCSI Electrical Characteristics

All signals consist of two lines denoted +SIGNAL and –SIGNAL. A signal is true when +SIGNAL is more positive than –SIGNAL. A signal is false when –SIGNAL is more positive than +SIGNAL.

Each signal pair should be terminated external to the EXB-8200 as follows:

- n –SIGNAL should have a 330 ohm resistor to +5 volts (nominal). +SIGNAL should have a 330 ohm resistor to ground. There should be a 150 ohm resistor connected between +SIGNAL and –SIGNAL.
- n The DIFFSENS signal (pin 21) is used as an active high enable for the differential drivers. If a single-ended device or terminator is inadvertently connected, this signal is grounded and the drivers are disabled.

The EXB-8200 does not provide termination power outside the drive.

Each signal driven by the EXB-8200 has the following output characteristics when measured at the SCSI connection:

- n  $V_{OL}$  (low-level output voltage): 2.0 V max. at  $I_{OL}$  (low-level output current) of 55mA.
- n  $V_{OH}$  (high-level output voltage): 3.0 V min. at  $I_{OL}$  (high-level output current) of –55mA.
- n  $V_{OD}$  (differential voltage): 1.0 V min. with common-mode voltage ranges from –7 VDC to 12 VDC.

$V_{OL}$  and  $V_{OH}$  are measured between the output terminal and the EXB-8200 logic ground.

Each signal received by the EXB-8200 has the following output characteristics when measured at the SCSI connection:

- n  $I_I$  (input current on either input):  $\pm 2.0$  mA max.

**Important**

Do not install the SCSI cable into the EXB-8200 with the power applied to the drive because a SCSI bus reset may occur.

## 3 SCSI Physical Path Communications

Implementation characteristics of the SCSI controller include the following:

- n SCSI bus parity checking is configurable through the MODE SELECT (15h) command or by hardware switch selection. (See Section 23.9 for details about switch selection.)
- n Single or multiple initiator configuration support
- n Asynchronous data transfer support
- n Single-ended or differential electrical interface
- n Standard non-shielded 50-pin ribbon cable connector (some applications may require a shielded cable)

### 3.1 SCSI Messages

The SCSI message system allows communication between the initiator and the EXB-8200 for physical path management. Table 3-1 lists the messages supported by the EXB-8200. Definitions of the messages are provided following the table.

**Note:** The EXB-8200 does not support the extended message format or the use of linked commands; therefore, these messages are not included.

**Table 3-1** SCSI Messages Supported by the EXB-8200

Hex Value	Message	Direction*	
		In	Out
00h	Command Complete	3	
02h	Save Data Pointer	3	
03h	Restore Pointers	3	
04h	Disconnect	3	
05h	Initiator Detected Error		3
06h	Abort		3
07h	Message Reject	3	3
08h	No Operation		3
09h	Message Parity Error		3
0Ch	Bus Device Reset		3
80h or C0h	Identify	3	3

\*In: EXB-8200 to initiator  
 Out: Initiator to EXB-8200

### Command Complete (00h)

The Command Complete message is sent from the EXB-8200 to the initiator to indicate that the execution of a command has terminated and that a valid status has been returned to the initiator. After successfully sending this message, the EXB-8200 goes to the Bus Free phase.

**Note:** The command may have been executed successfully or unsuccessfully as indicated in the status returned to the initiator.

### Save Data Pointer (02h)

The Save Data Pointer message is sent from the EXB-8200 to direct the initiator to save a copy of the present active data pointer for the currently attached LUN.

### Restore Pointers (03h)

The Restore Pointers message is sent from the EXB-8200 to direct the initiator to restore the most recently saved data pointers for the currently attached LUN to the active state. Pointers to the Command, Data, and Status

locations for the LUN are restored to the active pointers. Command and Status pointers are restored at the beginning of the present command and status areas. The Data pointer is restored to the value at the beginning of the data area or the most recent Save Data Pointer value.

### **Disconnect (04h)**

The Disconnect message is sent from the EXB-8200 to inform an initiator that the present physical path will be broken (the EXB-8200 will disconnect by releasing BSY) and that a later reconnect is required to complete the current operation. By not sending this message or the Command Complete message before going to the Bus Free phase (other than as a result of the Reset condition), the EXB-8200 indicates that a catastrophic error condition has occurred on the current command. This message should not cause the initiator to save the data pointer.

### **Initiator Detected Error (05h)**

The Initiator Detected Error message is sent from an initiator to inform the EXB-8200 that an error has occurred that does not preclude the EXB-8200 retrying the operation. The present pointer integrity is not ensured.

### **Abort (06h)**

The Abort message is sent from the initiator to the EXB-8200 to clear the present operation. If the initiator sending the Abort message is the same initiator that began the current command, the EXB-8200 accepts the Abort; otherwise, it ignores the Abort. If a LUN has been identified, all pending data and status for the issuing initiator is cleared, and the EXB-8200 goes to the Bus Free phase. If a LUN has not been identified, the EXB-8200 goes to the Bus Free phase.

For EXB-8200s containing 2600-level MX code and above, all operations associated with the current command continue until their completion, unless the command was one of the following:

- n READ
- n WRITE
- n SPACE
- n ERASE

For READ and WRITE, the Abort message terminates the operation. For SPACE and ERASE, the Abort message causes a variable delay to occur before the command is completed. The length of the delay depends on where the command was in its cycle when the Abort message was received. See the descriptions of the SPACE command (Chapter 19) and the ERASE command (Chapter 5) for more information.

No status or ending message is sent for the operation that was aborted. It is not an error to issue the Abort message to a LUN that is not currently performing an operation for the initiator.

#### **Message Reject (07h)**

The Message Reject message is sent from either the initiator or the EXB-8200 to indicate that the last message received was inappropriate or has not been implemented.

To indicate its intention of sending this message, the initiator must assert the ATN signal before releasing ACK for the REQ/ACK handshake of the message that will be rejected. When the EXB-8200 sends this message, it changes to the Message In phase and sends this message before requesting additional message bytes from the initiator. This provides an interlock so that the initiator can determine which message is rejected.

#### **No Operation (08h)**

The No Operation message is sent from an initiator in response to the EXB-8200's request for a message when the initiator does not currently have any valid message to send.

#### **Message Parity Error (09h)**

The Message Parity Error message is sent from the initiator to the EXB-8200 to indicate that one or more bytes in the last message it received had a parity error.

To indicate its intention of sending this message, the initiator must assert the ATN signal before releasing ACK for the REQ/ACK handshake of the message that has the parity error. This provides an interlock so that the EXB-8200 can determine which message has the parity error.

#### **Bus Device Reset (0Ch)**

The Bus Device Reset message is sent from the initiator to direct the EXB-8200 to reset all current I/O operations. This message forces the EXB-8200 to an initial state with no operations pending for any initiator. Upon recognizing this message, the EXB-8200 goes to the Bus Free phase.

#### **Identify (80h or C0h)**

The Identify message is sent by either the initiator or the EXB-8200. It is used to establish the physical path connection between an initiator and the EXB-8200 for a particular LUN.

When the Identify message is sent from the EXB-8200 to the initiator during reconnection, an implied Restore Pointers message must be implemented by the initiator before completion of this message.

The Identify message has the following format:

Bit Byte	7	6	5	4	3	2	1	0
00	Identify	DiscPriv	Reserved			LUN		

The field definitions for the Identify message are as follows:

#### **Bit 7 - Identify**

This bit is set to 1 to distinguish the Identify message from all other messages.

#### **Bit 6 - DiscPriv**

The DiscPriv (disconnect privilege) bit is used by the initiator to grant the EXB-8200 disconnect privileges, as follows:

- 0 – The initiator will not accommodate disconnection and reconnection.
- 1 – The initiator will accommodate disconnection and reconnection.

#### **Bits 5 through 3 - Reserved**

Reserved for future use.

#### **Bits 2 through 0 - LUN**

The logical unit number of the target. For the EXB-8200, the LUN is always 0.

## 3.2 Message Sequence

When the EXB-8200 connects to the SCSI bus, the following sequence of events occurs:

1. In the Selection phase, the initiator indicates ability to accommodate more than the Command Complete message phase by asserting the Attention condition before the SCSI bus condition of SEL true and BSY false.
2. The EXB-8200 indicates its ability to accommodate more than the Command Complete message by responding to the Attention condition with the Message Out phase after going through the Selection phase.
3. If the initiator supports messages other than Command Complete, the first message sent by the initiator after the Selection phase is the Identify message. This establishes the physical path for the LUN specified by the initiator. Only one LUN is identified for any one selection sequence. A second Identify message with a new LUN must not be issued before the SCSI bus has been released (Bus Free phase).

**Note:** Under some exceptional conditions, an Initiator may send the Abort message or the Bus Device Reset message instead of the Identify message as the first message.

4. If the disconnect privilege is enabled when the EXB-8200 receives a command, the EXB-8200 may send the Disconnect message to the initiator.
5. To re-establish communication with the initiator, the EXB-8200 goes to the Reselection phase. During this phase, the EXB-8200 has both the BSY and SEL signals asserted, and the data bus value is the logical OR of the EXB-8200's SCSI ID bit and the initiator's SCSI ID bit.
6. After reselection, the EXB-8200's first message is Identify. This allows the physical path to be re-established for the LUN specified by the EXB-8200.

Whenever a physical path is established with an initiator that can accommodate disconnection and reconnection, the initiator must ensure that the active pointers of the physical path are equal to the saved pointers for that particular target and LUN.

## 3.3 SCSI Bus Error Recovery

This section discusses potential error conditions and actions to be taken by the initiator and the EXB-8200. The errors and responses are separated into two categories:

- n Those related to initiators that support only the Command Complete message
- n Those related to initiators that support messages in addition to the Command Complete message.

### **Initiators That Support Only the Command Complete Message**

The following conditions apply to systems that support only the Command Complete message:

#### **Parity Error in the Command Out Phase**

When the EXB-8200 detects a parity error during the Command Out phase, it requests six bytes of the command and immediately returns Check Condition status and the Command Complete message. In response to the REQUEST SENSE (03h) command, the EXB-8200 returns Hardware Error (4h) in the sense key and sets the SCSI Bus Parity Error (BPE) bit. The initiator should send the command again.

**Parity Error in the Data Out Phase**

As the EXB-8200 receives data transferred from the initiator during a write operation, the data is mapped into the tape format. When parity checking is enabled and the EXB-8200 detects a parity error, it continues the data transfer until the transfer is complete or a disconnect occurs.

When a parity error occurs, the EXB-8200 sends Check Condition status to the initiator, followed by the Command Complete message. The sense key is set to Aborted Command (Bh), and the SCSI Bus Parity Error (BPE) bit is set.

The initiator may be able to recover from the data parity error by issuing the appropriate SPACE (11h) command to position the tape at a location on which the data in error can be rewritten.

**Parity Error in the Data In Phase**

When the initiator detects a parity error in the Data In phase, it must accept all bytes. If the EXB-8200 was processing a READ (08h) command, the initiator may recover the data in error by issuing the appropriate SPACE and READ commands to position the tape at a location at which the data can be reread.

For commands other than READ, when the initiator detects a parity error in the Data In phase, it is only necessary to reissue the command. If the command was REQUEST SENSE, valid sense data will be returned because the sense data is not reset until the next command other than REQUEST SENSE or INQUIRY (12h) is issued.

**Initiators That Support Additional Messages**

The following conditions apply to systems that support messages in addition to the Command Complete message:

**Parity Error in the Message Out Phase**

When parity is enabled and the EXB-8200 detects a parity error in a message received from the initiator, the EXB-8200 requests that the initiator resend the message by going to the Message Out phase again. If a parity error is detected the second time the message is received, the EXB-8200 goes to the Bus Free state by releasing BSY.

**Parity Error in the Message In Phase**

If the initiator detects a parity error during the Message In phase, it sends a Message Parity Error message to the EXB-8200. The EXB-8200 responds by resending the message.

The initiator should count Message Parity Error messages to qualify the communication. If the count exceeds a certain threshold, the initiator should clear the EXB-8200 from the bus by doing one of the following:

- n Sending the Abort message
- n Performing a bus reset
- n Sending the Bus Device Reset message

#### **Parity Error in the Command Out Phase**

When parity is enabled and the EXB-8200 detects a parity error in command bytes received from the initiator, the EXB-8200 immediately goes to the Message In phase and sends a Restore Pointers message. The initiator must restore the pointer back to the start of the command descriptor block (CDB). The EXB-8200 goes to the Command Out phase and accepts the CDB again. The initiator should count the Restore Pointers messages received during the Command Out phase. If the count exceeds a certain threshold, the initiator should clear the EXB-8200 from the bus by doing one of the following:

- n Sending the Abort message
- n Performing a bus reset
- n Sending the Bus Device Reset message

#### **Parity Error in the Data Out Phase**

As the EXB-8200 receives data transferred from the initiator during a write operation, the data is mapped into the tape format. When parity checking is enabled and the EXB-8200 detects a parity error in the data, it continues the data transfer until the transfer is complete or a disconnect occurs.

When a parity error occurs, the EXB-8200 sends Check Condition status to the initiator, followed by the Command Complete message. The sense key is set to Aborted Command (Bh), and the SCSI Bus Parity Error (BPE) bit is set.

The initiator may be able to recover from the data parity error by issuing the appropriate SPACE command to position the tape at a location at which the data in error can be re-written.

#### **Parity Error in the Data In Phase**

When the initiator detects a parity error in the Data In phase of a READ Command, it may send the Abort or Bus Device Reset message to reset the EXB-8200 at the end of the current CDB.

If the parity error is detected during the Data In phase of a REQUEST SENSE, MODE SENSE, INQUIRY, or READ BLOCK LIMITS command, the EXB-8200 responds to an Initiator Detected Error message by issuing the Restore Pointers message and resending the data.

## 3.4 General Error and Message Processing

### Effect of the Abort Message

For the READ and WRITE commands, the effect of the Abort message is to terminate the operation.

For the SPACE and ERASE commands (in EXB-8200s containing 2600-level MX code and above), a variable delay occurs before the command is completed depending on where the command is in its cycle. See the descriptions of the SPACE command (Chapter 19) and the ERASE command (Chapter 5) for more information.

For all other commands, the operation is completed and the SCSI bus is released (returns to the Bus Free state).

### Effect of the Bus Device Reset Message

After the initiator issues a Bus Device Reset message, the EXB-8200 aborts all operations and is re-initialized to the default state (see Section 23.2 for information about EXB-8200 initialization).

### Reselection Phase Timeout

In the Reselection phase, if a one-second timeout is detected while the EXB-8200 is waiting for a response from the initiator, the EXB-8200 immediately retries the reselection.

This retry operation continues until the reconnection request is reset or the initiator issues a Bus Device Reset.

### Parity Error in the Status In Phase

If the initiator detects a parity error in the Status In phase, it will not know whether Good status, Check Condition status, or another status was returned. The initiator should assume that Check Condition status was returned and should send the REQUEST SENSE command and process the sense bytes. If Busy or Reservation Conflict status is returned to the REQUEST SENSE command, this is also the valid status for the command that had the parity error in the Status byte. Decoding the sense data has no harmful effects on operation if Good status was returned for the command that had the parity error in the Status byte.

## 4 SCSI Commands

This section lists the SCSI commands supported by the EXB-8200 and provides basic information about command format, field definitions, command errors, and command status. Chapters 5 through 22 contain the detailed descriptions of the commands.

### 4.1 EXB-8200 SCSI Command Set

Table 4-1 lists the SCSI commands supported by the EXB-8200.

**Table 4-1** EXB-8200 SCSI Command Set in Operation Code (OP Code) Order

OP Code	Command	Described in...
00h	TEST UNIT READY	Chapter 20
01h	REWIND	Chapter 17
03h	REQUEST SENSE	Chapter 15
05h	READ BLOCK LIMITS	Chapter 12
08h	READ	Chapter 11
0Ah	WRITE	Chapter 21
10h	WRITE FILEMARKS	Chapter 22
11h	SPACE	Chapter 19
12h	INQUIRY	Chapter 6
15h	MODE SELECT	Chapter 8
16h	RESERVE UNIT	Chapter 16
17h	RELEASE UNIT	Chapter 14
19h	ERASE	Chapter 5
1Ah	MODE SENSE	Chapter 9
1Bh	LOAD/UNLOAD	Chapter 7
1Ch	RECEIVE DIAGNOSTIC RESULTS	Chapter 13
1Dh	SEND DIAGNOSTIC	Chapter 18
1Eh	PREVENT/ALLOW MEDIUM REMOVAL	Chapter 10

In the following chapters, the SCSI commands are described in alphabetic order, with each command starting a new chapter. For ease of reference, the command name and the OP code are included at the top of each page.

## 4.2 Command Format

The commands implemented for the EXB-8200 all use the SCSI Group 0, six-byte format. The command format for six-byte SCSI commands is specified in the *ANSI Small Computer System Interface (SCSI) (X3.131-1986)* standard. The following are the formats for the Command Descriptor Block, Operation Code, and Control Byte.

### Command Descriptor Block for Six-Byte Commands

Bit Byte	7	6	5	4	3	2	1	0
00	Operation Code							
01	Logical Unit Number			Reserved				
02	(MSB) Logical Block Address (LSB)							
03								
04								
05	Control Byte							

### Format of the Operation Code

Bit Byte	7	6	5	4	3	2	1	0
00	Group Code			Command Code				

### Typical Format of the Control Byte

Bit Byte	7	6	5	4	3	2	1	0
05	Vendor Unique		Reserved				Flag	Link

## Reserved and Vendor Unique Bits and Bytes

The terms *Reserved* (or *Rsvd*) and *Vendor Unique* (or *VU*) used in field definitions for SCSI commands have the following meanings:

- n **Reserved (or Rsvd):** These bits or bytes are defined as reserved by SCSI specification X3.131-1986. They are checked by the EXB-8200 for a value of 0. If not 0, the EXB-8200 returns Check Condition status with the sense key set to Illegal Request (5h).

**Note:** Some bits in data returned to the initiator from the EXB-8200 are reserved for future enhancements by EXABYTE. The values of these bits are undefined and may be returned as 0 or 1. Bits or bytes reserved by EXABYTE are noted in the command descriptions.

- n **Vendor Unique (or VU):** Vendor unique bits and bytes are not defined by the SCSI standard. They can be implemented for specific functions at the request of a vendor. If a Vendor Unique bit or byte is not defined, it should be set to 0.

## 4.3 Field Definitions for the Command Descriptor Block

The following sections provide field definitions for the six-byte command descriptor blocks (CDB).

### Byte 00 - Operation Code

The Operation Code consists of two subfields: the Group Code and the Command Code. These subfields are defined as follows:

<b>Group Code (Bits 7 through 5)</b>	The EXB-8200 supports Group 0 commands only. All commands must contain 0 in this field; any other value results in an error condition. Should a vendor unique command be developed, the Group Code for that command will be supported.
<b>Command Code (Bits 4 through 0)</b>	The Command Code is specific to each command.

### Byte 01, Bit 7 through 5 - Logical Unit Number (LUN)

The LUN designates the specific unit within the group of devices associated with a target. Since the EXB-8200 does not support multiple devices, the LUN must be 0 at all times.

If the Identify message specifies a LUN other than 0, or if there is no Identify message and the command descriptor block specifies a LUN other than 0, the EXB-8200 reports an error.

**Byte 01, Bits 4 through 0 - Reserved**

Reserved by ANSI for future standardization or used as defined for each command.

**Bytes 02, 03, and 04 - Logical Block Address**

These bytes are used as defined for each command.

**Byte 05 - Control Byte**

The Vendor Unique field of the Control byte is defined for each specific command, if needed. You do not need to support the vendor unique definitions to obtain specified performance. The fields of the Control byte are defined as follows:

<b>Vendor Unique (Bits 7 and 6)</b>	Command unique or 0.
<b>Reserved (Bits 5 through 2)</b>	Reserved by ANSI for future standardization.
<b>Flag (Bit 1)</b>	The EXB-8200 does not recognize the flag bit. Its value must be 0.
<b>Link (Bit 0)</b>	The EXB-8200 does not support linked commands. The value of this bit must be 0.

## 4.4 Command Errors

The following are situations in which errors are reported by the EXB-8200 in response to all supported SCSI commands:

**Illegal Operation Code**

When the EXB-8200 does not support the Command Code or Group Code in Byte 00 of the CDB, it returns Check Condition status with the sense key set to Illegal Request (5h).

**Reserved Bit Non-Zero**

When a Reserved bit or a bit defined by EXABYTE as 0 is not 0, the EXB-8200 returns Check Condition status with the sense key set to Illegal Request (5h).

**Link or Flag Bits Incorrectly Set**

If the Link or Flag bits are not 0, the command operation is terminated. Check Condition status is returned with the sense key set to Illegal Request (5h).

**Parity Error**

If the EXB-8200 detects a recovered or unrecovered parity error on the SCSI bus, it returns Check Condition status.

**Double-Bit Error in CDB**

If the EXB-8200 receives a command with a double bit error in the CDB, it attempts to decode the CDB and perform the command if it is legal. If the EXB-8200 decodes the CDB as an illegal command, it returns Check Condition status with the sense key set to Illegal Request (5h).

**Reset, Cartridge Replacement, or Power Interrupt**

When a SCSI bus reset has occurred, a new cartridge has been loaded, or power has been interrupted, the EXB-8200 returns Check Condition status with the sense key set to Unit Attention (6h).

## 4.5 Command Status

The EXB-8200 sends one status byte to the initiator after completing each command. The format of the status byte is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Rsvd	0	0	Status Byte Code				0

The possible settings for the Status Byte Code, bits 4 through 1, are shown in Table 4-2. (Note that bit 0 is always zero.) Expanded definitions of each status follow the table.

**Table 4-2** Status Byte Codes Supported by the EXB-8200

Hex Value	Bits					Status	Meaning
	4	3	2	1	0		
00h	0	0	0	0	0	Good	The EXB-8200 has successfully completed the command.
02h	0	0	0	1	0	Check Condition	An error, exception, or abnormal condition has caused sense information to be set.
08h	0	1	0	0	0	Busy	The EXB-8200 is busy and is unable to accept a command from an initiator.
18h	1	1	0	0	0	Reservation Conflict	Another SCSI device has reserved the EXB-8200.

The following definitions explain the status byte messages supported by the EXB-8200 and describe the reasons each status is sent.

### Good (00h)

Good status indicates that the operation specified by the CDB completed normally.

For commands that support the immediate return of status, Good status indicates that the EXB-8200 has accepted the command and will attempt to perform the operation specified by the CDB. If the specified operation does not complete normally, the EXB-8200 returns Check Condition status when it receives the next command from that initiator.

### Check Condition (02h)

The EXB-8200 returns Check Condition status after *receiving* a command in the following cases:

- n There is an error (bus parity error or format check) in the CDB.
- n The command is the first received after the EXB-8200 has been reset by the Bus Reset condition, a Bus Device Reset message, or the replacement of a data cartridge. The sense key is set to Unit Attention (6h).
- n LEOT or PEOT is detected during a write operation in the buffered mode. The EXB-8200 returns Check Condition in response to the next command received from the initiator.

The EXB-8200 returns Check Condition status after *executing* a command in the following cases:

- n An error occurs during command execution.
- n An error occurs while the EXB-8200 is disconnected from the initiator. In this case, the EXB-8200 reports Check Condition status following the reconnect process.
- n An error occurs after the EXB-8200 reported completion status to the initiator. For example, if an error occurs during a buffered write operation, the EXB-8200 returns Check Condition status when it receives the next command from that initiator. (Deferred error reporting.)
- n An error occurs after the EXB-8200 reported completion status to the initiator as a result of a command with the Immediate bit set. The EXB-8200 returns Check Condition status when it receives the next command from that initiator. (Deferred error reporting.)

Specific circumstances that cause Check Condition status to be returned are discussed in the command descriptions.

### **Busy (08h)**

Busy status indicates that the EXB-8200 is in the busy state. The EXB-8200 is in a busy state when it is performing an internal operation that prevents it from accepting another command until the operation is complete.

The EXB-8200 returns Busy status for a command request until the busy state is released. After the busy state is released, the initiator must reissue the command to the EXB-8200. When the busy state is released, selection operation and commands can be executed normally.

### **Reservation Conflict (18h)**

Reservation Conflict status indicates that the EXB-8200 is currently reserved for the exclusive use of another initiator. The EXB-8200 returns Reservation Conflict status until the initiator that reserved the EXB-8200 issues a RELEASE UNIT command or a reset condition occurs.

## 5 ERASE (19h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	0	0	1
01	Logical Unit Number			Reserved				Long
02 : 04	Reserved							
05	Vendor Unique		Reserved				0	0

The ERASE command causes the EXB-8200 to erase all of the remaining tape starting from the current valid tape position. Valid tape positions are logical beginning of tape (LBOT), blank tape, or the beginning of a long filemark. When the erase operation is successfully completed, a rewind automatically occurs. When the tape reaches LBOT, the EXB-8200 returns the Command Complete message, with Good status, to the initiator. The EXB-8200 performs the erase operation in disconnect mode.

**Note:** When an ERASE command is issued with a pre-written tape positioned at LBOT, the EXB-8200 rewinds the tape to PBOT and erases the entire length of the tape.

The erase operation is performed at the same speed as the read and write operations. Thus, it takes approximately two hours to erase an entire 112m data cartridge.

### 5.1 Field Definitions

#### Byte 01, Bit 0 - Long

The Long bit defines the amount of tape to be erased. The EXB-8200 supports only the long erase operation. That is, it erases from the current valid tape position to PEOT. The valid value for the Long bit is 1. If the Long bit is not set, the EXB-8200 accepts the ERASE command but no operation is performed.

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 5.2 Effect of the Abort (06h) Message on Erase Operations

For EXB-8200s containing 2600-level MX code and above, the effect of the Abort message on erase operations is as follows:

If the initiator sends the Abort message while an erase operation is in progress, the EXB-8200 erases a zone long enough to be interpreted as blank tape before rewinding and repositioning to LBOT.

A delay of at least 60 seconds occurs from the receipt of the Abort message before the erase operation is completed, unless PEOT is encountered. If PEOT is encountered before 60 seconds has passed, the Abort takes effect immediately.

If the initiator sends a command before the ERASE command has terminated, the EXB-8200 returns Busy status. This includes commands that normally execute immediately, such as REQUEST SENSE, TEST UNIT READY, and INQUIRY.

## 5.3 Errors Reported

In addition to the situations discussed in Section 4.4, the ERASE command results in an error condition under the following circumstances:

### Illegal Tape Position

If the tape is not positioned at the end of data (blank tape), at LBOT, or at the BOT side of a long filemark, the ERASE command is not executed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### Data Cartridge Write Protected

If a loaded data cartridge is write protected (see the *EXB-8200 8mm Cartridge Tape Subsystem Product Specification*, 510005), the ERASE command is not executed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Data Protect (7h) and the WP (Write Protect) bit set to 1.

### Tape Unloaded but Still in the EXB-8200

When the data cartridge has been inserted and the door closed with the auto load feature disabled, or when the data cartridge has been unloaded with the prevent medium removal feature enabled, the ERASE command results in a Check Condition status with the sense key set to Not Ready (2h).

## 6 INQUIRY (12h)

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

The INQUIRY command requests that the EXB-8200 send information regarding its parameters to the initiator. INQUIRY can be issued to an EXB-8200 reserved by another initiator.

### 6.1 Field Definitions

#### Byte 04 - Allocation Length

The Allocation Length field specifies the number of bytes that the initiator has allocated for data returned from the INQUIRY command. A value of 0 indicates that no Inquiry data is to be transferred. This is not an error.

The data length for the Inquiry data returned by the EXB-8200 is 38h (56) bytes, consisting of 5h bytes of standard Inquiry data and 33h bytes of vendor unique Inquiry data. The EXB-8200 terminates the Data In phase when it has transferred either the number of bytes specified by the Allocation Length field or all of its available Inquiry data, whichever is less.

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 6.2 Standard Inquiry Data Field Definitions

The format of the five bytes of standard Inquiry data returned by the EXB-8200 is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Device Type Code							
01	RMB	Device Type Qualifier						
02	ISO Version		ECMA Version		ANSI - Approved Version			
03	Reserved							
04	Additional Length							

The standard Inquiry data fields are defined as follows:

### Byte 00 - Device Type Code

The value returned for this byte is 01h, which identifies the EXB-8200 as a sequential access device. If the LUN in the CDB is not 0, the value returned is 7Fh, which indicates that the LUN is invalid.

### Byte 01, Bit 7 - RMB

The value returned for this field is 1, which indicates that the media is removable.

### Byte 01, Bits 6 through 0 - Device Type Qualifier

The value returned for this field is 00h, which indicates that there are no qualifiers.

### Byte 02 - Standards Versions (ISO Version, ECMA Version, ANSI-approved Version)

The value returned for this byte is 01h, which indicates support of the ANSI SCSI-1 specification.

### Byte 04 - Additional Length

The value returned for this byte is 33h, which indicates that there are 51 additional bytes of Vendor Unique Inquiry data available to be returned to the initiator. These bytes are defined in the following section.

## 6.3 Vendor Unique Inquiry Data Field Definitions

The format of the 51 bytes of vendor unique Inquiry data returned by the EXB-8200 is as follows:

Bit Byte	7	6	5	4	3	2	1	0
05	Vendor Unique							
06	Reserved*							
07								
08 : 15	(MSB)	Vendor Identification						(LSB)
16 : 31	(MSB)	Product Identification						(LSB)
32 : 35	(MSB)	Firmware Revision Level						(LSB)
36 : 55	(MSB)	Vendor Unique						(LSB)

\*EXABYTE-reserved

The vendor unique Inquiry data fields are defined as follows:

### Byte 05 - Vendor Unique

There are no vendor unique definitions for this byte. The value returned for this byte is 00h.

### Bytes 06 and 07 - Reserved (EXABYTE)

Reserved by EXABYTE for future use. The value returned for these bytes is 00h.

### Bytes 08 through 15 - Vendor Identification

The values contained in these bytes are the ASCII representation of "EXABYTE," followed by spaces.

**Bytes 16 through 31 - Product Identification**

The values contained in these bytes are the ASCII representation of the product name, “EXB-8200,” followed by spaces.

**Bytes 32 through 35 - Firmware Revision Level**

The values contained in these bytes are the ASCII representation of the firmware revision level followed by spaces (for example, “4.25” or other EXABYTE firmware revisions).

**Bytes 36 through 55 - Vendor Unique**

There are no vendor unique definitions for these bytes. The values contained in these bytes are the ASCII representation of blanks.

## **6.4 Errors Reported**

The EXB-8200 returns Check Condition status in response to the INQUIRY command under the conditions discussed in Section 4.4. Following a Check Condition status on an INQUIRY command, the sense data created prior to the INQUIRY command remains valid. Sense data for the error that the EXB-8200 encountered while processing the INQUIRY command is never constructed, and the initiator must assume that the Check Condition status was reported for one or more of the reasons listed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the INQUIRY command.

## 7 LOAD/UNLOAD (1Bh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	0	1	1
01	Logical Unit Number			Reserved				Immed
02	Reserved							
03								
04	Reserved							Load
05	Vendor Unique		Reserved				0	0

The LOAD/UNLOAD command causes the EXB-8200 to load the tape from the data cartridge into the tape path or to unload the tape from the tape path and eject the cartridge.

The tape in a data cartridge is automatically loaded into the tape path when the cartridge is inserted into the EXB-8200 and the door is closed, unless the autoload feature has been disabled. The autoload feature can be disabled through the MODE SELECT (15h) command. Loading automatically positions the tape at LBOT.

The LOAD command functions the same as inserting the tape in the EXB-8200. If the autoload feature has been disabled, the LOAD command must be used to load the tape.

Unloading the tape, either by pushing the button on the front of the EXB-8200 or by issuing the UNLOAD command, rewinds the tape to PBOT, unloads the tape from the tape path, and ejects the cartridge.

The ejecting of the cartridge can be disabled through the PREVENT/ALLOW MEDIUM REMOVAL (1Eh) command. If an initiator issues the PREVENT/ALLOW MEDIUM REMOVAL command with the Prevent bit set to 1 and then issues the UNLOAD command, the tape is rewound and unloaded from the tape path, but not ejected.

## 7.1 Field Definitions

### **Byte 01, Bit 0 - Immed**

The Immed bit determines when command status is returned to the initiator. If this bit is 0, status is reported upon completion of the operation. If this bit is 1, status is reported upon acceptance of the command. The EXB-8200 returns Busy status to all initiators until the operation is complete.

### **Byte 04, Bit 0 - Load**

This bit determines which operation, load or unload, is to be performed, as follows:

- 0 – Unload
- 1 – Load

### **Byte 05, Bits 7 and 6 - Vendor Unique**

There are no vendor unique definitions for these bits.

## 7.2 Actions Performed by the LOAD/UNLOAD Command

The actions performed by the EXB-8200 during load and unload operations depend on a number of factors, as explained below.

### **Load Operations**

The EXB-8200 performs load operations as follows:

- If a data cartridge is in the EXB-8200 but the tape is not loaded into the tape path, the tape is loaded and positioned at LBOT.
- If the tape is already loaded and there is no data in the buffer, the tape is rewound and positioned at LBOT.
- If the tape is already loaded and there is data in the buffer, the data is written to tape, and the tape is rewound and positioned at LBOT.
- If the tape is already at LBOT, the tape is not moved and Good status is returned to the initiator.
- If there is no data cartridge in the EXB-8200, an error condition exists. See Section 7.3 for information.

## Unload Operations

The EXB-8200 performs unload operations as follows:

- If a data cartridge is in the EXB-8200 and there is no data in the buffer, the tape is rewound to PBOT, unloaded from the tape path, and ejected.
- If a data cartridge is in the EXB-8200 and there is data in the buffer, the data is written to tape. Then, the tape is rewound to PBOT, unloaded from the tape path, and ejected.
- If a data cartridge is not in the EXB-8200 and the door is closed, the unload operation opens the door.
- If a data cartridge is in the EXB-8200, and the PREVENT MEDIUM REMOVAL (1Eh) command has been issued, the data cartridge is rewound to PBOT and unloaded from the tape path. However, the data cartridge is not ejected. Pressing the Unload button will **not** cause the cartridge to be ejected.
- If there is no data cartridge in the EXB-8200, and the PREVENT MEDIUM REMOVAL command has been issued, the door is not opened.

The status of the EXB-8200 after an UNLOAD command or without a tape inserted is Not Ready (2h).

Issuing the UNLOAD command to an EXB-8200 that is already unloaded is not an error.

## 7.3 Errors Reported

In addition to the situations discussed in Section 4.4, the LOAD/UNLOAD command results in an error condition under the following circumstance:

### **Attempt to Load without a Data Cartridge**

If the Load bit is set to 1 and a data cartridge is not in the EXB-8200 with the door closed, Check Condition status is returned to the initiator. Sense data is created with the sense key set to Not Ready (2h) and the TNP bit set to 1.

### **Attempt to Load a Data Cartridge Too Soon after Power-On or Unload**

After power-on or after an unload operation has been completed, a minimum of three seconds is required before the EXB-8200 can load a data cartridge. If you attempt to load a data cartridge before three seconds has elapsed, the cartridge will load but a servo error may occur. If a servo error occurs, Check Condition is returned to the initiator and sense data is created with the sense

key set to Hardware Error (4h) and the SSE bit set to 1. For EXB-8200s with 2600-level MX code and above, you can clear the servo error by pressing the unload button on the front panel.

## 8 MODE SELECT (15h)

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

The MODE SELECT command enables the initiator to specify medium, logical unit, or device parameters for the EXB-8200.

The initiator provides these parameters in a parameter list that contains the following:

- Parameter List Header (four bytes)
- Block Descriptor (eight bytes - optional)
- Vendor unique parameters (up to five bytes)

### 8.1 Field Definitions

#### Byte 04 - Parameter List Length

The value of this byte represents the length of the entire parameter list, including the Parameter List Header, Block Descriptor, and vendor unique parameters. The Parameter List Length byte can contain values in the range of 00h to 11h and must represent the total of all bytes to be sent. The following restrictions apply:

- For data transfers greater than 0, the entire 4-byte Parameter List Header must be transferred.
- For the Block Descriptor, valid lengths are zero or eight bytes. That is, the entire 8-byte Block Descriptor must be transferred when Block Descriptor data is to be defined. Transfers of bytes for the Block Descriptor start with Byte 0.
- The EXB-8200 does not allow multiple block descriptions.

Table 8-1 indicates the types of parameter data transferred from the initiator based on the value of the Parameter List Length byte.

**Table 8-1** Parameter List Data Transferred by the Initiator Based on the Value of the Parameter List Length Byte

To transfer the following data from the initiator...			Set the Parameter List Length byte to...
Parameter List Header	Block Descriptor	Vendor Unique Parameters	
none	none	none	00h*
all 4 bytes	none	none	04h
		1 byte	05h
		2 bytes	06h
		3 bytes	07h
		4 bytes	08h
		5 bytes	09h
		all 4 bytes	all 8 bytes
1 byte	0Dh		
2 bytes	0Eh		
3 bytes	0Fh		
4 bytes	10h		
5 bytes	11h		

\*A value of 0 for the Parameter List Length byte is not an error.

### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 8.2 Parameter List Header Field Definitions

The Parameter List Header specifies the mode of operation for the EXB-8200. The format of the four bytes of Parameter List Header information is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved							
01								
02	Rsvd	Buffered Mode			Speed			
03	Block Descriptor Length							

The Parameter List Header fields are defined as follows:

### Byte 02, Bits 6 through 4 - Buffered Mode

These bits define the mode of operation of the EXB-8200. The EXB-8200 supports two modes: buffered and non-buffered. The valid values for these bits are:

000 – Non-buffered mode

001 – Buffered mode

In buffered mode, data from a WRITE command is held in the EXB-8200 buffer until the default motion threshold of 128 KBytes is reached or until another command requiring tape motion is executed. Then, the data is written to the tape. Status is returned when the last block of data has been transferred to the EXB-8200 buffer.

In non-buffered mode, the data is transferred directly to the tape or to the initiator. Status is returned only after the data has been transferred.

The default power-on mode for the EXB-8200 is buffered.

**Note:** Write operations past LEOT cause the mode to be set to non-buffered.

### Byte 02, Bits 3 through 0 - Speed

The EXB-8200 does not support any operations at different speeds. All operations have a defined speed that cannot be modified by this parameter. The valid value for these bits is 0h.

### Byte 03 - Block Descriptor Length

This byte contains the length of the Block Descriptor in bytes. The EXB-8200 does not support multiple block descriptions; therefore, the valid values for this byte are 00h and 08h.

### 8.3 Block Descriptor Field Definitions

The Block Descriptor indicates whether the block length is fixed or variable. If the block length is fixed, the Block Descriptor indicates the length of each logical block to be transferred to the EXB-8200. The format of the 8-byte Block Descriptor is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Density Code							
01	(MSB) <span style="float: right;">(LSB)</span>							
02								
03								
04	Reserved							
05	(MSB) <span style="float: right;">(LSB)</span>							
06								
07								

#### Byte 00 - Density Code

The EXB-8200 does not support multiple density codes. The density is established by the EXB-8200 format and cannot be changed by this command. The valid value for this byte is 0.

#### Bytes 01 through 03 - Number of Blocks

The Number of Blocks field identifies the number of logical blocks on the data cartridge that meet the density definition. Since the EXB-8200 supports only one density, all logical blocks on the data cartridge meet this requirement. Therefore, the valid value for the Number of Blocks is 0.

#### Bytes 05 through 07 - Block Length

The Block Length field defines the length in bytes of each logical block. A value of 0 in the Block Length indicates that the logical block length is variable. A value greater than 0 defines the length of fixed-length logical blocks.

The power-on default block length for the EXB-8200 is 1,024 bytes (400h). When the ND (No Disconnect During Data Transfer) bit is 0, the maximum value that can be specified is 240 KBytes (3C000h). When the ND bit is set to 1, the maximum value that can be specified is 160 KBytes (28000h). The minimum value, in fixed mode, is 1 byte.

## 8.4 Vendor Unique Parameters Field Definitions

The format of the five bytes of vendor unique parameters is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	CT	Rsvd*	ND	Rsvd*	NBE	EBD	PE	NAL
01	Reserved*							P5
02	Motion Threshold							
03	Reconnect Threshold							
04	Gap Threshold							

\*EXABYTE-reserved

### Byte 00, Bit 7 - CT (Cartridge Type)

The EXB-8200 autosizes all loaded data cartridges. That is, it automatically determines the size of each loaded cartridge. The EXB-8200 bases its autosizing calculation on the type of cartridge that it is expecting. By default, the expected cartridge type is P6 (Domestic). This is factory-set in the EXB-8200's hardware by a switch on the Level 2 MX card (see Section 23.9). On power-up, P6 autosizing mode is automatically selected unless the MX card switch setting has been changed.

If the hardware default does not reflect the type of cartridge inserted, you can use the CT bit to indicate the type that has been loaded. The CT bit works in combination with the P5 bit to specify the cartridge type, as shown in Table 8-2. For a complete summary of the cartridge types, sizes, and restrictions, see Section 9.2.

**Table 8-2** Cartridge Type as Indicated by the CT and P5 Bits

When the CT and P5 bits are...		The cartridge type* indicated is...		
CT	P5	P6 - Domestic	P5 - European	PI - International Mixed Mode
0	0	✓		
0	1		✓	
1	1		✓	
1	0			✓

\*See MODE SENSE Parameter List Header Byte 01 for a description of the cartridge types.

**Note:** Information about the cartridge type can be sent to the EXB-8200 with the MODE SELECT command either before or after a tape is loaded.

**EXATAPE™ 8mm data cartridges** If you are using EXATAPE data cartridges *only*, select the P5 mode by setting the CT bit to 0 and the P5 bit to 1. This results in accurate sizing for all EXATAPE data cartridge sizes.

EXATAPE data cartridges are available for purchase from EXABYTE and are recommended for use with all EXABYTE products. Table 8-3 indicates the sizes of EXATAPE data cartridges and their industry equivalents.

**Table 8-3** EXATAPE Data Cartridges and Their Industry Equivalents

EXATAPE Size	Industry Equivalent	Maximum Capacity (when written by an EXB-8200)
15m	P6-15	294 MBytes
54m	P6-60	1,174 MBytes
112m	P5-90	2,472 MBytes

#### Byte 00, Bit 6 - Rsvd

Reserved by EXABYTE for future use.

#### Byte 00, Bit 5 - ND (No Disconnect During Data Transfer)

This bit is used to disable the disconnect function during data transfers between the initiator and the EXB-8200.

This mode of operation is restricted by the following:

- The total number of bytes that can be transferred as a result of a single WRITE or READ command, in fixed or variable mode, is 160 KBytes (28000h).
- During a write operation in buffered or non-buffered mode, the data transfer from the initiator does not start until the number of bytes of space in the EXB-8200 buffer is at least equal to the total transfer length in the CDB.
- During a read operation in buffered or non-buffered mode, data transfer to the initiator does not start until all of the data, up to a total transfer length of 160 KBytes, is resident in the EXB-8200 buffer.

#### Byte 00, Bit 4 - Rsvd

Reserved by EXABYTE for future use.

**Byte 00, Bit 3 - NBE (No Busy Enable)**

This bit is used to turn on or off the reporting of Busy status as follows:

0 – Report Busy Status

1 – No Busy Enable (Busy status not reported)

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Report Busy Status (NBE=0). The No Busy Enable and Report Busy Status modes of operation are described below.

**No Busy Enable:** If the No Busy Enable bit is 1 and the EXB-8200 receives a command while in the busy state, it stays on the SCSI bus or disconnects until it can execute the command. For read or write operations, the No Busy Enable mode delays the reporting of ending status until tape motion has stopped. This accommodates host drivers that are not designed to handle a status of Busy between repetitive data transfer commands.

In the No Busy Enable mode of operation, Busy status is reported *only* in the following cases:

- When the EXB-8200 receives a REWIND command with the Immed bit set. In this case, the EXB-8200 returns Busy status until tape motion is complete.
- While the EXB-8200 is executing diagnostic tests following power up. In this case, the EXB-8200 returns Busy status until the diagnostics are complete.

**Report Busy Status:** If the No Busy Enable bit is 0 and the EXB-8200 receives a command while in the busy state, it reports Busy status and frees the bus until the initiator re-issues the command.

Exceptions to this mode of operation are as follows:

- Following the successful completion of a READ command, the EXB-8200 continues reading ahead on the tape to fill the buffer. During this time, the EXB-8200 does not report Busy status in response to a command even though it delays execution of the command until it is finished filling the buffer and tape motion has stopped.
- Following the successful completion of a WRITE command, the EXB-8200 continues writing data from the buffer until the buffer is empty. The EXB-8200 does not report Busy status in response to a command even though it delays execution of the command until it is finished emptying the buffer and tape motion has stopped.

In these two cases, the EXB-8200 queues the command and stays on the SCSI bus or disconnects until it can execute the command.

### **Byte 00, Bit 2 - EBD (Even Byte Disconnect)**

This bit is used to enable even byte (four-byte) boundary disconnect as follows:

- 0 – Even or Odd Byte Disconnect
- 1 – Even Byte Disconnect

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Even or Odd Byte Disconnect (EBD=0).

### **Byte 00, Bit 1 - PE (Parity Enable)**

This bit is used to enable parity checking on the SCSI bus as follows:

- 0 – Parity Checking Disabled
- 1 – Parity Checking Enabled

When this bit is set, every byte received by the EXB-8200 is checked for parity.

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Parity Checking Disabled (PE=0).

### **Byte 00, Bit 0 - NAL (No Autoload)**

This bit is used to disable the automatic loading of the data cartridge upon insertion into the EXB-8200 as follows:

- 0 – Autoloading Enabled
- 1 – Autoloading Disabled

The power-on default value for the EXB-8200 is Autoloading Enabled (NAL=0).

### **Byte 01, Bits 7 through 1 - Reserved**

Reserved by EXABYTE for future use.

### **Byte 01, Bit 0 - P5**

The P5 bit is used in combination with the CT bit to indicate the type of cartridge loaded in the EXB-8200. See the description of the CT bit (Byte 00, Bit 7) for information about setting this bit.

### **Byte 02 - Motion Threshold**

The Motion Threshold byte sets the amount of data that must be in the buffer before the tape motion is started for a write or read operation. The default is 80h (128 KBytes). Value limits are 20h to D0h.

When the buffer is filled to the motion threshold during a write operation, the tape motion begins and the EXB-8200 starts writing data to tape. When the buffer is emptied to the motion threshold value during a read operation, the tape motion begins and the EXB-8200 starts refilling the buffer with new data from the tape.

### **Byte 03 - Reconnect Threshold**

The Reconnect Threshold byte sets the amount of data that must be in the buffer before the EXB-8200 reconnects to the SCSI bus for a write or read operation. The default is A0h (160 KBytes). Value limits are 20h to D0h.

After a disconnect, when this amount of data has been removed from the buffer during a write operation, the EXB-8200 reconnects to the SCSI bus to accept additional data from the initiator.

After a disconnect, when the buffer fills to this level during a read operation, the EXB-8200 reconnects to the SCSI bus to transfer data to the initiator.

**Note:** When the ND bit is set, the reconnect threshold defaults to 160 KBytes and cannot be changed through the MODE SELECT command.

### **Guidelines for Setting the Motion and Reconnect Thresholds**

During a write operation:

- Lower the motion threshold for faster transfer rates.
- Raise the reconnect threshold for slower transfer rates.

During a read operation:

- Lower the motion threshold for slower transfer rates.
- Raise the reconnect threshold for faster transfer rates.

### **Byte 04 - Gap Threshold**

The Gap Threshold byte determines the number of consecutive gap blocks the EXB-8200 writes before stopping tape motion. Before stopping the tape, the EXB-8200, by default, writes gap blocks to complete the current track plus one additional track of gap blocks (a gap track).

The Gap Threshold byte should be set only in cases where the average data transfer rate is slow and is impacting the capacity of the data cartridge. This threshold should be used in conjunction with the motion and reconnect thresholds.

Valid values for the gap threshold are in the range 00h to FFh. However, any value greater than 07h is treated as 07h. The default value for the gap threshold is 07h. This value causes the EXB-8200 to stop tape motion after

writing eight consecutive gap blocks. Values less than 07h result in fewer consecutive gap blocks being written before the tape motion is stopped. A value of 00h causes the EXB-8200 to stop tape motion after writing gap blocks to finish the current data track.

## 8.5 Errors Reported

In addition to the situations discussed in Section 4.4, the MODE SELECT command results in an error condition under the following circumstances:

### **Invalid Buffered Mode**

Any value greater than 001 in the Buffered Mode field of the Parameter List Header is invalid. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Invalid Speed**

The EXB-8200 operates only at a design-specified speed that cannot be changed. Any value other than 0 in the Speed field of the Parameter List Header is invalid. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Invalid Block Descriptor Length**

The EXB-8200 accepts only a single Block Descriptor and requires that all elements of the descriptor be transferred. If the value of the Block Descriptor Length in the Parameter List Header is other than 0 or 8, Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Invalid Density Code**

The only value accepted by the EXB-8200 for the Density Code field in the Block Descriptor is 0. Any other value results in an error. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Invalid Number of Blocks**

The only value accepted by the EXB-8200 for the Number of Blocks field in the Block Descriptor is 0. Any other value results in an error. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Modes Do Not Match**

If the EXB-8200 receives a WRITE or READ command with the Fixed bit set to 1 and a MODE SELECT Block Length of 0, an error condition exists. Or, if the EXB-8200 receives a WRITE or READ command with the Fixed bit set to 0 and a MODE SELECT Block Length equal to a number other than 0, an

error condition exists. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

**Total Transfer Length Exceeds 160 KBytes for No Disconnect During Data Transfer**

If the MODE SELECT command has set the ND bit to 1, and a READ or WRITE command specifies a total transfer length exceeding 160 KBytes, the read or write operation is not performed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

If the MODE SELECT command has set the ND bit to 1, and the logical block size is greater than 160 KBytes, Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

## 9 MODE SENSE (1Ah)

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

The MODE SENSE command enables the EXB-8200 to report its medium, logical unit, and device parameters to the initiator. MODE SENSE is a complementary command to the MODE SELECT (15h) command.

### 9.1 Field Definitions

#### Byte 04 - Allocation Length

The Allocation Length specifies the maximum number of bytes that the initiator has reserved for parameter data returned by the EXB-8200.

The EXB-8200 returns a total of 17 (11h) bytes of Mode Sense data to the initiator in the following order:

1. Parameter List Header (four bytes)
2. Block Descriptor (eight bytes)
3. Vendor Unique Parameters (five bytes)

The EXB-8200 terminates the Data In phase when the number of bytes specified by the Allocation Length byte have been transferred or when all available Mode Sense data has been transferred to the initiator, whichever is less.

When the value of Allocation Length is 0, the EXB-8200 does not transfer any data. A value of 0 is not an error.

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 9.2 Parameter List Header Field Definitions

The Parameter List Header specifies the mode of operation for the EXB-8200. The format of the four bytes of Parameter List Header information is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Sense Data Length							
01	Medium Type							
02	WP	Buffered Mode			Speed			
03	Block Descriptor Length							

The Parameter List Header fields are defined as follows:

### Byte 00 - Sense Data Length

The Sense Data Length byte indicates the total number of sense bytes available to be returned to the initiator, excluding this byte.

### Byte 01 - Medium Type

The Medium Type byte identifies the size of the data cartridge currently loaded in the EXB-8200. The EXB-8200 automatically determines the size of a loaded cartridge based on the type of cartridge it expects. By default, the EXB-8200 is in P6 “autosizing mode.” That is, it expects a loaded data cartridge to be a P6 cartridge and sizes all data cartridges accordingly. You can change the default autosizing mode to P5 or PI by moving a switch on the Level 2 MX card or by using the MODE SELECT command (see Section 8.4).

Table 9-1 indicates the Medium Type values that are returned by the EXB-8200 for various data cartridge sizes based on autosizing mode. It also indicates the maximum number of MBytes that can be written from LBOT to LEOT for each cartridge, based on the autosizing measurement. This table is valid for EXB-8200s containing 2600-level MX code and above.

**Note:** The shaded entries in Table 9-1 are cases in which the loaded cartridge is not autosized to its greatest advantage by the EXB-8200. That is, the cartridge may be autosized too large, allowing PEOT to be encountered without LEOT warning, or too small, underutilizing the tape’s capacity. The shaded combinations are not recommended.

**Table 9-1** Cartridge Data for Tapes in P6, P5, and PI Autosizing Mode

	P6 Autosizing Mode			P5 Autosizing Mode			PI Autosizing Mode		
	Med. Type Value	Auto-sized as	MBytes to LEOT	Med. Type Value	Auto-sized as	MBytes to LEOT	Med. Type Value	Auto-sized as	MBytes to LEOT
<b>P6-15 or EXATAPE 15m</b>	81h	P6-15	294	81h	P6-15	294	81h	P6-15	294
<b>P6-30</b>	82h	P6-30	588	82h	P6-30	588	82h	P6-30	588
<b>P6-60 or EXATAPE 54m</b>	83h	P6-60	1,174	83h	P6-60	1,174	83h	P6-60	1,174
<b>P6-90</b>	84h	P6-90	1,761	C3h	P5-60**	1,648	C3h	P5-60**	1,648
<b>P6-120</b>	85h	P6-120	2,348	C4h	P5-90*	2,472	85h	P6-120	2,348
<b>P5-15</b>	C1h	P5-15	430	C1h	P5-15	430	C1h	P5-15	430
<b>P5-30</b>	C2h	P5-30	836	C2h	P5-30	836	C2h	P5-30	836
<b>P5-60</b>	84h	P6-90*	1,761	C3h	P5-60	1,648	C3h	P5-60	1,648
<b>P5-90 or EXATAPE 112m</b>	85h	P6-120**	2,348	C4h	P5-90	2,472	85h	P6-120**	2,348

\*This mode allows PEOT to be encountered without LEOT warning.

\*\*This mode underutilizes the tape by about 5%.

**Note:** The EXB-8200 can automatically distinguish between a regular data cartridge and a cleaning cartridge. When a cleaning cartridge is inserted, the EXB-8200 identifies it as such and performs a preset cleaning cycle.

### Byte 02, Bit 7 - WP (Write Protect)

The Write Protect bit indicates whether or not the data cartridge currently loaded in the EXB-8200 is write protected. This bit is defined as follows:

- 0 – Data cartridge write enabled
- 1 – Data cartridge write protected

If a data cartridge is not loaded in the EXB-8200, a 0 is returned.

**Byte 02, Bits 6 through 4 - Buffered Mode**

These bits indicate the mode of operation of the EXB-8200. The EXB-8200 will operate in either of two modes: buffered or non-buffered. The valid values for these bits are:

000 – Non-buffered mode

001 – Buffered mode

The power-on default mode for the EXB-8200 is Buffered.

**Note:** Write operations past LEOT cause the mode to be set to non-buffered.

**Byte 02, Bits 3 through 0 - Speed**

The EXB-8200 does not support any operations at different speeds. All operations have a defined speed that cannot be modified by this command. The valid value for these bits is 0.

**Byte 03 - Block Descriptor Length**

This byte contains the length of the Block Descriptor in bytes. The EXB-8200 does not support multiple block descriptions; therefore, the valid values for this byte are 00h and 08h. The MODE SENSE command returns the value 08h in this byte.

### 9.3 Block Descriptor Field Definitions

The Block Descriptor indicates whether the block length is fixed or variable. If the block length is fixed, the Block Descriptor indicates the length of each logical block the EXB-8200 is expecting. The format of the 8-byte Block Descriptor is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Density Code							
01	Number of Blocks							
02								
03								
04	Reserved							
05	Block Length							
06								
07								

**Byte 00 - Density Code**

The EXB-8200 does not support multiple density codes. The value returned to the initiator in this byte is 00h. This identifies the density code as being the only density supported.

**Bytes 01 through 03 - Number of Blocks**

The value for the Number of Blocks field identifies the number of physical 1,024-byte blocks on the data cartridge that meet the density definition. Since the EXB-8200 supports only one density, all physical blocks on the data cartridge meet this requirement. The value returned to the initiator is the number of physical blocks of data that can be written from LBOT to LEOT plus the number of blocks occupied by LBOT (500h).

The autosizing algorithm calculates the number of physical blocks that can be recorded on the various types and sizes of data cartridges based on either the setting of switch 8 on the Level 2 MX card or the setting of vendor unique parameters CT and P5 through the MODE SELECT command.

The following tables indicate the number of physical blocks that can be recorded on each type and size of data cartridge. The actual usable data space is affected by filemarks, pad blocks and tracks, and rewritten blocks.

**Note:** The type of cartridge actually loaded may not be the same as the type that the EXB-8200 returns as Medium Type.

**Table 9-2** P6 Data Cartridge Block Data

Value returned for Medium Type	Data cartridge sized as	EXATAPE equivalent	Number of blocks from LBOT to LEOT*	Number of blocks from LEOT to PEOT
81h	P6-15	15m	46220h	8D48h
82h	P6-30		8C148h	7DC0h
83h	P6-60	54m	117F90h	8A70h
84h	P6-90		1A3DE0h	9140h
85h	P6-120		22FC20h	8CE8h

\*The value returned for Number of Blocks (bytes 01–03 of the MODE SENSE command) includes an additional 500h blocks. These blocks are the space occupied by LBOT.

**Table 9-3** P5 Data Cartridge Block Data

Value returned for Medium Type	Data cartridge sized as	EXATAPE equivalent	Number of blocks from LBOT to LEOT*	Number of blocks from LEOT to PEOT
C1h	P5-15		666A8h	8758h
C2h	P5-30		C7440h	8AC8h
C3h	P5-60		188F68h	9738h
C4h	P5-90	112m	24D5A0h	8A80h

\*The value returned for Number of Blocks (bytes 01–03 of the MODE SENSE command) includes an additional 500h blocks. These blocks are the space occupied by LBOT.

**Note:** If you issue a REQUEST SENSE (03h) command to determine the number of blocks from LBOT to LEOT before any data has been written to the tape, you may obtain a number 1 greater than the amounts shown in the tables.

#### Bytes 05 through 07 - Block Length

The Block Length field defines the length in bytes of each logical block. A value of 0 in the Block Length field indicates variable-length logical blocks. A value greater than 0 defines the length of fixed-length logical blocks.

The power-on default value for Block Length is 1,024 (400h) bytes.

## 9.4 Vendor Unique Parameters Field Definitions

The format of the five bytes of vendor unique parameters is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	CT	Rsvd*	ND	Rsvd*	NBE	EBD	PE	NAL
01	Reserved*							P5
02	Motion Threshold							
03	Reconnect Threshold							
04	Gap Threshold							

\*EXABYTE-reserved

#### Byte 00, Bit 7 - CT (Cartridge Type)

The CT bit, in combination with the P5 bit, indicates the type of cartridge that the EXB-8200 is expecting. The values returned for these bits will reflect either the switch 8 setting on the Level 2 MX card or the software setting for the CT and P5 bits established by the MODE SELECT command.

Table 9-4 shows the values that can be returned for the CT and P5 bits and the corresponding cartridge type expected by the EXB-8200. See Section 9.2 for a complete summary of the cartridge types and sizes.

**Table 9-4** Cartridge Type as Indicated by the CT and P5 Bits

When the CT and P5 bits are...		The cartridge type indicated is...		
CT	P5	P6 - Domestic	P5 - European	PI - International Mixed Mode*
0	0	✓		
0	1		✓	
1	1		✓	
1	0			✓

\*For a complete description, see the discussion of Parameter List Header Byte 01—Medium Type.

#### **Byte 00, Bit 6 - Rsvd**

Reserved by EXABYTE for future use.

#### **Byte 00, Bit 5 - ND (No Disconnect During Data Transfer)**

This bit is used to disable the disconnect function during data transfers between the initiator and the EXB-8200.

This mode of operation is restricted by the following:

- The total number of bytes that can be transferred as a result of a single WRITE or READ command, in fixed or variable mode, is 160 KBytes (28000h).
- During a write operation in buffered or non-buffered mode, the data transfer from the initiator does not start until the number of bytes of space in the EXB-8200 buffer is at least equal to the total transfer length in the CDB.
- During a read operation in buffered or non-buffered mode, data transfer to the initiator does not start until all of the data, up to a total transfer length of 160 KBytes, is resident in the EXB-8200 buffer.

#### **Byte 00, Bit 4 - Rsvd**

Reserved by EXABYTE for future use.

**Byte 00, Bit 3 - NBE (No Busy Enable)**

This bit indicates whether the reporting of Busy status is turned on or off as follows:

- 0 – Report Busy Status
- 1 – No Busy Enable (Busy status not reported)

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Report Busy Status (NBE=0). The No Busy Enable and Report Busy Status modes of operation are described below.

**No Busy Enable:** If the No Busy Enable bit is 1 and the EXB-8200 receives a command while in the busy state, it stays on the SCSI bus or disconnects until it can execute the command. For read or write operations, the No Busy Enable mode delays the reporting of ending status until tape motion has stopped. This accommodates host drivers that are not designed to handle a status of Busy between repetitive data transfer commands.

In the No Busy Enable mode, The EXB-8200 reports Busy status *only* in the following cases:

- When the EXB-8200 receives a REWIND command with the Immed bit set. In this case, the EXB-8200 returns Busy status until tape motion is complete.
- While the EXB-8200 is executing diagnostic tests following power up. In this case, the EXB-8200 returns Busy status until the diagnostics are complete.

**Report Busy Status:** If the No Busy Enable bit is 0 and the EXB-8200 receives a command while in the busy state, it reports busy status and frees the bus until the initiator re-issues the command. Exceptions to this mode of operation are as follows:

- Following the successful completion of a READ command, the EXB-8200 continues reading ahead on the tape to fill the buffer. During this time, the EXB-8200 does not report Busy status in response to a command even though it delays execution of the command until it is finished filling the buffer and tape motion has stopped.
- Following the successful completion of a WRITE command, the EXB-8200 continues writing data from the buffer until the buffer is empty. The EXB-8200 does not report Busy status in response to a command even though it delays execution of the command until it is finished emptying the buffer and tape motion has stopped.

In these two cases, the EXB-8200 queues the command and stays on the SCSI bus or disconnects until it can execute the command.

**Byte 00, Bit 2 - EBD (Even Byte Disconnect)**

This bit is used to enable even byte (four-byte) boundary disconnect as follows:

- 0 – Even or Odd Byte Disconnect
- 1 – Even Byte Disconnect

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Even or Odd Byte Disconnect (EBD=0).

**Byte 00, Bit 1 - PE (Parity Enable)**

This bit is used to enable parity checking on the SCSI bus as follows:

- 0 – Parity Checking Disabled
- 1 – Parity Checking Enabled

When this bit is set, every byte received by the EXB-8200 is checked for parity.

This option is switch configurable. See Section 23.9 for additional information on switch configurations. The standard factory default for the EXB-8200 is Parity Checking Disabled (PE=0).

**Byte 00, Bit 0 - NAL (No Autoload)**

This bit is used to disable the automatic loading of the data cartridge upon insertion into the EXB-8200 as follows:

- 0 – Autoloading Enabled
- 1 – Autoloading Disabled

The power-on default for the EXB-8200 is Autoloading Enabled (NAL=0).

**Byte 01, Bits 7 through 1 - Reserved**

Reserved by EXABYTE for future use.

**Byte 01, Bit 0 - P5**

The P5 bit, in combination with the CT bit, indicates the type of data cartridge loaded. See the description of the CT bit (Vendor Unique Byte 00, Bit 7) for more information.

**Byte 02 - Motion Threshold**

The Motion Threshold byte reports the amount of data that must be in the buffer before the tape motion is started for a write or read operation. (See Section 8.4 for more information.)

**Byte 03 - Reconnect Threshold**

The Reconnect Threshold byte reports the amount of data that must be in the buffer before the EXB-8200 reconnects to the SCSI bus for a write or read operation. (See Section 8.4 for more information.)

**Byte 04 - Gap Threshold**

The Gap Threshold byte reports the number of consecutive gap blocks the EXB-8200 writes before stopping tape motion. (See Section 8.4 for more information.)

## 9.5 Errors Reported

The EXB-8200 returns Check Condition status in response to the MODE SENSE command under the conditions discussed in Section 4.4. Following a Check Condition status on a MODE SENSE command, the sense data created prior to the MODE SENSE command remains valid. Sense data for the error that the EXB-8200 encountered while processing the MODE SENSE command is never constructed, and the initiator must assume that the Check Condition status was reported for one or more of the reasons listed in Section 4.4. The initiator may be able to recover from a Check Condition status by retrying the MODE SENSE command.

## 10 PREVENT/ALLOW MEDIUM REMOVAL (1Eh)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	1	1	1	0
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04	Reserved							Prevent
05	Vendor Unique	Reserved				0	0	

The PREVENT/ALLOW MEDIUM REMOVAL command requests that the EXB-8200 enable or disable the removal of the data cartridge. The PREVENT MEDIUM REMOVAL command disables the unload button on the front panel of the EXB-8200.

**Note:** When the PREVENT MEDIUM REMOVAL command is in effect and a servo error occurs, the tape is unloaded from the tape path but not ejected. The unload button cannot be used to reset the servo error. The ALLOW MEDIUM REMOVAL command must be issued to allow removal of the tape and enable the unload button.

### 10.1 Field Definitions

#### Byte 04, Bit 0 - Prevent

The Prevent bit enables or disables the removal of the data cartridge, as follows:

- 0 – Allow removal of the data cartridge
- 1 – Inhibit removal of the data cartridge (Prevent Medium Removal)

The Prevent Medium Removal condition terminates in the following cases:

- The EXB-8200 receives a PREVENT/ALLOW MEDIUM REMOVAL command with the Prevent bit set to 0. This command must come from the initiator that set the Prevent Medium Removal condition.
- The EXB-8200 receives a Bus Device Reset message from an initiator.
- A SCSI bus Reset condition occurs.

**Byte 05, Bits 7 and 6 - Vendor Unique**

There are no vendor unique definitions for these bits.

## **10.2 Errors Reported**

The EXB-8200 returns Check Condition status in response to the PREVENT/ALLOW MEDIUM REMOVAL command under the conditions discussed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the PREVENT/ALLOW MEDIUM REMOVAL command.

## 11 READ (08h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	1	0	0	0
01	Logical Unit Number			Reserved			SILI	Fixed
02	Transfer Length							
03								
04								
05	Vendor Unique		Reserved				0	0

The READ command transfers one or more bytes or logical blocks of data from the EXB-8200 to the initiator beginning with the next logical block.

The EXB-8200 can perform variable read or fixed read operations. For a variable read operation, the EXB-8200 reads a single logical block from the tape. The READ command specifies the length of this block in bytes. For a fixed read operation, the EXB-8200 reads one or more logical blocks of data of the length specified by the MODE SELECT command. The READ command specifies the number of blocks to be read.

### 11.1 Field Definitions

#### Byte 01, Bit 1 - SILI (Suppress Illegal Length Indication)

The SILI bit is used to suppress the illegal length indication (ILI) Check Condition status that results from a difference in the transfer length specified by the READ command and the logical block length as defined on the tape. This bit is valid only when the read operation is for variable length mode. The SILI bit values are as follows:

- 0 – Do not suppress ILI
- 1 – Suppress ILI

#### Byte 01, Bit 0 - Fixed

The Fixed bit defines the type of read operation to be performed, as follows:

- 0 – Variable Read Mode
- 1 – Fixed Read Mode

#### Byte 02 through 04 - Transfer Length

The Transfer Length field defines the amount of data to be read, as follows:

- When the Fixed bit is 0 (variable read mode), the Transfer Length field indicates the length of the logical block to be read in bytes.
- When the Fixed bit is 1 (fixed read mode), the Transfer Length field indicates the number of logical blocks to be read.

**Note:** When the value for the Transfer Length field is 0, no data is transferred and the current position on the tape is not changed. A value of 0 in these bytes is not an error.

### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 11.2 Read Operations

To insure proper read operations, the EXB-8200 must be set appropriately by the MODE SELECT command for the read operation desired (variable or fixed). See Chapter 8 for information about the MODE SELECT command.

The Fixed bit of the READ command determines whether the read operation is variable or fixed. Table 11-1 summarizes the differences between the two types of read operations performed by the EXB-8200.

**Table 11-1** Read Operations as Determined by the Fixed Bit

When the Fixed bit is...	The EXB-8200 performs a...	The number of logical blocks sent to the initiator is...	The number of bytes in each logical block read from tape is...	The EXB-8200 starts reading data from...
0	Variable read	1	Determined by the Transfer Length field	The next logical block on the tape
1	Fixed read	Determined by the Transfer Length field	Determined by the MODE SELECT command	The next logical block on the tape

When the EXB-8200 encounters LEOT during a read operation, it does not terminate the read operation. The EXB-8200 continues reading until it has transferred the requested data to the initiator or until it encounters blank (unrecorded) tape, PEOT, or a filemark.

## 11.3 Errors Reported

In addition to the situations discussed in Section 4.4, the READ command results in an error condition under the following circumstances:

### **SILI Bit Set in Fixed Read Mode**

The SILI bit is valid only in variable read mode. If a fixed read operation is specified (Fixed bit = 1) and the SILI bit is set, Check Condition status is sent to the initiator. Sense data is created with the sense key set to Illegal Request (5h).

### **Illegal Length Indication (ILI)**

When the Transfer Length specified in the READ command is different from the block length written on the tape, an error condition results. For a variable read operation, an error condition also results if the Transfer Length is greater than the maximum block size indicated in the Read Block Limits data. When either of these conditions occurs, Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The ILI bit is set to 1, and the sense key is set to No Sense (0h). Negative values (2s complement notation) are reported by the EXB-8200.

If a variable read operation was requested, the value in the Information bytes represents the difference in bytes between the requested length in the CDB and the actual length of the logical block of data read from the tape. Negative values (2s complement notation) are reported by the EXB-8200.

If a fixed read operation was requested, the value in the Information bytes represents the difference between the requested number of blocks in the CDB and the actual number of blocks read from the tape.

When the SILI bit is set to 1, no sense data is created and Check Condition status is *not* sent to the initiator for the illegal length error. In variable read mode, the amount of information transferred from the EXB-8200 to the initiator is the number of bytes contained in the logical block or the number of bytes requested by the CDB, whichever is less.

### **Modes Do Not Match**

When the mode of operation that the EXB-8200 is set to does not agree with the mode requested by the READ command, an error condition results. Check Condition status is sent to the initiator and sense data is created with the sense key set to Illegal Request (5h).

### **Filemark Encountered During READ**

When the EXB-8200 encounters a filemark during a read operation, the read operation is terminated and the write/read head is positioned on the EOT side

of the filemark. Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The FMK bit is set to 1 and the sense key is set to No Sense (0h).

For variable read mode, the Information bytes indicate the number of *bytes* not sent. For fixed read mode, the Information bytes indicate the number of *blocks* not sent.

Setting the SILI bit does not suppress the reporting of this error.

### **PEOT Encountered**

When the EXB-8200 encounters PEOT during a read operation, it terminates the read operation. Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The EOM bit and PEOT bit are set to 1, and the sense key is set to Medium Error (3h).

The Information bytes are set as described for the ILI error.

Setting the SILI bit does not suppress the reporting of this error.

### **Blank Tape Encountered**

When the EXB-8200 encounters blank tape during a read operation, it terminates the read. Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The sense key is set to Blank Check (8h).

The Information bytes are set as described for the Filemark Encountered During Read error.

Setting the SILI bit does not suppress the reporting of this error.

### **Tape Unloaded but Still in the EXB-8200**

When the data cartridge has been inserted and the door closed with the autoloader feature disabled, or when the data cartridge has been unloaded with the prevent medium removal feature enabled, the READ command results in a Check Condition status with the sense key set to Not Ready (2h).

## **11.4 Error Correction Code (ECC) Failures**

The EXB-8200 attempts to provide correct data to the initiator by using ECC and rereads when the data transferred from the tape is in error. When the ECC fails to correct the data, the data stream is checked to see if the failed physical block of data was rewritten.

If the EXB-8200 is unable to locate a rewritten block, the original block is reread and ECC correction is attempted again. The failed block is reread nine

times before the read operation is terminated (ten read attempts total). For EXB-8200s containing 2600-level MX code and above, the servo system varies its track offset position on each of the reread attempts until the failed block is read. Tracking is reset to normal before subsequent write or space operations are performed.

If the read operation is terminated, Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The sense key is set to Medium Error (3h).

## 12 READ BLOCK LIMITS (05h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	1	0	1
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04								
05	Vendor Unique		Reserved				0	0

The READ BLOCK LIMITS command requests that the EXB-8200 return data identifying the maximum and minimum block lengths supported. The Read Block Limits data is returned during the Data In phase of the command and applies to both the variable and fixed block lengths for READ and WRITE commands.

### 12.1 Read Block Limits Data Field Definitions

The Read Block Limits data is returned by the EXB-8200 in the following format:

Bit Byte	7	6	5	4	3	2	1	0
00	Reserved							
01	Maximum Block Length							
02								
03								
04	Minimum Block Length							
05								

The Read Block Limits data fields are defined as follows:

#### **Byte 00 - Reserved**

Reserved by ANSI for future use. The value for this byte is 0.

### **Byte 01 through 03 - Maximum Block Length**

The values for the Maximum Block Length bytes are:

Byte 01 = 03h

Byte 02 = C0h

Byte 03 = 00h

The maximum block length is 03C000h bytes (240 KBytes) for the fixed or variable length block modes. This ensures interchangeability between the two modes on a block-by-block basis at the tape format level.

When No Disconnect During Data Transfer is set by the MODE SELECT (15h) command (see Section 8.4), the maximum block length is 028000h bytes (160 KBytes):

Byte 01 = 02h

Byte 02 = 80h

Byte 03 = 00h

### **Byte 04 and 05 - Minimum Block Length**

The values for the Minimum Block Length bytes are:

Byte 04 = 00h

Byte 05 = 01h

The minimum block length is 0001h byte (1 byte) for the fixed or variable length block modes. This ensures interchangeability between the two modes on a block-by-block basis at the tape format level.

## **12.2 Errors Reported**

The EXB-8200 returns Check Condition status in response to the READ BLOCK LIMITS command under the conditions discussed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the READ BLOCK LIMITS command.

## 13 RECEIVE DIAGNOSTIC RESULTS (1Ch)

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

The RECEIVE DIAGNOSTIC RESULTS command requests that the EXB-8200 send diagnostic data to the initiator.

**Note:** This command is the second of two commands necessary to obtain valid diagnostic data. The RECEIVE DIAGNOSTIC RESULTS command must be preceded by the SEND DIAGNOSTIC (1Dh) command. If not, the data returned by the RECEIVE DIAGNOSTIC RESULTS command is not valid.

### 13.1 Field Definitions

#### Bytes 03 and 04 - Allocation Length

The Allocation Length bytes specify the number of bytes that the initiator has allocated for diagnostic data returned from the EXB-8200. The total number of bytes of diagnostic data available from the EXB-8200 is six. An Allocation Length of 0 indicates that no diagnostic data is to be transferred. A value of 0 is not an error.

The EXB-8200 terminates the Data In phase when the number of bytes specified by Allocation Length have been transferred or when all available diagnostic data has been transferred, whichever is less.

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 13.2 Diagnostic Data Field Definitions for Tracking, Reread, and Write Recovery Counters

The format of the diagnostic data returned for the tracking, reread, and write recovery counters is as follows:

Bit Byte	7	6	5	4	3	2	1	0	
00	(MSB) Additional Length								
01								(LSB)	
02	Reserved*						Rovfl	Tovfl	
03	Tracking Counter								
04	Reread Counter								
05	Write Recovery Counter								

\*EXABYTE-reserved

### Byte 00 and 01 - Additional Length

The value returned is 0004h, which indicates that there are four additional bytes of diagnostic data available to be returned to the initiator. These bytes are defined as follows:

### Byte 02, Bits 7 through 2 - Reserved

Reserved by EXABYTE for future use.

### Byte 02, Bit 1 - Reread Counter Overflow (Rovfl)

This bit is set to 1 when the Reread counter has overflowed. The counter can contain a maximum value of FFh.

### Byte 02, Bit 0 - Tracking Counter Overflow (Tovfl)

This bit is set to 1 when the Tracking counter has overflowed. The counter can contain a maximum value of FFh.

### Byte 03 - Tracking Counter

The Tracking counter indicates the number of tracking errors that occurred. The value in this counter is reset to 0 when a load, unload, rewind, or reset operation is performed. The initiator can reset this counter by issuing the REQUEST SENSE (03h) command with the RC bit set.

### Byte 04 - Reread Counter

The Reread counter indicates the number of physical rereads of data that occurred. The value in this counter is reset to 0 when a load, unload, rewind, or reset occurs. The initiator can reset this counter by issuing the REQUEST SENSE command with the RC bit set.

**Byte 05 - Write Recovery Counter**

The Write Recovery counter indicates the number of times the Write Recovery procedure was invoked. The value in this counter is reset to 0 whenever the drive is reset.

**13.3 Errors Reported**

The EXB-8200 returns Check Condition status in response to the RECEIVE DIAGNOSTIC RESULTS command under the conditions discussed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the RECEIVE DIAGNOSTIC RESULTS command.

## 14 RELEASE UNIT (17h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	1	0
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04								
05	Vendor Unique		Reserved			0	0	

**Note:** The RELEASE UNIT command is available only for 2600-level MX code and above.

The RELEASE UNIT command releases an EXB-8200 from an initiator's exclusive use. To have effect, the RELEASE UNIT command must be issued by the initiator that reserved the EXB-8200 with the RESERVE UNIT (16h) command.

If the EXB-8200 is not currently reserved by the requesting initiator, but is reserved by another initiator, the RELEASE UNIT command has no effect. Good status is returned to the requesting initiator.

If the EXB-8200 is not currently reserved by any initiator, the RELEASE UNIT command has no effect. Good status is returned to the requesting initiator.

The third party option has not been incorporated. Any attempt to use this option causes Check Condition status to be returned to the initiator.

### 14.1 Field Definitions

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

### 14.2 Errors Reported

The EXB-8200 returns the Check Condition status in response to the RELEASE UNIT command under the conditions discussed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the RELEASE UNIT command.

## 15 REQUEST SENSE (03h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	1	1
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04	Number of Bytes Allocated							
05	RC	VU	Reserved				0	0

The REQUEST SENSE command requests that the EXB-8200 transfer sense data to the initiator. The EXB-8200 provides sense data in Error Class 7 (extended sense data format). The EXB-8200 returns a total of 26 bytes of sense data.

When the EXB-8200 issues Check Condition status, it creates and saves sense data for the initiator. The sense data is valid for the Check Condition status just presented. The EXB-8200 clears this sense data after receiving any subsequent command that is not REQUEST SENSE or INQUIRY (12h) from the initiator receiving the Check Condition status.

### 15.1 Field Definitions

#### Byte 04 - Number of Bytes Allocated

The Number of Bytes Allocated field specifies the number of bytes that the initiator has allocated for sense data returned from the EXB-8200. The EXB-8200 provides a total of 26 (1Ah) bytes of sense data. A value of 0 causes four bytes of sense data to be transferred. All other values indicate the exact number of bytes to be transferred, up to the maximum of 26. The EXB-8200 terminates the Data In phase when the number of bytes specified by the Number of Bytes Allocated value have been transferred or when all available sense data has been transferred to the initiator, whichever is less.

#### Byte 05, Bit 7 - RC (Reset Counters)

The RC bit enables the initiator to reset the Read/Write Data Error Counter (Bytes 16, 17, and 18 of the extended sense bytes). The values for this bit are as follows:

- 0 – Do not reset Read/Write Data Error Counter
- 1 – Reset Read/Write Data Error Counter

To reset the error counter, the initiator must read it; that is, the initiator must allocate at least 19 bytes for sense data from the EXB-8200. If the RC bit is set, the EXB-8200 resets the error counter after completing the REQUEST SENSE command.

**Important:** If the EXB-8200 is reserved by an initiator and a second initiator issues a REQUEST SENSE command with the RC bit set, the EXB-8200 returns Reservation Conflict status to the second initiator. This prevents the second initiator from resetting the Read/Write Data Error Counter while the EXB-8200 is in use by the first initiator. However, if the second initiator issues the REQUEST SENSE command with the RC bit not set, the EXB-8200 returns the requested sense data to the second initiator.

**Byte 05, Bit 6 - VU (Vendor Unique)**

There is no vendor unique definition for this bit.

## 15.2 Error Class 7 Extended Sense Byte Definitions

For Error Class 7, the format of the extended sense bytes returned by the EXB-8200 is as follows:

Bit Byte	7	6	5	4	3	2	1	0
00	Valid	1	1	1	0	0	0	0
01	Reserved							
02	FMK	EOM	ILI	Rsvd	Sense Key			
03 : 06	(MSB) Information Bytes (LSB)							
07	Additional Sense Length							
08 : 11	Reserved*							
12	Additional Sense Code (ASC)							
13	Additional Sense Code Qualifier (ASCQ)							
14 15	Reserved*							
16 17 18	(MSB) Read/Write Data Error Counter (LSB)							
19	PF	BPE	FBPE	ME	ECO	TME	TNP	LBOT
20	XFR	TMD	WP	FMKE	URE	WE1	SSE	FE
21	Reserved*					PEOT	WSEB	WSEO
22	Reserved*							
23 24 25	(MSB) Remaining Tape (LSB)							

\*EXABYTE-reserved

The extended sense bytes are defined as follows:

**Byte 00, Bit 7 - Valid**

The Valid bit is set to 1 when the data in the Information bytes (Bytes 03 through 06) is valid for the command that received the Check Condition status. The value in the Information bytes is undefined when the Valid bit is 0.

**Byte 00, Bits 6 through 4 - Error Class**

Always 7h.

**Byte 00, Bits 3 through 0 - Error Code**

Always 0h.

**Byte 02, Bit 7 - FMK (Filemark)**

When set to 1, this bit indicates that the current command encountered a filemark.

**Byte 02, Bit 6 - EOM (End of Medium)**

When set to 1, this bit indicates that LBOT or LEOT has been reached. In write mode, this bit is set only when LEOT is encountered.

**Byte 02, Bit 5 - ILI (Illegal Length Indicator)**

When set to 1, this bit indicates that the logical block length requested did not match the logical block length of the data recorded on the tape.

**Byte 02, Bit 4 - Rsvd**

Reserved by ANSI for future use.

**Byte 02, Bit 3 through 0 - Sense Key**

The values returned in the Sense Key field are defined in Table 15-1.

**Table 15-1** Sense Key Values

Hex Value	Sense Key	Meaning
0h	No Sense	The EXB-8200 has no specific sense key information to report. This is the case for a successful command or a Check Condition status due to the FMK, EOM, or ILI bits being set to 1.
1h	(not used)	This sense condition is not supported by the EXB-8200.
2h	Not Ready	The EXB-8200 cannot be accessed. Operator intervention may be required to correct this condition.
3h	Medium Error	The command terminated with a non-recovered error condition that was caused by a flaw in the tape or an error in the blocked data.
4h	Hardware Error	The EXB-8200 detected a non-recoverable hardware failure while performing a command or a self-test.
5h	Illegal Request	The EXB-8200 is in the wrong mode to execute the command, or the command is logically incorrect, or there was an illegal parameter in the CDB or in the additional parameters supplied as data for the command.
6h	Unit Attention	<p>The cartridge may have been changed or the EXB-8200 has been reset (by a Bus Device Reset message, SCSI reset, or power-on reset) since the last command was issued to the drive.</p> <p>The EXB-8200 returns Check Condition with the sense key set to Unit Attention in response to the first command (except INQUIRY or REQUEST SENSE) issued by the initiator. The EXB-8200 does not perform the requested command unless it was INQUIRY or REQUEST SENSE. The EXB-8200 clears the Unit Attention sense key after it receives the next command from the initiator. (In the case of INQUIRY or REQUEST SENSE, the EXB-8200 performs the command and does not return Check Condition.)</p>
7h	Data Protect	A command that writes to the data cartridge was attempted on a cartridge that is protected from this operation. The write operation is not performed.
8h	Blank Check	The end of data or a logically blank tape was encountered during a read operation.

Hex Value	Sense Key	Meaning
9h	EXABYTE	This is a vendor unique sense key used by EXABYTE to indicate that an error occurred that is defined by one of the following vendor unique status bits:  TMD (Tape mark detect error) – Byte 20, Bit 6 XFR (Transfer abort error) – Byte 20, Bit 7
Ah	(not used)	This sense condition is not supported by the EXB-8200.
Bh	Aborted Command	The EXB-8200 aborted the command. The initiator may be able to recover by trying the command again.
Ch	(not used)	This sense condition is not supported by the EXB-8200.
Dh	Volume Overflow	The last WRITE or WRITE FILEMARKS command reached PEOT with data remaining in the buffer, or the filemarks were not correctly written.
Eh	(not used)	This sense condition is not supported by the EXB-8200.
Fh	(reserved)	Reserved for future implementation in the ANSI SCSI specification.

### Bytes 03, 04, 05, and 06 - Information Bytes

The Information bytes contain a value that represents the number of unprocessed blocks, filemarks, or bytes of data resulting from a Check Condition status for the READ, WRITE, WRITE FILEMARKS, or SPACE commands.

The value in the Information bytes is valid only when the Valid bit (Byte 00, Bit 7) is set. When the Valid bit is 0, any data in the Information bytes is invalid.

### Byte 07 - Additional Sense Length

This byte indicates the number of additional bytes of sense data provided by the EXB-8200, excluding this byte. The value is 12h for sense data generated for all commands.

### Bytes 12 and 13 - Additional Sense Code (ASC) and Additional Sense Code Qualifier (ASCQ)

The EXB-8200 supports the ASC and ASCQ values shown in Table 15-2.

**Table 15-2** ASC and ASCQ Values Supported by the EXB-8200

For this Sense Key...	The following ASC and ASCQ values are supported...		Meaning
	ASC	ASCQ	
All supported sense keys	00h	00h	No Additional Sense Information
Not Ready (2h)	04h	00h	Volume Not Mounted (cartridge not present)
Not Ready (2h)	04h	01h	Currently Rewinding or Loading
Blank Check (8h)	30h	02h	Cannot Read Medium—Incompatible Format

**Bytes 14 and 15 - Reserved**

Reserved by EXABYTE for future use.

**Bytes 16, 17, and 18 - Read/Write Data Error Counter**

The Read/Write Data Error Counter is a dual function counter that logs write retries and read Error Correction Code (ECC) operations for recovered physical blocks (physical block size is 1K). The mode of operation determines which error is being counted:

- During write operations, the counter is incremented when a physical block is rewritten following a read-after-write failure.
- During read operations, the counter is incremented when a physical block is reconstructed in the formatter by the ECC operation.

The value of the Read/Write Data Error Counter is cumulative for consecutive READ and WRITE commands.

The Read/Write Error Counter is reset to 0 under the following circumstances:

- After a load operation is completed
- After a rewind operation is completed
- When the EXB-8200 changes from read mode to write mode or from write mode to read mode
- When a backward space operation reaches LBOT

The initiator can reset the error counter by sending the REQUEST SENSE command with the RC bit (Byte 05, Bit 7) set. To reset the error counter, the initiator must read it; that is, the initiator must allocate at least 19 bytes for sense data from the EXB-8200 in the REQUEST SENSE command.

### Bytes 19, 20, and 21 - Unit Sense Bytes

For each bit defined in the Unit Sense bytes, the normal or good status is 0. When set to 1, these bits indicate the defined condition. Zero is the effective value for the reserved bits. The bit definitions for the Unit Sense bytes are shown in Table 15-3.

**Table 15-3** Bit Definitions for the Unit Sense Bytes

Byte	Bit	Name	Meaning
19	7	PF (Power Fail)	The EXB-8200 has been reset since the last status, or it has performed an internal reset due to power-up.
	6	BPE (SCSI Bus Parity Error)	The EXB-8200 detected a SCSI bus parity error.
	5	FBPE (Formatted Buffer Parity Error)	The EXB-8200 detected an internal data buffer parity error.
	4	ME (Media Error)	In write mode, a permanent write error occurred. In read mode, an uncorrectable read error occurred.
	3	ECO (Error Counter Overflow)	The Read/Write Data Error Counter overflowed to 0.
	2	TME (Tape Motion Error)	The EXB-8200 detected an error while attempting to move the tape.
	1	TNP (Tape Not Present)	The EXB-8200 does not have a data cartridge inserted.
	0	LBOT (Logical Beginning of Tape)	The cartridge is at the logical beginning of tape.

Byte	Bit	Name	Meaning
20	7	XFR (Transfer Abort Error)	An error condition occurred while the EXB-8200 was attempting to pause the data transfer in preparation for a disconnect sequence.
	6	TMD (Tape Mark Detect Error)	An error occurred while the EXB-8200 was attempting to perform a SPACE filemark, resulting in an invalid location relative to the requested location. The Valid bit is set to 1, and the Information bytes contain the difference between the number of filemarks specified by the initiator and the actual number of filemarks processed by the EXB-8200. This may be a host-recoverable error. The initiator should resend the SPACE command with the correct number of filemarks.
	5	WP (Write Protect)	The cartridge is write-protected.
	4	FMKE (Filemark Error)	A write error occurred while the EXB-8200 was attempting to write a filemark.
	3	URE (Under Run Error)	A hardware data formatter underrun error occurred. (Byte 20, Bit 0 is also set.)
	2	WE1 (Write Error 1)	The maximum number of write retries were attempted. This is a media error.
	1	SSE (Servo System Error)	A catastrophic hardware error, detected by the servo system, occurred.
	0	FE (Formatter Error)	A catastrophic hardware error, detected by the data formatter, occurred.
21	7 – 3	Reserved	Reserved by EXABYTE for future use.
	2	PEOT (Physical End of Tape)	The cartridge is at the physical end of tape.
	1	WSEB (Write Splice Error, Blank)	A gap track was not encountered when the EXB-8200 was trying to splice data. This is a hardware error.
	0	WSEO (Write Splice Error, Overshoot)	The EXB-8200 overshot the position when trying to splice data. This is a hardware error.

**Byte 22 - Reserved**

Reserved by EXABYTE for future use.

**Bytes 23, 24, and 25 - Remaining Tape**

Indicates the amount of tape remaining (in 1,024-byte blocks). This is the LEOT position minus the current physical position.

**Note:** If you issue a REQUEST SENSE command to obtain the amount of remaining tape before any data has been written to the tape, you may obtain a number that is 1 greater than the actual number of blocks from LBOT to LEOT.

**Priorities of Sense Bytes**

Multiple errors may occur simultaneously in the EXB-8200. The sense key reflects the most catastrophic error of all those simultaneously occurring.

**Sense Byte Pending Status**

When the EXB-8200 reports Check Condition status in response to a command from an initiator, the EXB-8200 retains the sense byte pending status, including error information and Check Condition status, for the initiator until one of the following occurs:

- Error information is reset by the execution of the next command that is not an INQUIRY or REQUEST SENSE command from the same initiator.
- Error information is reset by a Bus Device Reset message or a Bus Reset condition.

## 15.3 Errors Reported

The EXB-8200 returns Check Condition status in response to the REQUEST SENSE command under the conditions discussed in Section 4.4. Following a Check Condition status on a REQUEST SENSE command, the sense data remains valid. Sense data for the error that the EXB-8200 encountered while processing the REQUEST SENSE command is never constructed, and the initiator must assume that the Check Condition was reported for one or more of the reasons listed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the REQUEST SENSE command.

## 16 RESERVE UNIT (16h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	1	1	0
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04								
05	Vendor Unique		Reserved			0	0	

**Note:** The RESERVE UNIT command is available only for 2600-level MX code and above.

The RESERVE UNIT command reserves the EXB-8200 for exclusive use by the requesting initiator. The reservation remains in effect until the EXB-8200 receives another RESERVE UNIT or a RELEASE UNIT command from the same initiator, or when a Bus Device Reset or hard reset occurs.

If a reserved EXB-8200 receives any command other than INQUIRY or REQUEST SENSE from another initiator, the command is rejected. The EXB-8200 returns a Reservation Conflict (18h) status to the initiator that sent the command.

**Note:** If a reserved EXB-8200 receives a REQUEST SENSE command with the RC bit set from another initiator, it rejects the command and returns Reservation Conflict. If the RC bit is not set, the EXB-8200 accepts the command and returns sense data to the requesting initiator.

The third party option has not been incorporated. Any attempt to use this option causes Check Condition status to be returned to the initiator.

### 16.1 Field Definitions

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

## 16.2 Errors Reported

The EXB-8200 returns Check Condition status in response to the RESERVE UNIT command under the conditions discussed in Section 4.4. The initiator may be able to recover from the Check Condition status by retrying the RESERVE UNIT command.

## 17 REWIND (01h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	0	1
01	Logical Unit Number			Reserved				Immed
02	Reserved							
03								
04								
05	Vendor Unique		Reserved				0	0

The REWIND command causes the EXB-8200 to rewind the cartridge tape to LBOT. If the EXB-8200 receives the REWIND command after a WRITE command, it performs a *buffer flush* before rewinding the tape; that is, it automatically writes any data in its buffer to the tape before rewinding.

### 17.1 Field Definitions

#### Byte 01, Bit 0 - Immed

The Immed bit determines when command status is returned to the initiator, as follows:

- 0 – Status is reported after the REWIND command is completed.
- 1 – Status is reported as soon as the REWIND command is initiated.

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

### 17.2 Errors Reported

In addition to the situations discussed in Section 4.4, the REWIND command results in an error condition under the following circumstances:

- Following an immediate REWIND, if an error exists in the CDB or if a permanent write error is detected on the buffer flush operation, the EXB-8200 returns Check Condition status. Any other errors are reported on the next command issued following the immediate REWIND command.
- Following a non-immediate REWIND after a write operation, if an error occurs during the buffer flush or during the rewind operation, the

EXB-8200 returns Check Condition status. All errors that can occur with the WRITE command, as described in Section 21.5, are applicable.

- When a data cartridge has been inserted in the EXB-8200 and the door closed with the autoload feature disabled, the REWIND command results in a Check Condition status with the sense key set to Not Ready (2h).
- When a data cartridge has been unloaded with the prevent medium removal feature enabled, the REWIND command results in a Check Condition status with the sense key set to Not Ready (2h).
- When a data cartridge is not present, the REWIND command results in a Check Condition status with the sense key set to Not Ready (2h).

## 18 SEND DIAGNOSTIC (Extended) (1Dh)

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

The SEND DIAGNOSTIC command requests that the EXB-8200 perform diagnostic tests on itself. The EXB-8200 can perform a variety of diagnostic operations including returning data counter information and performing power-on, user-selected tests, with and without tape.

The EXB-8200 is capable of disconnected operation during these tests. Test results are indicated by the status returned upon completion of the command. Details of test failures are posted in the extended sense bytes returned from the REQUEST SENSE (03h) command.

**Note:** This command is the first of two commands necessary to obtain valid diagnostic data. The SEND DIAGNOSTIC command must be followed by the RECEIVE DIAGNOSTIC RESULTS (1Ch) command. If not, the data returned by the RECEIVE DIAGNOSTIC RESULTS command is not valid.

### 18.1 Field Definitions

EXB-8200 test operations are determined by the values of bits 0, 1, and 2 of Byte 01. The tests specified by various combinations of these bits are described in Section 18.3.

#### **Byte 01, Bit 2 - SelfTest**

Power-on self test (used in combination with bits 1 and 0 of Byte 01 to request specific diagnostic tests).

#### **Byte 01, Bit 1 - DevOfL**

Device off-line (used in combination with bits 2 and 0 of Byte 01 to request specific diagnostic tests).

**Byte 01, Bit 0 - UnitOfL**

Logical unit off-line (used in combination with bits 2 and 1 of Byte 01 to request specific diagnostic tests).

**Bytes 03 and 04 - Parameter List Length**

The Parameter List Length bytes specify the number of bytes contained in the Parameter List that the initiator will transfer to the EXB-8200. The Parameter List enables the initiator to specify diagnostic options (see Section 18.2). The number of bytes of Parameter List Data available from the initiator is 02h. A Parameter List Length of 0 indicates that no Parameter List Data will be transferred. A value of 0 is not an error.

**Byte 05, Bits 7 and 6 - Vendor Unique**

There are no vendor unique definitions for these bits.

**18.2 Parameter List Data Field Definitions**

Bit Byte	7	6	5	4	3	2	1	0
00	(MSB) Diagnostic Options							
01								(LSB)

**Bytes 00 and 01 - Diagnostic Options**

The Diagnostic Options field identifies the specific diagnostic function to be performed. The EXB-8200 supports the following Diagnostic Option only:

0001h      Tracking and Reread Counter

This option, when used in combination with Test 000 described in the following section, makes the Tracking and Reread counter available for retrieval by the RECEIVE DIAGNOSTIC RESULTS command.

## 18.3 Test Definitions

Test operations are determined by setting the SelfTest, DevOfL, and UnitOfL bits in the combinations shown in Table 18-1. Descriptions of the tests and guidelines for setting them up follow the table.

**Table 18-1** Test Operations Determined by the SelfTest, DevOfL, and UnitOfL Bits

To specify this test...	Set these bits as follows...		
	SelfTest	DevOfL	UnitOfL
Test 000 – Set up counters with Parameter List	0	0	0
Test 100 – Power-on tests without tape	1	0	0
Test 101 – Power-on, write/read, filemark, and load tests without tape	1	0	1
Test 110 – Power-on tests with tape	1	1	0
Test 111 – Power-on, write/read, and filemark tests with tape	1	1	1

### Test 000 – Set Up Counters with Parameter List

This option, accompanied by the Parameter List diagnostic option 0001h, makes the Tracking and Reread counter available for retrieval by the RECEIVE DIAGNOSTIC RESULTS command.

### Test 100 – Power-On Tests without Tape

This option causes the EXB-8200 to perform its power-on RAM and servo diagnostic tests. The drive returns Good status if it finds no failures. Improper setup or a test failure returns status and creates sense data as described in Section 18.4.

**Note:** For this test, the EXB-8200 performs its full power-on memory test even if dip switch 1 on the Level 2 MX card is set to bypass the memory test.

### Test Setup

The EXB-8200 must be powered on with no tape cartridge in the drive. The drive must respond to a TEST UNIT READY command with Check Condition status. It must respond to a REQUEST SENSE command with a

sense key of Not Ready (2h) and with Volume Not Mounted indicated in the Additional Sense Code Qualifier (Byte 13).

### **Test 101 – Power-On, Write/Read, Filemark, and Load Tests without Tape**

This option causes the EXB-8200 to first perform its power-on RAM and servo diagnostic tests. If no failures are found, the green LED on the front panel blinks to prompt the operator to insert a scratch tape cartridge. The EXB-8200 loads the tape and performs tests that verify the following operations:

- Write internally generated data to buffer
- Write buffer data to tape
- Write filemark to tape
- Rewind tape
- Read data to buffer
- Read and verify data in buffer
- Read filemark

Successful completion of all tests results in the return of Good status and an unconditional unload and eject of the scratch tape. (If the PREVENT MEDIUM REMOVAL command has been issued, it is overridden.) Improper test setup or a test failure returns status and creates sense data as described in Section 18.4.

#### **Test Setup**

The EXB-8200 must be powered on with no tape cartridge in the drive. The drive must respond to a TEST UNIT READY command with Check Condition status. It must respond to a REQUEST SENSE command with a sense key of Not Ready (2h) and with Volume Not Mounted indicated in the Additional Sense Code Qualifier (Byte 13).

#### **CAUTION**

This test requires a scratch tape cartridge that is write-enabled.  
Use of a tape containing data will result in the loss of the data.

## Test 110 – Power-On Tests with Tape

This option causes the EXB-8200 to perform its power-on RAM and servo diagnostic tests. Successful completion of all tests results in the tape being positioned at LBOT and the return of Good status. Improper test setup or a test failure returns status and creates sense data as described in Section 18.4.

### Test Setup

The EXB-8200 must be powered on with a write-enabled tape cartridge inserted in the drive. The drive must respond to a TEST UNIT READY command with Good status.

### CAUTION

This test requires a scratch tape cartridge that is write-enabled. Use of a tape containing data may result in the loss of the data.

## Test 111 – Power-On, Write/Read, and Filemark Tests with Tape

This option causes the EXB-8200 to first perform its power-on RAM and servo diagnostic tests. If no failures are found, the EXB-8200 continues by performing tests that verify the following operations:

- Write internally generated data to buffer
- Write buffer data to tape
- Write filemark to tape
- Rewind tape
- Read data to buffer
- Read and verify data in buffer
- Read filemark

Successful completion of all tests results in the scratch tape being positioned at LBOT and the return of Good status. Improper test setup or a test failure returns status and creates sense data as described in Section 18.4.

### Test Setup

The EXB-8200 must be powered on with a write-enabled scratch tape cartridge inserted in the drive. The drive must respond to a TEST UNIT READY command with Good status. It must respond to a REQUEST

SENSE command with an indication of LBOT (that is, with the EOM and LBOT bits set).

### CAUTION

This test requires a write-enabled scratch tape cartridge. Use of a tape containing data will result in the loss of the data.

**Note:** Data created during SEND DIAGNOSTIC tests are not readable in the EXB-8200's normal mode of operation. However, the tape may be re-used for normal operation.

## 18.4 Errors Reported

In addition to the situations discussed in Section 4.4, the SEND DIAGNOSTIC command results in error conditions under the following circumstances:

### Invalid SelfTest, DevOfI, UnitOfL Combinations

Any combinations of values other than those defined in Section 18.3 for SelfTest, DevOfI, and UnitOfL are invalid. When invalid combinations are detected, Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### Invalid Test Setup

An attempt to execute a test with an invalid test setup returns Check Condition status and creates sense data with the sense key set to Illegal Request (5h).

An attempt to execute the functional tape tests in Tests 101 or 111 with the cartridge set for Write Protect returns Check Condition status and creates sense data with the sense key set to Data Protect (7h).

### Test Failures

A failure during the power-on portion of a test results in the following:

- Check Condition status is returned, and sense data is created with the sense key set to Hardware Error (4h).
- The FBPE bit of the extended sense data is set if a data RAM failure occurred, or the SSE bit is set if a servo error occurred.

- The front panel amber LED lights.
- The tape is ejected.

A failure during the functional portion of a test results in the following:

- Check Condition status is returned, and sense data is created with the sense key set to Hardware Error (4h) or Medium Error (3h), as appropriate.
- Extended sense data is set as appropriate.
- The front panel amber LED lights.
- The tape remains positioned at the point of failure and is not ejected.

**Note:** To unload a tape after a functional test failure, issue a REWIND (01h) or UNLOAD (1Bh) command.

## 19 SPACE (11h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	0	0	1
01	Logical Unit Number			Reserved			Code	
02	Count							
03								
04								
05	Vendor Unique			Reserved			0	0

The SPACE command provides a variety of positioning functions that are determined by the Code and Count fields in the CDB. The EXB-8200 can space over blocks and filemarks. Both forward (toward end of tape) and reverse (toward beginning of tape) positioning are provided.

**Note:** SPACE block operations update the Read/Write Data Error Counter values.

### 19.1 Field Definitions

#### Byte 01, Bits 1 and 0 - Code

The Code field determines the type of space operation to be performed, as follows:

Code Value	Operation
00	Space over logical blocks
01	Space over filemarks
10	(Not supported)
11	(Not supported)

#### Bytes 02 through 04 - Count

The Count field specifies the number of logical blocks or filemarks to be spaced over, as follows:

- A positive value of  $n$  causes the EXB-8200 to space forward  $n$  logical blocks or filemarks. When the space operation is complete, the tape is positioned on the EOT side of the  $n$ th logical block or filemark.

**Note:** If you issue a forward SPACE filemark command and specify more filemarks than are written on tape, the tape is spaced forward to PEOT.

- A negative value of  $n$  (in 2s complement notation) causes the EXB-8200 to space backward  $n$  logical blocks or filemarks. When the space operation is complete, the tape is positioned on the BOT side of the  $n$ th logical block or filemark.
- A value of 0 causes no tape movement. This is not an error.

#### **Byte 05, Bits 7 and 6 - Vendor Unique**

There are no vendor unique definitions for these bits.

## **19.2 Improved Backward Space Block Performance**

For 2600-level MX code and above, the backward space block operation has been enhanced to reduce its execution time. With previous code levels, the EXB-8200 performed a backward space block operation by backing up to the previous filemark or LBOT, then reading forward to the desired block. For very large files, the result often was very long read times before the desired position was reached.

With the current MX code level, the EXB-8200 calculates the time required to back up to a point just before the desired block. It then backs the tape to this point and reads forward to the desired block. Typically, a backward space block operation now requires about 20 seconds. Exact execution time varies depending on the logical block size, the proximity of filemarks, and other factors that affect positioning.

## **19.3 Effect of the Abort (06h) Message on Space Operations**

For EXB-8200s containing 2600-level MX code and above, the effect of the Abort message on space operations depends on the type of space operation being performed, as follows:

### **Abort during SPACE Filemark**

The EXB-8200 normally aborts the SPACE filemark command immediately after receiving the Abort message. However, under the following two circumstances, a delay will occur before the command is aborted:

- When the EXB-8200 is performing a forward space filemark operation from LBOT, there is a 5-7 second period during which the LBOT is read

at normal speed. If the Abort message is received during this time, the termination of the command is delayed until all LBOT blocks are read.

- When the EXB-8200 is performing a backward space filemark operation after a write operation and the buffer still contains data, the Abort message causes the buffered data to be written to tape. An erase gap is written before the filemark search operation is aborted.

When the space filemark operation is terminated, high-speed search motion is stopped regardless of the direction of the search. The tape is then backed up until data is found. Then, the tape is read forward until either the start of a logical block (start block) or a filemark is found.

If a start block is found, the EXB-8200 synchronizes the read pointer to that block and continues reading until the buffer is full.

If a filemark is found, the final position depends on the original search direction, as follows:

- Forward SPACE filemark: The final position will be on the EOT side of the filemark. A READ command received at this time will not result in Check Condition status.
- Backward SPACE filemark: The final position will be on the BOT side of the filemark. A READ command received at this time will result in Check Condition status with the FMK (filemark detected) bit set to 1 and the tape positioned at the EOT side of the filemark.

If neither a start block nor filemark is found, Check Condition status is sent to the initiator and sense data is created with the sense key set to Hardware Error (4H).

The initiator should send the REQUEST SENSE command at the completion of an Abort message to determine the final location of the tape and the sense data values. The Valid bit is set to 1, and the Information bytes contain the number of filemarks not yet found.

The final position at the end of the Abort can be determined by one of the following formulas:

For forward SPACE filemark,

$$\text{Current File} = \text{Start File} + \text{Space Request} - \text{Information Bytes}$$

For backward SPACE filemark (“Space Request” is a negative number),

$$\text{Current File} = \text{Start File} + \text{Space Request} + \text{Information Bytes}$$

**Note:** A forward SPACE filemark command can be aborted such that the final position is in “old” data. As long as a start block or filemark can be found, no error will be posted.

## Abort During SPACE Block

### Forward SPACE Block

When an Abort is executed during a forward space block operation, the read pointer is synchronized to the first start block found, and data is read until the buffer is full. Check Condition status is sent to the initiator. The Valid bit is set to 1, and the Information bytes contain the number of blocks not yet found.

For a forward SPACE block operation, the final position at the end of the Abort can be determined by the following formula:

$$\text{Current Block} = \text{Start Block} + \text{Space Request} - \text{Information Bytes}$$

### Backward SPACE Block

During a backward space block operation, the EXB-8200 delays the execution of the Abort message until it finds the next filemark or LBOT, or until the reverse tape motion of the backward space block operation is completed.

For a backward SPACE block operation, no formula can be used to determine the final position at the end of an Abort. The Valid bit may be set, but the Information bytes are *not* valid.

After an Abort during a backward SPACE block operation, the initiator should issue the REWIND command and prepare for the next command.

## 19.4 Errors Reported

In addition to the situations listed in Section 4.4, the SPACE command results in an error condition under the following circumstances:

### Filemark Encountered While Spacing Over Blocks

When the EXB-8200 encounters a filemark while spacing over logical blocks, the space operation is terminated and the tape is positioned as follows:

- If the filemark is detected during a forward space operation, the tape is positioned on the EOT side of the filemark.

- If the filemark is detected during a backward space operation, the tape is positioned on the BOT side of the filemark.

Check Condition status is sent to the initiator, and sense data is created with the sense key set to No Sense (0h) and the FMK bit set to 1. The Valid bit is set to 1, and the value for the Information bytes is calculated.

The Information bytes contain the difference between the Count in the CDB and the number of blocks the EXB-8200 spaced over before encountering the filemark.

### **PEOT Reached**

When the EXB-8200 encounters PEOT while spacing over filemarks or blocks, the space operation is terminated. Check Condition status is sent to the initiator. Sense data is created with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Valid bit is set to 1 and the value for the Information bytes is calculated.

The Information bytes contain the difference between the Count in the CDB and the number of blocks or filemarks the EXB-8200 spaced over before reaching PEOT.

### **PBOT or LBOT Reached**

When the EXB-8200 encounters PBOT or LBOT while spacing over filemarks or blocks, the space operation is terminated and the tape is positioned at LBOT. Check Condition status is sent to the initiator. Sense data is created with the sense key set to No Sense (0h) and the EOM bit and LBOT bit set to 1. The Valid bit is set to 1 and the value for the Information bytes is calculated.

The Information bytes contain the difference between the Count in the CDB and the number of blocks or filemarks the EXB-8200 spaced over before reaching PBOT or LBOT.

### **Blank Tape Encountered While Spacing Over Blocks**

When the EXB-8200 encounters blank (unrecorded) tape during a space block operation, the operation is terminated. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Blank Check (8h). The Valid bit is set to 1, and the value for the Information bytes is calculated.

The Information bytes contain the difference between the Count in the CDB and the number of blocks the EXB-8200 spaced over before reaching blank tape.

**Incorrect Filemark Detected**

When the EXB-8200 is executing the space filemark operation and miscounts the number of filemarks encountered, Check Condition status is sent to the initiator. Sense data is created with the sense key set to EXABYTE (9h) and the FMK bit set to either 0 or 1. The Valid bit is set to 1 and the value for the Information bytes is calculated.

The actions you can take to correct the position depend on the value of the FMK bit, the direction of the space operation, and the value of the Information bytes.

If the FMK bit is 0, contact your vendor for assistance. If the FMK bit is 1, perform the appropriate steps below, based upon the direction of the space operation:

**Backward Space Filemark Operation** For a backward space filemark operation, perform one of the following actions depending on the value of the Information bytes:

- If the value of the Information bytes is positive, execute a forward SPACE filemark command using the value of the Information bytes. Then, execute a backward SPACE filemark using a value of 1.
- If the value of the Information bytes is negative, execute a backward SPACE filemark command using the value of the Information bytes.

**Forward Space Filemark Operation** For a forward space filemark operation, perform one of the following actions depending on the value of the Information bytes:

- If the value of the Information bytes is positive, execute a forward SPACE filemark command using the value of the Information bytes.
- If the value of the Information bytes is negative, execute a backward SPACE filemark command using the value of the Information bytes. Then, execute a forward SPACE filemark command using a value of 1.

**Tape Unloaded but Still in the EXB-8200**

When the data cartridge has been inserted and the door closed with the autoloader feature disabled, or when the data cartridge has been unloaded with the prevent medium removal feature enabled, the SPACE command results in a Check Condition status with the sense key set to Not Ready (2h).

## 20 TEST UNIT READY (00h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	0	0	0	0
01	Logical Unit Number			Reserved				
02	Reserved							
03								
04								
05	Vendor Unique		Reserved				0	0

The TEST UNIT READY command provides a means for determining if the EXB-8200 is powered on, a cartridge is in place and loaded, and the drive is ready to accept a medium access command. This is not a request for unit self-test.

The EXB-8200 returns Good status if it is ready to accept a medium access command.

### 20.1 Field Definitions

#### Byte 05, Bits 7 and 6 - Vendor Unique

There are no vendor unique definitions for these bits.

### 20.2 Errors Reported

In addition to the situations listed in Section 4.4, the TEST UNIT READY command results in an error condition under the following circumstances:

- When a cartridge is not present, the EXB-8200 returns Check Condition status with the sense key set to Not Ready (2h) and the Tape Not Present (TNP) bit set. The Additional Sense Code (ASC) byte is set to 04h (Logical Unit Not Ready), and the Additional Sense Code Qualifier (ASCQ) byte is set to 00h (Volume Not Mounted).
- When a cartridge is present but not loaded, the EXB-8200 returns Check Condition status with the sense key set to Not Ready (2h). The Additional Sense Code (ASC) byte is set to 04h (Logical Unit Not Ready), and the Additional Sense Code Qualifier (ASCQ) byte is set to 00h (Volume Not Mounted).

- When the unload button on the front of the EXB-8200 has been used to unload a data cartridge, the EXB-8200 returns Check Condition status with the sense key set to Unit Attention (6h) and the Tape Not Present (TNP) bit set.

## 21 WRITE (0Ah)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	0	1	0	1	0
01	Logical Unit Number			Reserved				Fixed
02	Transfer Length							
03								
04								
05	Vendor Unique	Reserved				0	0	

The WRITE command transfers one or more bytes or blocks of data from the initiator to the EXB-8200. The EXB-8200 writes the data to tape starting at the current valid tape position. Valid tape positions are logical beginning of tape (LBOT), blank tape, or the beginning of a long filemark.

The EXB-8200 can perform variable write or fixed write operations. For a variable write operation, the EXB-8200 writes a single logical block to tape. The WRITE command specifies the length of this block in bytes. For a fixed write operation, the EXB-8200 writes one or more logical blocks of data of the length specified by the MODE SELECT command. The WRITE command specifies the number of blocks to be written.

### 21.1 Field Definitions

#### Byte 01, Bit 0 - Fixed

The Fixed bit defines the type of write operation to be performed, as follows:

- 0 – Variable Write Mode
- 1 – Fixed Write Mode

#### Byte 02 through 04 - Transfer Length

The Transfer Length field defines the amount of data to be transferred by the write operation, as follows:

- When the Fixed bit is 0 (variable write mode), the Transfer Length field indicates the length of the logical block to be written in bytes.
- When the Fixed bit is 1 (fixed write mode), the Transfer Length field indicates the number of logical blocks to be written.

**Note:** When the value for the Transfer Length field is 0, no data is written to tape. A value of 0 is not an error.

### **Byte 05, Bits 7 and 6 - Vendor Unique**

There are no vendor unique definitions for these bits.

## **21.2 Data Buffering**

The EXB-8200 provides two modes of operation for the WRITE command: buffered and non-buffered. The mode of operation is set by the MODE SELECT (15h) command (see Chapter 8).

### **Buffered Operation**

When the EXB-8200 is set for buffered operation, the data buffer is a logical extension of the tape. Data transferred from the initiator is retained in the buffer until the motion threshold (see Chapter 8) is reached. Then, all the data in the buffer is written to tape. The default motion threshold value for the WRITE (and READ) command is 128 KBytes. In the buffered mode, status is returned to the initiator even though the data has not been physically written to the tape.

If the data transfer rate from the initiator is greater than 246 KBytes per second or if data is being written starting at LBOT, the buffer eventually fills with data. When this occurs, the EXB-8200 performs a SCSI disconnect to halt data transfers from the initiator while it continues to write data to tape from the buffer. Once the amount of available space in the buffer equals the reconnect threshold (see Chapter 8), the EXB-8200 performs a SCSI reconnect and accepts more data from the initiator.

**Note:** If the No Disconnect During Data Transfer feature is selected, either through the MODE SELECT command or the Level 2 MX card switch settings, the total number of bytes that can be transferred by a single write operation is 160 KBytes.

### **Non-Buffered Operation**

When the EXB-8200 is set for non-buffered operation, data transferred from the initiator is written to the tape as soon as it is received. The EXB-8200 returns Good status after all of the transferred data is physically written to the tape.

**Note:** When LEOT is encountered during buffered operation, the EXB-8200 automatically switches to non-buffered operation.

## 21.3 Write Mode

The EXB-8200 is in the write mode from the time it receives the first WRITE command until it receives one of the following commands:

- REWIND
- UNLOAD
- LOAD
- SPACE
- WRITE FILEMARKS

While the EXB-8200 is in the write mode and data remains in the buffer, the front panel button of the EXB-8200 is disabled. When the EXB-8200 leaves the Write mode and all of the buffered data is written to the data cartridge, the front panel button is re-enabled.

## 21.4 Write Operations

To ensure proper write operations, the EXB-8200 must be set appropriately by the MODE SELECT command for the write operation desired (variable or fixed). See Chapter 8 for information about the MODE SELECT command.

The Fixed bit of the WRITE command determines whether the write operation is variable or fixed. Table 21-1 summarizes the differences between the two types of write operations performed by the EXB-8200.

**Table 21-1** Write Operations as Determined by the Fixed Bit

When the Fixed bit is...	The EXB-8200 performs a...	The number of logical blocks sent from the initiator is...	The number of bytes in each logical block written to tape is...	The EXB-8200 starts writing data at..
0	Variable write	1	Determined by the Transfer Length field	The next logical block on the tape
1	Fixed write	Determined by the Transfer Length field	Determined by the MODE SELECT command	The next logical block on the tape

## 21.5 Errors Reported

In addition to the situations listed in Section 4.4, the WRITE command results in an error condition under the following circumstances:

### **Block Length Not Within Limits**

When the EXB-8200 is operating in variable mode and the Transfer Length is not within the specified limits (see READ BLOCK LIMITS (05h)), the WRITE command is not executed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Modes Do Not Match**

When the mode of operation that the EXB-8200 is set to does not agree with the mode requested by the WRITE command, an error condition results. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **LEOT Encountered**

When the EXB-8200 encounters LEOT during a write operation, it switches from buffered to non-buffered operation. It completes the write operation for the current logical block, then terminates the write operation.

For a variable length write operation, Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 0, the EOM bit set to 1, and the sense key set to No Sense (0h).

For a fixed length write operation, Check Condition status is sent to the initiator. Sense data is created with the Valid bit set to 1, and the value for the Information bytes is calculated. The EOM bit is set to 1, and the sense key is set to No Sense (0h).

The value contained in the Information bytes represents the difference between the requested number of blocks in the CDB and the actual number of blocks written to the tape.

### **PEOT Encountered**

When the EXB-8200 encounters PEOT during a variable write operation, it terminates the write operation for the current logical block and sends Check Condition status to the initiator. Sense data is created, and the Valid bit, EOM bit, and PEOT bit are set to 1. If data remains in the buffer, the sense key is set to Volume Overflow (Dh). The value contained in the Information bytes indicates the difference between the requested number of bytes in the CDB and the actual number of bytes written to tape.

For a fixed length write operation, Check Condition status is sent to the initiator. Sense data is created with the sense key set to No Sense (0h) if no

data remains in the buffer or Volume Overflow (Dh) if data remains in the buffer. The Valid bit, PEOT bit, and EOM bit are set to 1. If data remains in the buffer, the value contained in the Information bytes indicates the difference between the requested number of blocks in the CDB and the actual number of blocks written to tape.

### **Illegal Tape Position**

If the tape is not positioned at the end of data (blank tape), at LBOT, or at the BOT side of a long filemark, the EXB-8200 does not execute the WRITE command. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

### **Data Cartridge Write Protected**

If the loaded data cartridge is write protected (see the *EXB-8200 8mm Cartridge Tape Subsystem Product Specification*), the EXB-8200 does not execute the WRITE command. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Data Protect (7h) and the WP bit set to 1.

### **Read-after-Write Failure**

To ensure data integrity, the EXB-8200 performs a read-after-write operation on all information written to the tape. If it fails to read back a physical block just written, the EXB-8200 rewrites the physical block at a different location on the tape.

If it cannot successfully write a single physical block in twelve attempts, the EXB-8200 terminates the write operation and sends Check Condition status to the initiator. Sense data is created with the sense key set to Medium Error (3h) and the ME bit and WE1 bit set to 1. The Valid bit is set to 1 and the value for the Information bytes is calculated.

If the EXB-8200 cannot successfully write 18 consecutive physical blocks (approximately two tracks), it terminates the write operation and sends Check Condition status to the initiator. Sense data is created with the sense key set to Medium Error (3h) and the ME bit set to 1. The Valid bit is set to 1 and the value for the Information bytes is calculated.

For a fixed length write operation, the value in the Information bytes represents the difference between the requested number of blocks in the CDB and the actual number of blocks written to the tape.

### **Tape Unloaded but Still in the EXB-8200**

When the data cartridge has been inserted and the door closed with the autoload feature disabled, or when the data cartridge has been unloaded with the prevent medium removal feature enabled, the WRITE command results in a Check Condition status with the sense key set to Not Ready (2h).

## 22 WRITE FILEMARKS (10h)

Bit Byte	7	6	5	4	3	2	1	0
00	0	0	0	1	0	0	0	0
01	Logical Unit Number			Reserved				
02	Number of Filemarks							
03								
04								
05	Short	VU	Reserved				0	0

The WRITE FILEMARKS command causes the EXB-8200 to write the specified number of filemarks starting at the current valid tape position. Valid tape positions are logical beginning of tape (LBOT), blank tape, or the beginning of a long filemark.

The EXB-8200 supports two types of filemarks: short and long. Both filemarks can be used for positioning on the tape and they can be intermixed. The short filemark occupies 480 KBytes (60 tracks) of space. The long filemark occupies 2,160 KBytes (270 tracks) of space.

The long filemark includes a long erase gap. This gap allows the initiator to position on the BOT side of the filemark, in the erase gap, and append data with a write operation. This causes the long filemark and any data following the long filemark to be erased.

The short filemark contains a short erase gap that does not allow a write operation to be performed. The short filemark cannot be overwritten except when the write operation is performed from LBOT or from a previous long filemark.

Data can be appended on the EOT side of either a short or long filemark that is followed by blank tape.

WRITE FILEMARKS is also used to force the EXB-8200 to write any buffered data to tape. For example, if the previous command was a WRITE command, WRITE FILEMARKS causes any data remaining in the buffer to be written to the tape before the filemark is written.

The WRITE FILEMARKS command terminates successfully and returns Good status when all buffered data blocks and the filemarks (if any) are correctly written to the tape.

## 22.1 Field Definitions

### **Bytes 02 through 04 - Number of Filemarks**

The Number of Filemarks field represents the number of filemarks to be written to the tape.

A 0 in this field indicates that no filemarks are to be written. A value of 0 is not an error. Instead, all buffered data is written to tape.

### **Byte 05, Bit 7 - Short**

When this bit is set to 1, only short filemarks are written to the tape. When this bit is 0, only long filemarks are written to the tape.

### **Byte 05, Bit 6 - VU (Vendor Unique)**

There is no vendor unique definition for this bit.

## 22.2 Errors Reported

In addition to the situations listed in Section 4.4, the WRITE FILEMARKS command results in an error condition under the following circumstances:

### **LEOT Encountered**

When the EXB-8200 encounters LEOT while writing filemarks, it continues writing filemarks until the requested number of filemarks has been written or until it reaches PEOT. If it completes the requested number of filemarks before reaching PEOT, the EXB-8200 sends Check Condition status to the initiator. The EOM bit is set to 1, and the PEOT and LBOT bits are 0. The sense key is set to No Sense (0h). If the EXB-8200 does not complete the requested number of filemarks before reaching PEOT, it terminates the operation as explained below.

### **PEOT Encountered**

When the EXB-8200 encounters PEOT while writing filemarks, it terminates the operation. If filemarks remain to be written, Check Condition status is sent to the initiator, and sense data is created with the Valid bit set to 1. The sense key is set to Volume Overflow (Dh), the EOM and PEOT bits are set to 1, and the LBOT bit is 0. The value for the Information bytes indicates the number of unwritten filemarks.

### **Illegal Tape Position**

If the tape is not positioned at the end of data (blank tape), at LBOT, or at the BOT side of a long filemark, the WRITE FILEMARKS command is not executed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Illegal Request (5h).

**Data Cartridge Write Protected**

If the data cartridge loaded in the EXB-8200 is write protected (see the *EXB-8200 8mm Cartridge Tape Subsystem Product Specification*), the WRITE FILEMARKS command is not executed. Check Condition status is sent to the initiator, and sense data is created with the sense key set to Data Protect (7h) and the WP bit set to 1.

**Failure Writing a Filemark**

If the EXB-8200 is unable to correctly write a filemark, the operation is terminated. Check Condition status is sent to the initiator. Sense data is created with the sense key set to Medium Error (3h) and the ME bit and FMKE bit set to 1. The Valid bit is set to 1, and the value for the Information bytes is calculated.

**Tape Unloaded but Still in the EXB-8200**

When the data cartridge has been inserted and the door closed with the autoload feature disabled, or when the data cartridge has been unloaded with the prevent medium removal feature enabled, the WRITE FILEMARKS command results in a Check Condition status with the sense key set to Not Ready (2h).

## 23 Usage Notes

This chapter provides additional information about the operation of the EXB-8200, including the following:

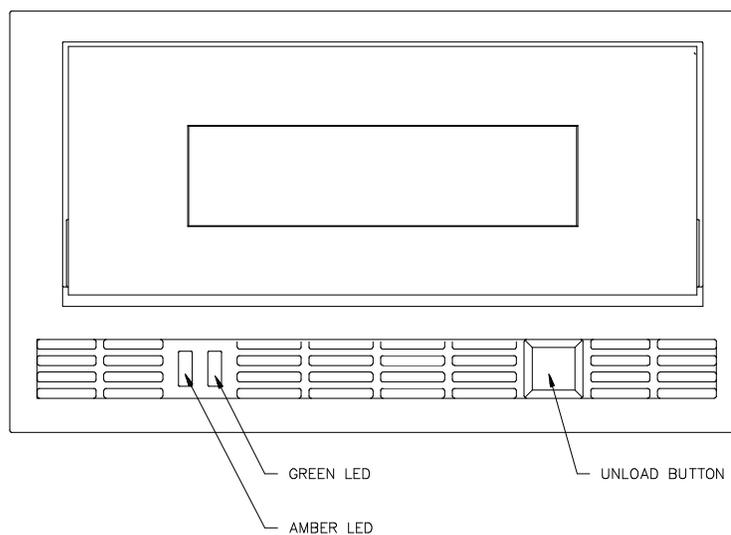
- Data cartridge load and unload procedure
- EXB-8200 initialization
- Status resulting from the first command following power-on reset
- Buffered operation
- Block size optimization
- First write at LBOT
- Gap bytes, blocks, and tracks
- Tape tension release and drum motion suspension
- Level 2 MX card DIP switch definitions
- Front panel LED indicator sequences
- Servo failures and push-button servo reset
- Using a data cartridge written on an EXB-8500 in an EXB-8200

### 23.1 Data Cartridge Load and Unload Procedure

#### Loading a Data Cartridge into the EXB-8200

To load a data cartridge into the EXB-8200, follow these steps:

1. Make sure that the write-protect switch on the data cartridge has been set correctly for the desired operation. (If the red switch is visible, the data cartridge is write-protected and cannot be written to or erased.)
2. If the EXB-8200's front door is closed, press the unload button to open the door. Figure 23-1 shows the location of the unload button.



**Figure 23-1** Unload Button on the EXB-8200's Front Panel

3. Insert the data cartridge, label side up, with the write-protect tab facing you.
4. Gently close the front door. The data cartridge is automatically loaded (unless the NAL bit has been set by the MODE SELECT command).

### **Unloading a Data Cartridge from the EXB-8200**

To unload a data cartridge from the EXB-8200, press the unload button located on the front panel 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 MEDIUM REMOVAL command has been issued by the host. In this situation, if you press the unload button, nothing happens. If you issue the UNLOAD command, the tape is rewound and unloaded but not ejected.
- Data remains in the EXB-8200 buffer from a previous write operation. If you press the unload button, nothing happens. In this situation, if you issue the UNLOAD command, the data is written to the tape and the tape is rewound, unloaded, and ejected.

## **23.2 EXB-8200 Initialization**

Following a power-on reset, SCSI bus Reset, or Bus Device Reset message, the EXB-8200 cannot respond to any SCSI bus signals for a minimum of 300 milliseconds. After this period, the EXB-8200 is set to a default mode, as defined by the MODE SELECT command and as set by the DIP switches on the Level 2 MX card. These DIP switch settings are described in Section 23.9. If the EXB-8200 is performing a power-on initialization, the on-board RAM buffer is tested if the RAM buffer test is enabled.

The EXB-8200 accepts commands during initialization, executing those not requiring the tape to be loaded and ready, and responding with Busy status to those that do.

**Note:** Information returned by the REQUEST SENSE or MODE SENSE command is not completely accurate during initialization. For

example, the TNP (Tape Not Present) bit of the REQUEST SENSE data is not valid for a minimum of five seconds from the start of initialization. The Number of Blocks count in the MODE SENSE data is not updated until the cartridge, if loaded, is rewound and sized.

### 23.3 Status Resulting from the First Command Following Power-On Reset

Following a power-on reset, the first SCSI command, other than REQUEST SENSE or INQUIRY, issued by an initiator results in a Check Condition status with the sense key set to Unit Attention (6h).

### 23.4 Buffered Operation

Buffered mode of operation is recommended for writing data to tape. Buffered mode allows more data to be written in a continuous, streaming operation. Fewer start/stop operations occur and fewer gap blocks and tracks are written. Upon the execution of a REWIND, LOAD, UNLOAD, or WRITE FILEMARKS command, any data in the EXB-8200 buffer that has not been written is transferred to tape.

### 23.5 Block Size Optimization

The optimum block size for data sent to the EXB-8200 is the physical block size (1,024 bytes) or multiples of the physical block size. A block size of 1,024 bytes results in a one-to-one ratio of data transferred from the initiator to data being stored on the tape. Data block sizes that do not have a one-to-one ratio cause a reduction in the capacity of the tape.

**Example:** If the initiator sets the logical block size to 1,536 bytes and writes data to fill a data cartridge, the capacity of the tape is reduced by approximately one-fourth. This is because the first block written to tape contains 1,024 bytes of data while the second contains 512 bytes of data and 512 gap bytes. Similarly, the third block contains 1,024 bytes of data while the fourth block contains 512 bytes of data and 512 gap bytes, and so forth. Thus, only three-fourths of the available physical block space on the tape is filled with actual data.

## 23.6 First Write at LBOT

When the data cartridge is loaded, the tape is positioned at LBOT. If the initiator issues a WRITE command while the tape is at LBOT and the EXB-8200 is operating in buffered mode, the following actions occur:

1. The EXB-8200 accepts data from the initiator and holds it in the buffer until the motion threshold value is reached or until it receives a WRITE FILEMARKS, REWIND, LOAD, or UNLOAD command.
2. The drum rotation is started and the tape is rewound to PBOT.
3. The tape is then positioned before LBOT. Depending on whether the tape has previously been written, one of the following occurs as LBOT is approached:
  - If the tape has never been written, an LBOT pattern is written on the tape at a specific location for adaptation of this write and subsequent operations.
  - If the tape has previously been written, the EXB-8200 erases the tape that is currently in the tape path. It erases the old LBOT pattern and writes a new LBOT pattern to ensure proper adaptation. The sequence guarantees blank tape for future write operations.
4. Data from the EXB-8200 buffer is written to the tape. The typical time from the issuance of the WRITE command at LBOT to the writing of data to tape is approximately 37 seconds.

## 23.7 Gap Bytes, Gap Blocks, and Gap Tracks

During a write operation, the EXB-8200 adds gap bytes, gap blocks, and gap tracks to the data written to tape, as explained below:

### Gap Bytes

The EXB-8200 writes data to tape in physical blocks consisting of 1,024 bytes each. When any physical block contains less than 1,024 bytes of data, the EXB-8200 adds gap bytes to the block to make it equal to 1,024 bytes as it writes it to tape. For example, if the logical block size for the data transferred from the initiator is 1,000 bytes, the EXB-8200 must add 24 gap bytes to each physical block.

### Gap Blocks

Each track of data written to tape consists of eight physical blocks of 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. Each gap block consists of 1,024 gap bytes.

## Gap Tracks

A single track of eight gap blocks is written following the last track of data at the completion of a write operation. When a subsequent WRITE or WRITE FILEMARKS command is issued, the tape is moved back nine tracks to achieve head synchronization, and data is appended starting after the gap track.

The space used by gap bytes, gap blocks, and gap tracks is not recoverable on subsequent write operations. The read operation skips all gap bytes, gap blocks, and gap tracks. No data is transferred to the initiator when they are encountered.

## 23.8 Tape Tension Release and Drum Motion Suspension

Tape tension is released whenever there has been no tape motion command for a period of 5 seconds when the tape is positioned at LBOT or for 15 seconds when it is positioned elsewhere. Drum rotation is stopped whenever there has been no tape motion command for a total of 75 seconds.

If the tape tension has been released, approximately 1.5 seconds are required before a tape motion command can be performed. If the tape tension has been released and the drum rotation has been stopped, approximately 5 seconds are required before a tape motion command can be performed.

If the drum fails to resume operation after a READ or WRITE command has been issued, Check Condition status is sent to the initiator. Sense data is created with the sense key set to Hardware Error (4h) and the SSE bit set to 1.

## 23.9 Level 2 MX Card DIP Switch Definitions

Table 23-1 contains the DIP switch definitions for the Level 2 MX card (part number 724022). These switches select the default options used by the software each time the EXB-8200 is powered on.

**Note:** The default setting for each switch is shown in **bold**.

**Table 23-1** Level 2 MX Card DIP Switch Settings

Switch	Off Position (0)	On Position (1)
1	<b>Run Memory Test on Power-On Reset</b> (65 Sec)	Bypass Memory Test on Power-On Reset (8 Sec)
2	<b>Parity Checking Disabled</b>	Parity Checking Enabled
3	<b>Odd or Even Byte Disconnect*</b>	Even Byte Disconnect
4	<b>Report Busy Status</b>	No Busy Enable
5	<b>Fixed Block Mode on Power Up</b>	Variable Block Mode on Power Up
6	<b>Normal Data Operations</b>	No Disconnect During Data Transfer
7	<b>Reserved for Future Use</b>	Reserved for Future Use
8	<b>P6 Cartridge Type (Domestic)</b>	PI Cartridge Type (International)

\* 4-byte boundary on even byte disconnect (see Section 8.4)

**Note:** For information about Level 1 MX card jumper settings, refer to the Appendix at the end of this manual.



include the Bus Device Reset message, SCSI bus reset, and power-off/power-on reset.

**Note:** When the PREVENT MEDIUM REMOVAL command is in effect and a servo error occurs, the tape is unloaded from the tape path but not ejected. The unload button cannot be used to reset the servo error. The ALLOW MEDIUM REMOVAL command must be issued to allow removal of the tape and enable the unload button.

### CAUTION

When loading a tape after resetting a servo error, use a scratch tape. Servo errors are caused by hardware errors in the drive. Loading a tape containing data immediately after a servo error reset may result in the loss of the data.

## 23.12 Using a Data Cartridge Written on an EXB-8500 in an EXB-8200

EXABYTE's EXB-8500 8mm Cartridge Tape Subsystem can write data in two formats: EXB-8500 format and EXB-8200 format. Tapes written in EXB-8500 format can be read only by an EXB-8500. Tapes written in EXB-8200 format can be read by an EXB-8500, EXB-8200, or EXB-8200SX.

When you insert a cartridge written in EXB-8500 format into an EXB-8200 and issue a READ, SPACE block, or SPACE filemark command, the EXB-8200 responds with Check Condition status. In response to a subsequent REQUEST SENSE command, the following information is provided:

- The sense key is set to Blank Check (8h)
- The EOM and LBOT bits are set
- The Additional Sense Code (ASC) is set to 30h and the Additional Sense Code Qualifier (ASCQ) is set to 02h (Cannot Read Medium–Incompatible Format)

A subsequent WRITE or WRITE FILEMARKS command can be used to overwrite the data on the tape.

Table 23-3 summarizes the EXB-8200's responses to blank tape, tape written in EXB-8200 format, and tape written in EXB-8500 format.

**Table 23-3** EXB-8200 Responses to Blank Tape, Tape Written in EXB-8200 Format, and Tape Written in EXB-8500 Format

When the tape loaded in the EXB-8200 is...	The EXB-8200 responds to these commands as follows...		
	READ	SPACE Block or SPACE Filemark	WRITE or WRITE FILEMARKS
<b>Blank</b>	Returns Check Condition. Responds to REQUEST SENSE with: <ul style="list-style-type: none"> <li>• EOM=1</li> <li>• LBOT=1</li> <li>• Sense Key=8h (Blank Check)</li> <li>• ASC=00h and ASCQ=00h (No Additional Sense Information)</li> </ul>	Returns Check Condition. Responds to REQUEST SENSE with: <ul style="list-style-type: none"> <li>• EOM=1</li> <li>• LBOT=1</li> <li>• Sense Key=8h (Blank Check)</li> <li>• ASC=00h and ASCQ=00h (No Additional Sense Information)</li> </ul>	Performs the operation as required
<b>Written in EXB-8200 format</b>	Performs the operation as required	Performs the operation as required	Performs the operation as required
<b>Written in EXB-8500 format</b>	Returns Check Condition. Responds to REQUEST SENSE with: <ul style="list-style-type: none"> <li>• EOM=1</li> <li>• LBOT=1</li> <li>• Sense Key=8h (Blank Check)</li> <li>• ASC=30h and ASCQ=02h (Cannot Read Medium—Incompatible format)</li> </ul>	Returns Check Condition. Responds to REQUEST SENSE with: <ul style="list-style-type: none"> <li>• EOM=1</li> <li>• LBOT=1</li> <li>• Sense Key=8h (Blank Check)</li> <li>• ASC=30h and ASCQ=02h (Cannot Read Medium—Incompatible format)</li> </ul>	Performs the operation as required

## 24 Tape Motion Command Execution Based on Tape Position

Tape motion commands are executed or rejected based upon the current tape position. The tape motion commands supported by the EXB-8200 are the following:

- ERASE
- LOAD/UNLOAD
- READ
- REWIND
- SPACE
- WRITE
- WRITE FILEMARKS

If the location of the write/read head is appropriate for the command, the command is executed. If the location of the write/read head is not appropriate for the command, the initiator is sent Check Condition status. The initiator must then issue appropriate commands to change the physical location of the write/read head to a position that allows the execution of the rejected command.

The following sections discuss the actions and statuses that result from various tape motion commands based on tape position. Where appropriate, figures depicting the tape positions are provided.

### 24.1 Commands Issued with the Tape Unloaded but Still in the EXB-8200

When the data cartridge has been inserted and the door closed with the autoloader feature disabled, or when the data cartridge has been unloaded with the Prevent Medium Removal feature enabled, subsequent tape motion commands will execute as follows:

#### **Valid Commands**

The valid tape motion commands are LOAD and UNLOAD. The LOAD command causes the tape to be loaded and positioned at LBOT. The UNLOAD command causes the tape to be loaded, positioned at LBOT, then unloaded again.

#### **Other Commands**

All other tape motion commands (READ, WRITE, REWIND, and so forth) result in a Check Condition status with the sense key set to Not Ready (2h).

## 24.2 Commands Issued after an Erase Operation

An erase operation automatically rewinds and positions the tape at LBOT. When the tape is at LBOT after an erase operation, subsequent tape motion commands will execute as follows:

### Valid Commands

The valid tape motion commands are ERASE, LOAD, UNLOAD, REWIND, WRITE, and WRITE FILEMARKS. The REWIND and LOAD commands immediately return Good status to the initiator without moving the tape.

### READ Command or Forward SPACE Block Command

The READ and forward SPACE block commands result in Check Condition status with the sense key set to Blank Check (8h) and the EOM and LBOT bits set to 1. For a variable read, the Information bytes indicate the number of bytes not found. For a fixed read or space block operation, the Information bytes indicate the number of blocks not found.

### Forward SPACE Filemark Command

The forward SPACE filemark command results in Check Condition status with the sense key set to Blank Check (8h) and the EOM and LBOT bits set to 1. The Information bytes indicate the number of filemarks not found.

### Backward SPACE Block or Backward SPACE Filemark Command

The backward SPACE block and backward SPACE filemark commands result in Check Condition status with the sense key set to No Sense (0h) and the EOM and LBOT bits set to 1. The Information bytes indicate the number of blocks or filemarks not found.

## 24.3 Commands Issued after a Load Operation

A load operation (with autoloading enabled) automatically positions the tape at LBOT. When the tape is at LBOT, subsequent tape motion commands will execute as follows:

### Valid Commands

The valid tape motion commands are ERASE, LOAD, UNLOAD, REWIND, WRITE, and WRITE FILEMARKS. If the tape contains data, the READ and SPACE commands are also valid. The REWIND and LOAD commands immediately return Good status to the initiator without moving the tape.

### READ Command or Forward SPACE Block Command

If the tape is blank, the READ and forward SPACE block commands result in Check Condition status with the sense key set to Blank Check (8h) and the LBOT and EOM bits set to 1. For a variable read, the Information bytes

indicate the number of bytes not found. For a fixed read or space block operation, the Information bytes indicate the number of blocks not found.

If the tape contains data, a READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before blank tape or the erase gap of the first filemark.

If the number of blocks to be processed by a READ or forward SPACE block command is greater than the number of blocks remaining before blank tape or the erase gap of the first filemark, the EXB-8200 processes all of the blocks up to the blank tape or erase gap. If it reaches blank tape, the EXB-8200 positions the write/read head at the end of data and returns Check Condition status with the sense key set to Blank Check (8h). If it reaches the erase gap of a filemark, the EXB-8200 positions the write/read head at the EOT side of the filemark and returns Check Condition status with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

#### **Forward SPACE Filemark Command**

If the tape is blank, the forward SPACE filemark command results in Check Condition status with the sense key set to Blank Check (8h) and the EOM and LBOT bits set to 1. The Information bytes indicate the number of filemarks not found.

If the tape contains data, a forward SPACE filemark command results in Good status if the number of filemarks to be processed by the command is less than or equal to the number of filemarks remaining before blank tape.

If the number of filemarks to be processed by the forward SPACE filemark command is greater than the number of filemarks remaining before blank tape, the EXB-8200 positions the write/read head at PEOT. Check Condition status is returned with the EOM bit and PEOT bit set to 1 and the sense key set to Medium Error (3h). The Information bytes indicate the number of filemarks not found.

#### **Backward SPACE Block or Backward SPACE Filemark Command**

The backward SPACE block and backward SPACE filemark commands result in Check Condition status with the sense key set to No Sense (0h) and the EOM and LBOT bits set to 1. The Information bytes indicate the number of blocks or filemarks not found.

## 24.4 Commands Issued after an Unload Operation

When the UNLOAD command is issued and the Prevent Medium Removal feature is not enabled, the tape is rewound to PBOT and unloaded from the tape path. The cartridge is then ejected from the drive. The status of the drive for all tape motion commands is Not Ready (2h).

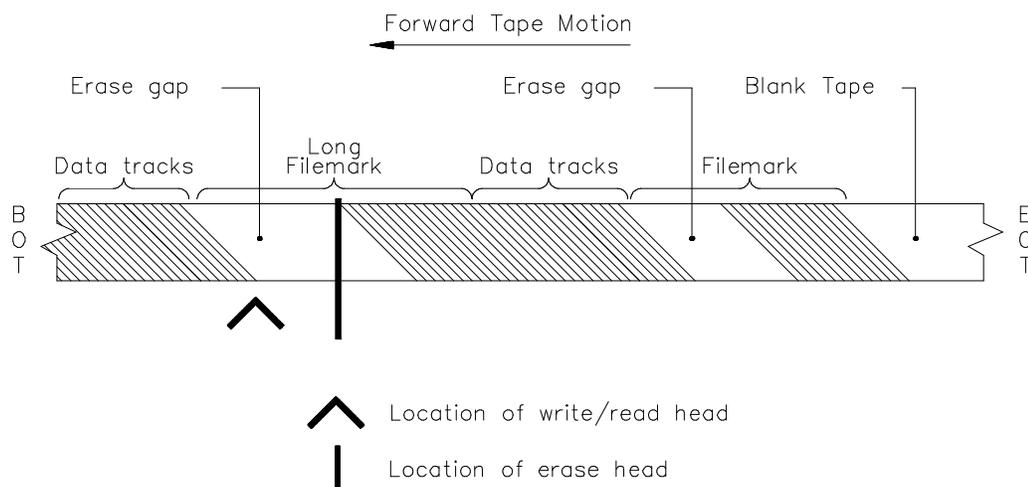
When the UNLOAD command is issued and the Prevent Medium Removal feature is enabled, the tape is rewound and unloaded, but the cartridge is not ejected. The valid tape motion commands are LOAD and UNLOAD. All other tape motion commands result in a Check Condition status with the sense key set to Not Ready (2h).

**Note:** After an unload operation has been completed, a minimum of three seconds is required before the EXB-8200 can load a tape. If an attempt is made to load a tape before three seconds has passed, the tape will load but a servo error may occur. If a servo error occurs, Check Condition status is returned to the initiator and sense data is created with the sense key set to Hardware Error (4h) and the SSE bit set to 1.

For EXB-8200s with 2600-level MX code and above, you can clear the servo error by pressing the unload button on the front panel. After clearing the servo error, try loading the tape again.

## 24.5 Commands Issued after a Read Operation

Figure 24-1 shows the location of the write/read head and the erase head following the completion (with Good status) of a read operation ending just before a long filemark.



**Figure 24-1** Physical Position after a Read Operation Ending Before a Long File-

Subsequent tape motion commands will execute as follows:

**READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command causes the write/read head to be positioned on the EOT side of the filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

**Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to 1 or 2 completes successfully. The write/read head is located on the EOT side of the filemark.

A forward SPACE filemark with the Count bytes set to a value greater than 2 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

**WRITE Command**

The WRITE command starts appending data following the last data track before the long filemark. The long filemark and subsequent data are erased during the write operation.

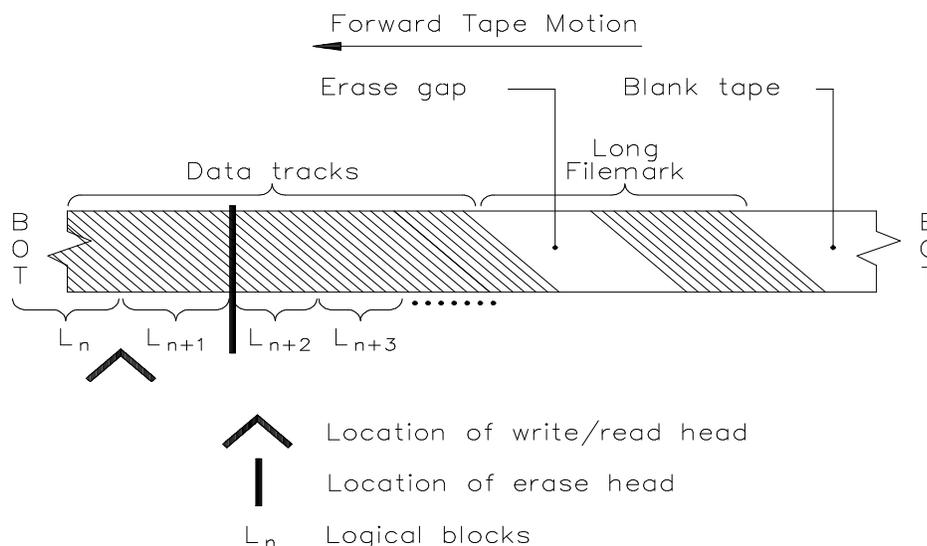
**WRITE FILEMARKS Command**

The WRITE FILEMARKS command writes a new filemark on the tape. The old filemark and subsequent data are erased as the new filemark is written.

**Other Commands**

All other commands operate normally.

Figure 24-2 shows the location of the write/read head and the erase head following the completion (with Good status) of a read operation ending within data.



**Figure 24-2** Physical Position after a Read Operation Ending in Data

Subsequent tape motion commands will execute as follows:

### **READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before the erase gap of the filemark.

If the number of blocks to be processed by the command is greater than the number of blocks remaining before the erase gap, the EXB-8200 processes all of the blocks up to the erase gap then positions the write/read head at the EOT side of the filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the EOT side of the filemark.

A forward SPACE filemark command with the Count bytes set to a value greater than 1 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

**WRITE Command or WRITE FILEMARKS Command**

The WRITE and WRITE FILEMARKS commands are illegal and result in a Check Condition status with the sense key set to Illegal Request (5h). No tape motion occurs.

**Other Commands**

All other commands operate normally.

## 24.6 Commands Issued after a Rewind Operation

The rewind operation positions the tape at LBOT. When the tape is at LBOT, subsequent tape motion commands will execute as follows:

**Valid Commands**

The valid tape motion commands are ERASE, LOAD, UNLOAD, REWIND, WRITE, and WRITE FILEMARKS. If the tape contains data, the READ and SPACE commands are also valid. The REWIND and LOAD commands immediately return Good status to the initiator without moving the tape.

**READ Command or Forward SPACE Block Command**

If the tape is blank, the READ and forward SPACE block commands result in Check Condition status with the sense key set to Blank Check (8h) and the LBOT and EOM bits set to 1. For a variable read, the Information bytes indicate the number of bytes not found. For a fixed read or space block operation, the Information bytes indicate the number of blocks not found.

If the tape contains data, a READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before blank tape or the erase gap of the first filemark.

If the number of blocks to be processed by a READ or forward SPACE block command is greater than the number of blocks remaining before blank tape or the erase gap of the first filemark, the EXB-8200 processes all of the blocks up to the blank tape or erase gap. If it reaches blank tape, the EXB-8200 positions the write/read head at the end of data and returns Check Condition status with the sense key set to Blank Check (8h). If it reaches the erase gap of a filemark, the EXB-8200 positions the write/read head at the EOT side of the filemark and returns Check Condition status with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

**Forward SPACE Filemark Command**

If the tape is blank, the forward SPACE filemark command results in Check Condition status with the sense key set to Blank Check (8h) and the EOM and

LBOT bits set to 1. The Information bytes indicate the number of filemarks not found.

If the tape contains data, a forward SPACE filemark command results in Good status if the number of filemarks to be processed by the command is less than or equal to the number of filemarks remaining before blank tape.

If the number of filemarks to be processed by the forward SPACE filemark command is greater than the number of filemarks remaining before blank tape, the EXB-8200 positions the write/read head at PEOT. Check Condition status is returned with the EOM bit and PEOT bit set to 1 and the sense key set to Medium Error (3h). The Information bytes indicate the number of filemarks not found.

### Backward SPACE Block or Backward SPACE Filemark Command

The backward SPACE block and backward SPACE filemark commands result in Check Condition status with the sense key set to No Sense (0h) and the EOM and LBOT bits set to 1. The Information bytes indicate the number of blocks or filemarks not found.

## 24.7 Commands Issued after a Forward Space Block Operation

Figure 24-3 shows the location of the write/read head and the erase head following the completion (with Good status) of a forward space block operation.

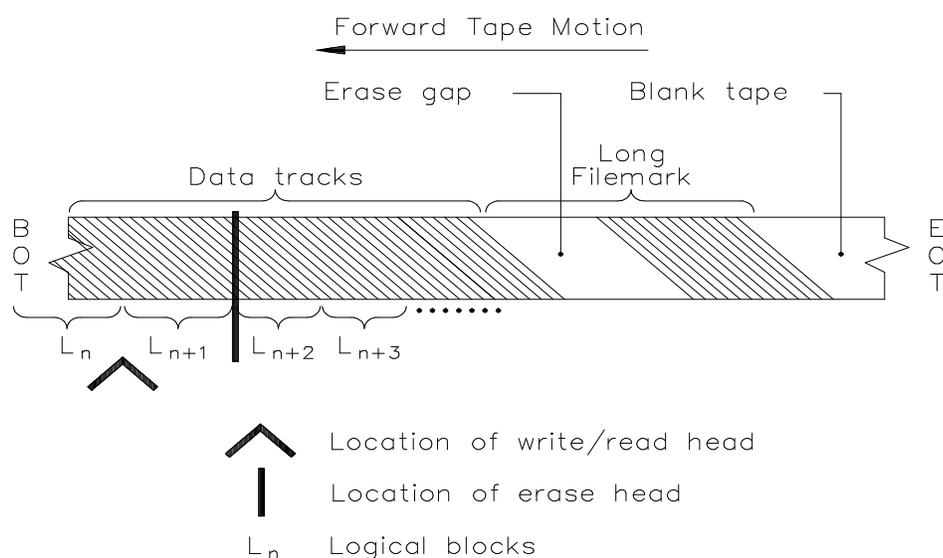


Figure 24-3 Physical Position after a Forward Space Block Operation

Subsequent tape motion commands will execute as follows:

### **READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before the erase gap of the filemark.

If the number of blocks to be processed by the command is greater than the number of blocks remaining before the erase gap, the EXB-8200 processes all of the blocks up to the erase gap then positions the write/read head at the EOT side of the filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the EOT side of the filemark.

A forward SPACE filemark command with the Count bytes set to a value greater than 1 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

### **WRITE or WRITE FILEMARKS Command**

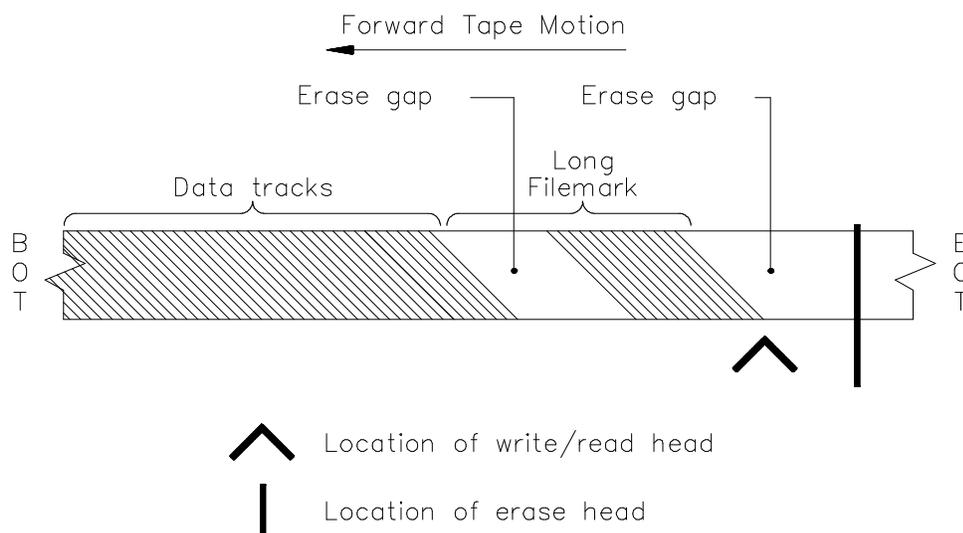
The WRITE and WRITE FILEMARKS commands are illegal and result in a Check Condition status with the sense key set to Illegal Request (5h). No tape motion occurs.

### **Other Commands**

All other commands operate normally.

## 24.8 Commands Issued after a Forward Space Filemark Operation

Figure 24-4 shows the location of the write/read head and the erase head following the completion (with Good status) of a forward space filemark operation that ends at the end of data.



**Figure 24-4** Physical Position after a Forward Space Filemark Operation Ending at the End of Data

Subsequent tape motion commands will execute as follows:

### **READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in a Check Condition status with the sense key set to Blank Check (8h). The Information bytes indicate the number of blocks not found.

### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to a value of 1 or greater causes the write/read head to be positioned at PEOT. Check Condition status is returned with the EOM bit and PEOT bit set to 1 and the sense key set to Medium Error (3h). The Information bytes indicate the number of filemarks not found.

### **Backward SPACE Filemark Command**

A backward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the BOT side of the filemark.

A backward SPACE filemark command with the Count bytes set to a value greater than 1 completes successfully if there are previously written filemarks on the tape and the Count bytes value is less than or equal to the number of filemarks preceding this position.

If the Count bytes value is greater than the number of previously written filemarks, the backward SPACE filemark command causes the write/read head to be positioned at LBOT. Check Condition status is returned with the sense key set to No Sense (0h), the EOM bit set to 1, and the LBOT bit set to 1. The Information bytes indicate the number of filemarks not found.

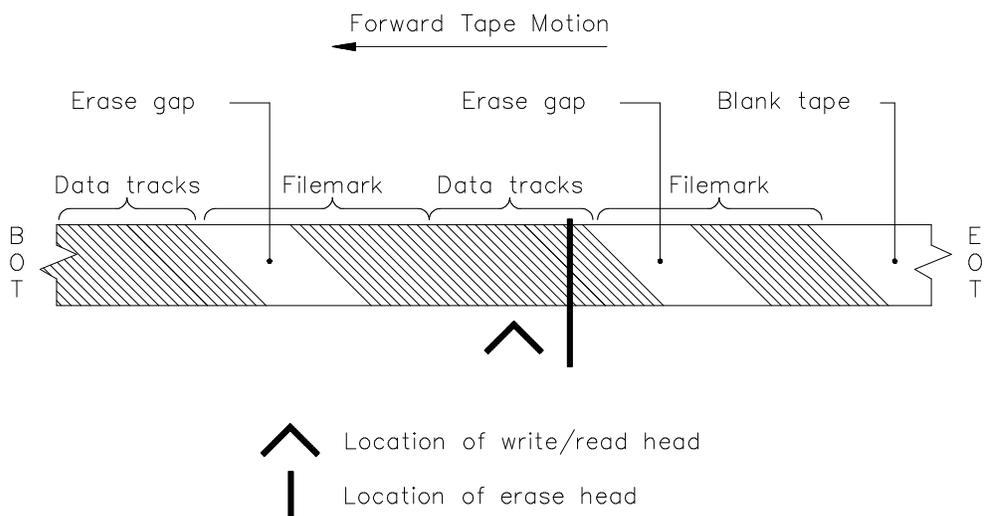
### WRITE Command

The WRITE command starts appending data following the last track of the filemark.

### Other Commands

All other commands operate normally.

Figure 24-5 shows the location of the write/read head and the erase head following the completion (with Good status) of a forward space filemark operation ending before additional data.



**Figure 24-5** Physical Position after a Forward Space Filemark Operation Ending before Additional Data

Subsequent tape motion commands will execute as follows:

### READ Command or Forward SPACE Block Command

A READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before the erase gap of the next filemark.

If the number of blocks to be processed by the command is greater than the number of blocks remaining before the erase gap, the EXB-8200 processes all of the blocks up to the erase gap then positions the write/read head at the EOT side of the filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned on the EOT side of the second filemark shown in the figure. The Information bytes indicate the number of filemarks not found.

A forward SPACE filemark command with the Count bytes set to a value greater than 1 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the EOM bit and PEOT bit set to 1 and the sense key set to Medium Error (3h).

### **Backward SPACE Filemark Command**

A backward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the BOT side of the first filemark shown in the figure.

A backward SPACE filemark command with the Count bytes set to a value greater than 1 completes successfully if there are previously written filemarks on the tape and the Count bytes value is less than or equal to the number of filemarks preceding this position on the tape.

If the Count bytes value is greater than the number of previously written filemarks, this command causes the write/read head to be positioned at LBOT. Check Condition status is returned with the sense key set to No Sense (0h), the EOM bit set to 1, and the LBOT bit set to 1. The Information bytes indicate the number of filemarks not found.

### **WRITE Command or WRITE FILEMARKS Command**

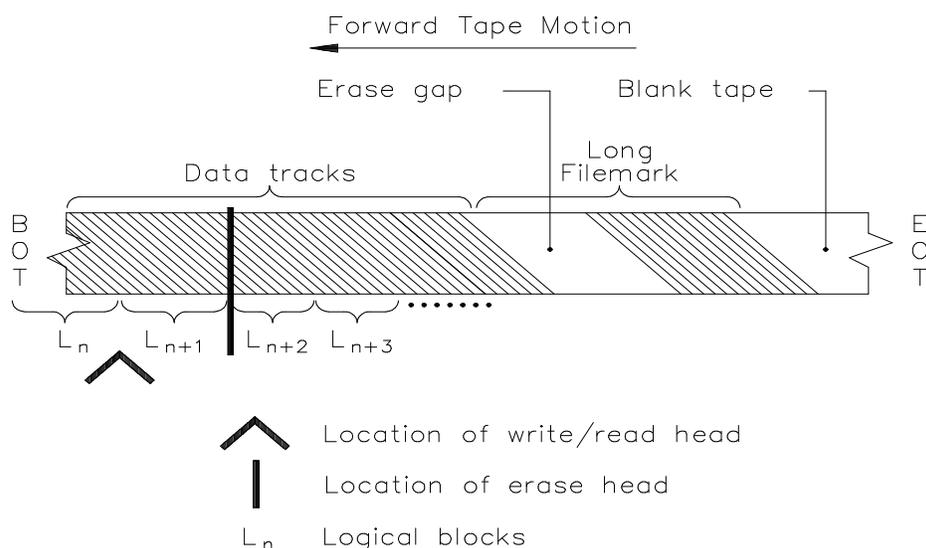
The WRITE and WRITE FILEMARKS commands are illegal and result in a Check Condition status with the sense key set to Illegal Request (5h). No tape motion occurs.

### **Other Commands**

All other commands operate normally.

## 24.9 Commands Issued after a Backward Space Block Operation

Figure 24-6 shows the location of the write/read head and the erase head following the completion (with Good status) of a backward space block operation.



**Figure 24-6** Physical Position after a Backward Space Block Operation

Subsequent tape motion commands will execute as follows:

### **READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in Good status if the number of blocks to be processed by the command is less than or equal to the number of blocks remaining before the erase gap of the filemark.

If the number of blocks to be processed by the command is greater than the number of blocks remaining before the erase gap, the EXB-8200 processes all of the blocks up to the erase gap then positions the write/read head at the EOT side of the filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the EOT side of the filemark.

A forward SPACE filemark command with the Count bytes set to a value greater than 1 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

### WRITE Command or WRITE FILEMARKS Command

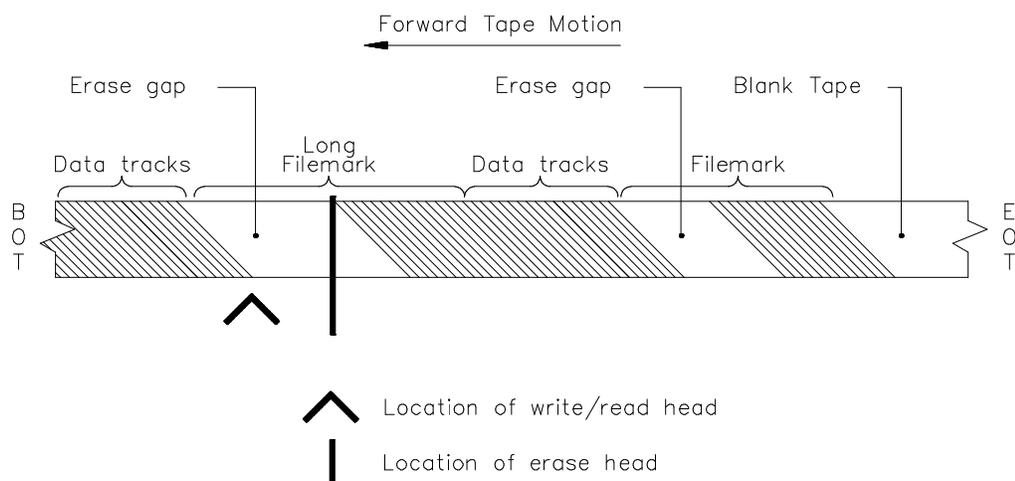
The WRITE and WRITE FILEMARKS commands are illegal and result in a Check Condition status with the sense key set to Illegal Request (5h). No tape motion occurs.

### Other Commands

All other commands operate normally.

## 24.10 Commands Issued after a Backward Space Filemark Operation

Figure 24-7 shows the location of the write/read head and erase head following the completion (with Good status) of a backward space filemark operation.



**Figure 24-7** Physical Position after a Backward Space Filemark Operation

Subsequent tape motion commands will execute as follows:

### READ Command or Forward SPACE Block Command

A READ or forward SPACE block command causes the write/read head to be positioned at the EOT side of the long filemark. Check Condition status is returned with the FMK bit set to 1 and the sense key set to No Sense (0h). The Information bytes indicate the number of blocks not found.

### Forward SPACE Filemark Command

A forward SPACE filemark command with the Count bytes set to 1 or 2 completes successfully. The write/read head is positioned at the EOT side of the filemark.

A forward SPACE filemark command with the Count bytes set to a value greater than 2 causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

### WRITE Command

The WRITE command starts appending data following the last data track before the long filemark. The long filemark and subsequent data are erased during the write operation.

### WRITE FILEMARKS Command

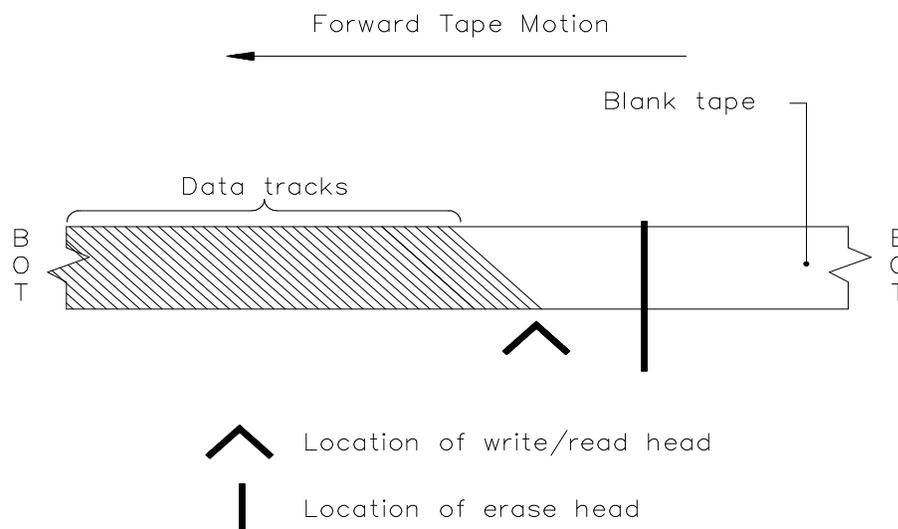
The WRITE FILEMARKS command writes a new filemark on the tape. The old filemark and subsequent data are erased as the new filemark is written.

### Other Commands

All other commands operate normally.

## 24.11 Commands Issued after a Write Operation

Figure 24-8 shows the location of the write/read head and the erase head following the completion (with Good status) of a write operation.



**Figure 24-8** Physical Position after a Write Operation

Subsequent tape motion commands will execute as follows:

#### **READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in a Check Condition status with the sense key set to Illegal Request (5h). The Information bytes indicate the number of blocks not found.

#### **Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to a value of 1 or greater causes the write/read head to be positioned at PEOT. Check Condition status is returned with the sense key set to Medium Error (3h) and the EOM bit and PEOT bit set to 1. The Information bytes indicate the number of filemarks not found.

#### **WRITE Command**

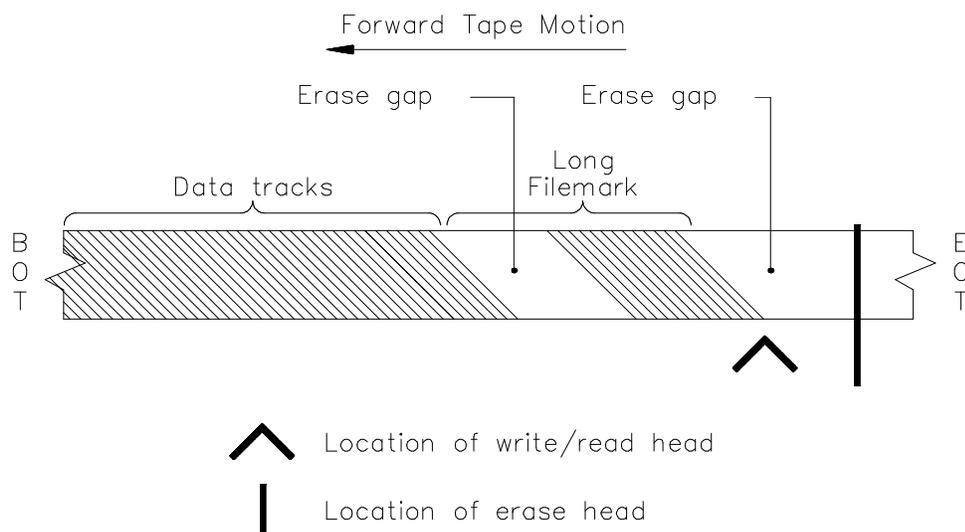
The WRITE command starts appending data following the last data track.

#### **Other Commands**

All other commands operate normally.

## 24.12 Commands Issued after a Write Filemarks Operation

Figure 24-9 shows the location of the write/read head and the erase head following the completion (with Good status) of a write filemarks operation.



**Figure 24-9** Physical Position after a Write Filemarks Operation

Subsequent tape motion commands will execute as follows:

**READ Command or Forward SPACE Block Command**

A READ or forward SPACE block command results in a Check Condition status with the sense key set to Illegal Request (5h). The Information bytes indicate the number of blocks not found.

**Forward SPACE Filemark Command**

A forward SPACE filemark command with the Count bytes set to a value of 1 or greater causes the write/read head to be positioned at PEOT. Check Condition status is returned with the EOM bit and PEOT bit set to 1 and the sense key set to Medium Error (3h). The Information bytes indicate the number of filemarks not found.

**Backward SPACE Filemark Command**

A backward SPACE filemark command with the Count bytes set to 1 completes successfully. The write/read head is positioned at the BOT side of the filemark.

A backward SPACE filemark command with the Count bytes set to a value greater than 1 completes successfully if there are previously written filemarks on the tape and the Count bytes value is less than or equal to the number of filemarks preceding this position.

If the Count bytes value is greater than the number of previously written filemarks, this command causes the write/read head to be positioned at LBOT. Check Condition status is returned with the sense key set to No Sense (0h), the EOM bit set to 1, and the LBOT bit set to 1. The Information bytes indicate the number of filemarks not found.

**WRITE Command**

The WRITE command starts appending data following the last track of the filemark.

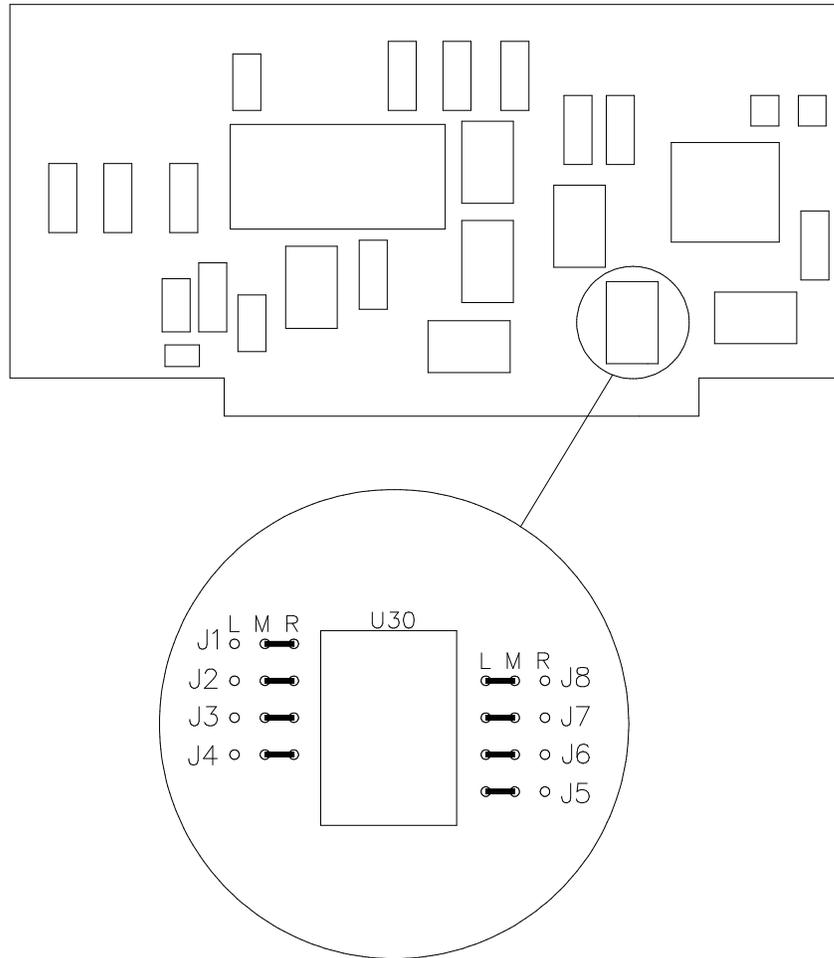
**Other Commands**

All other commands operate normally.

## Appendix Level 1 MX Card Jumper Settings

If your EXB-8200 contains a Level 1 MX card (part number 724021), use the information in this appendix to set the defaults used during power up.

Figure A-1 shows the location of the jumpers on the Level 1 MX card. The settings shown at the bottom of the figure are the power-up defaults.



**Figure A-1** Jumper Locations on the Level 1 MX Card

Table A-1 lists the jumper definitions for the Level 1 MX card. The factory default setting for each jumper is shown in **bold**.

**Table A-1** Level 1 MX Card Jumper Settings

Jumper	Jumper Connections					
	L	M	R	L	M	R
						
J1	Bypass memory test on power-on reset (8 sec)			<b>Run memory test on power-on reset (65 sec)</b>		
J2	Parity checking enabled			<b>Parity checking disabled</b>		
J3	Even byte disconnect			<b>Odd or even byte disconnect</b>		
J4	No busy enable			<b>Report busy status</b>		
J5	<b>P6 cartridge type (domestic)</b>			PI cartridge type (international)		
J6	<b>Reserved for future use</b>			Reserved for future use		
J7	<b>Normal data operations</b>			No disconnect during data transfer		
J8	<b>Fixed block mode on power up</b>			Variable block mode on power up		

## Glossary

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

ACK	Signal sent by the initiator to a target to indicate acknowledgement for a REQ/ACK data transfer handshake.
ATN	Attention signal on the bus asserted by the initiator to indicate that the initiator has a message to transmit to the target.
block	The amount of data to be transferred. The EXB-8200 can accommodate block sizes from one byte to 240 KBytes.
BSY	Abbreviation for a control line on the SCSI bus to indicate that the bus is busy.
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 or one character.
CDB	Command descriptor block.
command status	Information sent from the target to the initiator upon completion of one command.
connect	The establishment of communications between the initiator and the selected target.
disconnect	The termination of communications between the initiator and the target when the target releases control of the SCSI bus, allowing the bus to become free.
EOD	End of data.

EOM	End of medium.
EOT	End of tape.
GBytes	Gigabytes.
h	Hexadecimal (base 16) numbering system. Numbers followed by a lowercase “h” are hexadecimal values. All other numbers are decimal values.
host	The computer system that acts as the initiator of an operation.
ID (SCSI)	The bit-significant representation of the SCSI address referring to one of the signal lines (0-7).
initiator	Usually a host system that requests an operation to be performed by the target.
KBytes	Kilobytes.
LBOT	Logical beginning of tape. The LBOT is the 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 before PEOT where an EOM warning is issued to the initiator during write or write filemark operations.
LSB	Least significant bit.
LUN	Logical unit number.
mA	Milliamp.
Mbits	Megabits.
MBytes	Megabytes.

ms	Millisecond.
μs	Microsecond.
MSB	Most significant bit.
ns	Nanosecond.
PBOT	Physical beginning of tape. The PBOT is the point at which the tape is attached to the translucent leader.
PEOT	Physical end of tape. The PEOT is the point at which the tape is attached to the translucent trailer.
POST	Power-on self-test.
reconnect	Function that occurs when the target arbitrates and reconnects to an initiator after a disconnect.
REQ	Signal sent by a target to the host requesting a REQ/ACK data transfer handshake.
Reserved, Rsvd	Elements set aside for future standardization.
SCSI	Small Computer System Interface.
SEL	Select bus condition.
signal assertion	Driving a signal to the true state.
signal de-assertion	Driving a signal to the false state or biasing the signal by the cable terminators to the false state.
signal release	When a signal is not driven by a bus but is biased by the cable terminators to the false state.
status	Information sent from the target to the initiator upon completion of a command.
target	A bus device (usually a peripheral device) that performs an operation requested by an initiator. The EXB-8200 is a target.

VDC	Volts DC.
Vendor Unique (VU)	Bits, bytes, or fields of a command that can be implemented for specific functions at the request of a vendor. Vendor unique bits, bytes, and fields are not defined by the SCSI standard.