IBM

20/40 GB, 8 mm Internal Tape Drive

User's Guide

OPTIONS
by IBM

Contents

About This Book

This manual contains information on the 20/40 GB, 8 mm Internal
Tape Drive. The manual is divided into the following parts:

Part 1: Abbreviated installation instructions and usage information in
the following languages:

English	German
French	Spanish
Italian	Brazilian Portuguese
Japanese	

Part 2: Product information, installation and usage information

Part 3: Safety, tape drive operational messages, specifications,
technical support procedures, warranty, and trademarks
information

Note: The illustrations in this manual might be slightly different
from your hardware.

Part 1: Quick Installation Guide

The 20/40 GB, 8 mm Internal Tape Drive is a SCSI-2 Fast Wide tape drive for backing up and restoring data. In addition to the User's Guide and Warranty Registration Card, the option package contains:

- 20/40 GB, 8 mm Internal Tape Drive
- One data cartridge
- One cleaning cartridge
- Four M3 x 0.5 x 6 mm mounting screws

Installing the Drive

The following section is an overview of the option installation instructions. For more detailed information and a list of tested server backup and restore software, go to "Part 2: User's Guide" on page 2-1.

> ⚠ **Caution:** Read the Safety Information in the Appendix, page 3-1, before installing this product.

1. Select a SCSI ID for the tape drive in the range of 0 to 15. The SCSI ID must be one that is supported by your SCSI host adapter. The tape drive is shipped with the SCSI ID preset to 5. Do not assign an ID of 7 since this is normally used for the SCSI host adapter.

2. Turn off all attached devices. Turn off the computer. Unplug the power cords for the computer and all attached devices; then open the computer.

3. Before opening the static-protective bag containing the tape drive, touch the bag to an unpainted metal surface on the computer for at least two seconds. Remove the drive from the static-protective bag. If you must put the drive down, place the drive on the static-protective bag.

   To install the drive, refer to the drive backpanel illustration.
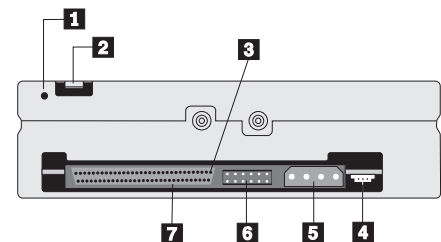
1 Grounding hole
2 Grounding tab
3 Pin 1 of the SCSI connector
4 Service port (reserved for service)
5 Power connector
6 SCSI ID jumper block
7 SCSI connector

4. Use the SCSI jumper block **6** to set your SCSI ID. The following illustration shows how to set the jumper block for each ID.

0	1	2	3
4	5	6	7
8	9	10	11
12	13	14	15
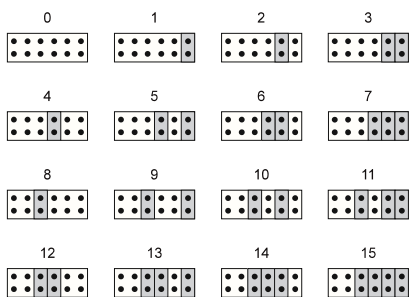
5. Mount the drive in either a horizontal or vertical position. The drive has three sets of mounting holes to allow for a number of mounting positions. There are four holes in each set. Use only one set of mounting holes.

6. To protect the tape drive from electrostatic discharge, you must attach the drive to the metal chassis of the computer. If the drive does not contact the metal chassis of the computer when mounted, use one of the following methods to connect a chassis ground wire to a: M3 x 0.5 x 6 mm self-tapping screw to the grounding hole **1** on the backpanel, or ¼-inch female spade connector to the grounding tab **2** on the backpanel.

7. Locate an available SCSI connector at the opposite end of the bus cable from the SCSI host adapter. Use all empty bus connectors at the end farthest from the adapter first to ensure better signal quality. Connect the SCSI and power cables to the tape drive connectors **7** and **5** . Ensure that pin 1 of the SCSI cable (usually color coded) aligns with pin 1 **3** of the SCSI connector.

8. If the tape drive is the last device on the SCSI chain, the chain must be terminated at the drive. To terminate the SCSI chain, attach a fast/wide, in-line, active terminator plug to the SCSI connector **7** , then connect the SCSI cable to the terminator plug. (Optionally, put a hard disk drive at the end of the SCSI chain to terminate the chain.)

9. Replace the computer cover and secure it in place. Reconnect the power cords and cables. Turn on all attached devices; then turn on the computer. Ensure that the appropriate Advanced SCSI Programming Interface (ASPI) drivers are installed to support the tape drive. Drivers should be provided with the SCSI host adapter.

10. Press the **power switch** on the tape drive to the on position. The tape drive then performs a power-on self-test within 30 seconds and performs a drive reset. It is important to not insert a cartridge into the tape drive during the power-on self-test. The tape drive will eject the data cartridge.

    To change the language the LCD displays messages:

    a. Press and hold the **unload button** on the right side of the frontpanel after the RESET message appears on the LCD. The LCD cycles through the available languages.
    b. When the desired language displays, release the button.

11. Install your backup and restore tape software. Follow the installation and operating instructions included with your software to begin using the tape drive.

Using the Drive

The following section is an overview of the usage instructions. For more detailed information, go to "Using the Drive" on page 2-8. The indicator lights on the left side of the drive frontpanel are:

- Top light (amber): When this light is flashing, an error has occurred. When this light is on, the tape drive needs cleaning.
- Middle light (green): When this light is on, the tape cartridge is loaded and the tape drive is operational.
- Bottom light (green): When this light is flashing, the tape is in motion.

When the indicator lights are off, the tape drive is ready to accept a cartridge. Do not insert a data cartridge if the tape drive is still performing its power-on self-test.

The liquid crystal display (LCD) shows information about the operational status of the tape drive. Refer to Appendix B, "LCD Messages" on page 3-6 for the LCD messages.

For writing data, use only advanced metal evaporated (AME) data cartridges. Any of the following 170 m AME data cartridges are acceptable and require no formatting or other media conditioning before use: IBM 59H2679, Sony QGD-170ME, or Exabyte EXATAPE AME.

On the back of the data cartridge, set the switch to the right for write-protect, or to the left for write-enable. Insert the data cartridge. When the middle indicator lights, the tape drive is ready for read and write operations. To unload a cartridge, press the **unload button**.

To reset the tape drive, press and hold the **unload button** for at least 10 seconds, or turn the drive off and back on again. The reset rewinds the tape and clears the buffer of previous tape drive commands and data.

When the top (amber) indicator lights the tape drive requires cleaning. Clean the drive as soon as possible after the indicator light turns on. To clean the tape drive, insert a cleaning cartridge (IBM 59H2898 or Exabyte Mammoth 8 mm Cleaning Cartridge).

Product Description

The 20/40 GB[1], 8 mm Internal Tape Drive is a Fast Wide SCSI-2 tape drive for backing up and restoring data and file archiving. Tape cartridges can each store 20 GB of data. If you use data compression, you might store up to 40 GB on a cartridge at a transfer rate of up to 20 GB an hour depending on the data content. The tape drive is a high capacity tape drive for handling multimedia, imaging, transaction processing, large databases, and other storage-intensive applications.

In addition to the User's Guide and Warranty Registration Card, the option package contains:

- 20/40 GB, 8 mm Internal Tape Drive
- One data cartridge
- One cleaning cartridge
- Four M3 x 0.5 x 6 mm mounting screws

Before You Begin

To install this drive, you must have the following:

- Single-ended SCSI host adapter meeting the SCSI-2 Fast Wide standards.

- Documentation for your computer, SCSI bus adapter, or external enclosure

- Fast/Wide (16-bit) SCSI active, in-line SCSI terminator plug (IBM 92F0322) if the drive ends the SCSI chain (Optionally, put a hard disk drive at the end of the SCSI chain to terminate the chain. Disk drives typically have a switchable active termination built in.)

- Screw driver for the mounting screws

- Flat-nose pliers to remove and set jumpers (optional)

- If using a remote switch on a storage enclosure to set SCSI ID, AMP 1-111623-7-7 cable to make the connection to the SCSI jumper block

- AMP 382575-2 for replacement SCSI ID jumpers

---

[1] *GB equals approximately 1 000 000 000 bytes.*

© Copyright IBM Corp. 1996

Backup and Restore Server Software

The tape drive has been tested with the following server backup and restore software:

Software for Windows NT
Cheyenne ARCserve v 6.0 for Windows NT
Legato Networker v 4.2.1 for Windows NT
Seagate Backup Exec v 6.0 Rev 90 for Windows NT
Seagate Backup Director v 4.00 for Windows NT
Seagate Storage Manager v 4.00 for Windows NT
Microsoft NT 3.51[2] (native)

Software for NetWare
Cheyenne ARCserve v 6.0 for NetWare
Legato Networker v 4.0 for NetWare
Seagate Backup Exec v 7.01b for NetWare
Seagate Backup Director v 4.11 for NetWare
Seagate Storage Manager v 4.11 for NetWare
Novell NetWare v 3.12[3] (SBACKUP)
Novell NetWare v 4.10 (SBACKUP)

Software for OS/2
IBM ADSM/2 for OS/2

Software for SCO
Legato Networker for SCO

---

[2] *For Microsoft NT 3.51 (native), the NTBackup device driver is available from Exabyte homepage.*

[3] *For Novell NetWare v 3.12 and v 4.10, the device driver is available from Exabyte homepage.*

Installing the Drive

Follow these steps to install the tape drive.

Step 1. Selecting a SCSI ID

Each device on a SCSI bus must have its own SCSI ID. You can select a SCSI ID for the tape drive in the range of 0 to 15. The SCSI ID must be one that is supported by your SCSI host adapter. Refer to your SCSI host adapter documentation for the range of and the relative priority of the IDs supported. The tape drive is shipped with the SCSI ID preset to 5.

Follow these guidelines to select a SCSI ID:

- Assign the tape drive to the lowest priority ID available.
- Assign the higher ID priority numbers to those devices that are most often used or are faster than other devices in the chain.
- Do not assign an ID of 7 since this is normally the highest priority ID and it is used for the SCSI host adapter.
- If installing in a RAID storage enclosure, the lowest SCSI IDs might be reserved for hard disk drives. Assign the tape drive to the lowest priority SCSI ID available.

Depending on your computer, there are several ways to view your current SCSI ID setting:

- For most IBM computers, press F1 during the startup, after the memory check completes,
- Use SCSI adapter utility programs
- Inspect the installed SCSI devices to see how the IDs are set.

For more information, refer to the documentation that comes with your computer or SCSI bus adapter.

Step 2. Preparing for Installation

Refer to the drive backpanel illustration during installation.
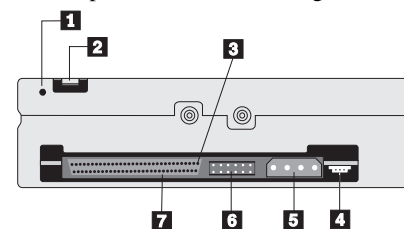
The tape drive components are:

    1 Grounding hole
    2 Grounding tab
    3 Pin 1 of the SCSI connector
    4 Service port (reserved for service)
    5 Power connector
    6 SCSI ID jumper block
    7 SCSI connector

To prepare for installation:

1. Turn off all attached devices. Turn off the computer. Unplug the power cords for the computer and all attached devices; then open the computer. For specific information on opening your computer refer to the documentation that comes with your computer.

Attention: Tape drives are sensitive to static electricity discharge. The drives are wrapped in a static-protective bag to prevent damage.

2. Before opening the static-protective bag containing the tape drive, touch the bag to an unpainted metal surface on the computer for at least two seconds. Remove the drive from the static-protective bag. If you must put the drive down, place the drive on the static-protective bag.

Step 3. Setting the SCSI ID

Use the SCSI jumper block **6** to set your SCSI ID. Remove and position jumpers to obtain the ID. If necessary, use a pair of flat-nose pliers to remove the jumpers. The following illustration shows how to set the jumper block for each ID.

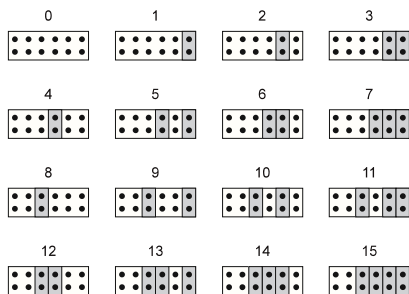To use a remote switch or dial on an external storage enclosure to set the SCSI ID, connect the remote cable to the SCSI ID jumper block **6** .

Step 4. Mounting the Drive

Mount the tape drive and then firmly attach the signal and power cables to it. If there is insufficient working space to attach the connectors after mounting the drive, attach the cables first. To mount the drive:

1. Locate an available bay or space in your computer to mount the tape drive. The drive can be mounted in either a horizontal or vertical position. Remove the cover plate from the bay selected.

2. The drive housing has three sets of four mounting holes to provide a number of mounting positions. Use one of the three sets of mounting holes that provides the best fit and mounts the drives securely. The illustration only shows the pairs of hole on one side of the drive:
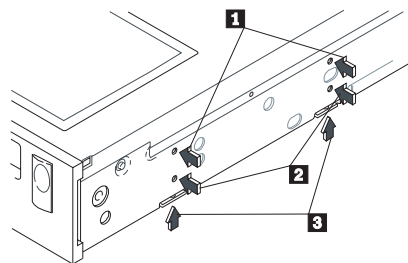
3. Align the drive-bay screw holes with the threaded holes in the drive housing. When mounting the tape drive, follow these guidelines:

   • Use only one set of mounting holes.

- Use all four holes in whichever set you choose; do not use combinations of mounting holes from different sets.
- Ensure that no objects such as screw heads, cables, or adjacent devices are pressing against the frame.
- Ensure no obstruction blocks the ventilation slots on the bottom and at the rear of the tape drive.

4. Connect the SCSI and power cables to the tape drive connectors (refer to **7** and **5** on page 2-3) on the backpanel.

5. To protect the tape drive from electrostatic discharge, you must attach the drive to the metal chassis of the computer. After mounting the tape drive, if the drive does not contact the metal chassis of the computer, use one of the following methods to connect a chassis ground wire to a:

- M3 x 0.5 x 6 mm self-tapping screw to the grounding hole (see **1** on page 2-3) on the backpanel.
- ¼-inch female spade connector to the grounding tab (see **2** on page 2-3) on the backpanel.

Step 5. Connecting Cables and Terminating the Chain

To attach the SCSI and power cables to the tape drive:

1. Locate the SCSI bus cable (usually a 68-pin ribbon cable). One end of the cable connects to the SCSI host adapter that can be on the computer system board or an adapter installed in an expansion slot. The other end can have several connectors for attaching devices.

2. Locate an available SCSI connector at the opposite end of the bus cable from the SCSI host adapter. Use all empty bus connectors at the end farthest from the adapter first to ensure better signal quality. Attach the SCSI bus cable to the tape drive. Ensure that pin 1 of the SCSI cable (usually color coded) aligns with pin 1 (refer to **3** on page 2-3) of the SCSI connector.

3. The following example shows a bus cable with two devices on it. The last device **1** on a bus cable must terminate the device chain.
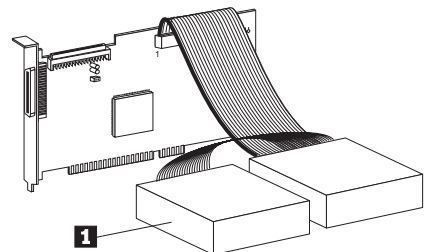
If the tape drive is the last device on the SCSI chain, the chain must be terminated at the drive using a fast/wide, in-line, active SCSI terminator plug.

To terminate the SCSI chain:

  a. Connect the terminator plug to the SCSI connector.
  b. Connect the SCSI interface cable to the terminator plug.

(Optionally, put a hard disk drive at the end of the SCSI chain to terminate the chain. Disk drives typically have a switchable active termination built in.)

If you install the device in an external storage enclosure and the device is at the end of the SCSI chain, refer to your enclosure documentation on termination. The enclosure might have a terminator on a connector outside the enclosure.

Attention: Do not force the power cable into the tape drive power connector. If the power cable is upside down and you force the connection, you might damage the drive.

---

4. Connect the power cable connector to the four-pin connector on the tape drive. If all the power cables are in use, purchase a dc Y-connector at your computer dealer.

Step 6. Completing the Installation

Check your work before closing the computer.

1. Be sure that the power and interface connectors are securely attached. Be sure that the cables are neatly routed.

2. Replace the computer cover and secure it in place. Reconnect the power cords and cables.

   If your computer has Micro Channel architecture, you might have to update the computer configuration information when adding or removing a device.

3. Turn on all attached devices; then turn on the computer.

   Ensure that the appropriate Advanced SCSI Programming Interface (ASPI) drivers are installed to support the tape drive. Drivers should be provided with the SCSI host adapter.

Step 7. Updating the Configuration

For most computers, the power-on self-test (POST) and the configuration-setup utility program automatically recognize the new tape drive. However, you might have to answer questions about your system changes when you restart (boot) your computer.

If your host computer does not recognize the tape drive after startup or you receive startup errors, run the configuration-setup utility program as described in the documentation that comes with your computer. For additional information see page 2-3.

Step 8. Setting Up the Device

Press the **power switch** to the on position. The tape drive then performs a power-on self-test within 30 seconds and performs a drive reset. It is important to not insert a cartridge into the tape drive during the power-on self-test. The tape drive will eject the data cartridge.

To change the language the LCD displays messages:

1. Press and hold the **unload button** after the Reset message appears on the LCD. The LCD cycles through the available languages:
   - English
   - German
   - French
   - Spanish
   - Italian
   - Portuguese
2. When the desired language displays, release the button.

During the reset sequence, the tape drive rewinds the tape in the unit and restores the drive to its initial state. When the tape drive is ready to accept a cartridge, the indicator lights on the front panel of the tape drive turn off. Do not insert a cartridge into the tape drive during the reset sequence because the drive will eject the cartridge.

Step 9. Installing Backup/Restore Software

Install your backup and restore tape software. See "Backup and Restore Server Software" on page 2-2 for more information. Follow the installation and operating instructions included with your software to begin using the tape drive.

Using the Drive

The illustration shows the drive frontpanel.
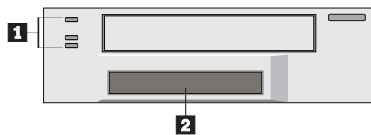
1 Indicator lights
2 LCD display

Using Indicators and LCD Messages

The indicator lights **1** are:

- Top light (amber): When this light is flashing, an error has occurred. When this light is on, the tape drive needs cleaning.
- Middle light (green): When this light is on, the tape cartridge is loaded and the tape drive is operational.
- Bottom light (green): When this light is flashing, the tape is in motion.

The liquid crystal display (LCD) **2** shows information about the operational status of the tape drive. Refer to Appendix B, "LCD Messages" on page 3-6 for the LCD messages.

The following table describes the indicator light **1** combinations that occur during tape operation.

Tape Drive Condition	Top Light	Middle Light	Bottom Light
POST[4] or reset	On	On	On
Error or failed POST	Flash	Off	Off
Ready, no tape loaded	N/A[5]	Off	Off
Ready, tape loaded	N/A[5]	On	Off
Normal tape motion	N/A[5]	On	Flash
Time to clean	On	N/A[5]	N/A[5]
Clean in progress	On	Off	Flash

If the drive fails with a flashing amber indicator light **1** , three sets of numbers appear on the LCD **2** showing the three most recent errors. The first two digits in error 1 are the fault symptom code for the most recent error. Using this fault symptom code, go to Appendix B, "LCD Messages" on page 3-6 to help resolve the problem.

---

[4] *POST is power-on self-test. A series of tests run by the drive when power is turned on.*

[5] *Not applicable (N/A): The indicator light might be in any state.*

Selecting Data Cartridges

For writing data, use only advanced metal evaporated (AME) data cartridges. Any of the following 170 m AME data cartridges are acceptable and require no formatting or other media conditioning before use:

- IBM 59H2679
- Sony QGD-170ME
- Exabyte EXATAPE AME

The tape drive can also read data from metal particle (MP) tape when it is written in 8500c, 8500, or 8200 formats. The drive cannot write to an MP tape or read data written in 8200c format. Before using an AME cartridge after reading MP tape, clean the tape drive (see "Cleaning the Drive" on page 2-10).

Loading and Unloading Data Cartridges

When the indicator lights are off, the tape drive is ready to accept a cartridge. Do not insert a data cartridge if the tape drive is still performing its power-on self-test. To load a cartridge:

1. Set the cartridge for write-protect **1** or write-enable **2** .
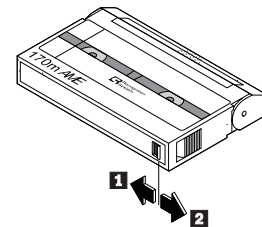
2. Insert the cartridge into the door **3** as shown in the following illustration.
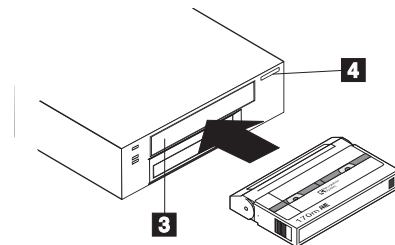
The tape drive loads the tape in approximately 20 seconds. When the middle indicator lights, the tape drive is ready for read and write operations.

To unload a cartridge, press the **unload button 4** . Do not press and hold the **unload button** for more than 10 seconds; this can cause a reset under certain conditions. If the tape drive is free of errors, it performs the following actions when you unload a cartridge:

- Completes any command in process
- Writes any buffered information to tape
- Rewinds the tape to the beginning
- Unloads the tape and ejects the cartridge

If an error occurs before or during the unload procedure, the tape drive suspends the unload sequence. To clear the error, press the **unload button** again.

> **Attention:** After pressing the unload again, the tape drive tries the unload sequence, but does not write data in the buffer to the cartridge.

Resetting the Drive

To reset the tape drive, press and hold the **unload button 4** for at least 10 seconds, or turn the drive off and back on again. The reset rewinds the tape and clears the buffer of previous tape drive commands and data.

If you reset the tape drive while a cartridge is loaded, the tape rewinds to the beginning. The reset might take as long as two minutes if the tape is positioned near the end. After the resetting the drive, tape operation starts from the beginning of the data cartridge. After resetting the drive, also restart your backup tape software.

Cleaning the Drive

When the top (amber) indicator lights the tape drive requires cleaning. Clean the drive as soon as possible after the indicator light turns on. The drive-cleaning requirements depend on the number of tape motion hours and the type of tape being used (MP or AME).

If you insert an AME cartridge after reading MP tape, the top indicator lights and the cartridge is ejected. Before you can use the AME tape, you must clean the tape drive.

To clean the tape drive, insert a cleaning cartridge (IBM 59H2898 or Exabyte 315205-000). When the cleaning is finished, the tape drive turns off the top indicator light and ejects the cleaning cartridge.

Packing the Drive

If you are shipping the tape drive to another location or returning it for repair, pack the tape drive in its original shipping container and packing materials.

> **Attention:** To avoid damaging the tape drive and voiding your warranty, use the original shipping materials. If you are returning the tape drive for service, remove and keep all cartridges, cables, and terminators.

Appendix B.
LCD Messages

Refer to the following table for a detailed list of messages that might appear on the LCD display on the frontpanel of the tape drive.

Reset Messages

When the tape drive is reset, the LCD cycles through these messages:

RESET   First message during the power-on sequence.

MODEL: Model number of the tape drive.

SUBMOD: Submodel number of the tape drive.

SN: Serial number of the tape drive.

CODE: Level of the tape drive microcode.

LASTCLN: Number of hours since the tape drive was cleaned.

COMPRESSION: Compression turned on or off by default.

SINGLE ENDED Drive is single-ended SCSI.

WIDE   Drive has a wide SCSI configuration.

SCSI ID: SCSI ID of the tape drive.

LANGUAGE: Current language for the LCD appears when you hold the **Unload** button after the RESET message appears. Press and hold the button to cycle through the available languages until the one you want appears.

Tape Drive Status Messages

READY-NO TAPE
Drive is ready to accept a cartridge.

◯˜◯ **LOADING**
Drive is loading the tape.

◯˜◯ **READY-TAPE**
Drive has successfully loaded the tape and is ready for read and write operations.

◯˜◯ **EJECT ■■■===**
Unload button was pressed. Drive will eject the cartridge as soon as it has finished its current operation.

◯˜◯ **EJECT PREVNT**
Software has disabled the eject function with the PREVENT/ALLOW MEDIA REMOVAL command. Drive will rewind and unload the tape, but will not eject the cartridge.

ILLEGAL TAPE
Drive detected an incompatible cartridge and ejected it.

Tape Motion Messages

◯⁺◯ **READ+** ■■■===
  Drive is reading data. The + sign appears when the data is compressed. The boxes show the amount of tape used.

◯⁺◯ **WRITE+** ■■■===
  Drive is writing data. The + sign appears when the data is compressed. The boxes show the amount of tape used.

◯╱◯ **PROTECTED**
  Drive cannot write data because the data cartridge is write-protected.

◯╱◯ **ILLEGAL WRT**
  Drive cannot write to the type of tape cartridge inserted. This message remains until an appropriate tape is inserted and a tape motion command is issued.

>> **SEARCH** ■■■===
  High-speed search in progress.

<< **REWIND** ■■■===
  Tape rewind in progress.

◯✕◯ **ERASE** ■■■===
  Drive is erasing data on the tape.

Cleaning Messages

◯ᴺ◯ **CLEAN SOON**
  Drive should be cleaned at the next convenient time.

◯ᴺ◯ **MUST CLEAN**
  Drive must be cleaned after a metal particle tape has been used in the drive. If you attempt to insert a data cartridge before cleaning the tape drive, the cartridge will be ejected.

◯ᴺ◯ **CLEANING ...**
  Cleaning is in progress.

◯ᴺ◯ **DEPLETED**
  Cleaning tape in the cartridge is depleted; the drive ejects the cartridge. Use a new cleaning cartridge.

Error Messages

When a tape drive error occurs, the LCD cycles through the current error code and previous error codes.

ERR 1: *xx yy zz*
  The most recent error displays where *xx* is the fault symptom code, and *yy* and *zz* indicate secondary errors (if any).

ERR 2 (or 3): *xx yy zz*
  Previous error messages display.

The following table lists fault symptom codes that might display on the LCD. The fault symptom codes are arranged in alphanumeric order:

Fault System Codes	Error Recovery Procedures
02, 05, 10, 15, C0, C1, C2, C3, C7, C8, C4, CA, CB, D8, DC, E0, E1, E2, E3, E4, E5, E6, E7, E9	Restart your software backup procedure.
03, 27, 4C, 73	Move the write protect switch on the data cartridge to write enable the tape.
08, 17, 18, 19, 34, 35, 98, 99, 9A, 9C, A1, A2, A4, A5, A7, A8	You must perform the actions in the following order: 1. Reset the tape drive by holding down the unload button for more than 10 seconds, then restart the your backup software procedure. 2. Replace the tape drive.

Fault System Codes	Error Recovery Procedures
0B	You must perform the actions in the following order: 1. Clean the tape drive and restart your backup software operation. 2. Replace the tape drive.
11, 16, 36, 38, 95, 9B, 9D, 9E, 9F, AC, AD, AE, B0, B3, B4, B5	You must perform the actions in the following order: 1. Clean the tape drive and restart your backup software operation. 2. Repeat your backup software operation with a new data cartridge. 3. Replace the tape drive.
1C, 3A, 47, 74, C5, C6, DB, DD	Repeat your backup software operation with a new data cartridge
37	You must perform the actions in the following order: 1. Clean the tape drive and restart your backup software operation. 2. Reset the tape drive by holding down the unload button for more than 10 seconds, then restart the your backup software procedure. 3. Replace the tape drive.

Fault System Codes	Error Recovery Procedures
3D, 94	You must perform the actions in the following order: 1. Power the tape drive off and back on again; then reissue the failed command sequence. 2. Repeat your backup software operation with a new data cartridge.
53, 8C, 8D, A3, A6	You must perform the actions in the following order: 1. Power the tape drive off and back on again; then reissue the failed command sequence. 2. Replace the tape drive.
96, 97	You must perform the actions in the following order: 1. Repeat your backup software operation with a new data cartridge. 2. Replace the tape drive.
67, 6D, AF, E8, FA, FC, FD	Replace the tape drive.
C9	Insert a data cartridge into the tape drive.
D2, D6	Power the tape drive off and back on again; then reissue the failed command sequence.
D7	Repeat the operation with a different data cartridge; the tape drive cannot read the tape.

Appendix C.
Cartridge Format Compatibility

Use tape cartridges from other tape drives with the 20/40 GB, 8 mm Internal Tape Drive if the cartridge format is compatible. The following table lists compatible cartridge formats:

Cartridge Format	Compatibility
EXABTYE Mammoth	Read and Write
EXABTYE 8505XL	Read only
EXABTYE 8505	Read only
IBM 3445001	Read only
EXABTYE 8500	Read only
EXABTYE 8205XL	Read only
EXABTYE 8205	Read only
IBM 3532023	Read only
EXABTYE 8200	Read only

The 20/40 GB, 8 mm Internal Tape Drive requires media recognition system (MRS) data cartridges. The tape drive will eject advanced metal evaporated (AME) non-MRS cartridges. Non-MRS metal particle (MP) cartridges can be read, but they might affect the long term reliability of the tape drive.

Appendix D.
Product Specifications

This appendix includes the following specifications and requirements:

- Maximum Data Capacity
- Input Voltages
- Maximum Sustained Data Transfer Rates
- Operating Environment
- SCSI Cable Specifications

Maximum Data Capacity		
Tape Length	Compressed Data[6]	Uncompressed Data
22 m	5 GB[7]	2.5 GB
170 m	40 GB	20 GB

Input Voltages
Standard +5 V dc and +12 V dc ±5%

Maximum Sustained Data Transfer Rates	
Compressed data	6 MB[8] per second
Uncompressed data	3 MB per second

Operating Environment	
Tape path temperature range	+5°C to +40°C (+41°F to +104°F)
Relative humidity	20% to 80%; noncondensing
Wet bulb	26°C (79°F) maximum
Altitude	−304.8 m to +3,048 m (−1 000 ft to +10 000 ft)

SCSI Cable Specifications	
Connector	68-pin male, shielded, AMP 786090-7
Maximum length	3 m (19.7 ft) A maximum cable length of 6 m is acceptable if the transfer rate is less than 5 MB per second.

Appendix E.
Technical Support

Before calling, please prepare for your call by following these steps.

Step 1: Troubleshooting

You might be able to solve the problem yourself. If you observe one of the following problems, one of the associated responses might fix the problem.

Software doesn't recognize the tape drive?

- Check for proper termination of the SCSI bus. The SCSI bus must be terminated at both ends.
- Check for conflicting SCSI ID settings. Each SCSI ID must be unique on the SCSI chain.
- Ensure that the appropriate Advanced SCSI Programming Interface (ASPI) drivers are installed to support the tape drive. Drivers should be provided by the SCSI host adapter.

Tape operation is unreliable?

- Clean the tape heads
- Try another tape cartridge

---

[6] *Assume a 2:1 compression ratio*

[7] *GB equals approximately 1 000 000 000 bytes.*

[8] *MB equals approximately 1 000 000 bytes.*

Does the drive fail with a flashing amber indicator light?

Three sets of numbers appear on the LCD **2** showing the most recent three errors. The first two digits in error 1 are the fault symptom code. Using this fault symptom code, go to Appendix B, "LCD Messages" on page 3-6 to help resolve the problem.

Step 2: Preparing for the Call

To assist the technical support representative, have available as much of the following information as possible:

1. Computer manufacturer and computer model
2. Option name: 20/40 GB, 8 mm Internal Tape Drive
3. Proof of purchase
4. Exact wording of the error message (if any)
5. Description of the problem
6. Hardware and software configuration information for your system
7. Error information or error code shown on the LCD (if any)

If possible, be at your computer. Your technical support representative might want to walk you through the problem during the call.

Step 3: Placing the Call to IBM

Technical support is available during the warranty period to answer any questions about your new IBM option. Support response time will vary depending on the number and nature of calls received.

For the support telephone number and support hours by country, refer to the following table or to the enclosed technical support insert. If the number is not provided in the table or insert, contact your IBM reseller or IBM marketing representative.

Support 24 hours a day, 7 days a week	
Canada	1-800-565-3344
Puerto Rico	1-800-772-2227
United States	1-800-772-2227

Appendix F.
Product Warranty

The following warranty information applies to products purchased in the United States, Canada, and Puerto Rico. For warranty terms and conditions for products purchased in other countries, see the enclosed Warranty insert, or contact your IBM reseller or IBM marketing representative.

International Business Machines Corporation   Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.

Machine: 20/40 GB, 8 mm Internal Tape Drive

Warranty Period*: Two Years

*Contact your place of purchase for warranty service information.

Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty for Machines

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications. The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your receipt is the Date of Installation, unless IBM or your reseller informs you otherwise.

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines which have a life-time warranty, this warranty is not transferable.

Warranty Service

To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at **1-800-772-2227**. In Canada, call IBM at **1-800-565-3344**. You may be required to present proof of purchase.

IBM or your reseller will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service. You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

1. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
2. where applicable, before service is provided —
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
   b. secure all programs, data, and funds contained in a Machine, and
   c. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Extent of Warranty
IBM does not warrant uninterrupted or error-free operation of a Machine.

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

THESE WARRANTIES REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Limitation of Liability
Circumstances may arise where, because of a default on IBM's part or other liability you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other contract or tort claim), IBM is liable only for:

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages or loss, up to the greater of U.S. $100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR LOSSES OR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES (INCLUDING LOST PROFITS OR SAVINGS), EVEN IF IBM OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU.

Appendix G.
Notices and Trademarks

References in this publication to IBM products, programs, or services do not imply that IBM intends to make these available in all countries in which IBM operates. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Subject to IBM's valid intellectual property or other legally protectable rights, any functionally equivalent product, program, or service may be used instead of the IBM product, program, or service. The evaluation and verification of operation in conjunction with other products, except those expressly designated by IBM, are the responsibility of the user.

IBM may have patents or pending patent applications covering subject matter in this document. The furnishing of this document does not give you any license to these patents. You can send license inquiries, in writing, to:

IBM Director of Licensing
IBM Corporation
500 Columbus Avenue
Thornwood, NY 10594
U.S.A.

Trademarks

The following terms are trademarks of the IBM Corporation in the United States or other countries or both:

IBM   OS/2   Micro Channel

The following terms are trademarks of other companies:

AMP   AMP Incorporated
ARCserve   Cheyenne Software Inc.
EXABYTE   Exabyte Corporation
NetWare   Novell, Inc.
Novell   Novell, Inc.
SCO   The Santa Cruz Operation, Inc.
Seagate   Seagate Technology, Inc.
Sony   Sony Corporation

Microsoft, Windows, and Windows NT are trademarks or registered trademarks of Microsoft Corporation.

Other company, product, or service names may be trademarks or service marks of others.

IBM®

Part Number: 78H5108

Printed in U.S.A.