IBM

12/24 GB, DDS/3 4mm Internal Tape Drive

User's Guide

OPTIONS
by IBM

Note: If you are using this product in the United States, Canada, or Puerto Rico, be sure to read the information under Appendix E, "Product Warranty" on page 3-15 before using this information and the product it supports.

For all other countries, the warranty terms and conditions applicable in the country of purchase are available from IBM or your reseller.

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About This Book

This manual contains information on the 12/24 GB DDS/3 4 mm
Internal Tape Drive. The manual is divided into the following parts:

Part 1 contains:

Abbreviated installation and usage instructions in the following
languages:

English	German
French	Spanish
Italian	Brazilian Portuguese
Japanese	

Part 2 contains:

- Product description
- Detailed installation instructions
- Detailed usage information

Part 3 contains:

- Safety information
- Product specifications
- Help and Service information
- Warranty
- Notices and trademarks

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

Part 1: Quick Installation Guide

The 12/24 GB[1] DDS/3 4 mm Internal Tape Drive is a SCSI-2 Fast tape drive for backing up and restoring data and archiving files. In addition to the User's Guide, the option package contains the following:

- 12/24 GB DDS/3 4 mm Internal Tape Drive, with white 5.25-inch bezel attached

- One data cartridge

- One cleaning cartridge

- Four M3 x 0.5 x 6 mm mounting screws

- One SCSI converter for attaching a 50-pin device to a 68-pin cable

- Two 3.5-inch bezels, one white and one black

- One black 5.25-inch bezel

Contact your place of purchase if an item is missing or damaged. Be sure to retain your proof of purchase and packing material. They might be required to receive warranty service.

The following section is an overview of the installation instructions. For more detailed information and a list of tested server backup and restore software, see "Backup and Restore Server Software" on page 2-2.

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

Installing the Drive

Follow these instructions to install your tape drive:

1. All devices attached to a SCSI adapter must have a unique SCSI identification number (ID). Select a SCSI ID for the tape drive in the range of 0 to 6. 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 0. Do not assign an ID of 7 because this is normally used for the SCSI host adapter.

2. Turn off all attached devices. Turn off the computer. Unplug the

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[1] *GB equals one billion bytes when referring to storage capacity.*

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. This will drain any accumulated static electricity from the bag and your body. Remove the drive from the static-protective bag. If you must put the drive down, place the drive on the static-protective bag. Do not touch any exposed components on the drive.

To install the drive, refer to the following drive backpanel illustration.
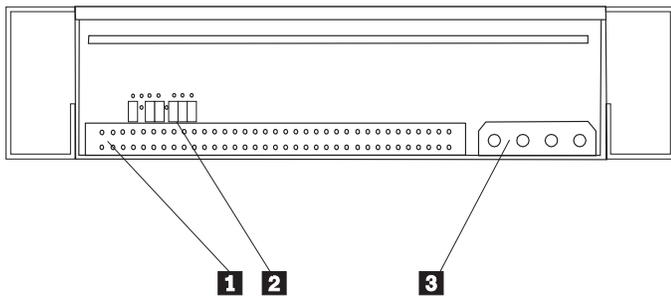
1 SCSI connection
2 Jumper block
3 Power connection

4. Use the jumper block **2** to set your SCSI ID. The following illustration shows the ON and OFF positions for the jumpers.

Jumper ON   Jumper OFF

Pin 7 Omitted
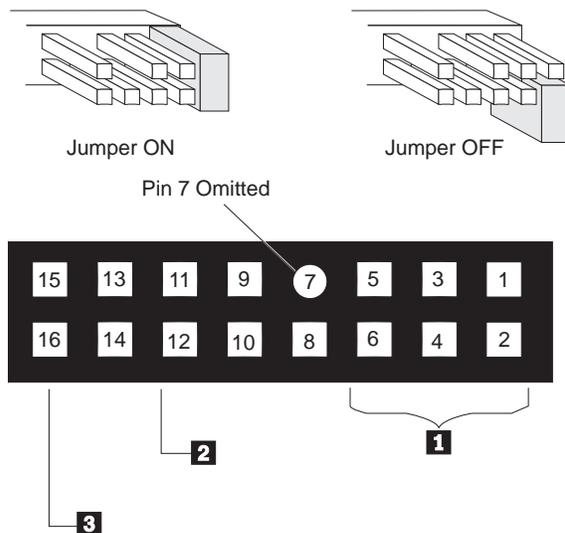
1 SCSI ID area
2 Active Termination Enabled
3 Termination Power On

Area **1** is where you will set your SCSI ID. Refer to the following table in order to determine the settings required:

Pins 5-6	Pins 3-4	Pins 1-2	SCSI ID
Off	Off	Off	0
Off	Off	On	1
Off	On	Off	2
Off	On	On	3
On	Off	Off	4
On	Off	On	5
On	On	Off	6
On	On	On	7

5. Determine if you have a 3.5-inch bay or a 5.25-inch bay for installation. If you have a 5.25-inch bay available, use the tape drive as it is, or you can use the black 5.25-inch bezel which is included in your option package. If you only have a 3.5-inch bay available, remove the side rails on the tape drive and replace the 5.25- bezel with either of the included 3.5-inch bezels, as illustrated in the following picture.
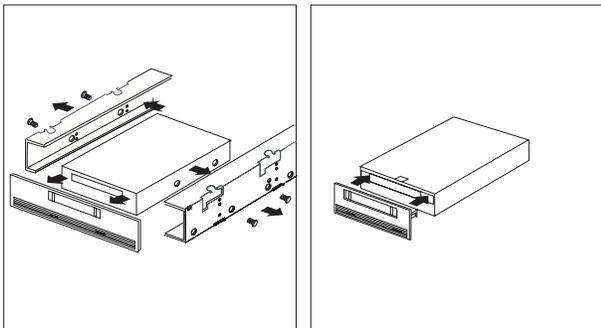
6. Mount the tape drive in either a horizontal or vertical position. The drive has two sets of mounting holes to allow for a number of mounting positions. There are two holes **1** **2** in each set; use only one set of mounting holes. The following illustration shows the mounting holes on only one side of the drive.
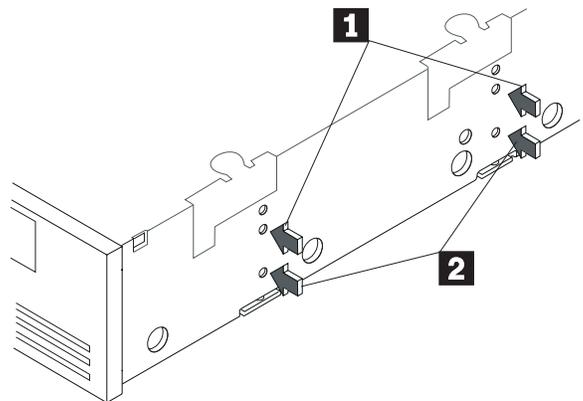
Insert each of the screws through a drive-bay mounting hole into a threaded screw hole on the tape drive; then tighten with a screwdriver.

7. To install the cables, refer to the following illustration:
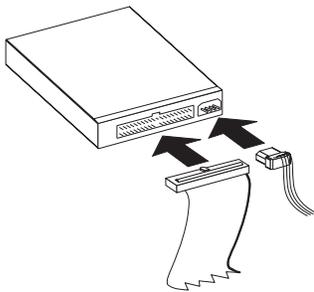
When you connect SCSI drives to the SCSI adapter, start with the SCSI connector on the cable that is farthest from the adapter. Then, with each additional device, work your way in from the far end back towards the adapter. Connecting the devices in this order ensures the best possible signal quality. Connect the SCSI and power cables to the tape drive connectors. Ensure that pin 1 of the SCSI cable aligns with pin 1 of the SCSI connector. Pin 1 is usually a different color than the other pins so that it can be easily identified. If your SCSI cable is a different size than the connector on your tape drive, use the converter that is included in the option package. For more information, see "Step 5. Connecting Cables and Terminating the Chain" on page 2-6.

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, you must set the Active Termination Enabled jumper to ON. To locate the Active Termination Enabled jumper, refer to the illustration on page 1-2. There is also an illustration on page 1-2 which shows how to set jumpers to ON or OFF.

9. Replace the computer cover and secure it in place. Reconnect the power cord and any other signal cables. Turn on all attached devices; then turn on the computer. Ensure that the appropriate advanced SCSI programming interface (ASPI) device drivers are installed to support the tape drive. These device drivers are usually provided with the SCSI adapter. You might need to reconfigure your SCSI adapter. See the documentation that comes with your computer or adapter.

10. After the power is turned on, or after any power reset, the tape drive performs a power-on self test. This is indicated by both LEDs blinking for about 5 seconds. It is important to make sure the drive is empty during the self-test. Do not try to insert a cartridge into the tape drive during the self-test.

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

12. If your computer does not recognize your tape drive during the computer's power-on self test (POST) or if you receive startup errors, run the configuration-setup utility program as described in the documentation that comes with your computer.

Using the Drive

The following section is an overview of the instructions for using your tape drive. For more detailed information, see "Using the Drive" on page 2-8.

The indicator lights on the drive front panel are:

- **Left (green):** This light indicates cartridge status. When the light is on, the cartridge is inserted and ready for use. When flashing, the drive requires cleaning or the cartridge needs to be replaced.

- **Right (amber):** This light indicates drive status. When the light is on, the drive is reading or writing to tape. When the light is flashing, a hardware fault has occurred. If this happens, the drive might need to be replaced. See the warranty in Appendix E, or contact your IBM reseller.

For writing data, use only IBM 59H3465 data cartridges. For more information on compatible cartridges, see Appendix B.

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 into the drive. When the left indicator light comes on, the tape drive is ready for read and write operations. To unload a cartridge, press the **unload** button.

When the left indicator light flashes, the tape drive requires cleaning. Clean the drive as soon as possible after the indicator light begins flashing. To clean the tape drive, insert the cleaning cartridge which comes with your drive. For more information, see "Cleaning the Drive" on page 2-10.

Product Description

The 12/24 GB[8] DDS/3 4 mm Internal Tape Drive is a Fast SCSI-2 tape drive for backing up and restoring data and archiving files. Tape cartridges can each store 12 GB of data. If you use data compression, you might store up to 24 GB on a cartridge at a transfer rate of up to 7 GB an hour, depending on the data content.

In addition to the User's Guide, the option package contains:

- 12/24 GB DDS/3 4 mm Internal Tape Drive

- One data cartridge

- One cleaning cartridge

- Four M3 x 0.5 x 6 mm mounting screws

- One SCSI converter for attaching a 50-pin device to a 68-pin cable

- One 3.5-inch bezel

Before You Begin

To install this drive, you must have the following:

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

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

- Screw driver for the mounting screws

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

- Backup and restore software

- Device drivers

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[8] *GB equals one billion bytes when referring to storage capacity.*

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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
Seagate Backup Exec v 6.0 Rev 90 for Windows NT
Microsoft NT 3.51 (native tape support)
Microsoft NT 4.0 (native tape support)

Software for Windows 95
Seagate Backup Exec v 2.0 for Windows 95
Seagate DTA v 2.05 for Windows 95

Software for NetWare
Cheyenne ARCserve v 6.0 for NetWare
Seagate Backup Exec v 7.01b for NetWare

Software for OS/2
IBM ADSM/2 for OS/2
Seagate Sytos Premium v 2.2 for OS/2

Software for SCO
Legato Networker v 5.0 for SCO

Note: Backup software manufacturers continually change which devices are supported by their software. If your specific software is not shown above, contact your software manufacturer for updated information.

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 7. 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 0.

Follow these guidelines to select a SCSI ID:

- Assign the tape drive to the lowest priority ID available.
- Assign the higher-priority ID 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 because this is normally the highest
  priority ID and it is used for the SCSI host adapter.
- If you are installing the tape drive in a RAID storage enclosure,
  the lowest SCSI IDs might be reserved for hard disk drives.
  Assign the tape drive to the lowest available SCSI ID.

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 your SCSI adapter's utility programs, if available.
- 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.
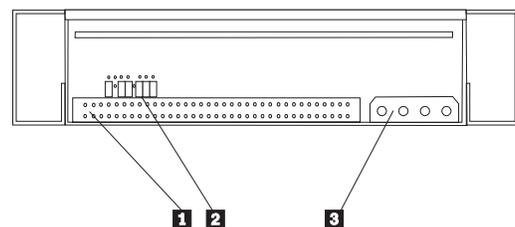
The tape drive components are:

1 SCSI connector
2 Jumper block
3 Power 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. Make sure to touch a metal surface before touching the drive, to ground any accumulated static energy. 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 jumper block, **2** in the back panel illustration on page 2-3, to set your SCSI ID. To set your jumpers, refer to the following illustrations. 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 the ON and OFF positions for jumpers.

Jumper ON   Jumper OFF

Pin 7 Omitted
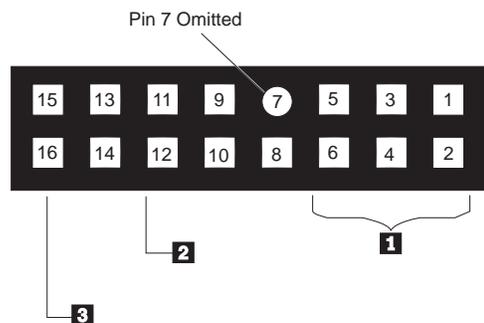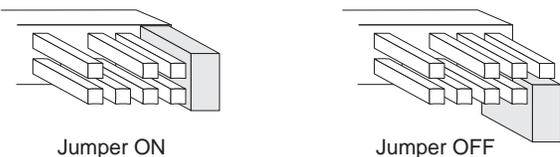
1 SCSI ID area
2 Active Terminator Enabled
3 Termination Power On

Area **1** on the jumper block, above, is where you will set your SCSI ID. Refer to the following table in order to determine the settings required:

Pins 5-6	Pins 3-4	Pins 1-2	SCSI ID
Off	Off	Off	0
Off	Off	On	1
Off	On	Off	2
Off	On	On	3
On	Off	Off	4
On	Off	On	5
On	On	Off	6
On	On	On	7

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 two sets of four mounting holes **1** **2** to provide a number of mounting positions. Use one of the two sets of mounting holes that provides the best fit and mounts the drives securely. The illustration shows the pairs of hole on only one side of the drive.
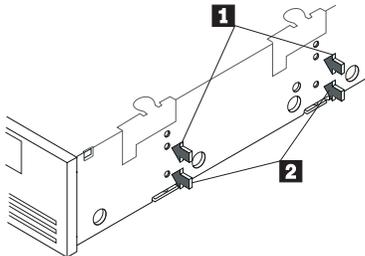
3. Align the drive-bay screw holes with the threaded holes in the drive housing. When mounting the tape drive, follow these guidelines:

   • 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.

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 (often 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. The tape drive has a 50-pin connector. If your SCSI cable has a 68-pin connector, use the included 68-pin to 50-pin converter. Connect the cable to the 68-pin side of the converter and connect the converter to the tape drive Ensure that pin 1 of the SCSI cable aligns with pin 1 of the SCSI connector. Pin 1 is often a different color than the other pins to make it easier to identify.

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.
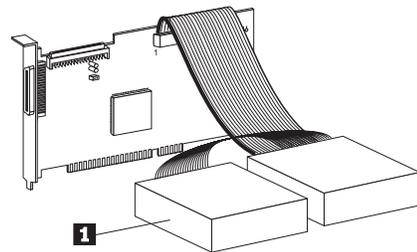
If the tape drive is the last device on the SCSI chain, the chain must be terminated at the drive.

To terminate the SCSI chain, set the "Active Termination Enabled" jumper (pins 11-12) to ON. For more information, refer to the illustrations on page 2-4.

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 power-splitting cable 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. Be sure that the air vents to the power supply are not blocked.

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

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 many 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.

Step 8. Installing Backup and 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

This illustration shows the drive front panel:
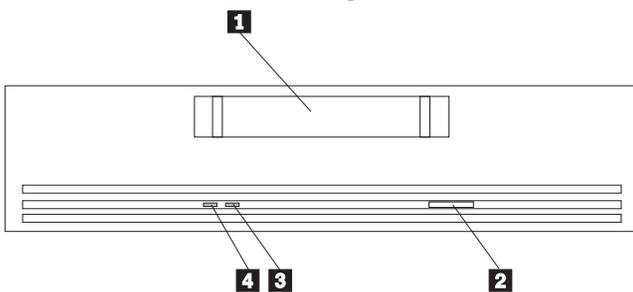
1 Tape drive door
2 Unload button
3 Right indicator light
4 Left indicator light

Using the Indicator Lights

The indicator lights **3** **4** are:

- **Left (green):** This light indicates cartridge status. When this light is on, the cartridge is inserted and ready for use. When this light is flashing, it indicates that the tape drive needs cleaning or that the cartridge needs to be replaced.
- **Right (amber):** This light indicates drive status. When this light is on, the tape drive is reading or writing to tape. When this light is flashing, it indicates that a hardware fault has occurred. If this

happens, the tape drive might need to be replaced. Refer to the warranty in Appendix E, or contact your IBM reseller.

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

LED	Action	Meaning
Amber	On	The tape drive is reading or writing to tape.
Amber	Flashing rapidly	A hardware fault occurred.
Green	On	A cartridge is inserted and does not generate errors.
Green	Flashing slowly	A cartridge is inserted and generates errors beyond a predefined error threshold. Use your enclosed cleaning cartridge to clean the heads. If the problem persists, replace the data cartridge.
Green	Flashing rapidly	The drive could not write to tape correctly. Use your enclosed cleaning cartridge to clean the heads. If the problem persists, replace the data cartridge.

Loading and Unloading Data Cartridges

Use only IBM 59H3465 data cartridges or other equivalent IBM approved 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** .
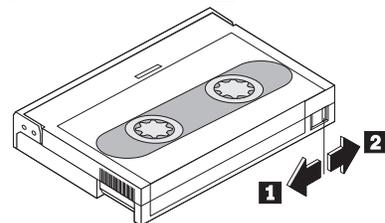
2. Insert the cartridge into the door **3** , as shown in the following illustration.
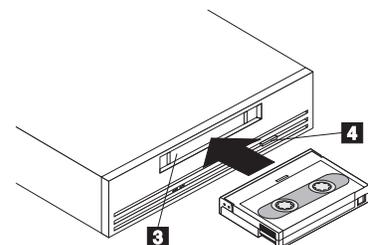
The tape drive loads the tape in approximately 20 seconds. When the green indicator light is on, the tape drive is ready for read and write operations.

To unload a cartridge, press the **unload button** ▓4 . The tape drive 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

Note: The time between pressing the unload button and cartridge ejection might be several seconds. Do not turn off your computer during this time.

Cleaning the Drive

When the left (green) indicator light is flashing slowly the tape drive requires cleaning. Clean the drive as soon as possible after the indicator light turns on.

Clean the tape drive more often if you are using a lot of new tapes or if you are operating in an environment which contains a lot of dust or other particulate matter that could contaminate the magnetic tape.

To clean the tape drive, insert a cleaning cartridge (IBM 59H3090). When the cleaning is finished, the tape drive turns off the green 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.
Cartridge Format Compatibility

You can use tape cartridges from other tape drives with the 12/24 GB DDS/3 4 mm Internal Tape Drive if the cartridge format is compatible. The following table lists compatible cartridge formats.

Cartridge Format	Compatibility
DDS-3 (125 m)	Read and Write
DDS-2 (120 m)	Read and Write
DDS (90 m)	Read and Write
DDS (60 m)	Read and Write

The 12/24 GB DDS/3 4 mm Internal Tape Drive requires media recognition system (MRS) data cartridges. Non-MRS metal particle (MP) cartridges can be read, but they might affect the long term reliability of the tape drive.

Appendix C.
Product Specifications

This appendix includes the following specifications and requirements:

- Typical Data Capacity
- Power Specifications
- Typical Data Transfer Rates
- Environmental Specifications
- SCSI Cable Specifications

Typical Data Capacity		
Tape Length	Uncompressed Data	Compressed Data[9]
60 m	1.3 GB	2.6 GB
90 m	2 GB	4 GB
120 m	4 GB	8 GB
125 m	12 GB	24 GB

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[9] *Assumes a 2:1 compression ratio; actual compression ratio depends on data type.*

Power Specifications		
DC Voltage	+12 v dc	+5 v dc
Voltage Tolerance	+ or − 10%	+ or − 7%
Operational Current	250 milliamps	600 milliamps
Standby Current	50 milliamps	550 milliamps
Peak	600 milliamps	800 milliamps
Ripple, Peak to Peak	<= 100 mv	<= 100 mv
Standby Power Dissipation	< 3.3 watts	< 2.2 watts
Operating Power Dissipation	< 5.5 watts	< 5.5 watts

Environmental Specifications		
	Operational	Nonoperational
Temperature Range	+41° to +113°F (+5°C to +45°C)	−40° to +149°F (−40° to +65°C)
Relative Humidity	20% to 80%; noncondensing	0% to 90%; noncondensing
Maximum Wet Bulb Temperature	78.8°F (26°C) maximum	No condensation
Altitude	−100 m to +4575 m (−330 ft to +15000 ft)	−300 m to +15200 m (−985 ft to +49900 ft)

Typical Sustained Data-Transfer Rates	
Compressed Data	2.2 MB[10] per second
Uncompressed Data	1.1 MB per second

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[10] *MB equals one million bytes when referring to storage capacity.*

SCSI Cable Specifications	
Connector	68-pin male, shielded, AMP 786090-7
Maximum length	3 m (10 ft) A maximum cable length of 6 m (19.7 ft) is acceptable if the transfer rate is less than 5 MB per second.
SCSI restrictions	6 m - up to 10 MB per second 3 m - up to 20 MB per second with up to 3 devices on the cable 1.5 m - up to 20 MB per second with 4 or more devices on cable

Appendix D.
Help and Service Information

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, and only at the 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) device drivers are installed to support the tape drive. Device drivers usually are provided with the SCSI host adapter.

Tape operation is unreliable.

- Clean the tape heads
- Try another tape cartridge

Drive fails with a flashing amber indicator light.

A hardware fault has occured. Contact the HelpCenter for assistance.

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: 12/24 GB DDS/3 4 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[11]	
Canada	1-800-565-3344
Puerto Rico	1-800-772-2227
United States	1-800-772-2227

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[11] *Excluding certain holidays.*

Appendix E.
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: 12/24 GB DDS/3 4 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.

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Appendix F.
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