IBM 4690 Store System:

IBM

TR-4 Tape Drive User's Guide

Last Updated: February 19, 1998

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Contents

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Preface

This book describes the 4690 Store System support for both the SCSI and the EIDE tape drives.

Who Should Read This Manual

This book is intended for users who are familiar with hardware and software installation procedures, and also with the concepts and facilities of the IBM 4690 OS Version 2 (hereafter called the operating system) and the IBM 4690 Store System.

How This Manual is Organized

This book contains 5 chapters. The following list briefly describes each chapter of the book.

- "Chapter 1. Overview" on page 1 provides a general overview of the tape drives including tape capacity and reliability information.

- "Chapter 2. Tape Drive Installation" on page 3 provides instructions on installing the hardware and software for the tape drives.

- "Chapter 3. Using the Tape Drive" on page 13 provides operating instructions for the tape drives.

- "Chapter 4. Tape Drive Specifications" on page 19 provides specifications and requirements for the tape drive.

- "Chapter 5. Maintenance and Troubleshooting" on page 23 provides instructions on performing maintenance on the tape drive. It also contains troubleshooting information.

Related Publications

A CD-ROM is available that contains the online books that are a part of the IBM Store Systems Library Collection, SK2T-0331.

Store System Related Publications — Software

IBM 4690 Store System Library

IBM 4690 Store System: Touch Screen Support for 4690 OS Programming Guide, SC30-3780

IBM 4690 OS V2: Planning, Installation, and Configuration Guide, GC30-3984

IBM 4690 OS V2: Programming Guide, SC30-3987

IBM 4690 OS V2: User's Guide, SC30-3983

IBM 4690 OS V2: Communications Programming Reference, SC30-3986

IBM 4690 OS V2: Messages Guide, SC30-3985

IBM 4680 Store System: Preparing Your Site, GA27-3692

IBM 4680 BASIC: Language Reference, SC30-3356

IBM 4680 Store System: Display Manager User's Guide, SC30-3404

IBM 4690 Store System: 4690 Terminal Services for DOS User's Guide, SC30-3688

IBM 4680 and 4680-90 General Sales Application

IBM 4680-90 General Sales Application: Planning and Installation Guide, GC30-3630

IBM 4680-90 General Sales Application: Guide to Operations, SC30-3632

IBM 4680-90 General Sales Application: Programming Guide, SC30-3631

IBM 4680 General Sales Application – Price Management Feature: User's Guide, SC30-3461

IBM 4680 General Sales Application – Terminal Offline Feature: User's Guide, SC30-3499

IBM 4680-90 General Sales Application: Full Screen – Guide to Operations, SC30-3664

IBM 4680-90 General Sales Application: Master Index, GX27-3958

IBM 4680 and 4680-90 Supermarket Application

IBM 4680-90 Supermarket Application: Planning and Installation Guide, GC30-3633

IBM 4680-90 Supermarket Application: Guide to Operations, SC30-3635

IBM 4680-90 Supermarket Application: Programming Guide, SC30-3634

IBM 4680 Supermarket Application – Terminal Offline Feature: User's Guide, SC30-3512

IBM 4680 Supermarket Application – Electronic Funds Transfer Feature: User's Guide, SC30-3513

IBM 4680-4690 Supermarket Application – Electronic Funds Transfer Feature Enhancement: User's Guide, SC30-3718

IBM 4680-90 Supermarket Application: Master Index, GX27-3957

IBM 4680 Chain Drug Sales Application

IBM 4680 Chain Drug Sales Application: Planning and Installation Guide, GC30-3412

IBM 4680 Chain Drug Sales Application: Guide to Operations, SC30-3413

IBM 4680 Chain Drug Sales Application: Programming Guide, SC30-3414

IBM 4680 Store Management Application

IBM 4680 Store Management Application: Planning and Installation Guide, GC30-3483

IBM 4680 Store Management Application: Guide to Operations, SC30-3484

IBM 4680 Store Management Application: Programming Guide, SC30-3487

IBM 4680 Store Management Application – Inventory Control Feature: User's Guide, SC30-3485

IBM 4680 Store Management Application – Price Management Feature: User's Guide, SC30-3486

IBM Systems Application Architecture

IBM Systems Application Architecture: Common Programming Interface Communications Reference, SC26-4399

In-Store Processing

In-Store Processing: Application Development Guide, SC30-3534

In-Store Processing: IBM AIX – Application Development Guide, SC30-3537

In-Store Processing: IBM OS/2 Extended Edition – Application Development Guide, SC30-3538

In-Store Processing: IBM OS/400 – Application Development Guide, SC30-3535

In-Store Processing: IBM 4680 OS – Application Development Guide, SC30-3536

Store System Related Publications — Hardware

IBM 4694 Point-of-Sale Terminals

IBM 4694 Point-of-Sale Terminals: Installation and Operation Guide, SA27-4005

IBM Store Systems: Installation and Operation for Point-of-Sale Input/Output Devices, GA27-4028

IBM 4693, 4694, and 4695 Point-of-Sale Terminals: Hardware Service Manual, SY27-0337

IBM Store Systems: Hardware Service Manual for Point-of-Sale Input/Output Devices, SY27-0339

IBM Store Systems: Parts Catalog, S131-0097

IBM 4693 Point-of-Sale Terminals

IBM 4693 Point-of-Sale Terminals: Installation and Operation Guide, SA27-3978

IBM Store Systems: Installation and Operation for Point-of-Sale Input/Output Devices, GA27-4028

IBM 4693 Point-of-Sale Terminals: Setup Instructions, P/N 73G1012

IBM 4693 Point-of-Sale Terminals: Quick Reference Card, P/N 73G1022

IBM 4693, 4694, and 4695 Point-of-Sale Terminals: Maintenance and Test Summary, SX27-3919

IBM 4693, 4694, and 4695 Point-of-Sale Terminals: Hardware Service Manual, SY27-0337

IBM Store Systems: Hardware Service Manual for Point-of-Sale Input/Output Devices, SY27-0339

IBM Store Systems: Parts Catalog, S131-0097

IBM 4693 Point-of-Sale Terminals: Reference Diskette, SX27-3918

IBM 4693 Point-of-Sale Terminals: Diagnostic Diskette, SX27-3928

IBM 4693 Point-of-Sale Terminals: Support Diskette for Medialess Terminals, SX27-3929

IBM 4683/4684 Point-of-Sale Terminals

IBM 4683 Point-of-Sale Terminal: Installation Guide, SA27-3783

IBM 4684 Point-of-Sale Terminal: Installation Guide, SA27-3837

IBM 4684 Point-of-Sale Terminal: Introduction and Planning Guide, SA27-3835

IBM 4684 Store Loop Adapter/A: Installation, Testing, Problem Determination, and Technical Reference, SD21-0045

IBM 4683/4684 Point-of-Sale Terminal: Operations Guide, SA27-3704

IBM 4680 Store System and IBM 4683/4684 Point-of-Sale Terminal: Problem Determination Guide, SY27-0330

IBM 4684 Point-of-Sale Terminal: Maintenance Summary Card, SX27-3885

IBM 4680 Store System: Terminal Test Procedures Reference Summary, GX27-3779

IBM 4683/4684 Point-of-Sale Terminal: Maintenance Manual, SY27-0295

IBM Store Systems: Hardware Service Manual for Point-of-Sale Input/Output Devices, SY27-0339

IBM Store Systems: Hardware Technical Reference, SY27-0336

IBM Store Systems: Parts Catalog, S131-0097

Scanners

IBM 1520 Hand-Held Scanner User's Guide, GA27-3685

IBM 4686 Retail Point-of-Sale Scanner: Physical Planning, Installation, and Operation Guide, SA27-3854

IBM 4686 Retail Point-of-Sale Scanner: Maintenance Manual, SY27-0319

IBM 4687 Point-of-Sale Scanner Model 1: Physical Planning, Installation, and Operation Guide, SA27-3855

IBM 4687 Point-of-Sale Scanner Model 1: Maintenance Manual, SY27-0317

IBM 4687 Point-of-Sale Scanner Model 2: Physical Planning Guide, SA27-3882

IBM 4687 Point-of-Sale Scanner Model 2: Operator's Guide, SA27-3884

IBM 4687 Point-of-Sale Scanner Model 2: Maintenance Manual, SY27-0324

IBM 4696 Point-of-Sale Scanner Scale: Physical Planning, Installation, and Operation Guide, GA27-3965

IBM 4696 Point-of-Sale Scanner Scale: Maintenance Manual, SY27-0333

IBM 4696 Point-of-Sale Scanner Scale: Specification Sheet, G221-3361

IBM 4697 Point-of-Sale Scanner Model 001: Maintenance Manual, SY27-0338

IBM 4697 Point-of-Sale Scanner Model 001: Physical Planning, Installation, and Operations Guide, SY27-3990

IBM Personal Computer and IBM Personal System/2

IBM Personal System/2 – Model 50 Quick Reference and Reference Diskette, S68X-2247

IBM Personal System/2 – Model 60 Quick Reference and Reference Diskette, S68X-2213

IBM Personal System/2 – Model 70 Quick Reference and Reference Diskette, S68X-2308

IBM Personal System/2 – Model 80 Quick Reference and Reference Diskette, S68X-2284

IBM Personal System/2 – Store Loop Adapter/A – Supplements for the Hardware Maintenance Library, SK2T-0319

Cabling

A Building Planning Guide for Communication Wiring, G320-8059

IBM Cabling System Planning and Installation Guide, GA27-3361

IBM Cabling System Catalog, G570-2040

Using the IBM Cabling System with Communication Products, GA27-3620

Networks

IBM Local Area Network Support Program, IBM P/N 83X7873

IBM Token-Ring Network Introduction and Planning Guide, GA27-3677

IBM Personal System/2 Store Loop Adapter/A: Installation and Setup Instructions, SK2T-0318

General Publications

Advanced Data Communications for Stores – General Information, GH20-2188

Distributed Systems Executive – General Information, GH19-6394

Communications Manager X.25 Programming Guide, SC31-6167

IBM Disk Operating System 4.0 Command Reference, S628-0253

IBM Proprinters, SC31-3793

IBM 4680 Support for COBOL Version 2 (Softcopy provided with the product)

IBM 4680 Store System Regression Tester (Softcopy provided with the product)

IBM 4680 X.25 Application Programming Interface, GG24-3952

NetView Distribution Manager: General Information, GH19-6587

Systems Network Architecture: General Overview, GC30-3073

IBM Local Area Network Administrator's Guide, GA27-6367

DSX Preparing and Tracking Transmission Plans, SH19-6399

IBM Dictionary of Computing (New York; McGraw-Hill, Inc., 1993)

DSX Preparing and Tracking Transmission Plans, SH19-6399

IBM Local Area Network Support Program, IBM P/N 83X7873

Chapter 1. Overview

The operating system provides support for the following tape drives:

- EIDE Internal
- SCSI Internal
- SCSI External

Refer to the *IBM 4690 OS V2: User's Guide* for more information on using the Streaming Tape Drive Utility.

The following table shows the tape drives supported.

Name	Manufacturer	Model Number	Part Number
IBM 4.0/8.0GB TR4 Internal EIDE Tape Drive	Options by IBM	2359	06H9720
Seagate ATAPI TapeStor 8000	Seagate Technologies, Inc.	TST8000R-ABET	
IBM TR-4 4.0/8.0 GB Internal SCSI Tape Drive	Options by IBM		06H9716
IBM TR-4 4.0/8.0 GB External SCSI Tape Drive	Options by IBM	3502-900	
TapeStor 8000 TR-4 4-8 GB Internal SCSI Tape Drive	Seagate Technologies, Inc.	TST8000R-SBET	
TapeStore 8000 TR-4 4-8 GB External SCSI Tape Drive	Seagate Technologies, Inc.	TST8000E-SBET	

Tape Capacity

A Travan TR-4 cartridge can store up to 4 GB of uncompressed data. However, the actual capacity per cartridge varies according to the number and size of the files to be stored. Because the Travan TR-4 cartridge is designed to store data from an entire hard disk, under normal conditions you should not need to insert a second tape. The large storage capacity allows the tape drive to be used in unattended mode (Remote Command Processor), which is a significant advantage over tape drives that have smaller capacities and require user intervention to change tapes.

Low cost

Because only one cartridge is needed for most system backups, you save on tape cartridge cost. One Travan TR-4 cartridge may be cheaper than multiple smaller capacity tapes.

High Speed Data Transfer

The tape drive is capable of transferring raw data at 600 KB per second. Part of this data, Error Correction Code (ECC) data, is used to recover from read errors. The resulting throughput should be about 30 MB per minute when the tape drive is able to maintain streaming.

Buffered Data to Maintain Streaming

The tape drive's RAM allows buffering of data in the hardware. The software in the Store Controller also has a buffer. With buffering in the hardware and the software, the number of underruns should be reduced.

Compatibility with the Floppy Drive
> Because the tape drive attaches to either a SCSI or IDE cable instead of the floppy ribbon cable and does not use DMA channel 2, there is no contention with the floppy drive.

Installation Flexibility
> The tape drives install in either a 5.25-inch or 3.5-inch bay inside the Store Controller.
>
> **Note:** Because the TR-4 EIDE tape drive uses EIDE, it works with systems that do not have a SCSI card.

Reliability
> The Mean Time Between Failures (MTBF) is an impressive 200,000 hours. Reliability should be improved from previous tape drives because the ECC can recover up to 6 bad segments per block instead of the 3 bad segments per block.

Support
> The following table shows the systems that support the TR-4 tape drive.

Description	Machine Type
PC 300	6571*, 6573, 6581*, 6583, 6577, 6587, 6589
PC 700	6875, 6877, 6885, 6887

Notes:

1. The systems marked with an asterisk (*) cannot support the SCSI tape drive because they have no PCI slot.
2. For the SCSI tape drives, a SCSI host adapter is required if one is not already in the system.

The operating system does not support the TR-4 EIDE tape drive on IBM PS/2 (Microchannel) systems or IBM servers. However, the TR-4 SCSI tape drive is supported on the following IBM servers:

- PC Servers 310
- PC Servers 315
- PC Servers 325
- PC Servers 330

There may be additional desktop systems that support the tape drive that were not available at the time of this publication. In order for the tape drive to be supported on a system unit, all of the following conditions must be met:

- The tape drive is supported by the PC Company on a particular system. Contact the PC Company to determine if a particular system supports the TR-4 tape drive.
- The system is supported by the operating system. To view a list of systems supported by the operating system, see the Internet web address: http://www.raleigh.ibm.com/rds/storesys/4690/contmatx.htm.

The IBM 4690 Store System software does not support the formatting of a tape cartridge. The tapes must be preformatted.

Chapter 2. Tape Drive Installation

This chapter contains hardware and software installation instructions for the TR-4 tape drives. It contains instructions for both the EIDE tape drive and the SCSI internal and external tape drives.

Attention: Before installing this product, see "Safety" on page 25.

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

Installing the TR-4 EIDE Tape Drive

To install this drive, you must have the following:
- An IDE controller that supports the ATA Packet Interface (ATAPI). The ATAPI interface provides for communications between the store controller and the tape drive.
- The documentation that comes with your store controller.

Step 1. Preparing for Installation

1. Turn off the store controller and unplug the power cables from the power outlet for the store controller and all attached peripherals.
2. Open the store controller. For specific information on opening your store controller refer to the documentation that comes with your store controller. Become familiar with the store controller's internal components, and determine what kind of configuration you need to install.
3. Locate an available IDE connector on the secondary IDE cable in your store controller. The tape drive only works on the secondary IDE cable. If your store controller does not have a secondary IDE cable, you must add one. Because most IBM PC computers do not include a secondary IDE cable, you must purchase an IDE cable separately. If your store controller does not have a secondary IDE cable, purchase an 18-inch, 40-pin ribbon cable at your computer dealer or electronics store.
4. Touch the static-protective bag containing the tape drive to an unpainted metal surface on the store controller for at least 2 seconds. Remove the drive from the static-protective bag, holding the drive by the edges, and place it on the bag.

Step 2. Configuring the IDE Drive

1. Set the IDE jumper ON for the setting that applies to your IDE configuration. The tape drive is preset at the factory to slave (SL). The IDE configuration block pin assignments are:

    7 and **8**: Reserved

    5 and **6**: MA

    3 and **4**: SL

    1 and **2**: CS

    where:

    MA – Master

SL – Slave

CS – Cable Select

Each of the two IDE cables (primary and secondary) normally has two connectors for attaching two IDE devices (master and slave). The C: drive must be on the primary IDE cable, and the tape drive must be on the secondary IDE cable. When choosing your configuration, remember that two devices on the same IDE cable cannot be accessed at the same time. Performance is increased if you can avoid using both devices that are on the same IDE cable at the same time. A device will lock out another device on the same IDE cable until the operation is complete. Assuming that there are only two supported IDE devices, hard disks and tape drives, and that there can only be one tape drive and a maximum of two hard disks, the recommended configurations are:

Configuration 1

Master on primary IDE:
C: drive

Slave on primary IDE:
none

Master on secondary IDE:
tape drive

Slave on secondary IDE:
none

In the configuration above, you must configure the tape drive as the master (MA) by placing a jumper over vertical pins **5** and **6**. There is no contention for the devices.

Configuration 2

Master on primary IDE:
C: drive

Slave on primary IDE:
D: drive

Master on secondary IDE:
tape drive

Slave on secondary IDE:
none

In the configuration above, you must configure the tape drive as the master (MA) by placing a jumper over vertical pins **5** and **6**. The tape drive does not contend with other devices. The C: drive does contend with the D: drive. If a file access to one hard disk is in progress, a file access to the other hard disk must wait until the first access is complete before starting the file access to the second hard disk.

This configuration may be best when you have two hard disks and you have a need to run the tape drive while other applications are actively accessing the D: drive. There is no contention between the tape drive and the hard disks.

Configuration 3

Master on primary IDE:
    C: drive

Slave on primary IDE:
    none

Master on secondary IDE:
    D: drive

Slave on secondary IDE:
    tape drive

In the configuration above, you do not need to change the jumper on the tape drive, but you may need to change the jumper on the D: drive. Some hard disks have three possible jumper settings:

- master
- master with a slave attached
- slave

If you have one of these hard disks and it is currently a "master with no slave" and you are adding the tape drive as a "slave", then you must change the jumpers on the hard disk from "master" to "master with a slave attached". The C: drive does not contend with other devices. The D: drive does contend with the tape drive. If a tape operation is in progress, a file access to the D: drive must wait for the tape drive to complete a command before starting the file access. Any application waiting for the file access to complete cannot run during this time.

Alternatively, if a file access to the D: drive is in progress, the tape drive must wait for the file access to complete before a tape operation can begin. This may cause an underrun and the tape drive must stop, rewind a little, and start forward again, which impacts tape drive performance. The configuration above may be best when you have two hard disks and you have no need to run the tape drive while other applications are actively accessing the D: drive. There is no contention between the C: and D: drive.

Configuration 4

Master on primary IDE:
    none

Slave on primary IDE:
    none

Master on secondary IDE:
    tape drive

Slave on secondary IDE:
    none

The configuration above assumes that all of your hard disks are SCSI instead of IDE. In this configuration, you must configure the tape drive as the master (MA) by placing a jumper over vertical pins **5** and **6**. There is no contention for the devices.

2. Refer to your store controller documentation to determine if your store controller supports the cable select (CS) feature. With the cable select feature there is a special cable and the placement of the devices on the cable connectors determines whether a device is master or slave if the devices are set to CS. Most store controllers do not use this cable feature.

Step 3. Mounting the Drive

1. Locate an available bay or space in your store controller to mount the tape drive. The tape drive can be mounted in either a horizontal or vertical position. When mounted horizontally, the tape drive should be oriented so that the activity light is on the top left corner of the tape opening when looking at the tape drive from the front. The drive fits in a 3.5-inch (1-inch high) standard bay.

   Note: You can also mount the drive in a 5.25-inch (1.6-inch high) bay using the 5.25-inch mounting kit provided. When you attach the brackets to the sides of the 3.5-inch tape drive, you increase the width and height of the drive. The installation instructions are located on the mounting kit packaging.

2. Remove the cover plate from the bay selected. Slide the drive partially into the bay. Align the drive-bay screw holes with the threaded holes in the drive housing (or bracket, if applicable).

3. Use the screws provided to secure the drive in the bay. Usually two screws are used on each side. Some installations use the screw holes on the bottom (circuit board side) of the drive. Using the wrong size screws can damage the drive. Do not overtighten the screws. Check to ensure that the drive is securely mounted.

Step 4. Attaching the Cables

1. Locate the IDE and power connectors.

2. Locate the appropriate IDE cable and spare connector and attach it to the tape drive. Use a 40-pin ribbon cable to connect the tape drive on the rear of the drive. The connector is keyed and fits properly only one way if the ribbon is also keyed. Do not force the connector. If it does not attach easily, turn the connector around and try again. Ensure that line 1 of the IDE cable (usually color coded) aligns with pin 1 of the IDE connector. (Pin 1 is on the side closest to the power connector pins.)

3. Locate an unused power connector coming from the store controller power supply. If all power cables are in use, purchase a dc Y-connector at your computer dealer or electronics store. Locate an available power cable and connect it to the 4-pin power connector on the tape drive . The cable connector is keyed and will fit properly only one way.

Step 5. Completing the Installation

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

2. Be sure that the cables are neatly routed. They must not:
   - Get in the way when the cover is replaced
   - Impede the power supply fan blade
   - Block air flow paths

3. Replace the store controller cover and secure it in place.

4. Reconnect the ac power cord and cables. Turn on all attached devices; then turn on the store controller.

5. When the Configuration/Setup Utility is automatically entered, Select "Devices and I/O Ports".

6. Select "IDE Drives Setup...".

7. Select each item in the list of IDE drives and verify that all of your hard disks are defined correctly. They should not be shown as "Not Installed". To select

each item in the list, press the **Enter** key and use the arrow keys to move between items. Press the **Enter** key to select the item. Press the **Esc** key to return to the previous screen.

Also, make sure that the tape drive is reported as "Installed". The order of the list is important. The drives should be defined as:

Drive 0 is the master on primary IDE.

Drive 1 is the slave on primary IDE.

Drive 2 is the master on secondary IDE.

Drive 3 is the slave on secondary IDE.

An empty item is reported as a "Hard Disk Drive" and "Not Installed".

Note: The BIOS reports the tape drive incorrectly as a CD-ROM, but this does not cause a problem with operation.

8. Save the configuration and exit the Configuration/Setup Utility.

Installing the TR-4 SCSI Internal Tape Drive

This section provides instruction for installing the SCSI internal tape drive. To install this drive, you must have the following:

- A SCSI bus adapter that is a single-ended SCSI and meets SCSI-2 (ANSI X3.T92) or SCSI (ANSI X3.131-199X Rev.10h) standards
- The documentation that comes with your store controller

Step 1. Planning Your SCSI Configuration

You must plan what SCSI ID to give the tape drive connected to the SCSI bus adapter. Each device on the adapter bus must have a unique ID. You cannot assign a device 7 because most SCSI bus adapters use that as their ID. Typically, assign the higher SCSI ID numbers to those devices that are most often used or are faster than other devices in the SCSI chain. The tape drive is preset at the factory to SCSI ID 0. Refer to your SCSI bus adapter documentation for more information.

For most Store Controllers, you can press F1 during startup to view your Store Controller and SCSI bus adapter configuration. Other Store Controllers can have different procedures to view the configuration. Some SCSI adapters have utility programs that allow you to view the SCSI configuration, or you might have to physically inspect the installed SCSI devices to see how the IDs are set. For more information, refer to the documentation that comes with your Store Controller or SCSI bus adapter.

Step 2. Preparing for Installation

1. Turn off the Store Controller and unplug the power cables from the power outlet for the Store Controller and all attached peripherals.
2. Open the Store Controller. For specific information on opening your Store Controller refer to the documentation that comes with your Store Controller.
3. Touch the static-protective bag containing the tape drive to an unpainted metal surface on the Store Controller for at least 2 seconds. Remove the drive from the static-protective bag, holding the drive by the edges, and place it on the bag.

Step 3. Configuring the SCSI Drive

1. Locate the SCSI configuration block. The SCSI configuration block pin assignments are:

   15 and 16
   > Enable terminator power

   13 and 14
   > Enable termination

   11 and 12
   > Reserved

   9 and 10
   > Reserved

   7 and 8
   > Enable parity

   5 and 6
   > SCSI bit 2

   3 and 4
   > SCSI bit 1

   1 and 2
   > SCSI bit 0

2. Set the tape drive's SCSI ID to the ID you selected. If you need to reset the SCSI ID, refer to the following table, which contains SCSI ID Pin Assignments, for the ID jumper pin settings.

SCSI ID	Bit 2, Pin 5, 6	Bit 1 Pin 3, 4	Bit 0 Pin 1, 2
0	OFF	OFF	OFF
1	OFF	OFF	ON
2	OFF	ON	OFF
3	OFF	ON	ON
4	ON	OFF	OFF
5	ON	OFF	ON
6	ON	ON	OFF
7	ON	ON	ON

3. If the tape drive is the last device on the SCSI bus, it must be terminated. If you need to terminate the device, place a jumper over pins **13** and **14** to enable termination. The tape drive is shipped with enable termination OFF.

4. Normally, the SCSI bus adapter supplies terminator power. Therefore, the tape drive is shipped with enable terminator power OFF. If you need to enable terminator power, place the jumper over pins **15** and **16**.

5. The parity is set to ON, enable parity, as the default (jumper over pins **7** and **8**). To disable parity, set the jumper to OFF.

Step 4. Mounting the Drive

1. Locate an available bay or space in your Store Controller to mount the tape drive. The drive can be mounted in either a horizontal or vertical position. The drive fits in a 3.5-inch (1-inch high) standard bay. When mounted horizontally, the tape drive should be oriented so that the activity light is on the top left corner of the tape opening when looking at the tape drive from the front.

> **Note:** You can also mount the drive in a 5.25-inch (1.6-inch high) bay using the 5.25-inch mounting kit provided. When you attach the brackets to the sides of the 3.5-inch tape drive, you increase the width and height of the drive. The installation instructions are located on the mounting kit packaging.

2. Remove the cover plate from the bay selected. Slide the drive partially into the bay. Align the drive-bay screw holes with the threaded holes in the drive housing (or bracket, if applicable).

3. Use the screws provided to secure the drive in the bay. Usually two screws are used on each side. Some installations use the screw holes on the bottom (circuit board side) of the drive. Using the wrong size screws can damage the drive. Do not overtighten the screws. Check to ensure that the drive is securely mounted.

Step 5. Attaching the SCSI and Power Cables

1. Locate the SCSI and power connectors. The tape drive connectors are:
   - SCSI connector
   - SCSI connector - pin 1
   - Power connector

2. Locate the SCSI bus cable (usually a 50-pin ribbon cable). The SCSI bus adapter can be on the Store Controller system board or on an adapter installed in an expansion slot. If your Store Controller has a 68-pin cable, you need a 16-bit to 8-bit SCSI internal converter (IBM part number 32G3925 or equivalent).

3. There can be up to seven connectors on the cable from the SCSI bus adapter. Locate an available SCSI connector and plug it into the tape drive. Ensure that line 1 of the SCSI cable (usually color coded) aligns with pin 1 of the SCSI connector.

4. Locate an available power cable and connect it to the 4-pin power connector on the tape drive. If all power cables are in use, purchase a dc Y-connector at your computer dealer or electronics store. The power cable connector is keyed and fits properly only one way. Do not force it. If it does not attach easily, turn the connector around and try it again.

Step 6. Completing the Installation

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

2. Be sure that the cables are neatly routed. They must not:
   - Get in the way when the cover is replaced
   - Impede the power supply fan blade
   - Block air flow paths

3. Replace the Store Controller cover and secure it in place.

4. Reconnect the ac power cord and cables. Turn on all attached devices; then turn on the Store Controller.

Installing the External SCSI Drive

This section provides instructions for installing the external SCSI tape drive. The external SCSI model is essentially the internal SCSI model in a self-contained enclosure.

Step 1. Planning Your SCSI Configuration

Plan what SCSI ID to give the tape drive connected to the SCSI bus adapter. Each device on the adapter bus must have a unique ID. You cannot assign a device 7 because most SCSI bus adapters use this as their ID. Typically, assign the higher SCSI ID numbers to those devices that are most often used or are faster than other devices in the SCSI chain. The tape drive is preset at the factory to SCSI ID 0. Refer to your SCSI bus adapter documentation for more information.

For most Store Controllers, you can press F1 during startup to view your Store Controller and SCSI bus adapter configuration. Other Store Controllers can have different procedures to view the configuration. Some SCSI adapters have utility programs that allow you to view the SCSI configuration, or you might have to physically inspect the installed SCSI devices to see how the IDs are set. For more information, refer to the documentation that comes with your Store Controller or SCSI bus adapter.

Step 2. Preparing for Installation

1. Touch the static-protective bag containing the tape drive to an unpainted metal surface on the Store Controller for at least 2 seconds. Remove the drive from the static-protective bag, holding the drive by the edges, and place it in a convenient space next to your Store Controller.
2. Turn off the Store Controller and unplug the power cables from the power outlet for the Store Controller and all attached peripherals.

Step 3. Configuring the Drive

The external SCSI model comes with the same defaults (termination disabled, terminator power disabled, and parity enabled) as the internal SCSI model. Refer to the instructions for the internal model, "Step 3. Configuring the Drive", if you have to open the external enclosure and adjust these settings.

The power switch is on the front panel of the tape drive. The following interfaces are on the rear panel of the external drive:

- SCSI ID-selection push switch
- Two SCSI interface connectors
- Power cord connector

Follow these instructions to install the tape drive:

1. The tape drive has two SCSI cable connectors. Connect the external tape drive to your Store Controller's SCSI bus adapter using a 50-pin ribbon SCSI cable (not provided) to one of the SCSI connectors on the back of the tape drive.
2. The end of a SCSI chain must be terminated to ensure the quality of the signal throughout the SCSI chain. Use an 8-bit active or passive terminator. An active terminator (IBM part number 32G3919 or equivalent) provides improved signal quality. Determine if you need to terminate the tape drive:
   - When the drive is the last SCSI device in the chain (or the only drive) attach a terminator to the available SCSI connector on the back of the drive. Connect the second SCSI connector to the SCSI bus adapter cable.
   - When the drive is within the chain do not terminate the tape drive. Connect the first SCSI connector to the cable from the previous device in the chain. Connect the second SCSI connector to the next device in the chain.

3. Locate the SCSI ID push switch on the back of the tape drive. Select the SCSI ID for the drive by pressing the + or − button until the desired ID (0 through 7) appears in the window.

Step 4. Completing the Installation

1. Check your SCSI bus cable connections.
2. Connect one end of the power cord to the connector on the back panel of the tape drive then the other end to a convenient wall outlet. Turn the drive ON. (The power switch is on the front panel of the tape drive.) Turn on the other attached devices; then turn on the Store Controller.

Upgrading the Firmware

You may need to apply the latest firmware to both the Store Controller and the tape drive.

Upgrading the Firmware for the Store Controller

In some cases, it may be necessary to upgrade the BIOS in the Store Controller so that it will work with the tape drive. You can find the downloadable software to upgrade the firmware for the Store Controller at http://www.pc.ibm.com/us/files.html. Search on the model number of the Store Controller to find all information relating to that model.

Upgrading the Firmware for the Tape Drive

If you have an early version of the tape drive hardware, you must apply the latest firmware to the tape drive. To determine if you have an early version of the tape drive, look for a chip on the tape drive with "WDC" written on it. If this chip is present, your tape drive is an early version. If you do not upgrade the firmware, the BIOS continues to give the errors 1762 and 162, and repeatedly takes you into the Configuration/Setup Utility when the Store Controller is booted.

To upgrade the firmware for the tape drive:
1. Access the Internet web address: "http://www.pc.ibm.com/us/files.html".
2. Click on "Search".
3. Enter "tr4code" in the search field and click on "Search".
4. Click on "tr4code.exe".
5. Download the file to the subdirectory of your choice.
6. Click on "tr4code.txt" and follow the installation instructions provided in this file.

   Note: You may want to print this document to facilitate the installation process.

Installing the Software

This section describes the how to enable the feature.

Enabling the Feature

After purchasing the feature, you should run the featurization diskette to tell the operating system that you have purchased it. To enable the feature:

1. With the operating system running, start a Command Mode session.
2. Insert the 4690 Featurization Diskette.
3. Type **A:INSTALL**
4. Answer the questions and follow the prompts.
5. Place an X by the tape drive feature that describes the feature that you purchased.
6. Press the **Enter** key when finished.
7. Review the terminal features and press the **Enter** key when finished.

Selecting the Correct EIDE Tape Drive

During the boot process the operating system loads a tape driver. The operating system determines the correct tape driver to load using information gathered when issuing the TAPESTRS and TAPESTRM commands. To change the selection to the EIDE TR-4 tape drive:

1. With the operating system running, start a Command Mode session.
2. Type **TAPESTRM 5**.
3. Follow the instructions, including rebooting the store controller.
4. Boot the store controller using the operating system Supplemental Diskettes.
5. Start a Command Mode session.
6. Type **TAPESTRS 5**.
7. Follow the instructions, including rebooting the store controller.

Note: This process is automatic if you are using the SCSI tape drive. The TAPESTRM and TAPESTRS commands are not used with the SCSI tape drive.

Chapter 3. Using the Tape Drive

This section provides information on using the tape drive features. It explains the procedures for loading and unloading tape cartridges and setting the write-protect switch.

Loading and Unloading Tape Cartridges

The front panel of the tape drive contains the cartridge opening and an activity light that indicates drive activity. When the activity light is OFF, the drive is not active.

Your tape drive has a flip-up door that covers the cartridge opening when you do not have a tape cartridge in the drive. Once you insert a cartridge, the tape drive holds it in place using a positive locking mechanism.

Note: Do not remove the tape cartridge during drive operation. Complete any tape operation and wait until the activity light is OFF before removing the cartridge.

To load a cartridge, insert it with the metal base plate down and the tape access door facing the drive.

To unload a cartridge, wait until the drive activity light is OFF and then pull the cartridge straight out.

Setting the Write-Protect Switch

Tape drive cartridges feature a write-protect switch located in the upper, left corner of the cartridge. You can set the switch to keep data from being written on the tape. Use this switch when you want to ensure that important data on the tape is not overwritten.

To return a cartridge to the unprotected write state, push the switch toward the end of the cartridge or unlocked position.

Reviewing Performance Considerations

The tape drive is ideally suited to streaming operations compared to multiple-start-and-stop tape movement. Frequent start-and-stop operations are often the result of data underruns. Start-and-stop operation can also increase the stress on both the drive and the media.

If you need to improve the performance of the tape drive, consider one or more of the following:

- Reduce the number of other applications that might be running simultaneously with the backup application.
- For EIDE tape drives, consider moving the D: drive to the primary IDE cable if it is on the secondary IDE cable.

13

Checking the Reliability of the Tape Data

After the Streaming Tape Drive Utility completes a list or restore operation, the message "Reliability: Tape drive recovered from *xxx* soft errors" appears, with *xxx* representing the number of 512-byte blocks that could not be read successfully on the first attempt. However, the tape drive was able to recover the data successfully using either a read retry or ECC. The hardware specifications allow up to one soft error for every 102 KB of data, but testing has shown that a typical list or restore operation of 4 GB of data would only have one soft error for every 1 MB to 14 MB of data. For example, if a tape is full (it has 4 GB of data), it may have over 200 soft errors.

When the Streaming Tape Drive Utility is exited, a W660 B4/S055/E010 message is logged to record the number of soft errors encountered while the utility was running. If you format the W660 message using the Long Format Mode of the Scan System Log Data Utility in the Controller Events bucket, the following line appears:

DATA ERRORS: XXX   UNDERRUNS: XXX   PARITY ERRORS: XXX

The DATA ERRORS field shows the number of soft errors that were recovered using a read retry. The UNDERRUNS field is not used for the TR-4 Tape Drive and always shows 0. The PARITY ERRORS field indicates the number of soft errors that were recovered using ECC.

Listing a Tape

The directory information for each file on the tape is located immediately before the file data for each file. It does not have a separate directory. Therefore, listing the data on the tape requires reading all of the data on the tape. A full tape of 4 GB of data would require about 2.5 hours to list the tape at the rate of 30 MB per minute. It is recommended to list the tape after each backup. The list can be used to verify that the data can be successfully read if required.

Erasing a Tape

Erasing a tape takes approximately three minutes. The process writes an End-of-Data marker at the beginning of the tape, winds the tape to the end, and then rewinds back to the beginning in order to retension the tape.

Messages

This section describes the messages specific to the TR-4 Tape Drive.

W679   **W679 STREAMING TAPE DRIVE ERROR B4/S056/E***xxx*

Severity: 3

Explanation: The attempted streaming tape drive operation cannot be performed.

The event (E*xxx***) in the message indicates the following:**

E019 – Peripheral device write fault. This normally indicates a hardware problem with the tape cartridge.

E020 – No write current.

E021 – Excessive write errors.

E022 – Logical unit not ready, cause not reportable.

E023 – Logical unit is in process of becoming ready.

E024 – Logical unit not ready, initializing command required.

E025 – Logical unit not ready, manual intervention required.

E026 – Logical unit not ready, format in progress.

E027 – Logical unit not ready, operation in progress.

E028 – Logical unit does not respond to selection.

E029 – Multiple peripheral devices selected.

E030 – Logical unit communication failure.

E031 – Logical unit communication time-out.

E032 – Logical unit communication parity error.

E033 – Logical unit communication CRC error (Ultra-DMA/32).

E034 – Track following error.

E035 – Head select fault.

E036 – Error log overflow.

E040 – Write error.

E041 – Compression check miscompare error.

E042 – Data expansion occurred during compression.

E043 – Block not compressible.

E044 – Unrecovered read error.

E045 – Read retries exhausted.

E046 – Error too long to correct.

E047 – Multiple read errors.

E048 – Incomplete block read.

E049 – No gap found.

E050 – Miscorrected error.

E051 – Decompression CRC error.

E052 – Cannot decompress using declared algorithm.

E053 – Block sequence error.

E054 – Random positioning error.

E055 – Mechanical positioning error.

E056 – Positioning error detected by read of medium.

E057 – Defect list error.

E058 – Parameter list length error.

E059 – Synchronous data transfer error.

E060 – Invalid command operation code.

E061 – Logical block address out of range.

E062 – Invalid element address.

E063 – Invalid field in CDB.

E064 – Logical unit not supported.

E065 – Invalid field in parameter list.

E066 – Parameter not supported.

E067 – Parameter value invalid.

E068 – Threshold parameters not supported.

E069 – Invalid release of active persistent reservation.

E070 – Write protected.

E071 – Hardware write protected.

E072 – Logical unit software write protected.

E073 – Associated write protect.

E074 – Persistent write protect.

E075 – Permanent write protect.

E076 – Not ready to ready change, medium may have changed.

E077 – Import or export element accessed.

E078 – Power on, reset, or bus device reset occurred.

E079 – Power on occurred.

E080 – SCSI bus reset occurred.

E081 – Bus device reset function occurred.

E082 – Device internal reset.

E083 – Parameters changed.

E084 – Mode parameters changed.

E085 – Log parameters changed.

E086 – Reservations preempted.

E087 – Copy cannot execute because Store Controller cannot disconnect.

E088 – Command sequence error.

E089 – Overwrite error on update in place.

E090 – Commands cleared by another initiator.

E091 – Incompatible medium installed.

E092 – Cannot read medium - unknown format.

E093 – Cannot read medium - incompatible format.

E094 – Cleaning cartridge installed.

E095 – Cannot write medium - unknown format.

E096 – Cannot write medium - incompatible format.

E097 – Cannot format medium - incompatible medium.

E098 – Cleaning failure.

E099 – Medium format corrupted.

E100 – Tape length error.

E101 – Enclosure failure.

E102 – Enclosure services failure.

E103 – Unsupported enclosure function.

E104 – Enclosure services unavailable.

E105 – Enclosure services transfer failure.

E106 – Enclosure services transfer refused.

E107 – Rounded parameter.

E108 – Saving parameters not supported.

E109 – Sequential positioning error.

E110 – Tape position error at beginning-of-medium.

E111 – Tape position error at end-of-medium.

E112 – Reposition error.

E113 – Position past beginning of medium.

E114 – Medium destination element full.

E115 – Medium source element empty.

E116 – Medium magazine not accessible.

E117 – Medium magazine locked.

E118 – Invalid bits in identify message.

E119 – Logical unit has not self-configured yet.

E120 – Target operating conditions have changed.

E121 – Microcode has been changed.

E122 – Changed operating definition.

E123 – Inquiry data has changed.

E124 – Diagnostic failure.

E125 – Message error.

E126 – Internal target failure.

E127 – Select or reselect failure.

E128 – Unsuccessful soft reset.

E129 – SCSI parity error.

E130 – Initiator detected error message received.

E131 – Invalid message error.

E132 – Command phase error.

E133 – Data phase error.

E134 – Logical unit failed self-configuration.

E135 – Tagged overlapped commands.

E136 – Overlapped commands attempted.

E137 – Write append error.

E138 – Write append position error.

E139 – Position error related to timing.

E140 – Erase failure.

E141 – Cartridge fault.

E142 – Media load or eject failed.

E143 – Unload tape failure.

E144 – Medium removal prevented.

E145 – Operator request or state change input.

E146 – Operator medium removal request.

E147 – Operator selected write protect.

E148 – Operator selected write permit.

E149 – Log exception.

E150 – Threshold condition met.

E151 – Log counter at maximum.

E152 – Log list codes exhausted.

E154 – Voltage fault.

E155 – Decompression exception short algorithm ID.

E156 – Decompression exception long algorithm ID.

E157 – Unexpected sense data.

E158 – A Device malfunction prevents return of the sense data.

E159 – Store Controller is not an ISA bus machine.

E160 – Illegal Length Indicator.

E161 – Illegal command.

E162 – Store Controller does not support ABIOS.

E163 – ABIOS has used all available logical IDs and cannot allocate a logical ID for the tape drive.

E164 – The tape drive has multiple LUNs. The tape software only supports tape drives with one LUN.

E165 – The ABIOS is using logical data pointers. Logical data pointers are not supported.

E166 – Device is not a Tape Streamer.

E167 – Device does not support removable media.

E168 – Tape Drive does not support Accelerated DRQ.

E169 – Packet size is not 12 bytes.

E170 – Device is not an ATAPI device.

E171 – Page code is incorrect.

E172 – Page length is incorrect.

E173 – Page support does not support the necessary pages.

E174 – No format and partition recognition.

E175 – No fixed data partitions.

E176 – Tape drive command timed out.

User Response: Choose one of the following based on the event (E*xxx*) that is displayed:

E019, E020, E021, E036, E040, E041, E042, E043, E044, E045, E046, E047, E048, E049, E050, E051, E052, E053, E109, E110, E111, E112, E113, E137, E138, E140, E141, E149, E150, E151, E152 – These errors normally indicate a tape cartridge problem. Remove the cartridge and examine the tape. Look for any visible damage. Retension the tape and try again. If the problem persists, replace the tape cartridge. If the error still persists, contact your IBM Service representative.

E022, E023, E027, E076, E083, E084, E085, E119, E120, E121, E122, E123, E145, E146, E148 – These errors normally indicate a temporary condition that will clear itself. Wait for the tape motion to stop before attempting the operation again.

E024 – Reboot the Store Controller.

E025 – Insert the tape cartridge in the tape drive.

E026 – This error normally indicates a user problem caused by attempting another command to the tape drive before a format completes. Wait for format to complete.

E028, E030, E031, E032, E033 – These errors normally indicate a tape drive hardware problem. Check connections to the tape drive. If the error still persists, contact your IBM Service representative.

E029 – Make sure there is only one tape drive installed.

E034, E091, E092, E093, E094, E095, E096, E097, E098, E099, E100, E166, E167, E168, E169, E170, E173, E174, E175 – These errors normally indicate an attempt to use a tape drive that is not supported. Make sure that the tape is a TR-4 tape. If the problem persists, replace the tape cartridge. If the error still persists, contact your IBM Service representative.

E035, E054, E055, E056, E057, E124, E126, E127, E128, E129, E130, E134, E139, E142, E143, E158, E176 – These errors normally indicate a tape drive hardware problem. Contact your IBM Service representative.

E058, E059, E060, E061, E062, E063, E064, E065, E066, E067, E068, E069, E086, E087, E088, E089, E090, E107, E108, E114, E115, E118, E125, E131, E132, E133, E135, E136, E155, E156, E160, E161, E171, E172 – These errors normally indicate a tape drive software problem. Contact your IBM Software Support representative.

E070, E071, E072, E073, E074, E075, E116, E117, E144, E147 – These errors normally indicate a user problem caused by attempting to write to a tape that has been write protected. Remove write protection before retrying.

E077, E078, E079, E080, E081, E082, E154 – These errors normally indicate a temporary condition caused by a power line disturbance. It could also indicate a hardware problem. If there was a power line disturbance, retry to operation. If it is known that there was no power line disturbance, check connections. If the error still persists, contact your IBM Service representative.

E101, E102, E103, E104, E105, E106 – These errors normally indicate a tape drive enclosure hardware problem. Check connections to the enclosure. If the error still persists, contact your IBM Service representative.

E157 – This error indicates that an undocumented vendor-unique status was received.

E159, E162, E164 – These errors normally indicate an attempt to use a tape drive that is not supported or an attempt to use a supported tape drive on a Store Controller that does not support the specific model of tape drive. Check for compatibility between the tape drive model and the Store Controller model.

E163, E165 – These errors normally indicate a problem with the ABIOS. Check to see if you have the latest ABIOS patches and make sure your Store Controller is supported. Contact the IBM Support Center.

System Action: Logged as B4/S056/E*xxx* by the Streaming Tape Drive Utility. Refer to the *IBM 4690 OS V2: Messages Guide* for more information.

W680	W680 STREAMING TAPE DRIVE IS TOO HOT B4/S055/E038

Severity: 4

Explanation: The tape drive detected that it is too hot.

User Response: Check to see if the fan on the Store Controller is working and the vents are not blocked.

System Action: Logged as B4/S055/E038 by the streaming tape drive device driver. Refer to the *IBM 4690 OS V2: Messages Guide* for more information.

W681	W681 STREAMING TAPE DRIVE NEEDS CLEANING B4/S055/E018

Severity: 4

Explanation: The tape drive detected that it needs cleaning.

User Response: Clean the drive using the proper cleaning kit.

System Action: Logged as B4/S055/E018 by the streaming tape drive device driver. Refer to the *IBM 4690 OS V2: Messages Guide* for more information.

W682	W682 STREAMING TAPE DRIVE FAILURE PREDICTED B4/S055/E*xxx*

Severity: 4

Explanation: The attempted streaming tape drive operation was performed successfully, but the tape drive detected a potential problem.

The event (E*xxx*) in the message indicates the following:

E037 – Potential problem is unspecified.

E039 – The tape drive detected that the enclosure is degraded.

E153 – Failure prediction threshold exceeded.

System Action: Logged as B4/S055/E*xxx* by the streaming tape drive device driver. Refer to the *IBM 4690 OS V2: Messages Guide* for more information.

Chapter 4. Tape Drive Specifications

TR-4 1/4-inch tape cartridge technology offers fast, efficient, high capacity storage in a compact, easy-to-remove hard-shell package. This mass-storage technology evolved from the original reel-to-reel 1/2-inch tape storage medium. Storage capacities increased from 60 MB on 9 tracks (QIC-24, 1982) to the 4 GB capacity achievable with the tape cartridge.

This section includes the following specifications and requirements:
- Physical specifications
- Power requirements
- Drive performance
- Environmental requirements
- Tape cartridge specifications and capacities
- Regulatory compliance

Physical Specifications

The physical specifications[1] are of both the EIDE and SCSI tape drives are listed in the following tables.

Physical Specifications

Type Drive	Internal Drive	External Drive
Height	25 mm (1.0 in.)	51 mm (2.0 in.)
Width	102 mm (4.0 in.)	155 mm (6.1 in.)
Length	163 mm (6.4 in.)	234 mm (9.2 in.)
Weight	0.5 kg (1.0 lb.)	1.4 kg (3.0 lb.)

Power Requirements

The following table lists the power specifications by voltage level for the tape drive. The power specifications are measured at the tape-drive power connector and are nominal values.

Power Specifications

Voltage	+12 V dc	+5 V dc
Voltage tolerance	+ or −10%	+ or −5%
Operational current	2.0 amps	1.0 amps
Standby current	0.2 amps	0.6 amps
Peak	2.2 amps max	—
Power Sequence	None	None
Ripple (peak to peak)	⇐100 mV	⇐100 mV
Power user (nominal)	< 15 watts (excluding surge)	< 15 watts (excluding surge)

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1. Product-description data represents IBM's design objectives and is provided for comparative purposes; actual results might vary, based on a variety of factors. This product data does not constitute a warranty. Data is subject to change without notice.

19

Drive-Performance Specifications

The following table lists the performance specifications for the tape drive .

Drive Performance

Feature	Specification
Capacity	4.0 GB, 900 Oe^2 740 feet Travan cartridge
Effective backup rate	30 MB per minute typical
Data transfer rate	300/450/600 KB per second
Tape speed for Read/Write and Search/Rewind	33, 51, or 77 ips 90 ips maximum
Recording method	Serpentine
Recording format	QIC 3095MC
Recording code	1,7 RLL
Error recovery	Reed Solomon ECC
Recording unrecoverable errors	Less than 1 in 10^9 data Mb
Head configuration	Wide write/narrow read
Recording media	900 Oe 740 feet Travan
Cartridge size	3.2 in. x 2.4 in. x 0.4 in. (81 mm x 61 mm x 10.2 mm)
Synchronous transfer rate (burst)	5 MB per second maximum
Asynchronous transfer rate (burst)	5 MB per second maximum
Soft errors	less than 1 in 10^6 bits

Environmental Requirements

The following table lists the environmental specifications for the tape drive. You can mount the drive either vertically or horizontally.

Environmental Requirements

Specification	Operational	Nonoperational
Temperature	+41° to +113°F[3] (+5° to +45°C)	−40° to +149°F[4] (−40° to +65°C)
Thermal gradient	1°C per minute (no condensation)	20°C per hour
Relative humidity	20% to 80% noncondensing[3]	5% to 95% noncondensing[4]
Max wet bulb temperature	78.8°F (26°C)	No condensation
Altitude	−1000 to +15 000 feet	−1000 to +50 000 feet

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2. Oersted (Oe)

3. Mechanism and media

4. Mechanism

Environmental Requirements

Specification	Operational	Nonoperational
Vibration Peak to peak displacement Peak acceleration	0.005 in. max (5 to 44.3 Hz) 0.50 g max (44.3 to 500 Hz)	0.1 in. max (5 to 17 Hz) 1.5 g max (17 to 500 Hz)
Acoustic level operational (a-wt sum)	55 dBA maximum (measured in suitable enclosure at 3-ft. distance and operator height)	—
Shock (1/2 sine wave)	2.5 g peak 11 millisecond	100 g peak 11 millisecond

Tape Cartridge Specifications and Capacities

The tape drive uses prewritten cartridges. An 8-mm Travan (740 feet) 4.0 GB capacity tape is recommended.

Regulatory Compliance

The tape drive complies with the regulations listed in the following table.

Regulatory Compliance

Agency	Regulation
CSA	C22.2, No. 950-M89
TUV & IEC-RHEINLAND	EN 60 950/IEC 950
UL	1950
Canadian Department of Communications	Class B
VDE	Class B
FCC	Class B, Part 15

Use the tape drive only in equipment where the combination has been determined to be suitable by an appropriate certification organization (for example, Underwriters Laboratories Inc. of the Canadian Standards Association in North America). Consider the following safety points:

- Install the drive in an enclosure that limits the user's access to live parts, gives adequate system stability, and provides the necessary grounding for the drive.
- Provide the correct voltages (+5 V dc and +12 V dc) based on the regulation applied — Extra Low Voltage (SEC) for UL and CSA and Safety Extra Low Voltage for BSI and VDE (if applicable).

Chapter 5. Maintenance and Troubleshooting

This chapter describes several maintenance and troubleshooting procedures for the TR-4 EIDE Internal Tape Drive and the TR-4 SCSI Tape Drives.

Attention: To avoid electrical shock, unplug your store controller and all attached devices from electrical outlets before performing any troubleshooting procedure.

Maintenance

You should perform minimal maintenance to ensure that your tape drive operates in peak condition.

Caring for Tape Cartridges

The following points are guidelines for storing and using the cartridges:
- Do not open the tape access door of the cartridge or touch the tape itself.
- Keep cartridges away from sources of electromagnetic fields, such as telephones, dictation equipment, mechanical or printing calculators, motors, and bulk erasers. Do not place the cartridges on the store controller monitor or on the base unit of the store controller.
- Keep cartridges away from direct sunlight and heat sources, such as radiators or warm air ducts.
- Keep cartridges free of moisture. Do not wet or submerge cartridges in any liquid.
- Do not expose cartridges to temperature extremes.
- Retension tape cartridges that have not been used for more than a month before restoring or backing up data. Retensioning is the winding and rewinding of a tape cartridge. This action restores the proper tape tension to the media. The backup application software provides a function to retension a tape cartridge.

Cleaning the Tape Head

To properly maintain the drive, periodically clean the tape head. You do not need to perform any other periodic maintenance. Clean the tape head with a dry-process cleaning cartridge such as the Geneva DPCC-2000+. You can order a Geneva DPCC-2000+ cleaning cartridge directly from Geneva by calling 1-800-358-3559 and requesting part number GEN100-1 or by contacting your local Lexmark dealer.

The cleaning cartridge is good for 30 cleaning operations. Cleaning should be performed once a week. The cleaning process is simple to use; insert the cleaning cartridge into the tape drive, and the cleaning process is automatic. The entire process only takes a few seconds and is completed when the drive's activity light stops flashing.

Troubleshooting

EIDE Tape Drive

If the Store Controller is indicating an error during the boot process prior to the "IBM 4690 OS 386 V1 ..." message, the problem is not in the 4690 software. The problem is either a hardware failure, a hardware configuration problem, downlevel BIOS, or downlevel firmware in the tape drive. Check for the following conditions:

- Make sure the jumpers are correct. On each ribbon cable, there must be no more than one device jumpered as the "master" or "master with a slave attached". If there are two devices on the ribbon cable, one, and only one, must be jumpered as the slave.
- Make sure the ribbon cable is attached correctly to both the devices and the connector on the system board.
- Make sure the tape drive firmware is current. See "Upgrading the Firmware for the Tape Drive" on page 11 to determine if you need to upgrade the firmware.
- Make sure the BIOS of the Store Controller is current. You can try upgrading the BIOS to a more recent level.

If the Streaming Tape Drive Utility abends with a W639 B4/S056/E001 message, it indicates that either the TAPESTRS 5 or TAPESTRM 5 command was not executed, the Store Controller does not support the tape drive, or that the Store Controller could not detect the tape drive.

Make sure that the following conditions exist:

- The tape drive is on the secondary ribbon cable.
- TAPESTRM 5 was run from Command Mode and TAPESTRS 5 was run from the Supplemental Diskettes. After running the command, you must reboot your system.
- The Store Controller is an ISA bus system (that is, a PC 300 through PC 750 series).
- The Configuration/Setup Utility accessed by pressing F1 when prompted during the boot process can detect the tape drive. The tape drive should show as a CD-ROM and Installed. If the Configuration/Setup Utility cannot detect the tape drive, check the connections and jumpers.
- The tape drive model is supported.

EIDE and SCSI Tape Drives

If the Streaming Tape Drive Utility abends with a W679 B4/S056/E157 message, it can indicate numerous problems including:

- The tape to which you are trying to write is only supported in read-only mode.
- The device is not in a valid position. Make sure the drive is not upside down.
- The device has a hardware problem.

If the Streaming Tape Drive Utility abends with a W679 B4/S056/E034 message, it can indicate numerous problems including:

- The tape to which you are trying to write is not supported by the tape drive. The RHOMAT format tapes are not supported.
- The tape is not properly formatted. The tape drive only supports preformatted TR-4 tapes.

- The device has a hardware problem.

The "Reliability: Tape drive recovered from *xxx* soft errors" message displayed by the Streaming Tape Drive Utility is a normal message unless the number indicated by *xxx* is high. The number can exceed several hundred if the tape is full (contains 4 GB of data). To determine if the number is high, divide the number into the number of MB of data on the tape. Within the hardware specification, you can have up to 10 soft errors per 1 MB of data.

If the Streaming Tape Drive Utility logs a W660 B4/S055/E010 message, it is used for statistics and does not necessarily indicate an error.

If the Streaming Tape Drive Utility abends with read errors or if the number of soft errors becomes higher than normal, trying cleaning the tape drive. See "Cleaning the Tape Head" on page 23 for instructions.

Safety

Electrical current from power, telephone, and communication cables is hazardous. To avoid shock hazard, all cables should be disconnected before the store controller cover is opened and connected only after the store controller cover is closed. The power cord must be used with a properly grounded outlet.

Disconnecting

To disconnect your equipment:
- Turn all equipment OFF.
- First, remove power cord from outlet. (In the United Kingdom, by law, the power cord must be disconnected after the telephone line cable.)
- Remove signal cables from receptacles.
- Remove all cables from devices.

Connecting

To connect your equipment:
- Turn all equipment OFF.
- Attach all cables to devices. (In the United Kingdom, by law, the telephone cable must be connected after the power cord.)
- Attach signal cables to receptacles.
- Attach power cord to outlet.
- Turn equipment ON.

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