IBM TotalStorage™
Enterprise Automated Tape Library (3494)

Introduction and Planning Guide

GA32-0448-02

IBM TotalStorage™
Enterprise Automated Tape Library (3494)

Introduction and Planning Guide

GA32-0448-02

Note!
Before using this information and the product it supports, read the information in “Safety and Environmental Notices” on page xi and “Notices” on page 181.

Third Edition (May 2003)

This edition applies to the IBM® TotalStorage Enterprise Automated Tape Library and to all subsequent releases and modifications until otherwise indicated in new editions.

Contents

Figures

Tables

Safety and Environmental Notices

The following safety and environmental notice applies to the IBM TotalStorage Enterprise Automated Tape Library (3494).

Laser Safety and Compliance

The IBM® TotalStorage™ Enterprise Automated Tape Library is a Class II laser product. It is important for the operator to be aware of the laser caution label. See Figure 1 for an example of the label.

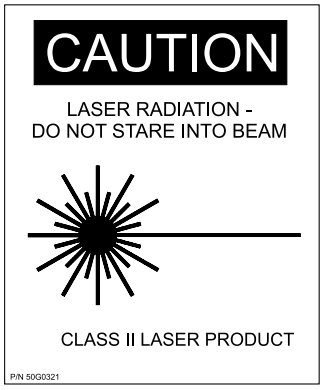


Figure 1. Class II Laser Safety Caution Label

This product complies with the performance standards set by the U.S. Food and Drug Administration for a Class II laser product. Class II laser products require taking precautions to avoid prolonged viewing of the laser beam. Under normal working conditions, you must not come in direct contact with the laser beam. This product has protective housings and scanning safeguards that ensure that laser radiation is inaccessible during operation or is within Class II limits. These products have been reviewed by external safety agencies and have obtained approvals to the latest standards as they apply to this product type.

Operator Safety

The operator should remember the importance of safe operation when performing any of the tasks in this book. The operator should know the location and how to use the switches and controls on the IBM TotalStorage Enterprise Automated Tape Library (see Chapter 2, “Specify and Special Features”, on page 53).

Safety Characteristics

The front doors on the library should not be opened during normal operation because of the moving components within the library. The doors have key locks to prevent the doors from being opened inadvertently. The Enterprise Tape Library includes integral safety control circuits that detect whether the doors are open or closed.

When a door is detected to be open, the power is removed from the cartridge accessor and the picker slowly descends. All host systems attached to the tape subsystems or through the RS-232 interfaces associated with the library are notified

of the condition. This gives the operator a warning of a safety exposure and a warning of potential unauthorized access to the cartridges stored in the library.

End of Life (EOL) Plan

This product is a purchased unit. Therefore, it is the sole responsibility of the purchaser to dispose of it in accordance with local laws and regulations at the time of disposal.

Preface

This publication provides installation, planning, and migration information for the IBM TotalStorage Enterprise Automated Tape Library (3494).

Organization of This Book

The information in this publication is organized as follows:

- Chapter 1, “Introduction”, on page 1 provides an overview of the IBM TotalStorage Enterprise Automated Tape Library (3494) and its functional units, configurations, and features.
- Chapter 2, “Specify and Special Features”, on page 53 describes the language group features, safety labels, cartridge features, and model and feature conversions for the 3494.
- Chapter 3, “Programming Support”, on page 93 describes the operating system support for the 3494.
- Chapter 4, “Site Planning and Preparation”, on page 111 describes the physical characteristics and installation requirements for the 3494.
- Chapter 5, “Migration to the Automated Tape Environment”, on page 119 describes the planning procedures for hardware and software migration for the 3494.
- Chapter 6, “Physical Planning and Specifications”, on page 131 describes the cooling and power requirements, acoustic and environmental specifications, and cabling information for the 3494.
- Appendix A, “Cartridge System Tape and Cartridge Labels”, on page 159 describes the tape cartridge requirements for the 3494.
- Appendix B, “Physical Planning Template”, on page 167 provides templates for planning space requirements for the 3494.
- Appendix C, “Planning for the 3494 and Task Allocation”, on page 171 discusses the task assignments recommended for the 3494.
- Appendix D, “Peer-to-Peer VTS Specialist Worksheet”, on page 177 provides a worksheet for recording name and address information for the IBM TotalStorage Peer-to-Peer Virtual Tape Server Specialist (Peer-to-Peer VTS Specialist).
- Appendix E, “Specialist Worksheet”, on page 179 provides a worksheet for recording name and address information for the IBM TotalStorage Enterprise Tape Library Specialist.
- “Glossary” on page 187 includes descriptions or terms used in this publication.
- “Index” on page 193 includes keywords and terms to help retrieve information in this publication.

Who Should Read This Book

This book is intended for system planners, programmers, and administrators.

Terminology Used in This Book

See “Glossary” on page 187 for definitions of terms, abbreviations, and acronyms in this publication.

Related Information

The following sections contain lists of information sources that you may need in order to accomplish installation, planning, and migration of the IBM TotalStorage Enterprise Automated Tape Library (3494).

IBM TotalStorage Enterprise Automated Tape Library (3494)

The following publications relate to the IBM TotalStorage Enterprise Automated Tape Library (3494) environment:

- *IBM TotalStorage Enterprise Automated Tape Library Operator Guide (3494)*, GA32-0449
- *IBM 3494 Physical Planning Template*, GX35-5049
- *IBM 3494 Operator's Quick Guide*, GX35-5051
- *IBM TotalStorage Enterprise Automated Tape Library Maintenance Information*, SA37-0407
- *IBM TotalStorage Virtual Tape Server Planning, Implementing and Monitoring*, SG24-2229
- *IBM Magstar® Tape Products Family: A Practical Guide*, SG24-4632
- *IBM Magstar Virtual Tape Server and Enhancements to Magstar: New Era in Tape*, SG24-4917
- *IBM TotalStorage Peer-to-Peer Virtual Tape Server Planning and Implementation Guide*, SG24-6115
- *Online Library Omnibus Edition Hardware Collection*, SK2T-5483

IBM 3490E Tape Subsystem

The following publications relate to the IBM 3490E tape subsystem environment:

- *Care and Handling of the IBM Magnetic Tape Cartridge*, GA32-0047
- *Tape and Cartridge Requirements for the IBM Magnetic Tape Cartridge Drive*, GA32-0048
- *Tape and Cartridge Requirements for the IBM Enhanced Capacity Magnetic Tape Cartridge Drive*, GA32-0216
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Introduction*, GA32-0217
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Operator's Guide*, GA32-0218
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Hardware Reference*, GA32-0219
- *IBM 3490E Tape Subsystem Models F01, F1A, F11, and FC0 Installation, Planning, and Operator's Guide*, GA32-0378
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Planning and Migration Guide*, GC35-0219

IBM TotalStorage Enterprise Tape System 3590

The following publications relate to the IBM TotalStorage Enterprise Tape System 3590 environment:

- *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, GA32-0329
- *IBM TotalStorage Enterprise Tape System 3590 Operator Guide*, GA32-0330
- *Magstar 3590 Tape Subsystem Hardware Reference*, GA32-0331

- *Magstar and IBM 3590 High Performance Tape Subsystem Technical Guide*, SG24-2506
- *Magstar and IBM 3590 High Performance Tape Subsystem: Multiplatform Implementation*, SG24-2594

AIX®

The following publications relate to the AIX systems and software environment:

- *AIX Parallel and ESCON® Channel Tape Attachment/6000 Installation and User's Guide*, GA32-0311
- *AIX General Concepts and Procedures for RISC System/6000®*, GC23-2202
- *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*, GC35-0154

IBM AS/400® and IBM @server iSeries

The following publications relate to the AS/400 and iSeries software environment:

- *AS/400 Physical Planning Considerations*, GA21-9585
- *AS/400 IBM Backup Recovery and Media Services/400*, GC41-0096
- *AS/400 Physical Planning Reference*, SA41-3109
- *AS/400 Automated Tape Library Planning and Management*, SC41-3309
- *OS/400® CL Reference*, SC41-3722
- *AS/400 System API Reference*, SC41-3801
- *AS/400 Basic System Operation, Administration, and Problem Handling*, SC41-5206
- *OS/400 Backup and Recovery*, SC41-5304
- *A Practical Approach to Managing Backup Recovery and Media Services for OS/400*, SG24-4840

IBM RS/6000® and IBM @server pSeries

The following publications relate to the RS/6000 and pSeries software environment:

- *RISC System/6000 Getting Started: Managing RISC System/6000*, GC23-2378
- *Site and Hardware Planning Information*, SA38-0508

MVS™, OS/390®, and z/OS

The following publications relate to the MVS, OS/390, and z/OS systems and software environment:

- *DFSMS/MVS® General Information*, GC26-4900
- *MVS/ESA™ Planning: Installation and Migration for MVS/ESA System Product Version 4*, GC28-1077
- *MVS/ESA Library Guide*, GC28-1601
- *MVS/ESA Conversion Notebook*, GC28-1608
- *MVS/ESA System Management Facilities (SMF)*, GC28-1628
- *JES3 Command Reference*, SC23-0063
- *DFSMS/MVS Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*, SC26-3051
- *DFSMS/MVS Object Access Method Application Programmer's Reference*, SC26-4917
- *DFSMS/MVS Planning for Installation*, SC26-4919
- *Basic Tape Library Support User's Guide and Reference*, SC26-7016
- *DFSMS/MVS DFSMShsm™ Implementation and Customization Guide*, SH21-1078

VM/ESA® and z/VM

The following publications relate to the VM/ESA and z/VM systems and software environment:

- *VM/ESA General Information*, GC24-5745
- *VM/ESA TCP/IP Planning and Customization*, SC24-5847
- *VM/ESA TCP/IP User's Guide*, SC24-5848
- *VM/ESA TCP/IP Programmer's Reference*, SC24-5849

VSE/ESA™

The following publications relate to the VSE/ESA systems and software environment:

- *IBM 3494 Tape Library Dataserver User's Guide: Library Control Device Driver for VSE/ESA*, GC35-0176
- *VSE/ESA System Control Statements*, SC33-6613

Additional Information

The following publications contain additional information that relates to the IBM TotalStorage Enterprise Automated Tape Library:

- *IBM Fiber-Optic Channel Link Planning and Installation*, GA23-0367
- *IBM 9309 Rack Enclosure General Information and Site Preparation Guide*, GA24-4103
- *IBM Token-Ring Network Introduction and Planning Guide*, GA27-3677
- *IBM General Information Manual: Installation Manual-Physical Planning*, GC22-7072
- *Resource Access Control Facility General Information*, GC28-0722
- *Guide to Sharing and Partitioning IBM Tape Library Dataservers*, SG24-4409
- *IBM Fiber Saver (2029) Implementation Guide*, SG24-5608
- *Distributed Console Access Facility: Installation and Configuration Guide*, SH19-4068
- *Distributed Console Access Facility: User's Guide*, SH19-4069
- *Distributed Console Access Facility Target User's Guide*, SH19-6839
- *IBM TotalStorage Expert Installation Guide*, GC26-7436

How to Send Your Comments

Your feedback is important in helping to provide the most accurate and high-quality information. If you have comments or suggestions for improving this publication, you can send us comments electronically by using these addresses:

- Internet: STARPUBS@us.ibm.com (or STARPUBS at us.ibm.com)
- IBMLink™ from U.S.A.: STARPUBS at SJEVM5
- IBMLink from Canada: STARPUBS at TORIBM
- IBM Mail Exchange: USIB3VVD at IBMMAIL
- Fax from U.S.A., Canada, and other countries/regions: 520-799-2906

Chapter 1. Introduction

The IBM TotalStorage Enterprise Automated Tape Library (3494), Figure 2 on page 2, provides a modular tape automation solution for multiple computing environments. It provides cost-effective, reliable, and space-efficient tape automation. The 3494 has the following functions:

- The 3494 has a data storage capacity of up to 124 terabyte (terabyte (TB)) of uncompacted data and up to 374 TB of compacted data.
- The 3494 allows the intermix of tape media in any frame. This includes Cartridge System Tape, Enhanced Capacity Cartridge System Tape, High Performance Cartridge Tape, and Extended High Performance Cartridge Tape.
- The 3494 supports the IBM TotalStorage 3590 tape drives Models B1A, E1A, H1A. It also supports the 3490E tape drives Models C1A, C2A, F1A, and the IBM TotalStorage 3590 Model A60.
- The 3494 provides a High Availability model which contains dual Library Managers and dual accessors for reduced service interventions and greater availability. Also, an optional feature enables two active accessors for increased performance.
- The 3494 provides multiple host connectivity options, including Application System/400 (AS/400), RS/6000, S/390, RS/6000 SP, Sun, HP, and Windows.
- The 3494 offers exceptional expandability. It can expand from one to 16 frame units and from one to seventy–six 3590 or thirty–two 3490E tape transports. It can expand from 160 to 6,240 cartridges (up to 1 132 TB with 3:1 compression).
- The 3494 can mount up to 610 cartridges per hour with dual active accessors.
- The 3494, with the B18, B10, or B20 VTSs, can utilize the full capacity of 3590 tape cartridges to significantly reduce overall tape operating costs.
- The 3494 also supports the B16 VTS and small computer system interface (SCSI) Host Attachment/Export and Import operations for selected VTSs.
- The 3494 supports IBM TotalStorage Peer-to-Peer Virtual Tape Servers (PtP VTSs) to enhance data availability.
- The 3494 supports the IBM 3466 Network Storage Manager.
- The 3494 provides an easy-to-use graphical user interface (GUI) for operational control and setup of the library. It also provides a Web-based Specialist for viewing and administering the library from a remote location.

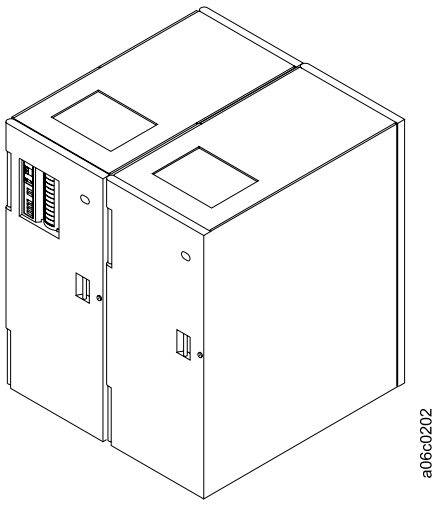


Figure 2. IBM TotalStorage Enterprise Automated Tape Library (3494)

New Improvements

The latest release includes the following key improvements:

- **PCI Library Manager** The 3494 is enhanced through integration of a new Library Manager with PCI technology and a faster 1.2 GHz processor speed.
- **IBM TotalStorage Enterprise Tape Drive 3590 Model H1A Attachment Supported in VTS** Virtualized data can now be stored on a 60 GB cartridge (180 GB compressed).
- **Peer-to-Peer VTS Enhancements** More enhancements enable system administrators to optimize the PtP VTS to maintain around-the-clock availability to critical business information.

PCI Library Manager

The new Library Manager with PCI technology and 1.2 GHz processor speed provides faster performance and reduced operation costs.

- Increases VTS logical mounts from approximately 3000 mounts/hour to 6000 mounts/hour
- Increases Ethernet LAN attachment performance to 100 Mb/second
- Improves LM switch-over times and remote database copies in High Availability (HA1) environments

Model H1A Support for VTS

You can now utilize the Model H1A tape drive with VTS. Virtualized data can now be stored on 60 GB (180 GB compressed) cartridges. The VTS supports up to 12 dedicated H1A tape drives. This higher capacity cartridge reduces cartridge handling, physical mounts, and number of cartridges required to accommodate storage requirements.

Peer-to-Peer VTS Enhancements

The following enhancements, which are set by a customer engineer, enable system administrators to optimize the PtP VTS for around-the-clock availability.

- Copy Files Preferenced to Reside in Cache — Allows you to set how copy files in the cache at the remote VTS are managed. This makes it more likely that the most recent copies will be in the cache when a recovery is performed.
- Recalls Preference for Cache Removal — Allows recalled data to be preferenced for removal from cache. This enables more cache hits and fewer recalls.
- Preferred Master VTS — Allows you to designate which VTS is the master, unless it is unavailable.
- Scratch Mount Direction — Instructs the Model AX0 to select a ″Preferred I/O VTS″ for scratch mounts, regardless of which VTS has the valid copy of the volume.
- Improved Link Balancing — Provides the AX0 with more information about the link distances (for example, throughput characteristics) to make a more informed decision when it selects which VTS to choose as the I/O VTS.
- Logging of PtP Option Settings — Provides the AX0 configuration information (including the new enhancements) into the statistical record provided to the host. Provides information to the customer as well as to engineering to aid in performance and operational analysis.

Model Attachments

A 3494, at a bare minimum, is two IBM TotalStorage Enterprise Tape Library Base Frames L10, L12, or L14. There are multiple optional frames and several possible configurations. This flexibility enables you to start small and grow in an affordable manner. This section outlines the different models that comprise the 3494. Please refer to the next section ″Configuration″ for more information on the many possible configurations.

The 3494 is available with the following models:

- IBM TotalStorage Enterprise Tape Library Base Frame L10, L12, or L14
- IBM TotalStorage Enterprise Tape Drive Expansion Frame D10, D12, D14
- IBM TotalStorage Virtual Tape Server B16, B18, B10, B20
- IBM TotalStorage Virtual Tape Frame CX0
- IBM TotalStorage Virtual Tape Controller AX0
- IBM TotalStorage Enterprise Tape Storage Frame S10
- IBM TotalStorage Enterprise High Availability Tape Frames HA1

IBM TotalStorage Enterprise Tape Library Base Frame L10, L12, or L14

The L10, L12, or L14 Frame is the minimum configuration and the base of a 3494. It contains a tape subsystem, library manager, cartridge accessor, convenience input/output (input/output (I/O)) station, accessor rail, and cartridge storage cells.

Table 1. L1x Frames

Name	Description
L10 Frame (Model L10)	Contains the following: • Cartridge storage cells • One 3490E Model C1A, C2A, or one to two Model F1A tape drives (the first 3490E Model F1A may contain the FC 3000 or FC 3500 Controller) • Library Manager • Cartridge accessor • Optional convenience I/O station feature (if installed)
L12 Frame (Model L12)	Contains the following: • Cartridge storage cells • Zero to two 3590 Model B1A, E1A or H1A tape subsystems • Library Manager • Cartridge accessor • Optional convenience I/O station feature (if installed)
L14 Frame (Model L14)	Contains the following: • Cartridge storage cells • Zero to one 3590 Model A00 or A50 Controller • Zero to two 3590 Model B1A, E1A or H1A tape subsystems • Library Manager • Cartridge accessor • Optional convenience I/O station feature (if installed) **Note:** The 3590 Model A00 or A50 Controller is required if any 3590 Model B1A or E1A tape subsystem is installed in the frame.

IBM TotalStorage Enterprise Tape Drive Expansion Frame D10, D12, D14

The D10, D12, or D14 Frame can contain zero to six drives, cartridge storage cells, and an accessor rail. This optional frame can be attached to any L1x Frame. Up to 15 D1x frames can be added to a 3494.

Table 2. D1x Frames

D10 Frame (Model D10) see note 1	Contains the following: • Cartridge storage cells • Zero to one 3490E Model C1A, C2A, or zero to two Model F1A tape drives (the first 3490E Model F1A may contain the FC 3000 or FC 3500 Controller)
D12 Frame (Model D12) see note 1	Contains the following: • Cartridge storage cells • Zero to six 3590 Model B1A, E1A or H1A tape subsystems

Table 2. D1x Frames (continued)

D14 Frame (Model D14) see note 1	Contains the following: • Cartridge storage cells • Zero to one 3590 Model A00, A50, or A60 Controller • Zero to four 3590 Model B1A, E1A, or H1A tape subsystems **Note:** The 3590 Model A00, A50, or A60 Controller is required if any 3590 Model B1A, E1A or H1A tape subsystem is installed in the frame.
Note: Additional storage can be added to a 3494 with a D10, D12, or D14 Frame, with or without tape drives.	

IBM TotalStorage Virtual Tape Server B16, B18, B10, B20

The VTS models deliver an increased level of storage capability to the traditional storage product hierarchy. To host software, a VTS looks like a 3490E Enhanced Capability Tape Subsystem with associated Cartridge System Tape or Enhanced Capacity Cartridge System Tape. This virtualization of both the tape drive and the storage media to the host allows transparent utilization of the 3590 tape technology capabilities. The PtP VTS interconnects models B18, B10, or B20 VTSs for enhancement of recoverability capabilities and data backup. It accomplishes this by providing dual-volume copy, remote functionality, and automatic recovery and switchover. For a more in-depth explanation of VTS and Peer-to-Peer concepts, please refer to the Concepts section.

Table 3. B16, B18, B10, B20 VTSs

B16 VTS (Model B16) withdrawn from marketing	Contains the following: • 400 cartridge storage cells • One reduced instruction-set computer (RISC) controller • Disk storage • 32 virtual tape drives (3490E)
B18 VTS (Model B18) withdrawn from marketing	Contains the following: • One RISC controller • Disk storage • 32, 64, or 128 virtual tape drives (3490E) With FC 4010 (Peer-to-Peer Copy Base), the B18 VTS is part of a PtP VTS and is coupled to one of the following through AX0s for high availability of VTS functions: • B18 VTS with FC 4010 • B10 VTS with FC 4010 • B20 VTS with FC 4010

Table 3. B16, B18, B10, B20 VTSs (continued)

B10 VTS (Model B10)	Contains the following: • One RISC controller • Disk storage • 64 virtual tape drives (3490E) With FC 4010 (Peer-to-Peer Copy Base), the B10 VTS is part of a PtP VTS and is coupled to one of the following through AX0s for high availability of VTS functions: • B18 VTS with FC 4010 • B10 VTS with FC 4010
B20 VTS (Model B20)	Contains the following: • One RISC controller • Disk storage • 128 or 256 virtual tape drives (3490E) With FC 4010 (Peer-to-Peer Copy Base), the B20 VTS is part of a Peer-to-Peer VTS and is coupled to one of the following through AX0s for high availability of VTS functions: • B18 VTS with FC 4010 • B20 VTS with FC 4010

IBM TotalStorage Virtual Tape Frame CX0

The CX0 provides the housing and power for up to four AX0s.

Table 4. CX0

CX0 (Model CX0)	Contains two or four AX0s. The AX0 is used in conjunction with the B18, B10, and B20 VTSs in a PtP VTS. It provides the interconnection of two VTSs (with FC 4010) and host systems ESCON attachments.

IBM TotalStorage Virtual Tape Controller AX0

The Virtual Tape Controllers provide interconnection between two B18, B10, or B20 VTSs with PtP Copy features.

Table 5. AX0

AX0 (Model AX0)	Provides two ESCON host attachments for 16 or 32 drives of the PtP VTS. Shipped with two 30 meter (100 ft) ESCON cables.

IBM TotalStorage Enterprise Tape Storage Frame S10

The S10 Frame is intended for additional storage capacity. It can be attached to the L1x Frame.

Table 6. S10 Frame

S10 Frame (Model S10)	Contains 400 cartridge storage cells and an accessor rail.

IBM TotalStorage Enterprise High Availability Tape Frames HA1

The HA1 Frames provide redundancy by providing a second Library Manager and a second accessor that run in hot standby mode. This, in most cases, eliminates the need for system outages or manual operation. If the primary LM or accessor fails, the HA1 Frames assume automatic control.

Note: With optional FC 5050 (Dual Active Accessors), both accessors can be active at the same time.

Table 7. HA1 Frames

HA1 Frames	Consists of a left service bay and a right service bay. The right service bay (as you view the library from the front, I/O station side) holds a second Library Manager and accessor.

3494 Conversions

Before the release of the optional frames, drive frames and storage frames were added to the L10 Frame through feature codes. Model designations have superseded these features. However, there is no conversion of the features to models. Table 8 shows these features and their equivalent model designations.

Table 8. 3494 Features

Feature	Description
FC 5300	Similar to the D10 Frame.
FC 5302	Similar to the D12 Frame. This feature converts FC 5300 to FC 5302 and provides for installation of 3590 Model B1A, E1A or H1A subsystems.
FC 5304	Similar to the D14 Frame. This feature converts FC 5300 to FC 5304 and provides for installation of 3590 Model subsystems and one 3590 Model A00 Controller.
FC 5400	Equivalent to the S10 Frame.

When a B16 VTS is upgraded to a B18 VTS, one of the following must be done:

- FC 5500 must also be ordered on the L1x Frame to convert the remaining frame to a storage frame on the 3494. FC 5500 is similar to a D12 Frame without FC 9630, FC 9631, or MES 4630.
- FC 5502 must also be ordered on the L1x Frame to convert the remaining frame to a D1x Frame for the B18 VTS. FC 5502 is similar to a D12 Frame with four of FC 9630, FC 9631, or MES 4630. It includes the SCSI Extenders for attachment to a B18 VTS.
- FC 5503 must also be ordered on the L1x Frame to convert the remaining frame to a SCSI Tape Drive Expansion Frame (similar to a D12 Tape Drive Expansion Frame).
- FC 5504 must also be ordered on the L1x Frame to convert the remaining frame to an ESCON Tape Drive Expansion Frame (similar to a D14 Tape Drive Expansion Frame).

A B16 VTS can also be converted to a D12 Frame.

In each of the L12 and L14 Frames, and D12 and D14 Frames, installation of a 3590 tape subsystem is optional. As tape subsystems are added, cartridge storage cells

are displaced. If the L14 Frame has any 3590 tape subsystem installed, it must have the 3590 Model A00 or A50 Controller. If the D14 Frame has any 3590 tape subsystem installed, it must have the 3590 Model A00, A50, or A60 Controller. The 3590 Model A00 and A50 Controllers can connect only to the tape subsystems in the same frame. The 3590 Model A60 Controller in a D14 Frame can connect to tape subsystems in an adjacent L12 or L14 Frame, or D12 Frame. FC 4060 (Adjacent Frame Support) must be installed in the D14 Frame.

In each of the L10 Frames and D10 Frames, installation of a 3490E tape subsystem is optional. The 3490E Model F1A FC 3000 or FC 3500 Controller can connect only 3490E Model F1A tape subsystems in the same frame.

A B16 VTS must be installed to the right (when facing the front of the library) of the D12 Frame that houses the B1A tape drives. The library configuration may contain only one B16 VTS.

You can locate the B18, B10, or B20 VTS up to 14 m (46 ft) from any D12 Frames (or FC 5502) associated with the VTS. You may include a maximum of two B18, B10, or B20 VTSs or one B16 VTS and one B18, B10, or B20 VTS in this configuration.

Figure 4 on page 9 shows the permitted 3494 model configurations.

Configuration

The 3494 is a self-contained, fully enclosed product that can be installed on a solid or a raised floor. It includes the stand-alone B18, B10, and B20 VTSs **4** and the CX0s **5** in Figure 3. Figure 3 also shows a 3494 with the following:

- an L1x **1** containing the 10-Cartridge Convenience I/O Station feature
- an optional D1x Frame **2**
- an optional S10 Frame **3**

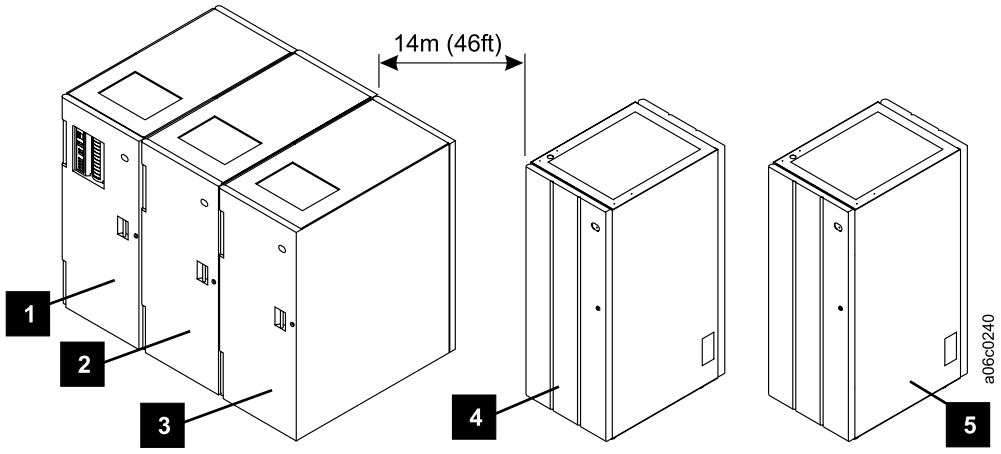


Figure 3. Enterprise Tape Library and Stand-Alone Frames

There are many factors to consider when configuring a 3494.

1. Intermix of 3494 Frames
2. Host Attachments
3. Cartridge Storage Locations
4. Tape Technology

1. Intermix of 3494 Frames

The permitted 3494 configurations are shown below.

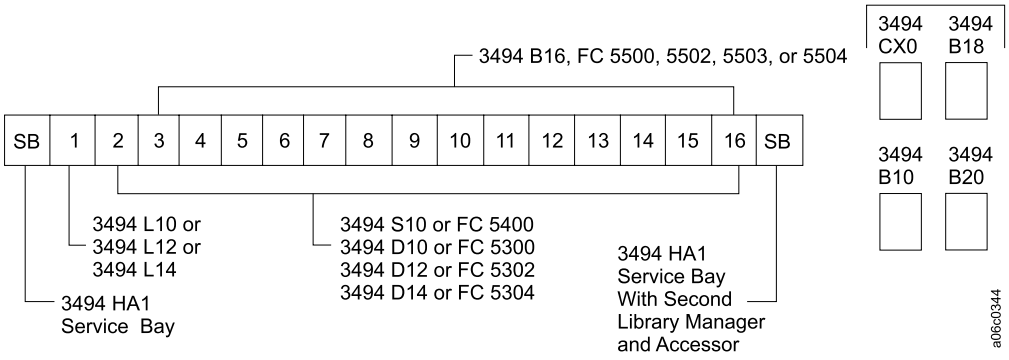


Figure 4. Permitted 3494 Model Configurations

All configurations must contain one L1x Frame. A maximum configuration contains 16 frames plus two attached service bays of the HA1 Frames. If FC 5050 Dual Active Accessors is installed, a minimum of four frames must be installed. The following outlines the components of a maximum configuration:

- One L1x Frame
- Up to 15 additional frames, excluding the HA1 Frames (see notes 2 and 3). The 15 additional frames can be comprised of any intermix of the following:
  - D1x Frames
  - A maximum of one B16 VTS (see note 1)
  - S10 Frames
- HA1 Frames
- Maximum of two B18, B10, or B20 VTSs. If there is a B16 installed, only one B18, B10, B20 (see note 4).
- For Peer-to-Peer with two B18, B10, or B20 VTSs, up to four CX0s can be installed. Each CX0 can contain combinations of four or eight AX0s. See Table 21 on page 42 for all of the possible PtP configurations (see note 5).
- In addition, the configuration can have one convenience I/O station (as part of the L1x Frame).

Notes:

1. A B16 VTS must be installed to the right (when facing the front of the library) of the D12 Frame that houses the B1A tape drives.
2. A 3494 without HA1 Frames can have configurations of one to eight, 10, 12, or 16 frames.
3. A 3494 with HA1 Frames can have configurations of three, four, six, eight, 10, 12, and 16 frames. This does not include the two service bays of the HA1 Frames.
4. Unlike the B16 VTS, which is installed in the 3494, a B18, B10, or B20 VTS is remote from the main string. It can be located up to 14 m (46 ft) from any D12 frame (or FC 5502) associated with the VTS.
5. The CX0s are remote from the main string. CX0s can be located up to 26 km (16 miles) from the B18, B10, or B20 VTSs.

2. Host Attachments

The 3494 provides multiple host connectivity options, including AS/400, RS/6000, S/390, RS/6000 SP, Sun, HP, and Windows. The following sections describe how the 3494 attaches to various host systems.

ES/9000®, Fibre Channel, and SCSI Host Systems

The tape subsystem control unit provides attachment by using either Enterprise System Connection (ESCON), FICON™, small computer system interface (SCSI), Fibre Channel, or parallel channel adapters. All host processors attach to the 3494 through the tape control units in the library or through the RS-232 or local area network (LAN) interface. See "Tape Subsystems" on page 38 for more information.

Except for direct-attached processors (for hosts using the RS-232 or LAN attachment), no additional attachments are required for the library. Existing channels between each attached host and the LM are used to pass commands. Therefore, a separate channel or communication link between the host and the LM is not necessary.

The following servers also require the RS-232 or LAN attachment for passing library commands directly to the LM:

- AS/400
- iSeries™
- RS/6000
- pSeries™
- Fibre Channel- or SCSI-attached

ES/9000 processors using VSE/ESA also require the LAN attachment. FC 5213 (Extended Length RS-232 Host Attachment) allows an attachment distance of up to 122 m (400 ft) on the AS/400 and iSeries. The SCSI-2 or Fibre Channel attachment allows an attachment distance of up to 25 m (82 ft).

The tape subsystems can be attached through the following channels in supported confirugations:

- an ESCON channel
- a FICON channel
- a SCSI fast wide interface
- a Fibre Channel

The Library Manager is controlled through the tape subsystem channels or through the RS-232 or LAN attachment. Up to four hosts (or eight hosts with FC 5229) can be connected to the Library Manager through the RS-232 attachment. In addition, up to 32 hosts can be connected to the Library Manager through the LAN (FC 5219 or 5220).

The 3490E Model C1A, C2A, and F1A tape subsystems can attach up to two channels per tape subsystem and can intermix ESCON, parallel, and SCSI attachments.

The 3590 Model B1A, E1A, and H1A tape drives can attach up to two SCSI or Fibre Channels per tape drive. Multiple 3590 units can be attached with 3590 Model A00, A50, and A60 Controllers to allow ESCON host attachment (H1A is only supported in the A60 controller). 3590 tape drives can be direct-attached for SCSI or Fibre Channel host processor attachment. Intermixing of SCSI or Fibre Channel with ESCON host attachments for the 3590 Model B1A, E1A and H1A tape drives is not

permitted within a frame. The library does not support parallel channel attachment of 3590 Model A00, A50, and A60 Controllers.

The VTS can be attached using FICON, ESCON, or SCSI to host processors. The number of channel attachments for B16, B18, B10, and B20 VTSs is feature-dependent. For more information on VTS SCSI host attachments, see "VTS SCSI Host Attachments" on page 13.

ESCON, parallel, Fibre Channel, or SCSI channel adapters provide support for processors, such as the ES/9000, AS/400, iSeries, RS/6000, pSeries, RS/6000 SP™, and Sun Microsystems processors. Parallel channels can be installed up to 122 m (400 ft) from the processor in most environments. However, when attaching parallel channels to the RS/6000 or pSeries, the distance is limited to a maximum of 61 m (200 ft). ESCON-connected tape subsystems that use 3590 Model A00, A50, and A60 Controllers can be installed up to 43 km (27 miles) from the host. FICON-connected tape subsystems that use 3590 Model A00, A50, and A60 Controllers can be installed up to 100 km (62 miles) from the host.

Note: See the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*.

The 3494 control path can be attached by two methods:

1. Using the channel attachment of the tape subsystem to send requests to the Library Manager. The library also sends status and other information back to the host through the tape subsystem attachment. Multiple hosts can simultaneously request operations and request status from the library.
2. Using the RS-232 or LAN attachment between the host and the Library Manager to control the library. All normal tape commands, data, and responses are transmitted using the tape subsystem attachments while the library commands and responses are transmitted using the RS-232 or LAN attachment.

The 3494 allows both methods of attachment to be used in the same library and provides maximum configuration flexibility. Figure 5 on page 12 shows an illustration of library attachments to host processors. Table 9 on page 13 shows the supported host processor attachments.

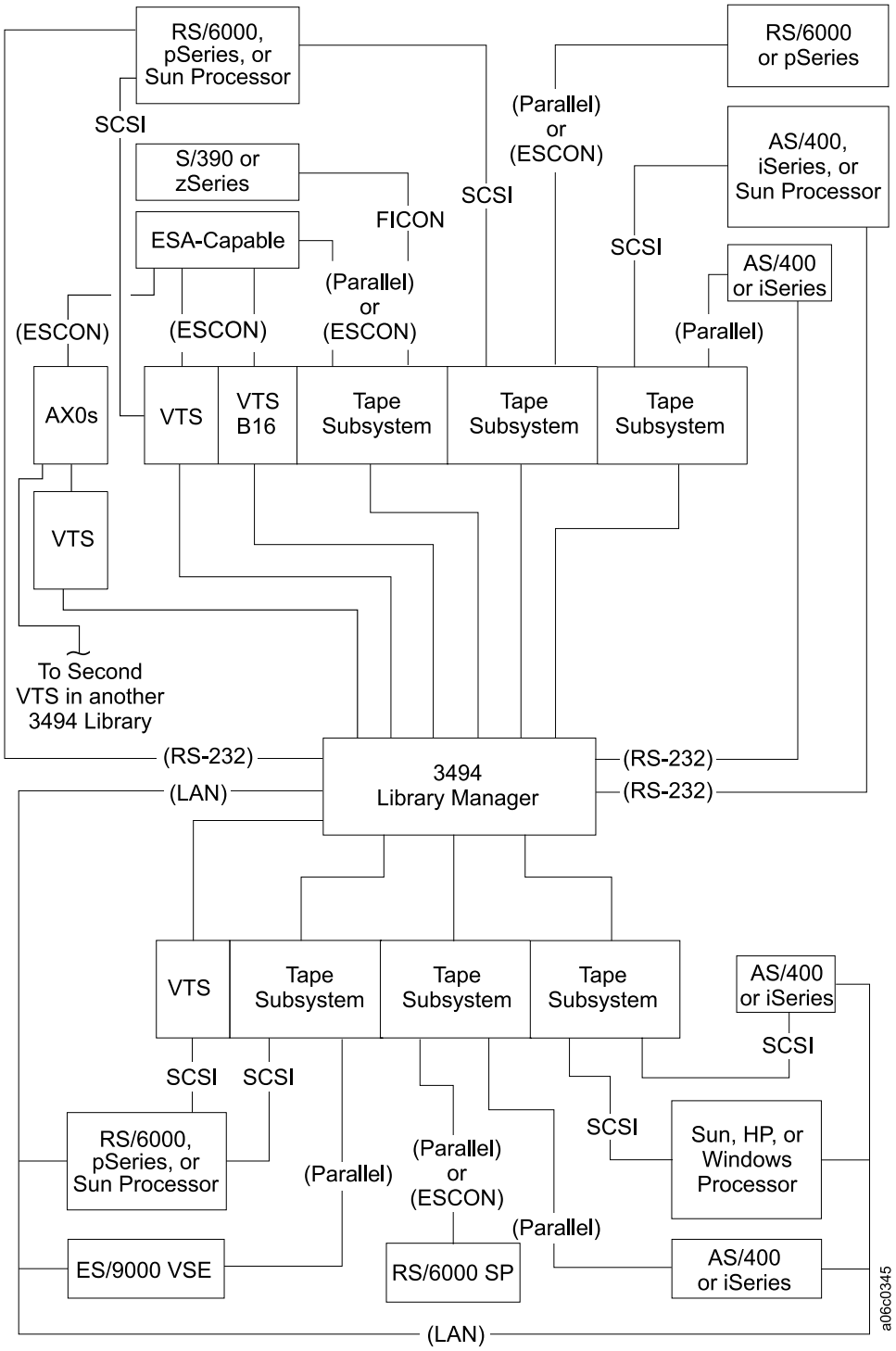


Figure 5. Host Connections

LAN attachment to the library is offered as an alternative to the use of the RS-232 interface in applications that do not use the tape subsystem channels to transmit requests. The LAN connection is used for library commands. The SCSI, Fibre Channel, ESCON, or parallel channel connection is used for data transmission. The Token-Ring or Ethernet LAN attachment supports both Transmission Control Protocol/Internet Protocol (TCP/IP) and advanced program-to-program communication (APPC) protocols.

Table 9. Host Processor Attachment

Host Processor	Parallel	ESCON	SCSI-2	RS-232	LAN	Fibre	FICON
ES/9000	Yes	Yes	–	–	–	–	–
ES/9000 VSE (virtual machine (VM) Guest)	Yes	Yes	–	–	–	–	–
ES/9000 VSE (Native)	Yes	–	–	–	Yes	–	–
ESA-Capable	Yes	Yes	–	–	–	–	–
AS/400, iSeries	Yes	–	–	Yes	–	–	
AS/400, iSeries	Yes	–	–	–	Yes	–	–
AS/400, iSeries	–	–	Yes	Yes	–	–	–
AS/400, iSeries	–	–	Yes	–	Yes	–	–
RS/6000, pSeries	Yes	Yes	–	–	–	–	–
RS/6000, pSeries	–	–	Yes	Yes	–	Yes	–
RS/6000, pSeries	–	–	Yes	–	Yes	Yes	–
S/390® Enterprise Server Model G5, G6	–	Yes	–	–	–	–	Yes
zSeries 900	–	Yes	–	–	–	–	Yes
Sun	–	–	Yes	–	Yes	–	–
Sun	–	–	Yes	Yes	–	–	–
Hewlett-Packard	–	–	Yes	–	Yes	–	–
Microsoft® Windows NT®	–	–	Yes	–	Yes	–	–
Microsoft Windows 2000®	–	–	Yes	–	Yes	–	–

Notes:

1. All host processors must attach to the tape subsystem through parallel, ESCON, FICON, Fibre Channel, or SCSI-2 interfaces for data communication.
2. Direct-attached processors must also attach to the Library Manager through RS-232 or LAN interfaces for library control communication.
3. Parallel attachments are not supported by the 3590 tape subsystem.

VTS SCSI Host Attachments

FC 3422 (SCSI Host Attachment) for the B18, B10, and B20 VTSs permits open-systems host attachment through industry-standard Small Computer System Interface (SCSI) buses.

For the B18 VTS, FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) is a prerequisite. FC 3302 (Additional Enhanced ESCON Channel Attachment), FC 4010 (Peer-to-Peer Copy Base), or a second FC 3412 (Extended Performance ESCON Channels) must not be installed. Up to two of FC 3422 may be specified, allowing a maximum of four SCSI attachments per VTS.

The B18 VTS must have an ESCON-attached host, or FC 3400 (Extended High Performance Option) must be installed and Call Home capability must be enabled.

For the B10 VTS, you may order two FC 3422 with one FC 3412 and one FC 3418 (Activate Additional ESCON Channels), or four FC 3422 without FC 3412. You may not install FC 3422 with two FC 3412. When FC 4010 is installed, all FC 3422 must be removed.

For the B20 VTS, you may order only four FC 3422. Two FC 3412 and two FC 3418 are prerequisites.

When FC 4010 is installed on a B18, B10, or B20 VTS, all FC 3422 must be removed.

See “Special Features” on page 67 for SCSI cabling information.

Table 10 shows the permitted feature combinations for the B10 VTS and the B20 VTS.

Table 10. Feature Combinations for B18, B10, and B20 VTSs

Model	**FC 3412 (ESCON)**		**FC 3418 (additional ESCON)**	**FC 3422 (SCSI)**		**FC 3415/3416 (FICON)**	
	Quantity	Channels	Quantity	Quantity	Channels	Quantity	Channels
B18 VTS	1	4	1	1	2	–	–
B18 VTS	1	4	1	2	4	–	–
B18 VTS	–	–	–	1	2	–	–
B18 VTS	–	–	–	2	4	–	–
B10 VTS	2	4	–	–	–	–	–
B10 VTS	1	4	1	2	4	–	–
B10 VTS	1	2	–	–	–	–	–
B10 VTS	–	–	–	4	8	–	–
B10 VTS	–	–	–	–	–	4	4
B10 VTS	1	2	–	–	–	2	2
B10 VTS	–	–	–	–	–	2	2
B20 VTS	4	16	4	–	–	–	–
B20 VTS	4	8	–	–	–	–	–
B20 VTS	2	8	2	4	8	–	–
B20 VTS	–	–	–	–	–	8	8
B20 VTS	–	–	–	–	–	4	4
B20 VTS	2	4	–	–	–	4	4
B20 VTS	2	8	2	–	–	4	4

RS/6000 and pSeries Host Attachment: SCSI host support is for RS/6000, pSeries, and RS/6000 SP models that run AIX 4.3.2 and later with the adapter feature codes shown in Table 11 on page 15. FC 9106 (RS/6000 Processor Attachment) must be installed to attach to an RS/6000 or pSeries. FC 9201 (VTS Open System Device Drivers) provides device driver support for the RS/6000 and pSeries host adapters shown in Table 11 on page 15.

Table 11. RS/6000 and pSeries Host Adapter Feature Codes

RS/6000 and pSeries Feature Codes	Host Bus	SCSI Type
2412	Micro Channel®	Fast/Wide
6209	Peripheral Component Interconnect (PCI)	Fast/Wide
6207	PCI	Wide/Ultra Differential
6204	PCI	Universal Ultra SCSI

Sun Microsystems Host Attachment: SCSI host support is for Sun models running Solaris 2.6, 7, or 8 with the adapters shown in Table 12. FC 9211 (Sun Attachment) must be installed to attach to a Sun system. FC 9201 (VTS Open System Device Drivers) provides device driver support for the Sun host adapters shown in Table 12.

Table 12. Sun Host Adapters

Sun Adapter	Host Bus	SCSI Type	OS Levels, Device Driver
X1062A	S-Bus	Differential Fast/Wide Intelligent SCSI-2	Solaris 2.6, 7, or 8, IBMtape
X1065A	S-Bus	Ultra Differential Fast/Wide Intelligent SCSI-2	Solaris 2.6, 7, or 8, IBMtape
X6541A	PCI	Dual-Channel Differential Ultra SCSI	Solaris 2.6, 7, or 8, IBMtape

Hewlett-Packard Host Attachment: SCSI host support is for Hewlett-Packard servers that run with the adapters, OS levels, and device drivers shown in Table 13. The servers must have sufficient random access memory (RAM) and disk space. FC 9210 (Hewlett-Packard HP-UX Attachment) must be installed. FC 9201 (VTS Open System Device Drivers) provides device driver support for attachment.

Table 13. Hewlett-Packard Host Adapters

Host	Adapter	OS Levels, Device Driver
HP 9000 L-Class, N-Class, and V-Class Enterprise Servers	HP F/W Differential SCSI-2 (HP A4800A)	HP-UX 11.0 (PCI, 64-bit), ATDD

Microsoft Windows NT and Windows 2000 Host Attachment: SCSI host support is for Intel-compatible servers that run with the adapters, OS levels, and device drivers shown in Table 14. The servers must have sufficient disk space and RAM. FC 9212 (Attached to Windows) must be installed. FC 9201 (VTS Open System Device Drivers) provides device driver support for attachment.

Table 14. Host Adapters for Attachment to Intel-Compatible Servers

Host	Adapter	OS Levels, Device Driver
Intel-compatible server	Adaptec AHA-2944UW PCI Differential Ultra SCSI	Microsoft Windows NT Version 4.0 with Service Pack 6, IBMmag

Table 14. Host Adapters for Attachment to Intel-Compatible Servers (continued)

Host	Adapter	OS Levels, Device Driver
Intel-compatible server	Adaptec AHA-2944UW PCI Differential Ultra SCSI	Microsoft Windows 2000 Build 2195 or later, IBMmag

System Area Network (SAN) Data Gateway Host Attachment: SAN Data Gateway attachment of the B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment) through the IBM 2108 G07 SAN Data Gateway with or without the IBM 2109 S08/S16 Fibre Channel Switch requires the host adapters, operating system levels, and device drivers shown in Table 15.

Table 15. Host Adapters for Attachment Using IBM 2108 G07 SAN Data Gateway and IBM 2109 Fibre Channel Switch

Host System	Adapter	OS Levels, Device Driver
RS/6000, pSeries	See note	AIX 4.3.3, Atape
Sun	See note	Solaris 2.6, 7, or 8, IBMtape
Intel compatible server	See note	Windows NT or 2000, IBMmag
Note: For details on supported servers, operating systems, fiber channel host bus adapters, and configurations refer to the following Web site: http://www.storage.ibm.com/hardsoft/products/sangateway/gatewayspec.htm		

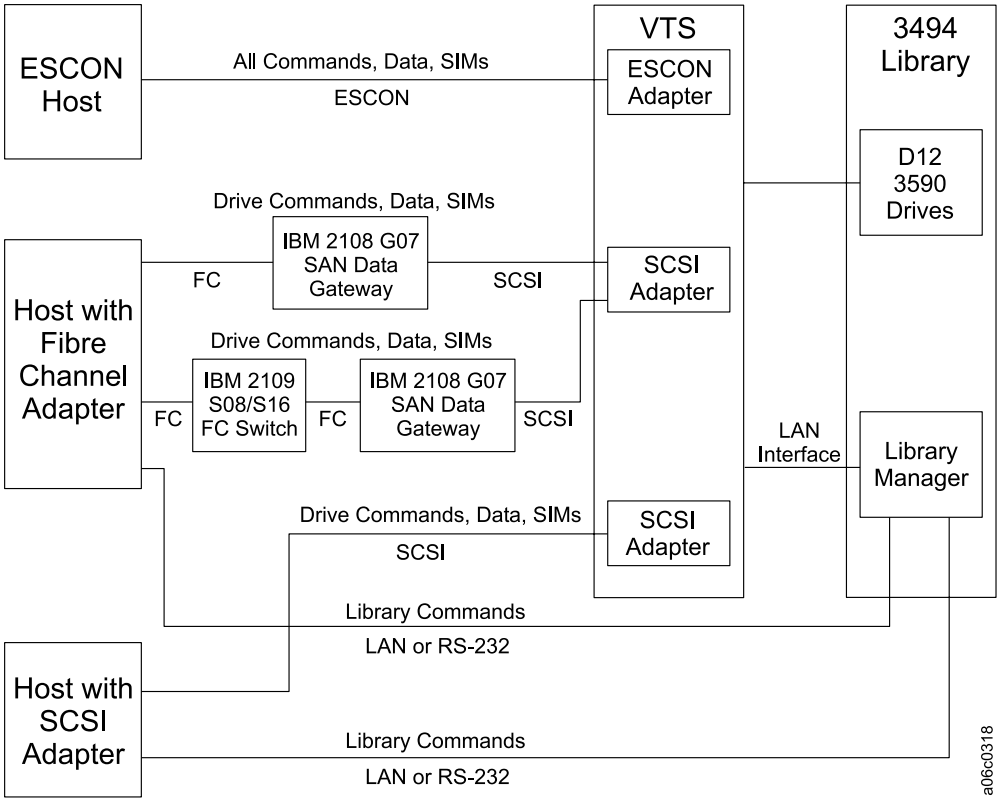


Figure 6. VTS Attachments

3490E drive commands, status, and data are passed on the SCSI bus directly or through the SAN Data Gateway, and communications between the host and

Library Manager are performed over a separate LAN or serial connection, bypassing the VTS. Figure 6 on page 16 shows the components and connections used by this feature.

The VTS logical tape drives are emulated 3490E tape drives. This emulation is used for both ESCON, FICON, and SCSI attachments. Behavior on the ESCON interface is not changed by FC 3422. Behavior on the SCSI bus is based on that of a 3490E Model C2A as described in the *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Hardware Reference*.

The number of virtual drives available with a single VTS remains unchanged with the installation of FC 3422; FC 3422 does ***not*** add virtual drives. The number of tape drives that may be addressed as SCSI devices depends on the number of FC 3422 on a particular VTS, as shown in the following list.

For the B18 VTS:

- FC 3200 (ESCON High Performance Option) or 3400 (Extended High Performance Option) is a pre-requisite for use of FC 3422.
- When the VTS tape volume cache is 72 GB, only 32 virtual tape drives are available, and two FC 3422 may address all 32 tape drives.
- When the VTS tape volume cache is greater than 72 GB and FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) is installed, 64 virtual tape drives are available. A maximum of 32 virtual tape drives may be addressed through SCSI hosts.
- When the VTS tape volume cache is greater than 72 GB and FC 5264 (64 Additional Virtual Drives) and either FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) is installed, 128 virtual tape drives are available. A maximum of 32 virtual tape drives may be addressed through SCSI hosts.

For the B10 VTS: Two or four FC 3422 allow addressability to a maximum of 32 or 64 virtual tape drives of the 64 configured devices.

For the B20 VTS: Four FC 3422 allow addressability to a maximum of 64 virtual tape drives of the 128 or 256 configured devices.

Open systems device drivers are described in the *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers: Installation and User's Guide*.

SCSI Bus: FC 3422 supports the SCSI-2 (Fast/Wide Differential) 20 MB per second standard interface, as well as the 40 MB per second Differential Wide Ultra SCSI interface. Connection to the VTS controller is through a 0.8-mm SCSI connector. Supported cable lengths are 4.5 m (14.8 ft), 10 m (32.8 ft), and 20 m (65.6 ft). FC 5004 provides a 10-m (32.8-ft) SCSI cable for daisy-chaining two VTS libraries to the same SCSI bus. The total cable length for a SCSI bus having VTS SCSI connection is 20 m (65.6 ft).

The SCSI host attachment feature on the VTS controller must be stopped externally using the provided terminators. Adapter cards are fitted with connection blocks to permit daisy-chain connections or external terminators.

Daisy-chain connections of multiple VTS SCSI adapters require reconfiguration of adapter nodes to provide unique starting target IDs. This is because all buses have a default configuration with a starting target ID of 8.

SCSI Target Addressing: The SCSI target addresses to be used on each bus are configurable through a service window by an IBM service representative upon installation of the VTS with FC 3422 (SCSI Host Attachment) or installation of FC 3422 in the field.

Each adapter provides two SCSI interfaces. Each adapter is restricted to accessing no more than 16 logical tape drives. Each bus may be configured to address any even number of up to 16 contiguous logical tape drives, starting with an even drive number. Note that, internally, logical tape drives are numbered from zero to 63. The target addresses for each bus of FC 3422 must be contiguous.

The division of the tape drives between logical control units is done for ESCON addressing purposes. Therefore, drive zero for one logical control unit is contiguous to drive 15 of the previous (lower-numbered) logical control unit. There may be overlap between the logical tape drives accessed on each bus or adapter. A detailed representation of SCSI drive addressing is shown in Figure 7. Hosts are expected to use the SCSI Reserve Unit and Release Unit commands to prevent use of a single drive by multiple initiators and contention with ESCON-attached hosts.

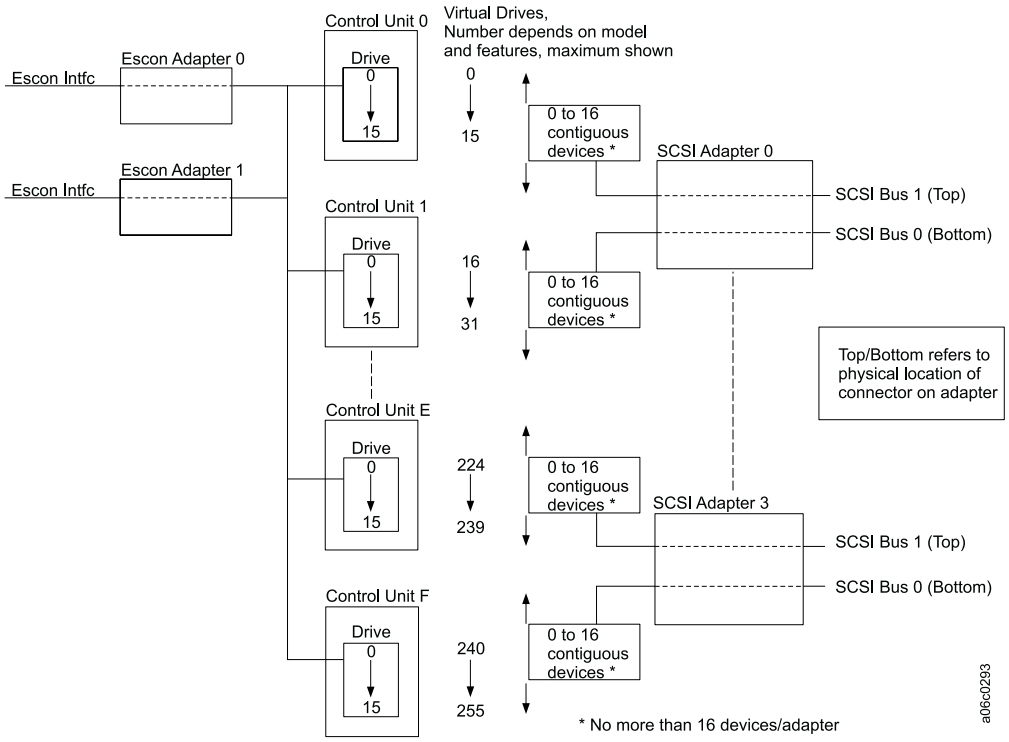


Figure 7. SCSI Drive Addressing

The adapter cards use one SCSI target address for every two logical tape drives configured, starting with the specified base address for the bus. LUN (Logical Unit Number) 0 and 1 are used for logical tape drives at each target address. The base target address for each bus may be set to 0–16 minus the number of tape drives addressed on the bus divided by two: 16-(number of tape drives/2). That is, no target address on the adapter may exceed 15. Each bus is configurable independently. An example of addressing on SCSI bus 0, base SCSI target address=4, starting logical drive=CU 1, drive 14, eight tape drives is shown in Table 16 on page 19.

For a detailed discussion on sharing a tape library between S/390 or zSeries and SCSI hosts, see the *Guide to Sharing and Partitioning IBM Tape Library Dataservers*. This reference includes considerations about sharing tape drives, sharing volumes, and related software implementation steps.

Table 16. SCSI Addressing Example

Control Unit ID	Drive Number	Virtual Drive Number	SCSI Target Address	Logical Unit Number
1	14	30	4	0
1	15	31	4	1
2	0	32	5	0
2	1	33	5	1
2	2	34	6	0
2	3	35	6	1
2	4	36	7	0
2	5	37	7	1

The initial SCSI device addressing for each bus of a SCSI Host Attachment feature is set for eight devices, starting at target address 8. Table 17 shows the initial assignments of target addresses for FC 3422 (SCSI Host Attachment). Your service representative may change these initial assignments from a service window. The number of SCSI adapters (shown in the first column of Table 17) depends on the number of FC 3422 ordered.

Multiple SCSI-attached VTSs on the same SCSI bus (daisy-chaining) require reassignment of the initial target address of one or more subsystems to avoid conflicts. Your service representative may change these initial assignments from a service window.

Table 17. Initial SCSI Host Attachment Address Assignments

SCSI Adapter	Bus on Adapter	SCSI Target Address Range	Logical Unit Number Range	Virtual Drive Number Range	Control Unit (CU)	Drive Range within CU
0	0	8–11	0–1	0–7	0	0–7
0	1	8–11	0–1	8–15	0	8–15
1	0	8–11	0–1	16–23	1	0–7
1	1	8–11	0–1	24–31	1	8–15
2	0	8–11	0–1	32–39	2	0–7
2	1	8–11	0–1	40–47	2	8–15
3	0	8–11	0–1	48–55	3	0–7
3	1	8–11	0–1	56–63	3	8–15

Host Processor Support

The 3494, with additional drive units, supports attachment of multiple host processors.

Note: The host processor support may change. Contact your IBM representative for current information.

The 3494 supports parallel attachments to the following hosts:

- ES/9000 Models 9221, 9121, and 9021 (all models)
- All ESA-capable S/370™, S/390, and zSeries models
- AS/400 and iSeries Models 9404 and 9406 (all models)
- pSeries models and RS/6000
- Scalable POWERparallel Systems® RS/6000 SP

Note: The AS/400 and iSeries also require the RS-232 or LAN attachment for library control.

The 3494 supports ESCON attachments to the following hosts:

- ES/9000 Models 9221, 9121, and 9021 (all models)
- All ESA-capable S/370, zSeries models, and S/390
- pSeries models and RS/6000

The 3494 supports FICON attachments to the following hosts:

- S/390 Enterprise Server Models G5 and G6
- zSeries 900 servers

The 3494 supports SCSI and Fibre Channel attachments to the following hosts:

- AS/400 and iSeries
- Hewlett-Packard HP 9000 Series 800 business servers
- Hewlett-Packard HP 9000 L-Class, N-Class, and V-Class Enterprise Servers
- Microsoft Windows NT processors
- Microsoft Windows 2000 processors
- RS/6000 and pSeries
- Sun Microsystems processors

All Fibre Channel- and SCSI-attached processors require the RS-232 or LAN attachment for library control. For Sun, HP, AS/400, and iSeries, the LAN is not supported in the HA1 Frames.

The B16, B18, B10, and B20 VTSs and the PtP VTS support ESCON attachments to the following hosts:

- ES/3090™
- ES/9000
- S/390 and zSeries

The B10 and B20 VTSs support FICON attachments to the following hosts:

- S/390 and zSeries

The B18, B10, and B20 VTSs support SCSI attachments to the following servers:

- RS/6000
- pSeries
- RS/6000 SP
- Sun Microsystems
- Hewlett-Packard HP 9000 L-Class, N-Class, and V-Class Enterprise Servers
- Intel-compatible servers that run Microsoft Windows NT or Windows 2000

3. Cartridge Storage Locations

The 3494 can hold from 160 to 6240 cartridges (Table 18 shows the cartridge capacity for various 3494 configurations). The storage capacity is determined by the number of frames, installation of an optional convenience I/O station feature, installation of the optional Dual Gripper feature, the number of tape subsystems installed, and the definition of the high-capacity I/O facility area configuration.

Cartridge Storage

The 3494 contains cartridge storage cells in all of the attached frames, except for the B18, B10, and B20 VTSs, the HA1 Frames, and the CX0s. In addition to storage cells, the L1X Frame and the D1x Frames can contain tape subsystems. Cartridges (of any supported media type) can be placed in any frame that has cartridge storage cells. The L1x Frame must be included in any configuration (see "1. Intermix of 3494 Frames" on page 9 for details).

Cartridge Accessor

The cartridge accessor identifies and moves cartridges between the storage cells, tape drives, and I/O facilities. The optional Dual Gripper feature may be installed on the cartridge accessor to provide increased performance and improved data availability (see "Dual Gripper" on page 82).

The HA1 Frames provides a second accessor, which acts as a "hot standby." The library can start the second accessor automatically if the first accessor fails. This allows library operations to continue without operator intervention. The second accessor can push the failing unit to a service bay. A service representative can then perform concurrent maintenance and return the accessor to "hot standby" status. With optional FC 5050 (Dual Active Accessors), both accessors can be active at the same time.

Table 18 shows the cartridge capacity of each frame.

Note: Selecting the high-capacity I/O facility reduces the cartridge capacity, depending on the options chosen (see "High-Capacity I/O Facility" on page 26).

Table 18. 3494 Cartridge Capacity

Model or Frame	Without Dual Gripper	With Dual Gripper
L10, L12, L14 Frame	240 (see notes 1, 4, 5, and 6)	216 (see notes 2, 4, 5, and 6)
S10 Frame, FC 5400	400	360
D10 Frame (without 3490E Model CxA or F1A)	400	360
D10 Frame, FC 5300 (with 3490E Model CxA or F1A)	300	270
D12 Frame, FC 5500	400	360
D12 Frame, FC 5302 (without 3590 Model B1A, E1A or H1A)	400	360
D12 Frame, FC 5302 (with one or two 3590 Model B1A, E1A or H1A)	335	305
D12 Frame, FC 5302 (with Request for Price Quotation (RPQ)), FC 5502 or 5503 (with three or four 3590 Model B1A, E1A or H1A)	290	260

Table 18. 3494 Cartridge Capacity (continued)

Model or Frame	Without Dual Gripper	With Dual Gripper
D12 Frame, FC 5302 (with RPQs), FC 5502 or 5503 (with RPQ and five or six 3590 Model B1A, E1A or H1A)	250	230
D14 Frame, FC 5304 (without 3590 Model B1A, E1A, or H1A)	400	360
D14 Frame, FC 5304 or 5504 (with one or two 3590 Model B1A, E1A, or H1A)	345	305
D14 Frame, FC 5304 or 5504 (with RPQ and three or four 3590 Model B1A, E1A, H1A)	305	275
B16 VTS	400	360
B18, B10, and B20 VTS, CX0	0	0
HA1 Frames (service bays)	0	0

Notes:

1. Optional convenience I/O station features reduce the cartridge capacity by 30 cartridges (FC 5210) or 80 cartridges (FC 5230).
2. With FC 5215 (Dual Gripper) installed, the convenience I/O station features reduce the cartridge capacity by 26 cartridges (FC 5210) or 72 cartridges (FC 5230).
3. Selecting the high-capacity I/O facility reduces the cartridge capacity, depending on the options chosen (see "High-Capacity I/O Facility" on page 26).
4. One cell is reserved for ejecting cartridges if a convenience I/O station feature is not installed and the high-capacity output facility is not defined.
5. A maximum of two cells is reserved for certain service representative functions. With the HA1 Frames installed, there are no cells reserved in the L1x Frame for service functions.
6. One cell is reserved for error-recovery operations in libraries without the HA1 Frames configuration. Two cells are reserved for error-recovery operations in libraries with the HA1 Frames configuration.

4. Tape Technology

The 3494 configuration must include at least one tape subsystem or VTS. The configuration can include a maximum of seventy-eight 3590 tape drives or thirty-two 3490E tape transports. With the 3590 Model A60 Controller, the configuration can include a maximum of sixty 3590 tape drives. However, with FC 4060 (Adjacent Frame Support), a 3494 can have a maximum of seventy-six 3590 tape transports attached to eight 3590 Model A60 controllers. The L1x contains the Library Manager, cartridge cells, zero to two tape drives, and a cartridge accessor. Cartridge cells on the inside walls of the L1x provide storage for the tape cartridges.

The L12 and D12 Frames support a mix of 3590 tape drives within a frame. However, if the D12 Frame is associated with a VTS, you may not mix 3590 Model B1A, E1A and H1A tape drives within the frame. Similarly, you may not mix 3590 tape drives within a L14 Frame or D14 Frame. You may combine frames that contain tape drives of one type with frames that contain a different type of tape drive in order to configure a complete library.

Tape Subsystems Compatibility

The 3494 supports the following tape subsystems to perform the tasks of reading and writing user data that is stored on tape cartridges:

- 3490E tape subsystem with Models C1A, C2A, and F1A (with or without the Model F1A FC 3000 or FC 3500 Controller)
- 3590 tape subsystem with Models B1A, E1A and H1A (each with or without a 3590 Model A00, A50, or A60 Controller) The H1A is only supported on the A60. The H1A can be installed in a D12 Frame in association with a VTS.
- 3494 B16, B18, B10, and B20 VTSs
- 3494 PtP VTSs

3590 Tape Subsystems

The 3494 supports the 3590 Model B1A, E1A, and H1A tape subsystems. Each 3590 model has a single tape drive with a dynamic buffer and two SCSI or Fibre Channel interfaces. The 3590 Model A00, A50, and A60 Controllers provide an ESCON host attachment for the tape subsystem. The 3590 Model A60 Controller provides a FICON host attachment for the tape subsystem.

All data communication is processed either through SCSI or Fibre Channel attachments integral to the tape subsystem or through ESCON/FICON if a controller is part of the subsystem. Data communication cannot be processed through both a direct-attached SCSI or Fibre Channel interface and a controller. When a 3590 Model B1A, E1A or H1A is direct-attached to a host through its SCSI or Fibre Channel interface, the RS-232 or LAN interface provides a communication path between the host and the Library Manager. When a 3590 Model B1A, E1A or H1A is attached through a controller, the communication path is through the ESCON/FICON channels.

Table 19. Native Cartridge Capacity of 3590 Models B1A, E1A and H1A

	Native Cartridge Capacity			
Cartridge Description	B1A	E1A	H1A	H1A (with 3:1 Compression)
3590 High Performance Tape Cartridge	10 GB	20 GB	30 GB	90 GB
3590 Extended High Performance Tape Cartridge	20 GB	40 GB	60 GB	180 GB

3590 Model B1A Tape Subsystems: The 3590 Model B1A tape drive performs read and write operations on the High Performance Cartridge Tape and the Extended High Performance Cartridge Tape.

The Model B1A tape drive attaches in one of the following ways:

- To a host system directly through one of its two SCSI or Fibre Channel interfaces
- To a 3590 Model A00, A50, or A60 Controller
- To a B16, B18, B10, or B20 VTS

The 3494, with the 3590 Model B1A tape subsystem, offers the high capacity of 128-track bidirectional recording, auto-blocking, and data compression. See the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide.*

3590 Model E1A Tape Subsystems: The 3590 Model E1A tape drive performs read and write operations on the High Performance Cartridge Tape and the Extended High Performance Cartridge Tape. A Model E1A can read data written by a Model B1A. However, a Model B1A cannot read data written by a Model E1A.

The Model E1A tape drive attaches in one of the following ways:

- To a host system directly through one of its two SCSI or Fibre Channel interfaces
- To a 3590 Model A50 or A60 Controller
- To a B18, B10, or B20 VTS

The 3494, with the 3590 Model E1A tape subsystem, offers the high capacity of 256-track bidirectional recording, auto-blocking, and data compression. See the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*.

3590 Model H1A Tape Subsystems: The 3590 Model H1A tape drive performs read and write operations on the High Performance Cartridge Tape and the Extended High Performance Cartridge Tape. A Model H1A can write data on existing 3590 cartridges and can read cartridges written by a Model B1A or E1A.

The Model H1A tape drive attaches in one of the following ways:

- To an open systems server directly through Ultra SCSI or Fibre Channel interfaces
- To a host system directly through one of its two SCSI or Fibre Channel interfaces
- To a 3590 Model A60 Controller

The 3590 Model H1A is supported in VTS. The H1A tape drive can be installed in a Tape Drive Expansion Frame D12 associated with a Model B10, B18, or B20 VTS.

The 3494, with the 3590 Model H1A tape subsystem, offers the high capacity of 384-track bidirectional recording, auto-blocking, and data compression. See the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*.

3490E Tape Subsystem

The 3494 supports the 3490E Models C1A, C2A, and F1A. Each Model C1A, C2A, or F1A has its own control unit. The Model C1A has a single tape transport; the Model C2A has two tape transports. The Model F1A drive consists of a single SCSI tape transport and may have an FC 3000 or FC 3500 Controller. A second Model F1A drive may attach to the FC 3000 or FC 3500 on the first Model F1A.

In addition to reading and writing user data stored on Cartridge System Tape, the 3490E provides a communication path between hosts that do not use the RS-232 or LAN interface and the Library Manager. All communication is processed through the channel interfaces integral to the tape subsystem that handles all the protocols and speed matching required by the attaching host. Hosts that use the RS-232 or LAN interface communicate with the Library Manager over the RS-232 or LAN interface. Models C1A, C2A, and F1A can read cartridges written by other 3480, 3490, and 3490E base models. Automatic cartridge loaders are not supported. However, a cartridge loader mode that emulates cartridge loader operation can be activated.

The 3494, with 3490E tape subsystems, offers the high capacity of 36-track bidirectional recording, Improved Data Recording Capability (IDRC), and the use of both standard Cartridge System Tape and Enhanced Capacity Cartridge System Tape, all in an automated environment. The 3490E Model F1A tape subsystem can also read, but not write, 18-track Cartridge System Tape.

IDRC (which is standard on Models C1A, C2A, and F1A) may increase storage capacity from two to five times (typically three times) compared to the 3480 tape subsystems without this capability, depending on the characteristics of the data and operating environment.

The Enhanced Capacity Cartridge System Tape contains double the capacity of the Cartridge System Tape. The combination of the 36-track write capability, the Enhanced Capacity Cartridge System Tape, and IDRC can improve the effective cartridge capacity up to 12 times when compared to a Cartridge System Tape without IDRC written in 18-track format.

To address high performance needs, the Performance Enhancement feature improves the Model C1A and C2A buffer performance and uses enhanced microcode with SCSI and ESCON channels to achieve an instantaneous data rate of up to 9 MB per second. See the *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Introduction*.

Options

In addition to the optional frames and features outlined in the Model Attachment section, the 3494 includes the following options:

- Convenience I/O station features
- A high-capacity I/O facility
- A Dual Gripper feature
- RS-232 or LAN host attachment capability
- A Remote Library Manager Console feature
- A second disk drive for the Library Manager
- A wide range of attachment capabilities
- HA1 Frames — Dual Library Manager/Dual Accessors
- Dual active accessors
- Cartridge System Tape
- Enhanced remote service support
- Unlabeled tape facility
- Simple Network Management Protocol (SNMP) Messaging
- A Remote Library Manager Console feature
- A Web Specialist feature

Convenience I/O Station

Optional convenience I/O station features are available for inserting or ejecting cartridges without interrupting the normal automated operations. Selection of FC 5210 (10-Cartridge Convenience I/O Station) reduces cartridge capacity by 30 cartridges. Selection of FC 5230 (30-Cartridge Convenience I/O Station) reduces cartridge capacity by 80 cartridges.

Single-Cell Output Facility

If a convenience I/O station is not installed and a high-capacity output facility or high-capacity I/O facility is not defined, a single cell in the door of the L1x Frame is provided for output. Without the Dual Gripper feature installed, this single cell is the top storage cell in the leftmost column of storage cells. With the Dual Gripper feature installed, this single cell is the third storage cell from the top of the leftmost column of storage cells. Any empty and unassigned cell can be used for input operations.

High-Capacity I/O Facility

Two types of high-capacity cartridge handling facilities can be defined in the library:

- High-capacity output facility
- High-capacity I/O facility

Note: The library may define only one type of high-capacity facility.

A teach operation configures the high-capacity output facility. It reserves a section of the cartridge storage area on the L1x Frame door (wall 2) for ejecting cartridges. The size of the selected area can be 10, 20, 40, 80, or 160 (full door) storage cells. If FC 5215 (Dual Gripper) is installed, the usable area is 10, 20, 36, 72, or 144 storage cells.

A teach operation configures the high-capacity I/O facility. It reserves an area on an inside wall of a frame other than the L1x Frame so that both Insert (input) and Eject (output) operations can be performed. An S10 Frame or the B16 VTS can be configured to use the upper storage racks (100 cells without the Dual Gripper feature) or the whole wall (200 cells without FC 5215) as I/O cells. A Tape Drive Expansion Frame is configured to use the available storage cells on the whole wall (50 to 135 cells, depending on the model and the drive configuration).

Cartridge cells allocated to a high-capacity facility are not available for normal cartridge storage. The operator puts the library in Pause mode and opens the appropriate library door when unloading or loading a high-capacity facility.

Dual Gripper

A gripper attached to the cartridge accessor moves cartridges between the storage cells, the tape subsystems, and the I/O areas. A vision system on the cartridge accessor identifies the cartridge or the presence of an empty cell in front of the gripper. An optional second gripper is available for installation.

RS-232 or LAN host attachment capability

Dual Library Managers/Dual Accessors

The HA1 Frames configuration includes a second Library Manager (LM) to improve availability if an LM failure occurs. It also adds a second accessor so that the system can stay in Auto mode if an accessor failure occurs. The system continues to operate in Auto mode during service on the failed accessor. This also reduces the amount of time the library must be offline in order to install LM code fix packs.

See Figure 8 on page 28 for a block diagram of the HA1 Frames configuration. Under normal operation (no elements have failed or are degraded), the *Active* LM is in LM A. The *Standby* LM is in LM B. The *Active* accessor is A (Local) and is controlled from the active LM. LM A receives host commands over the serial interfaces (RS-422) from direct-attached hosts and serially attached controllers. LM A also receives commands over the internal Ethernet LAN and Convenience I/O through the hardware switch with the Digital Input/Digital Output (DI/DO) lines. Through the hardware switch, the Accessor Manager in LM A knows that the standby accessor was parked safely in its service bay.

Two Ethernet LANs provide a Primary Link and an Alternate Link. The Primary Link keeps the secondary database in sync by using database services. It also provides component-to-component communication and “heartbeat” messages. The Alternate Link is used to pass accessor commands to the remote accessor, as a backup for component to component communication, and heartbeat messages. Heartbeat messages are messages that the *Active* LM sends to the *Standby* LM, letting it know that it is still functioning. If the heartbeat messages stop on both links, the Standby LM takes over and becomes the Active LM.

The Accessor Manager in LM A performs move operations by using Accessor A. When optional FC 5050 (Dual Active Accessors) is installed, the active Library Manager controls both accessors by queueing commands to both the local and the remote accessor manager. The active database is continually backed up onto LM B across the Primary link. The Non-Volatile Memory (NVRAM) element keeps track of the current state of the active and standby LMs. It is used when an LM cannot

communicate with the second LM on either of the links to decide whether this LM is active.

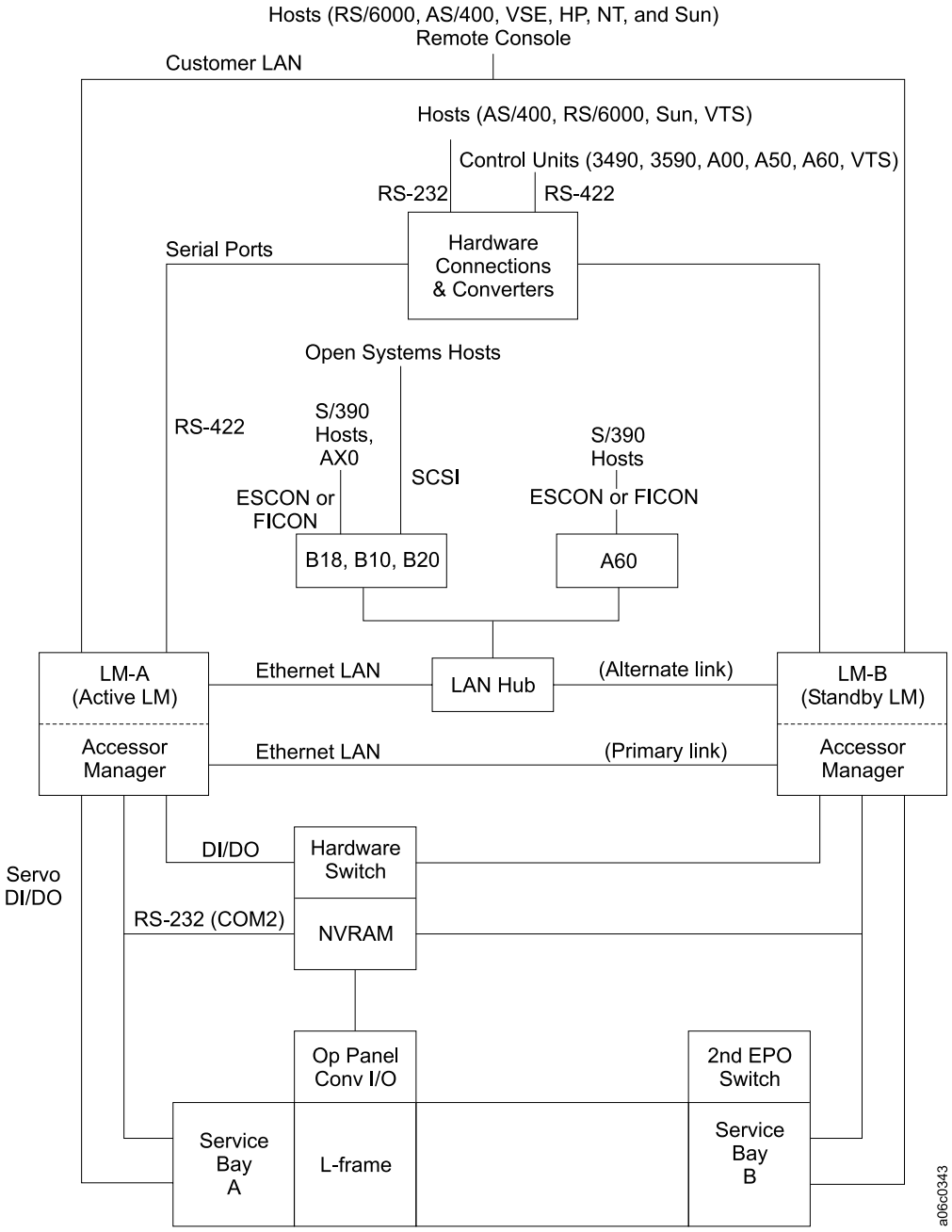


Figure 8. Dual Library Manager (DLM) with Dual Accessors

Dual Active Accessors

FC 5050 (Dual Active Accessors) is a performance enhancement to the HA1 Frames. This feature allows both accessors to be active at the same time. The HA1 Frames allow a reduction in system outages if an accessor fails. However, it does not take full advantage of having two accessors available. With this feature, both accessors can be active at the same time.

In order to reduce interference between accessors, the Library Manager divides the library into two zones, each designating a preferred accessor work area. The

boundary between the two zones is established at library initialization and may change over time as the Library Manager attempts to keep the accessors equally busy.

The Library Manager performs accessor selection in one of three ways:

- For drive-specific commands, the accessor zone that the drive is located in determines the accessor that the Library Manager selects. If the drive is in a frame in the Accessor A zone, the Library Manager selects Accessor A for mount commands to this drive. Optimally, this is a nonspecific mount, and the Library Manager selects the cartridge from near the drive. Regardless, Accessor A performs the entire operation, assuming that there is no error.
- For Insert and Eject operations using the convenience I/O station, the accessor controlling the operator panel handles the operation.
- For accessor commands that are not tied to a drive or to the convenience I/O station, the Library Manager uses the source cell to select the appropriate accessor. As such, the accessor working in the zone that contains the high-capacity I/O cells handles high-capacity Insert operations. The accessor working in the zone that contains the cartridge to be ejected handles high-capacity Eject operations.

Cartridge Selection and Home Cell

The Library Manager uses three basic techniques when placing and selecting tapes to better optimize performance of dual active accessors:

- High-Capacity Inserts

  When designating a home cell for the cartridge, the Library Manager considers the cartridge media type and the location of the tape drives that use the particular media type.
- Category Mounts (scratch)

  The Library Manager considers the zone in which the tape drive is located when selecting the accessor. Volume selection prefers cartridges within the selected accessor's zone.
- Demounts

  The Library Manager looks for a free cell within the same zone as the drive for the demount, effectively allowing floating home-cell mode, even with single gripper accessors. Volumes eventually collect around the subsystems on which they are used.

Dual Active Accessors Optimization

The Library Manager uses a boundary initially located at approximately the midpoint of the D1x Frames to establish the two accessor work zones. The Library Manager monitors the workload of each accessor and changes the zone boundary if one accessor is significantly busier than the other.

The Library Manager continually calculates a **workload factor** for each accessor to determine how busy each one is in relation to the other. Because mounts have the highest priority of all library operations, they are the biggest factor in establishing and maintaining the moveable boundary. Thus, the Library Manager gives mounts a heavier weight in calculating the workload factor for each accessor.

If Accessor B is performing a certain number of mounts and Accessor A is performing an equal number of ejects, Accessor B's workload factor actually increases at approximately double the rate of Accessor A's workload factor. Eventually, Accessor B's workload factor is significantly higher than that of Accessor A. This causes the Library Manager to move the boundary in the

direction of Accessor B's service bay, thus increasing the size of Accessor A's work zone. The rate of ejects then decreases as Accessor A receives more mounts to process.

Drive Selection

When the Library Manager receives a host request for volume data, the information sent back to the host includes a list of subsystems in order of distance from the volume. Certain host applications (such as MVS) use this list to attempt to allocate a drive close to the cartridge on the subsequent mount request. For systems with the Dual Active Accessors feature installed, the subsystem list is additionally ordered by zone. Hosts then prefer to mount volumes on tape drives within the same zone, even though there are tape drives in the other zone that may be closer. This method minimizes interference by attempting to make the host choose a tape drive that is in the same zone as the cartridge.

Inventory

The operation of inventory and inventory update are the same, except that both accessors are used to perform the scanning function. The only time both accessors are not used is when the vision system on one accessor is not operational.

Cartridge System Tape

The 3494 automates the storage and movement of the following tape cartridge types (volumes):

- Cartridge System Tape (CST) - media type **1**
- Enhanced Capacity Cartridge System Tape (ECCST) - media type **E**
- High Performance Cartridge Tape (HPCT) - media type **J**
- Extended High Performance Cartridge Tape (EHPCT) - media type **K**

See Appendix A, "Cartridge System Tape and Cartridge Labels", on page 159 for a description of tape cartridges and their labeling requirements.

Remote Service Support

Remote service allows field support personnel to access the Library Manager transaction and error logs remotely to diagnose difficult hardware problems or to analyze microcode problems. It provides faster emergency fixes by using fix packs for code problems. This eliminates the time required for sending the logs to the IBM Support Center and for recreating the error at the Support Center.

FC 2710, 2711, and 2712 provide remote support for the following units:

- 3494 Model B16, B18, B10, and B20 VTSs, AX0s, HA1 Frames, and L1x Frames
- 3590 Model A00, A50, and A60 Controllers
- 3490E Model F1A FC 3000 and FC 3500 Controllers

These features allow authorized personnel to access the logs normally available to the service personnel through the tape library operator menus and service menus.

Call Home Support

The Call Home function generates a service alert automatically when a problem with a B18, B10, or B20 VTS, AX0, or 3590 Model A50 or A60 Controller occurs. Status information is transmitted to the IBM Support Center for problem evaluation; a service representative can be dispatched to the installation. The user may also initiate the Call Home process using the Library Manager operator panel for a B18, B10, or B20 VTS, AX0, or 3590 Model A50 or A60 Controller problem. Call Home allows the service alert to be sent to a pager service so that multiple people, including the user, can be notified. The Call Home function requires no

new hardware; it uses the remote support FC 2710, 2711, and 2712 already installed. Call Home is not active automatically; the service representative can activate Call Home at the installation of the B18, B10, or B20 VTS, AX0, or 3590 Model A50 or A60 Controller or may activate or deactivate the function through service menus. The library manager calls home for failures if a VTS is attached.

Remote Support Access Security

There is no customer data on the 3494 library manager other than information about where the customer's tapes are located in the library. Customer data on the tapes is passed directly to the host from the tape drive and does not pass through the library manager.

Three levels of protection are available to prevent unauthorized access to the library manager logs when the remote support features are installed:

1. Modem password protection
2. Switch password protection
3. Library manager storage administrator password protection

The modem can be configured to have password protection so that only dial-in users with the password can gain access to the serial port of the library manager. The modem can accept up to 50 unique passwords, if desired.

In addition, the switch (if installed) allows selection of one unique password. This switch is in line with the modem, and either or both can be password enabled.

Finally, the storage administrator password is required to activate the remote capability in the library manager.

IBM TotalStorage Master Console

To improve serviceability, the IBM TotalStorage Master Console connects

- B18, B10, or B20 VTS and AX0**or**
- A60 Controller

to a dedicated, private local area network. Remote data monitoring of each VTS, AX0s attached to the master console facility, and A60 Controllers is provided for early detection of unusual conditions. Summary information is sent to IBM after monitoring is complete. Connection to the master console facility is required with a Model B10 or B20 VTS and associated AX0s, and is optional for the Model B18 VTS, AX0s associated with the B18 VTSs in a Peer-to-Peer VTS, or the A60 Controller.

Unlabeled Tape Facility

Unlabeled tape operations are designed to allow the operator to add occasional volumes that do not have a valid volser or external media-type label to the library. Volumes may be mounted and ejected in the same manner that regular, properly labeled volumes are handled.

The operator must first select the unlabeled tape option that adds the volser and media-type information for each unlabeled cartridge. Unlabeled tapes to be added to the database are then placed in the convenience I/O station. The data from the console is added to the database, and the cartridges are moved from the I/O station to their designated cells. All further operations with the cartridge are

handled as if the cartridge had a valid label. The inventory update operation verifies only that all unlabeled cartridges are in cells that previously contained unlabeled cartridges.

Note: The unlabeled tape facility should not be used for a large number of cartridges or for cartridges that are stored in the library for a long time. See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide (3494)* for additional information.

Simple Network Management Protocol (SNMP) Messaging

Many different host systems with various operating systems that communicate with the library using different types of connections can attach to the 3494. The library may encounter situations that the user would want to know about, such as a door being opened, which causes the library to stop. Because there are many attachment methods, the 3494 provides a standard TCP/IP protocol called Simple Network Management Protocol (SNMP) to send alerts (called SNMP traps) over a TCP/IP LAN network to SNMP monitoring stations. These monitoring stations, along with other user-supplied software, can alert operations staff of possible problems or operator interventions that occur at the library. Figure 9 shows a basic SNMP block diagram.

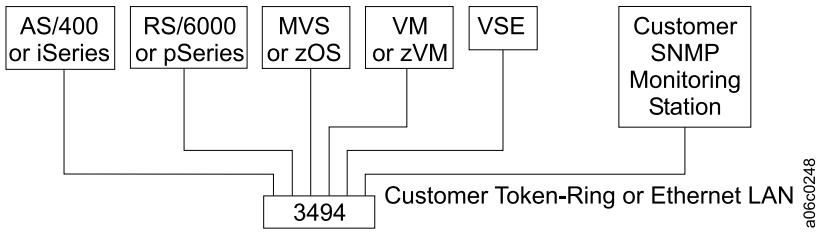


Figure 9. SNMP Basic Block Diagram

With this method, one or more locations can monitor the library, along with other equipment (both IBM and non-IBM) that also supports the SNMP protocol. Monitoring is independent of the host system that controls the equipment and independent of the library location.

Library Manager Communication Paths

Hosts can issue library commands to the Library Manager over three different paths:

- By ESCON or parallel channel attachment through a tape subsystem controller (for example, a 3590 Model A00, A50, A60, or a VTS)
- Directly through an RS-232 serial connection (for example, a direct-attached host or a 3490E Model F1A FC 3000 or FC 3500 Controller)
- Directly through an Ethernet or Token-Ring local area network (LAN) (direct-attached host)

All tape drives in the library must have a path to the Library Manager to communicate drive status and control information. There are three different paths for drive communication:

- Through a controller (for example, a 3490E Model CxA or a 3590 Model A00, A50, or A60) when multiple tape drives are combined under the controller. The controller attaches to the Library Manager through a single RS-422 connection.

- Through a controller (for example, a 3590 Model A60 or a B18, B10, or B20 VTS) when multiple tape drives are combined under a controller. The controller attaches to the Library Manager through an internal LAN Attachment Concentrator.
- Directly through a serial connection (RS-422) for 3490E Model F1A or 3590 Model B1A, E1A or H1A.

The number and type of communication paths limit the number of tape drives that you can install in a 3494. If the library has a B16 VTS, it requires two control unit paths and one RS-232 direct-attached host port. In addition, each 3590 Model B1A tape drive associated with the B16 VTS requires a control unit path.

The B18, B10, or B20 VTS and associated 3590 tape drives connect to the Library Manager through an internal LAN Attachment Concentrator. The 3590 Model A60 Controller can be attached in the same way.

Table 20 defines the number of serial (RS-232 or RS-422) connections available versus the features that are installed in the library.

Table 20. Library Manager Serial Communication Paths

Number of FC 5228 (Tape Control Unit Expansion)	RS-232 Direct-Attached Host Ports	Control Unit or Direct-Attached Drive Connection	Features Required
0	4	4	None
0	8	8*	FC 5229 (Expansion Attachment Card)
1	0	8	If SCSI Host or Open System Attachment, then FC 5219 (Token-Ring Adapter) or FC 5220 (Ethernet Adapter) is required for control path.
1	4	12*	FC 5229 (Expansion Attachment Card)
2	0	16*	FC 5229 and if SCSI Host or Open System Attachment, then FC 5219 or FC 5220 is required for control path.

Note: If FC 5227 (32 Port Attachment) is installed, add 16 to the numbers marked with an asterisk (*).

Each FC 5228 (Tape Control Unit Expansion) converts up to four RS-232 direct-attached host ports to be used to support control unit or direct-attached drive connections. Depending on the number of features that are installed, you can install up to thirty-two 3490E tape drives or 32 direct-attached 3590-type tape drives. You can install up to sixty-two 3590 tape drives that are attached through 3590 Model A00 or A50 Controllers by way of serial connections. The library can contain up to sixty 3590 tape drives that are attached through 3590 Model A60 Controllers by way of serial connections. With FC 4060 (Adjacent Frame Support),

a 3494 can have a maximum of seventy-six 3590 tape transports attached through eight 3590 Model A60 controllers by way of serial connections.

Remote Library Manager Console

The Library Manager or the remote console (if installed) controls all of the operations in the tape library, including the interaction between the library and its operators. The Library Manager hardware consists of a controller, display unit, keyboard and pointing device, and the hardware to support communication with the other units in the library.

During normal operations, the controls on the operator panel are sufficient to operate the library. The Library Manager is used for error recovery, for service, and for displaying operational status.

The HA1 Frames provides a second set of hardware (controller, display unit, and keyboard with its pointing device) to improve Library Manager availability. The second Library Manager takes control of the library automatically if the primary Library Manager fails.

IBM TotalStorage Enterprise Tape Library Specialists

The IBM TotalStorage family includes a number of IBM storage interfaces, or specialists, that enable operators and administrators to manage storage devices from any location in an enterprise. Microsoft Internet Explorer Version 5.0 or Netscape Navigator Version 4.7 with JavaScript™ and Java™ enabled provides compatible capability. There are two specialists for the 3494. The Enterprise Tape Library (3494) Specialist is a Web-based interface to the 3494 Library Manager that allows you remote access to the Library Manager and VTS status and operations. The Peer-to-Peer Virtual Tape Server (VTS) Specialist communicates with the AX0 to provide configuration details and status, see “Peer-to-Peer VTS Specialist” on page 46 for more information.

Tape Library Specialist

The Tape Library Specialist allows access to Library Manager information, such as current library status and VTS statistics. This is done with the Web server on the Library Manager PC, which serves Hypertext Markup Language (HTML) pages to a remote Web browser over a user LAN connection or through the Remote Service Access connection over a modem for Service.

The following are characteristics of the Tape Library Specialist:

- Allowed only when FC 5045 (Enhanced Library Manager) or equivalent is installed.
- Supports English and Japanese languages.
- Is not a replacement for FC 5226 (Remote Library Manager Console).
- User access requires FC 5219 (Token-Ring Adapter) or FC 5220 (Ethernet Adapter).
- If Remote Service is enabled, is accessible using the Remote Service Access (serial line Internet Protocol (SLIP) using the switch and modem).
- Multiple active server connections are allowed at the same time (service and several user connections).

Tape Library Specialist Connection

Figure 10 on page 35 shows the connection for the Specialist. The connection uses currently available 3494 components. The Web browser is in your system. Your

system must be LAN-attached to provide connectivity to the library. Service representatives may also use the Remote Access path using SLIP through the Remote Service modem and switch.

The Library Manager must be connected to your system's LAN using FC 5219 (Token-Ring Adapter) or FC 5220 (Ethernet Adapter). During the installation process, the service representative will set up TCP/IP on the Library Manager to use your assigned TCP/IP host name and TCP/IP address (and router information, if necessary). You can help the installation process if you obtain the following information before the installation starts:

- TCP/IP host name
- TCP/IP address
- Subnet mask (or network mask)
- Router address (or Gateway address)*
- Domain name*
- Nameserver address*

* These items are optional. Their use depends on your system's LAN configuration.

See Appendix E, "Specialist Worksheet", on page 179 for a worksheet on which to record the preceding information for the service representative to use during installation.

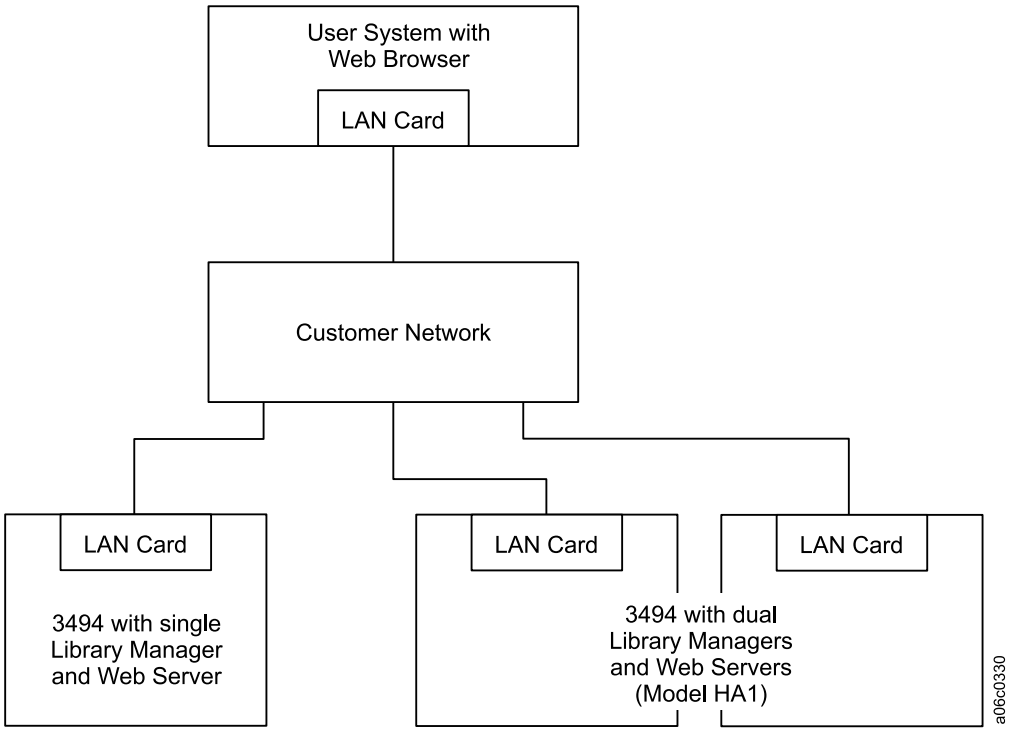


Figure 10. Specialist Connection

System Requirements

You are required to have a commonly used browser to view the information provided by the Specialist. Microsoft Internet Explorer Version 5.0 or Netscape Navigator Version 4.7 with JavaScript and Java™ enabled provides compatible capability. A text-based Web browser is not supported.

Help Text

Help is available on a page basis. There is a Help button on each Web page that, when selected, brings up a new instance of a browser with the Help text for that page. The user closes the new browser instance when finished with the Help. The Web page that called Help is still available in the background.

IBM TotalStorage Enterprise Tape Library Expert

The IBM TotalStorage family includes the Enterprise Tape Library Expert (ETL Expert). This product is purchased separately and helps storage administrators manage the performance of the 3494, its VTSs, and its PtP VTSs. The Expert does this by performing the following:

- Analyzing performance statistics, and maintaining a historical database
- Using a Health Monitor to allow viewing of key statistics in a desktop window
- Tracking a variety of performance, asset, and capacity information
- Maximizing IBM tape subsystem performance and disk subsystem performance when used with the ETL Expert
- Using a Web-based architecture that enables administrators to monitor IBM tape subsystems and disk subsystems located anywhere in the world

VTS Concepts

The 3494 automates the retrieval, storage, and control of Cartridge System Tape, Enhanced Capacity Cartridge System Tape, High Performance Cartridge Tape, and Extended High Performance Cartridge Tape. When used with supporting software and appropriate tape subsystems, the 3494 allows cartridges to be mounted and demounted on tape drives without operator involvement.

The VTS models deliver an increased level of storage capability to the traditional storage product hierarchy. They were originally introduced to solve the large problem of underutilization of tape capacity.

The VTS uses virtual tape drives for all interaction with host software. Although virtual tape drives are embodied only in licensed code in the VTS, they show the functional characteristics of a 3490 Enhanced Capability tape drive. To the host operating system and application programs, a virtual drive looks like a physical tape drive.

The difference between a virtual tape drive of the VTS and a real 3490E drive is that the data written to or read from the virtual drive resides on a virtual volume in the tape volume cache (not on a physical volume mounted on a physical drive). Tape operations that are gated by physical movement of tape show significant improvements in performance.

The functionality of the 3490E integrated cartridge loader is also included in the virtual drive's capability. All virtual tape drives indicate that they have a cartridge loader. Each virtual tape drive can be associated with a pool of scratch volumes that allow fast mount access for scratch mounts. The active status of the cartridge loader depends on the availability of scratch volumes in the assigned pool.

The VTS uses virtual volumes for all interaction with host software. Virtual volumes reside in the tape volume cache and show the characteristics of a Cartridge System Tape or an Enhanced Capacity Cartridge System Tape. A maximum of 250 000 logical volumes can be inserted into each of two attached VTSs in a 3494. This provides a maximum library capacity of 500 000 logical

volumes. Each VTS is assigned a range of volsers for its use. The tape volume cache consists of a high performance array of control software and disk storage. Virtual volumes are held in the tape volume cache when they are being used by the host system. Outboard storage management software manages the virtual volumes that are in the tape volume cache and the movement of data between the tape volume cache and physical 3590 tape drives (FC 4000 or FC 4001–4004 is required for this function). By using DFSMS policy management, users have the ability to control tape volume cache preference for retention of virtual volumes.

When a virtual volume is moved from the tape volume cache to a 3590 cartridge, the process is called a copy. The volume becomes a logical volume. When a logical volume is moved from a 3590 cartridge to the tape volume cache, the process is called a recall. The volume becomes a virtual volume again.

The cartridge storage cells, cartridge accessor, and tape subsystem are accessed by opening the door on the front of the unit. Maintenance activity and Manual mode are performed by using this door. The operator can perform Manual mode operations if the cartridge accessor is not operational.

Requests issued from the host may result in cartridge movement in the library. The primary requests issued are for mounting and demounting volumes to and from the tape drives and for ejecting volumes from the library. The following methods are used:

- Requests are sent to the library by using the channel attachments of the tape subsystem. The tape library provides status and other information to the host through the tape subsystem.
- Library requests are sent directly to the Library Manager by using RS-232 or LAN interfaces from an attached host. The tape library provides status and other information to the host through these interfaces.

Note: The VTS volume mounts and demounts are virtual and do not necessarily result in physical cartridge movement.

In either case, all tape subsystem requests and responses are sent to the tape subsystem through the tape subsystem channel attachment.

The host has no knowledge of the physical location of a cartridge or volume in the library. The physical location is managed exclusively by the library. When a virtual volume is moved from a tape volume cache to a 3590 cartridge, it becomes a logical volume. A 3590 cartridge that contains logical volumes is known as a stacked volume. The VTS maintains the relationship of logical volumes and the physical volumes on which they reside. Each physical cartridge inserted into the library must have an operator-readable and machine-readable external label. Labels identify the cartridge in the library during inventory operations and during insertion through the input facility.

The library stores the physical location of the cartridge in an inventory database based on the cartridge volser (volume serial number). Logical volumes are also stored in the same database. Host requests for operations that involve the movement or use of a cartridge need to specify only the cartridge volser for the library to perform the request. (Hosts must also specify the drive to be used.)

With the addition of the VTS, the number of volumes (physical and logical) that the Library Manager must manage and contain within its inventory increases

greatly. Overall performance of the library slows as the size of the inventory increases; therefore, you should define only the logical volumes required.

Tape Subsystems

3494 Virtual Tape Server

The VTS was created to provide a higher utilization of 3590 tape technology than current tape controller concepts enabled at that time. It provided the improvement in utilization without impacting current operating systems or third-party software. The subsystem combined the random access and high performance characteristics of disk storage with outboard hierarchical storage management and virtual tape drives to provide significant reductions in the number of physical cartridges, tape drives, and automated libraries needed to store the user tape data. The key functions for the architecture of the subsystem are the following:

- Emulation of 3490E-type virtual tape drives (32, 64, 128, or 256 virtual tape drives depending on the VTS models)
- Tape volume cache
- Storage management of the tape volume cache
- Maintaining fragments of copied volumes
- Fast response for nonspecific mount requests
- A maximum of 250 000 logical volumes in each of two attached VTSs in a 3494 for a maximum library capacity of 500 000 logical volumes
- Data compression (ESCON High Performance Option or Extended High Performance Option for the B18 VTS)
- The B18, B10, B20 VTSs use **J**-type (HPCT) and **K**-type (EHPCT) cartridges. The use of **K**-type (EHPCT) requires that the 3590 tape drives have that capability.
- The B16 VTS only uses the **J**-type (HPCT)

Emulation of 3490E Tape Drives: From a zSeries™ host perspective, the B16, B18, B10, or B20 VTS looks like two, four, eight, or sixteen 3490E subsystems, each with 16 tape drives. This provides a total of 32, 64, 128, or 256 virtual tape drives respectively.

A PtP VTS with four AX0s looks like four 3490E subsystems, each with 16 tape drives. This provides a total of 64 virtual tape drives.

A PtP VTS with eight AX0s looks like eight or sixteen 3490E tape subsystems, each with 16 tape drives. This provides a total of 128 or 256 virtual tape drives.

From a SCSI host perspective, each SCSI host attachment feature is configurable to eight 3490E control units, each with two 3490E tape drives. For more information, see “VTS SCSI Host Attachments” on page 13.

Each emulated drive is called a virtual tape drive. The subsystem handles all 3490 tape commands. Emulating a 3490E-type tape drive eliminates the need for host software changes to support the 3590-type tape drive. There is no direct relationship between a virtual tape drive and a real 3590 tape drive.

Data is written and read as if it is stored on a real Cartridge System Tape or an Enhanced Capacity Cartridge System Tape. However, within the subsystem, data is stored on disk storage. All tape read commands and write commands are translated to read and write data records from or to disk storage. Tape marks are stored as special records on the disk storage as well. Volumes residing on the disk storage are called virtual volumes.

The amount of data stored on a virtual volume is variable up to a maximum as determined by the media type selected. Two media types are supported (standard Cartridge System Tape and Enhanced Capacity Cartridge System Tape). These cartridges can hold up to 400 MB and 800 MB of user data, respectively.

All host interactions with data in a VTS are through virtual volumes and associated virtual tape drives; there is no direct access to the data on a physical cartridge or drive.

Tape Volume Cache: The size of the disk storage can be made large enough so that more virtual volumes can be retained in it than just the ones currently associated with the virtual tape drives. After an application closes a virtual volume, if it was modified, a copy of it is made by the storage management software in the subsystem onto a physical tape. The virtual volume remains available on the disk storage until the space it occupies is needed to satisfy another mount request. Leaving the virtual volume in the disk storage allows for fast access to it during a subsequent request for the volume. The disk storage and the management of that space to keep volumes available after they are closed are called the tape volume cache. The performance for mounting of a volume that is in the tape volume cache is quicker than if a real physical volume is mounted. The disk storage, in effect, caches your tape volumes and provides for fast access.

Storage Management of the Tape Volume Cache: Storage management software in the subsystem manages the contents of the tape volume cache. When an application closes a volume, a virtual tape volume is copied from the tape volume cache to physical tape as a background process. When there is a request to mount the volume, the virtual tape volume is recalled from the physical tape to the tape volume cache, if the volume is no longer resident in the tape volume cache. To improve average mount response time, Advanced Function (FC 4000) and Advanced Policy Management (FC 4001–4004) allow DFSMS policy management to control which virtual volumes are deleted first from tape volume cache when space is needed.

Maintaining Fragments of Copied Volumes: The data space in the tape volume cache is not automatically freed when the data occupying that space has been copied to a stacked volume. When the tape volume cache has filled with tape volumes and space is needed, space taken up by volumes preferred by DFSMS policy management for deletion, or by older volumes, is freed for new allocations. When the VTS is freeing space for new volumes, it maintains a small portion of an older volume (known as a fragment) in the tape volume cache. This fragment includes enough information about the copied virtual volume so that it can be recalled easily. It also includes the first several records from the last use of the volume. Normally, the first few records on a tape contain the tape volume label, and enough data records are maintained to contain an IBM standard tape label plus any unique user label records.

Fast Response for Nonspecific Mount Requests: When a nonspecific mount is requested, the user application is going to write data from the beginning of tape, overwriting any existing data on the tape. Within a VTS, a nonspecific mount request is satisfied by accessing the data fragment in the tape volume cache associated with the virtual volume selected by the Library Manager to satisfy the request. No recall of the data from the previous usage of the volume is performed because the fragment contains the label information needed by the host tape management software to validate the use of the volume for a nonspecific mount request. The subsystem signals the host that the mount is complete when the

fragment is accessed. The result is a very low mount response time because no physical movement or mounting of a cartridge is involved.

500 000 Logical Volumes: Up to 500 000 logical volumes are allowed per 3494. The volumes are assigned to, but not shared by, the VTSs in the library. Each B18, B10, or B20 VTS in the library may have a maximum of 250 000 logical volumes. The B16 VTS may have a maximum of 150 000 logical volumes. A PtP VTS presents a single VTS image and, therefore, may have only 250 000 logical volumes.

Data Compression: The B10 and B20 VTSs include data compression capability.

FC 3200 (ESCON High Performance Option) for the B18 VTS provides data compression capability for improved performance with two enhanced ESCON host channel attachments. Two additional enhanced ESCON host channel attachments are available with FC 3302 (Additional Enhanced ESCON Channel Attachment).

FC 3400 (Extended High Performance Option) with FC 3412 (Extended Performance ESCON Channels) provides data compression capability (similar to FC 3200) for the B18 VTS.

VTS Logical Volume Export and Import: Advanced Function (FC 4000) and Advanced Policy Management (FC 4001–4004) provide for the export and import of logical volumes, allowing movement of data between VTSs. The Export operation allows the library to export a set of logical volumes from a VTS to physical volumes for backup, archival, or transfer purposes. The Import operation allows the library to import a set of logical volumes that were exported previously from a VTS. The VTS has the following attributes for Export and Import operations:

- Only the convenience I/O station can be used for volumes being imported.
- The convenience I/O station operates in Import mode in systems that support Export and Import operations.
- User interface provides a way to assign **J**-type (HPCT) and **K**-type (EHPCT) cartridges to the Import categories or the Insert categories.
- Export and Import operations allow the use of **J**-type (HPCT) and **K**-type (EHPCT) cartridges.
- At least four physical tape drives that are associated with the VTS must be available for Export and Import operations.
- Only one Import operation is allowed at a time in the entire library.
- One Export operation may be in progress for each VTS in the library at any given time.
- An Import operation is not allowed in a VTS partition that is performing an Export operation.
- Requires host software support.
- Export and Import operations provide additional statistical data on Export activity and Import activity for each VTS.
- Export and Import operations are supported only for ESCON-attached hosts.
- Export and Import operations require FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option).
- During Export and Import operations, the library sends status messages to the host that requested the Export or Import operation.

- Exported Stacked Volumes created on 3590 Model B1A tape drives can be imported into 3590 Model E1A configurations. However, Exported Stacked Volumes created on 3590 Model E1A tape drives cannot be imported into 3590 Model B1A configurations.
- Exported Stacked Volumes created on 3590 Model B1A or E1A tape drives can be imported into 3590 Model H1A configurations. However, Exported Stacked Volumes created on 3590 Model H1A tape drives cannot be imported into 3590 Model B1A and E1A configurations.
- The Export and Import functions of Advanced Function (FC 4000) and Advanced Policy Management (FC 4001–4004) will be disabled when Peer-to-Peer Copy Base (FC 4010) is installed.

Other Key Functions: A VTS must be installed as part of a 3494 because the physical assets used by the subsystem are managed by the Library Manager in the library. The physical assets include the 3590 tape drives and the 3590 cartridges used for stacking logical volumes. The Library Manager provides several other key functions involving a VTS. These functions include the following:

- Logical library partitioning
- Operator interface
- Logical volume inventory

Logical Library Partitioning: To support the product requirement that a VTS can coexist with current 3490E and native 3590 subsystems in the same library, the Library Manager partitions the physical library into logical libraries. This must be done because a VTS presents the image of 3490E-type tape drives, yet cannot read or write a real 3490E cartridge. By placing a VTS in its own logical library, host software cannot attempt to allocate a VTS drive for a real 3490E mount and vice versa.

A logical library can contain **either** of the following:

- A single VTS or PtP VTS
- A current 3490E or native 3590 subsystem

Each logical library has its own unique library sequence number and looks like a separate physical library to the hosts attached to the subsystems in that partition.

Operator Interface: The Library Manager console is used to perform the setup, management, and status functions needed to support a VTS.

Logical Volume Inventory: The database in the Library Manager is expanded to handle the large number of logical volumes that a VTS uses. There are also new operator functions that allow you to add logical volumes by specifying a volume serial number range through the Library Manager console.

SCSI Attachment Capabilities: The B18, B10, and B20 VTSs have SCSI attachment capabilities, which expand the types of host systems that can attach to a VTS.

3590 Model A50 Controller

The 3494 incorporates the 3590 Model A50 Controller to provide a high-performance ESCON attachment of 3590 Model B1A and E1A tape drives to ES/3090, ES/9000, S/390, and zSeries. The architecture of this controller combines building blocks, such as RS/6000, pSeries, AIX, and PCI bus architecture, in a single controller. This controller has remote support capabilities to enable quick diagnostic tests, problem analysis and verification, and a means to upgrade 3590 microcode from remote sites through a modem. The 3590 Model A50 Controller is

integrated in a L14 Frame or D14 Frame to automate up to four 3590 Model B1A or E1A tape drives. You can configure a 3494 with up to sixteen 3590 Model A50 Controllers and up to sixty-two 3590 Model B1A or E1A tape drives.

The 3590 Model A50 Controller provides a single data transfer path with one or two ESCON channel adapters, each with up to 64 logical channels. It has a maximum channel distance of 43 km (27 miles) and supports multiple logical paths per MVS image.

A required feature provides the first ESCON channel adapter, and an optional feature provides the second ESCON channel adapter for increased configurability.

3590 Model A60 Controller

The 3590 Model A60 Controller provides a single data transfer path with up to eight ESCON channel adapters, each with up to 64 logical channels. It has a maximum channel distance of 43 km (27 miles) and supports multiple logical paths per MVS image. It can also have up to two FICON channel attachments. The 3590 Model A60 Controller is integrated in a D14 Frame to automate up to four 3590 Model B1A, E1A or H1A tape drives.

You can configure a 3494 with up to fifteen 3590 Model A60 Controllers and up to seventy-six 3590 Model B1A, E1A or H1A tape drives with FC 4060 (Adjacent Frame Support) installed.

Peer-to-Peer Virtual Tape Server

The PtP VTS consists of one of the following configurations:

- Two B18 VTSs
- One B18 VTS and one B10 VTS
- One B18 VTS and one B20 VTS
- Two B10 VTSs
- Two B20 VTSs

Each VTS requires FC 4010 (Peer-to-Peer Copy Base).

PtP VTS configurations may be comprised of combinations of four or eight AX0s, one to four CX0 frames, and two VTSs. All supported PtP configurations are listed in Table 21 below.

Table 21. Supported PtP Configurations

VTS Model	VTS Model	Number of AX0s	Virtual Drives	Drive addresses per AX0
B18	B18	4	64	16
B18 with 1 FC 5264	B18	4	64	16
B18 with 1 FC 5264	B18 with 1 FC 5264	8	128	16
B20	B18 with 1 FC 5264	8	128	16
B10	B10	4	64	16
B10	B18	4	64	16
B20	B20	8	128	16

Table 21. Supported PtP Configurations (continued)

B20 with 2 FC 5264	B20	8	128	16
B20 with 2 FC 5264	B20 with 2 FC 5264	8	256	32

Notes:

1. A PtP configuration with one B10 and one B20 VTS is not supported except as an intermediate step in a conversion from an all B10 to an all B20 configuration.
2. If you install AX0s in two CX0s, each CX0 must contain two AX0s. You may not install any other equipment in the CX0.

The B18, B10, and B20 VTS and the AX0s, and their interconnections provide a single PtP VTS that appears to the host system as a single VTS. FC 5236 (Performance Accelerator) and a minimum of 144 GB of disk storage must be installed on the B18 VTSs. The PtP VTS can have a maximum of 250 000 logical volumes.

Figure 11 shows an example of two PtP VTSs.

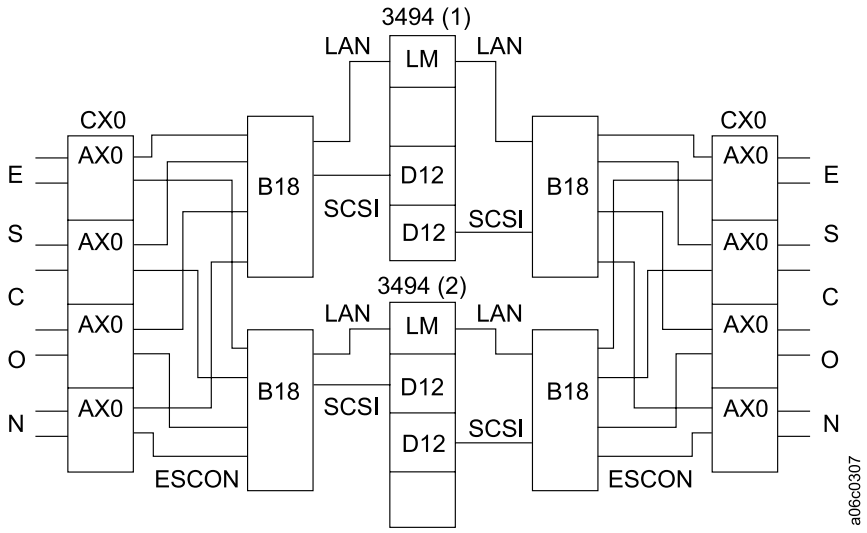


Figure 11. Example of 3494 Configuration with Two Peer-to-Peer VTSs

Note: Configuration rules allow a PtP VTS configuration having two, three, or four CX0s, each with two or four AX0s.

The PtP VTS provides the following:

- A dual copy of all virtual volumes, which it stores in each of the separate tape libraries. The AX0s create the second copy automatically and maintain the dual copy synchronization of the two VTSs.
- A solution for disaster recovery and electronic tape vaulting with transparent fail over and fail back.

The PtP VTS has the following characteristics:

- Each library must be taught to recognize which of the VTSs is part of a PtP VTS configuration. This includes whether this is the User Interface Distributed

Library. If the physical library has two VTSs that are enabled for PtP VTS operation, they must be associated with different PtP VTSs.

- The User Interface Distributed Library controls inserting logical volumes.
- A user cannot insert logical volumes to the non-User Interface Distributed Library.

Peer-to-Peer Virtual Tape Server Configuration Information

For each configuration of a PtP VTS, you must provide the following information to the service representative:

- Composite Library Name
- Composite Library Sequence Number
- Distributed Library 0 Name
- Distributed Library 0 Sequence Number
- Distributed Library 1 Name
- Distributed Library 1 Sequence Number
- Selection of the User Interface Distributed Library
- Selection of Immediate Copy mode or Deferred Copy mode. If you select Deferred Copy mode, you must also specify the Deferred Copy Priority Threshold.
- For each AX0, the switch address for each interface that is connected through a dynamic director
- Selection of a Preferred VTS for I/O (VTS0, VTS1, no preference)

B18, B10, and B20 VTS in a Peer-to-Peer VTS

A PtP VTS incorporates the functional capability of the B18, B10, and B20 VTSs, except for the SCSI host attachment and the Export and Import capability. The B18, B10, and B20 VTSs with FC 4010 (Peer-to-Peer Copy Base) are independently operating, distributed server nodes in a PtP VTS. They contain additional function to support the coupling functions that are required for operation in a PtP VTS. They also incorporate new channel commands to support large block transfers of compressed logical volumes to and from AX0s. These commands reduce the time that is needed to copy logical volumes, especially across extended distances. Other functions allow the AX0s to maintain dual copy synchronization of the two VTSs. They also provide expedited deletion of redundant logical volume copies from the tape volume cache.

Note: The installation of FC 4010 (Peer-to-Peer Copy Base) on a B18, B10, or B20 VTS limits the use of the B18, B10, or B20 VTS to a PtP VTS configuration.

The B10 and B20 VTSs have two primary control compartments, each with its own power cable, which allow connection to two power sources. Many B18s also have this capability. Field installation of FC 4010 (Peer-to-Peer Copy Base) on a B18 VTS does not provide two primary control compartments and two power cables.

Note: A B18, B10, or B20 VTS that is connected to two power sources will continue operation from only one source when HA1 Frames is included in the tape library.

It is highly recommended that the B18, B10, and B20 VTS in a PtP VTS configuration be configured with the same disk storage capacity. If Advanced Function (FC 4000) or Advanced Policy Management (FC 4001–4004) is installed on

a VTS with Peer-to-Peer Copy Base (FC 4010), the Export and Import functions must be disabled by a service representative. SCSI Host Attachment (FC 3422) cannot be installed.

AX0

The AX0 provides interconnection between two B18, B10, or B20 VTSs with FC 4010 and also provides two ESCON host system attachments for the PtP VTS. Each AX0 is an independently operating, distributed node within the PtP VTS. It continues to operate during scheduled or unscheduled service of another AX0. There must be four or eight AX0s in the PtP VTS, with each one attaching two VTSs at distances up to 26 km (16 miles) when using ESCON directors. Each AX0 provides two ESCON host attachments at distances up to 43 km (27 miles), using appropriate ESCON directors. Each AX0 also provides 16 or 32 virtual tape drive addresses and transfers data between host channels and the VTSs for each of its mounted volumes. For a mount on any of its virtual tape drives, the AX0 selects one of the VTSs to support the requested volume processing activities.

Each AX0 performs the following:

- Maintains synchronization of the dual copy of logical volumes
- Uses large block transfers of compressed logical volumes to create logical volume copies
- Balances work load between the VTSs
- Directs specific volume mounts to the VTSs with a cached copy of the requested virtual volume

When one of the VTSs is offline for service, the remaining VTS performs all library activity. When a VTS returns to an active state, each of the AX0s resumes dual copy operations to bring the VTSs into synchronization.

The AX0 has two modes of operation for creating logical volume copies: *Immediate Copy* mode and *Deferred Copy* mode. All AX0s within a PtP VTS must use the same mode of operation. The accessibility of the copy depends on the operational mode that is selected:

- In Deferred Copy mode, an AX0 schedules creation of the copy when it receives a Rewind Unload command and the unload operation is complete. The completion time of the copy operation depends on VTS activity.
- In Immediate Copy mode, while both VTSs are active, an AX0 starts the creation of a copy when it receives a Rewind Unload command. It signals completion of the Rewind Unload command when the copy operation is complete. If the companion VTS is inactive, the Rewind Unload command completes without a copy being made. When the companion VTS returns to the active state, copy creation operation has priority.

The mode of operation that is selected also determines the peak performance of the PtP VTS.

With Advanced Policy Management (FC 4001–4004), you can also change the mode of operation for creating copies (Immediate or Deferred) by volume.

CX0 Virtual Tape Frame

The CX0 provides the housing and power for two or four AX0s. It contains two primary control compartments, each with its own power cables, which allow connection to two power sources. You can configure a CX0 with two or four AX0s.

Peer-to-Peer VTS Specialist

The AX0 provides an optional Web server for the display of status on your Web browser by way of your intranet. In a PtP VTS, there are four or eight AX0s, which must be configured to provide the Web server function. You are responsible for providing the following hardware and information to the service representative to allow configuration of the Web server function:

- An Ethernet/twisted pair cable (category 5, 4-pair stranded, PVC, RJ45 connector) for connection to a 100/10 Base T connector on each AX0
- Standard Ethernet Network Interface (en0)
- Network names and addresses are required for each AX0:
  - HOSTNAME for the particular AX0 (for example, PTP0)
  - Internet ADDRESS of the particular AX0 (for example, x.xxx.xx.xxx)
  - Network MASK (for example, xxx.xxx.xx.x)
  - Optional NAMESERVER Internet ADDRESS (for example, x.xxx.x.xxx)
  - Optional NAMESERVER DOMAIN Name (for example, tucson.ibm.com)
  - Optional Default GATEWAY address (for example, x.xxx.xx.xxx or tucsongate)

See Appendix D, “Peer-to-Peer VTS Specialist Worksheet”, on page 177 for a worksheet on which to record the preceding information. The service representative will use this information during the installation of the PtP VTS or at a later time when the Peer-to-Peer VTS Specialist is to be enabled.

When an optional NAMESERVER is used, it must be updated with the addresses and names for each AX0 before enabling the Peer-to-Peer VTS Specialist in the AX0s. If a gateway is to be used, the GATEWAY address must be provided in order to configure the Peer-to-Peer VTS Specialist in each AX0.

Attachments for Virtual Tape Servers

The following section describes how the VTS attaches to various host systems.

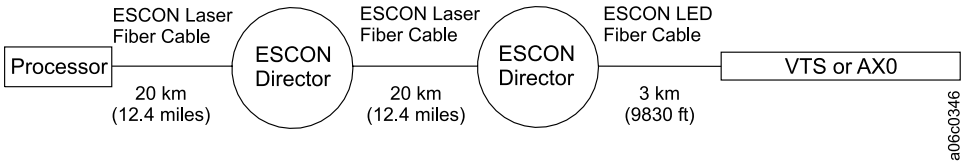
Host Systems Attachment

The B16, B18, B10, and B20 VTSs and the PtP VTS attach to ES/9000 host systems through ESCON or FICON channels. As part of your installation plan, analyze your performance and distance requirements carefully. The following considerations may be used as a starting point for a discussion with your IBM representative.

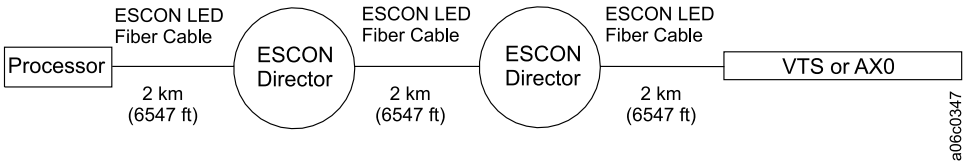
With ESCON or FICON, you have numerous options for the physical distance between the VTS and your ESCON or FICON-capable processor. Following are several configuration options.

ESCON

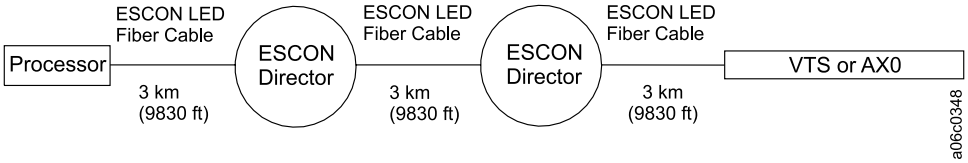
You can locate a VTS or PtP VTS up to 43 km (27 miles) from a processor when using the ESCON LED or ESCON laser fiber cable and two ESCON directors:



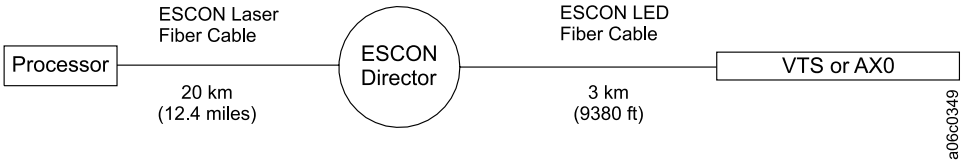
You can locate a VTS or PtP VTS up to 6 km (3.7 miles) from a processor when using the ESCON LED 50-micron cables and two ESCON directors:



You can locate a VTS or PtP VTS up to 9 km (5.6 miles) from a processor when using the ESCON LED 62.5-micron cables and two ESCON directors:



You can locate a VTS or PtP VTS up to 23 km (14.3 miles) from a processor when using ESCON laser fiber cable, an ESCON director, and an ESCON LED fiber cable:



The B16 VTS contains two ESCON host channel attachments. With ESCON directors, each subsystem ESCON host channel attachment provides for up to 64 logical attachments.

The B18 VTS contains up to eight ESCON host channel attachments.

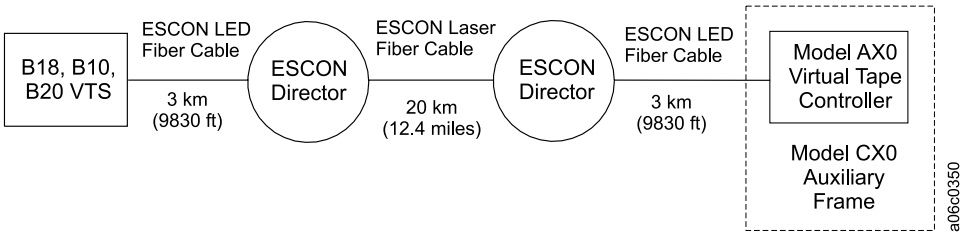
The B10 VTS contains up to four ESCON host channel attachments.

The B20 VTS contains up to 16 ESCON host channel attachments.

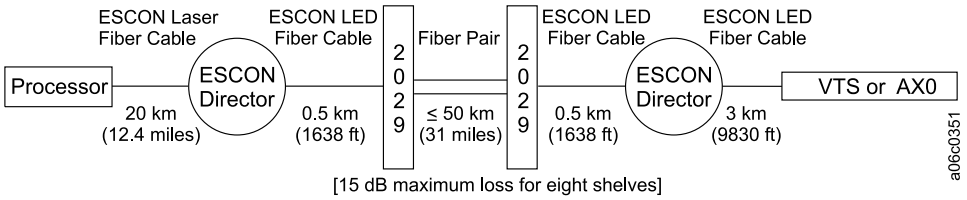
For additional information about ESCON attachments, see *IBM Fiber-Optic Channel Link Planning and Installation*.

Peer-to-Peer VTS Attachment: Each AX0 provides two ESCON host channel attachments for the PtP VTS.

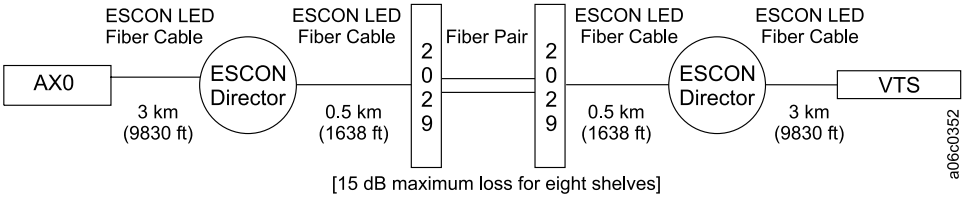
You can locate an AX0 up to 26 km (16 miles) from the VTS when using the ESCON laser fiber cable and two ESCON directors:



IBM 2029 Fiber Saver for Attachment: The IBM 2029 Fiber Saver extends the distance between a host system and a B18, B10, or B20 VTS or PtP VTS. The maximum end-to-end distance from the host system to the B18, B10, or B20 VTS ESCON interface or AX0 interface, including the Fiber Saver pair length, is 75 km (46.8 miles), as shown in the following figure:



You may also use the IBM 2029 Fiber Saver to extend the distance between an AX0 and the B18, B10, or B20 VTS. The maximum end-to-end distance from the AX0 to the B18, B10, or B20 VTS ESCON interface, including the Fiber Saver pair length, is 50 km (31 miles), as shown in the following figure:



For additional information about attachment using the IBM 2029 Fiber Saver, see the *IBM Fiber Saver (2029) Implementation Guide.*

FICON

The following diagram provides information about FICON attachments.

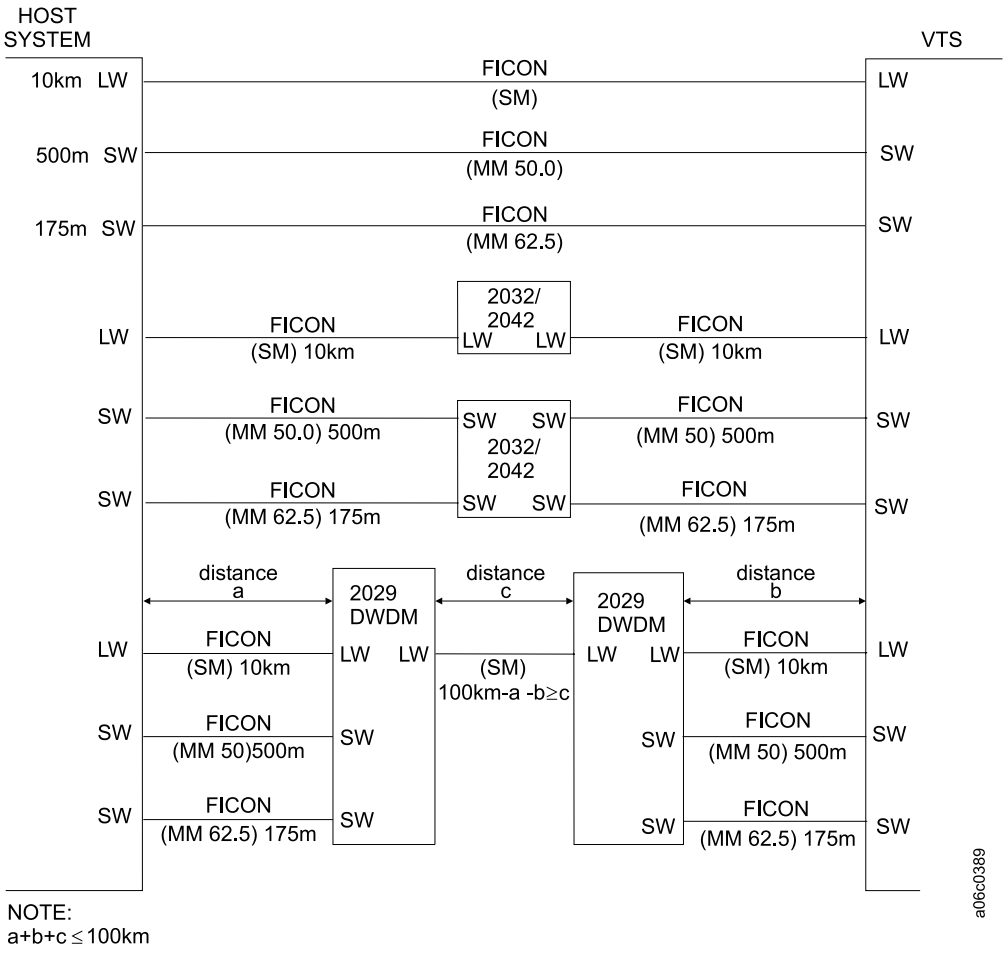


Figure 12. FICON Channel Host Systems Attachment (1 gigabit/sec distances)

- SM = Single Mode Fiber
- MM = Multi Mode Fiber
- LW = Long Wave Laser
- SW = Short Wave Laser

ESCON Cabling for 3494 VTS

Each B16, B18, B10, and B20 VTS (with ESCON attachment features), and AX0 provides two 30.5-m (100-ft) ESCON cables. FC 3302, 3412, and 3418 for the B18, B10, and B20 VTSs provide two 30.5-m (100-ft) ESCON cables. If cables of other lengths are required, order the cable Group Number and Connection ID from Table 22 and specify a length shown in Table 23 on page 51.

Table 22. 3494 VTS ESCON Cables

Model and FC	Interface	Group Number	Number of Cables	Connection ID
B16 VTS	Interface 0	3797 or 8486	1	55
	Interface 1	3797 or 8486	1	57
AX0	Interface 0	3797 or 8486	1	171
	Interface 1	3797 or 8486	1	173
B18 VTS	Interface 0	3797 or 8486	1	151
	Interface 1	3797 or 8486	1	153
B18 VTS with FC 3302, 3412	Interface 2	3797 or 8486	1	155
	Interface 3	3797 or 8486	1	157
B18 VTS with two FC 3418	Interface 4	3797 or 8486	1	161
	Interface 5	3797 or 8486	1	163
	Interface 6	3797 or 8486	1	165
	Interface 7	3797 or 8486	1	167
B18 VTS with one FC 3418	Interface 2	3797 or 8486	1	161
	Interface 3	3797 or 8486	1	163
B10 VTS	Interface 0	3797 or 8486	1	151
	Interface 1	3797 or 8486	1	153
B10 VTS with FC 3418 or second FC 3412	Interface 2	3797 or 8486	1	155
	Interface 3	3797 or 8486	1	157
B20 VTS with two FC 3412 and FC 3418, or four FC 3412	Interface 0	3797 or 8486	1	151
	Interface 1	3797 or 8486	1	153
	Interface 2	3797 or 8486	1	155
	Interface 3	3797 or 8486	1	157
	Interface 4	3797 or 8486	1	161
	Interface 5	3797 or 8486	1	163
	Interface 6	3797 or 8486	1	165
	Interface 7	3797 or 8486	1	167

Table 22. 3494 VTS ESCON Cables (continued)

Model and FC	Interface	Group Number	Number of Cables	Connection ID
B20 VTS with four FC 3412 and four FC 3418	Interface 8	3797 or 8486	1	191
	Interface 9	3797 or 8486	1	193
	Interface A	3797 or 8486	1	195
	Interface B	3797 or 8486	1	197
	Interface C	3797 or 8486	1	201
	Interface D	3797 or 8486	1	203
	Interface E	3797 or 8486	1	205
	Interface F	3797 or 8486	1	207

Notes:

1. Group number 3797 is for riser-rated cables.
2. Group number 8486 is for plenum-rated cables. You should order plenum-rated cables only when local codes require them.

Fiber-optic jumper cables attach the 3494 VTS to ESCON channels. Duplex-to-duplex 62.5/125-micron fiber-optic jumper cables are available from IBM in the fixed lengths shown in Table 23.

Table 23. Cable Fixed Lengths Available

Cable Length	Group Number 3797	Group Number 8486
4 m (13 ft)	Yes	No
7 m (23 ft)	Yes	Yes
13 m (43 ft)	Yes	Yes
22 m (73 ft)	Yes	Yes
31 m (102 ft)	Yes	Yes
46 m (151 ft)	Yes	Yes
61 m (200 ft)	Yes	Yes
77 m (253 ft)	Yes	No
92 m (302 ft)	Yes	No
107 m (352 ft)	Yes	No
122 m (400 ft)	Yes	No

Note: Cables of customized lengths up to 500 m (1640 ft) are also available.

FICON Cabling for 3494 VTS

For each FICON attachment FC 3415 or 3416, one cable should be ordered. FC 0201, 0202, 0203, 0204, 0205, and 0206 provide FICON cables for the B10 and B20 VTSs.

Table 24. 3494 VTS FICON Cables

Feature Code	Cable Length	Microns	Connectors
0201	31 meters	9	LC/LC
0202	31 meters	9	LC/SC

Table 24. 3494 VTS FICON Cables (continued)

0203	31 meters	50	LC/LC
0204	31 meters	50	LC/SC
0205	31 meters	62.5	LC/LC
0206	31 meters	62.5	LC/SC

Chapter 2. Specify and Special Features

The 3494 is available in several configurations. The L1x Frame contains a tape subsystem, the cartridge accessor, the Library Manager, storage for cartridges, and an optional convenience I/O station feature. The tape subsystem can be attached to SCSI, Fibre Channel, ESCON, FICON, and parallel channels in any combination.

Additional D1x Frames or the B16 VTS in a 3494 provide increased storage and performance. Additional S10 Frames in a 3494 provide increased cartridge storage.

The B18, B10, and B20 VTSs and the CX0s are installed as stand alone frames with external cabling to the library frames.

Language Group Features

Language features are factory-installed only. The default language is English, if it is not otherwise specified. Depending on the country, some or all of the user documentation may be available in the country language. Table 25 shows the keyboard and operator panel language features for the 3494.

Note: At installation, the customer specifies the language for the Library Manager display, and the service representative enables the selected language.

Table 25. Language Group Features

Feature Code	Language
FC 2924	English
FC 2928	French
FC 2930	Japanese (operator panel only)
FC 2931	Spanish
FC 2932	Italian
FC 2935	French Canadian (keyboard only)
Note: A maximum of one language may be specified.	

Safety Labels

Languages on safety labels in the operator access area are country-specific. The appropriate safety label language is selected at the factory based on the order destination country code. Table 26 shows the list of available languages and language groups for the safety labels.

Table 26. Safety Labels

English	Italian	French
German	Spanish	Dutch and French
Danish	Finnish	Norwegian
Portuguese	Swedish	French and English
Japanese	Brazilian Portuguese	Italian, German, and French

Specify Features

To populate the D1x Frames and L1x Frames with tape subsystems, the features shown in Table 27 are provided. These features provide only the hardware to install the subsystems in the 3494 frames; the actual tape drives and control units (and their associated features) must be ordered separately. Specify features are selected when ordering a 3494 from the factory.

Notes:

1. The design of the 3494 is for connection to Impedance Transformer (IT) power subsystems.
2. For language feature codes, see "Language Group Features" on page 53.

Table 27. 3494 Specify Features

Feature Code	Maximum Quantity	Description
FC 9002	7 (see note 7)	Storage Unit Attach (2–8 Frames)
FC 9003	7 (see note 7)	Drive Unit Attach (2–8 Frames)
FC 9004	4 (see note 6)	Storage Unit Attach (9–16 Frames)
FC 9005	4 (see note 6)	Drive Unit Attach (9–16 Frames)
FC 9006	1 (see notes 8 and 13)	VTS Attachment < 9 frames
FC 9007	1 (see notes 8 and 13)	VTS Attachment > 8 frames
FC 9010	1 (see note 9)	Attached to a VTS
FC 9011	1	Additional Drives Support
FC 9012	1	Attach Additional Drives
FC 9020	2 (see notes 20 and 21)	B20, B10, or B18 VTS Attachment
FC 9021	2	Virtual Drives Enhancement
FC 9040	1 (see note 12)	High Availability Attachment
FC 9041	1 (see note 14)	High Availability Direct Attachment (Withdrawn)
FC 9046	1	PCI Library Manager
FC 9060	15 (see note 22)	Attach A60 to 3494 Concentrator
FC 9061	15 (see note 22)	Attach A60 to 3494 RS-422
FC 9062	1	Adjacent Frame Drives Factory Installation
FC 9104	1 (see note 10)	AS/400 Processor Attachment
FC 9106	1 (see note 10)	Attach to RS/6000, pSeries
FC 9109	1 (see note 10)	Attach to S/390, zSeries
FC 9200	1	Open System Device Drivers
FC 9201	–	VTS Open System Device Drivers
FC 9203	32	Virtual Storage Extended LAN Device Driver (Withdrawn)
FC 9204	32	Sun Device Driver (Withdrawn)
FC 9210	32	HP-UX Attachment
FC 9211	32	Sun Attachment
FC 9212	32	Attached to Windows
FC 9510	6 (see note 26)	Factory Install Fibre Drive
FC 9511	4	Factory Install Fibre Drive
FC 9540	1 (see note 11)	No Data Cartridges
FC 9601	1 (see note 2)	3490E Model CxA/F1A Factory Installation
FC 9602	2 (see note 15)	3490E Model F1A Factory Installation
FC 9630	x (see notes 1, 3, and 4)	Field Merge Drives
FC 9631	x (see notes 1, 3, and 4)	3590 Model B1A Drive Factory Installation

Table 27. 3494 Specify Features (continued)

Feature Code	Maximum Quantity	Description
FC 9632	2 (see note 15)	3490E Model F1A Attachment Hardware for Field Merge
FC 9633	1 (see note 18)	3490E Model F1A FC 3000 Controller for Field Merge (Withdrawn)
FC 9634	1 (see note 18)	3490E Model F1A FC 3000 Controller Factory Installation (Withdrawn)
FC 9635	1 (see note 5)	3590 Model A00 Attachment Hardware for Field Merge (Withdrawn)
FC 9636	1 (see note 5)	3590 Model A00 Controller Factory Installation (Withdrawn)
FC 9645	1 (see note 25)	3490E Model F1A FC 3500 Controller for Field Merge
FC 9646	1 (see note 25)	3490E Model F1A FC 3500 Controller Factory Installation
FC 9655	1 (see note 16)	3590 Model A50 Attachment Hardware for Field Merge (Withdrawn)
FC 9656	1 (see note 16)	3590 Model A50 Controller Factory Installation (Withdrawn)
FC 9663	x (see notes 1, 3, and 4)	3590 Model E1A Drive Factory Installation
FC 9665	1 (see note 19)	3590 Model A60 Attachment Hardware for Field Merge
FC 9666	1 (see note 19)	3590 Model A60 Controller Factory Installation
FC 9669	x (see note 27)	3590 Model H1A SCSI Tape Drive Factory Installation
FC 9670	x (see note 27)	3590 Model H1A Fibre Channel Tape Drive Factory Installation
FC 9671	x (see note 27)	Field Merge 3590 Model H1A Tape Drive
FC 9690	4 (see note 23)	Field Merge AX0
FC 9691	x (see note 23)	Factory Installation AX0
FC 9700		No FICON Cable From Plant
FC 9702	4	Interposer, Double-Byte Wide
FC 9780	1 (see note 24)	Extended Media Support
FC 9798	4	Inline SCSI Terminator
FC 9799	4	VHDCI Cable/Interposer
FC 9986	1 (see note 17)	Chicago Power Cable

Table 27. 3494 Specify Features (continued)

Feature Code	Maximum Quantity	Description

Notes:

1. A maximum of two FC 9630, 9631, 9663, MES 4630 or 4663 is permitted on an L12 or L14 Frame.
2. A maximum of one FC 9601 or MES 4630 is permitted on a D10 Frame.
3. A maximum of six FC 9630, 9631, 9663, MES 4630 or 4663 is permitted on a D12 Frame. When attached to a B16 VTS, the D12 Frame must contain three, four, five, or six Model B1A drives. When attached to a B18 VTS, the D12 Frame must contain three, four, five, or six Model B1A or E1A drives. When attached to a B18 VTS with FC 5236, the D12 Frame must contain four, five, or six Model B1A or E1A drives.
4. A maximum of four FC 9630, 9631, 9663, MES 4630 or 4663 is permitted on a D14 Frame.
5. A maximum of one FC 9635, 9636, or MES 4635 is permitted on an L14 Frame or D14 Frame.
6. The library may be expanded to 10, 12, or 16 frames by the addition of any combination of FC 9004, 9005, and one FC 9007 per library.

   When the HA1 Frames installs, the library may be expanded to 12, 14, or 18 frames, including the service bays, by the addition of any combination of FC 9004, 9005, and one FC 9007 per library.
7. A maximum of seven FC 5300, 5302, 5304, 5400, 9002, 9003, and one FC 9006 can be configured in any combination.

   When the HA1 Frames installed, the library may be expanded to five, six, eight, or 10 frames, including the service bays, by the addition of FC 9002, 9003, and one FC 9007.
8. To add a B16 VTS to a library, a maximum of one FC 9006 or 9007 must be specified for the L1x Frame to track the number of frames installed in the library and to provide any necessary hardware.
9. This feature for the D12 Frame indicates that the 3590 drives in it are to be used by a VTS subsystem.
10. A minimum quantity of one FC 9104, 9106, or 9109 must be specified.
11. Either FC 9540, 8410, 8420, 8510, 8520, or 8610 must be specified for each frame.
12. Within the L1x Frame, a maximum of one FC 9040 is required if the HA1 Frames is installed. FC 9040 may also be an MES. The Enhanced Library Manager is included with FC 9040 when the existing Library Manager is not an Enhanced Library Manager.
13. FC 5214, 5228, and 5229 are required for B16 VTS attachment.
14. If ordered on HA1 Frames, it indicates LAN or SCSI attachment and must be ordered on all library frames.
15. A maximum of two FC 9602, 9632, or MES 4632 is permitted on an L10 Frame or D10 Frame.
16. A maximum of one FC 9655, 9656, or MES 4655 or 4650 is permitted on an L14 Frame or D14 Frame.
17. There is a maximum of one FC 9986 per model except for the S10 Frame, which cannot have any, and the HA1 Frames, which requires two.
18. There is a maximum of one FC 9633, 9634, or 4634.
19. A maximum of one FC 9665, 9666, or MES 4665 or 4660 is permitted on a D14 Frame.
20. FC 9020 must be on the L1x Frame for each B18, B10, or B20 VTS attached.
21. There is a maximum of two FC 9006, 9007, and 9020.
22. The maximum of 15 FC 9060 or 9061 applies only to the L1x Frame. A maximum of one FC 9060 or 9061 applies only to D14 Frames that contain the 3590 Model A60 Controller.
23. You may order only a quantity of two or four (with a maximum of four) FC 9690, 9691, or MES 4690 on a CX0. A maximum of one FC 9691 is permitted on a AX0.
24. FC 9780 must be on the L1x Frame if 3590 **K**-type (EHPCT) cartridges exist in the 3494. FC 9780 must also be on the D12 Frames and D14 Frames that contain 3590 tape drives with Extended Media Support.
25. There is a maximum of one FC 9645, 9646, or 4646.
26. The maximum of six FC 9510 applies to any D12 that contains Fibre Channel-attached 3590 Model E1A or H1A tape drives. For L12 Frames that contain Fibre Channel-attached 3590 Model E1A or H1A tape drives, the maximum of FC 9510 is two.
27. There is a maximum of six FC 9630, 9631, 9663, 9669, 9670, 9671, 4630, 4663, 4670, or 4671 on a D12 Frame. This maximum is four for the D14 Frame and two for the L12 Frame.

Storage Unit Attach (2–8 Frames)

In order to install the correct length accessor and control cables for the library, the factory must know the total number of frames in the planned library. FC 9002 must be specified for each S10 Frame included in the first eight frames of the library configuration.

Drive Unit Attach (2–8 Frames)

In order to install the correct length accessor and control cables for the library, the factory must know the total number of frames in the planned library. FC 9003 must be specified for each D1x included in the first eight frames of the library configuration.

Storage Unit Attach (9–16 Frames)

FC 9004 is used along with FC 9002, 9003, 9005, or 9006 to determine the library length so that the factory can provide the correct supporting hardware. FC 9004 must be specified for each S10 Frame included in the second eight frames of the library configuration.

Drive Unit Attach (9–16 Frames)

FC 9005 is used along with FC 9002, 9003, 9004, or 9006 to determine the library length so that the factory can provide the correct supporting hardware. FC 9005 must be specified for each D1x Frame included in the second eight frames of the library configuration.

Virtual Tape Server Attach < 9 Frames

In order to install the correct length accessor and control cables for the library, the factory must know the total number of frames in the planned library. FC 9006 must be specified for library configurations with a B16 VTS installed in the first eight frames.

Virtual Tape Server Attach > 8 Frames

In order to install the correct length accessor and control cables for the library, the factory must know the total number of frames in the planned library. FC 9007 must be specified for library configurations with a B16 VTS installed in the frames beyond eight.

Attached to a Virtual Tape Server

FC 9010 indicates that the D12 Frame is to be attached to a VTS in the 3494. It allows the factory to provide the appropriate SCSI cables for installation of 3590 tape drives and for attachment to the VTS.

Additional Drives Support

FC 9011 is required for an L1x Frame with FC 5502 (Drive Unit for B18) or D12 Frame that is attached to a B18 VTS with FC 5237 (Additional VTS Drives) or to a B10 or B20 VTS.

Attach Additional Drives

FC 9012 provides two 4.8-m (16-ft) SCSI cables to attach a D12 Frame to an L1x Frame with FC 5502 (Drive Unit for B18) and FC 9011 (Additional Drives Support) or to a D12 Frame with FC 9011. The two D12 Frames must be located next to each

other physically. The associated B18 VTS must have FC 5237 (Additional VTS Drives) installed. You cannot order FC 9012 with FC 9011.

B20, B10, or B18 VTS Attachment

FC 9020 indicates that a B20, B10, and B18 VTS is attached to the L1x Frame. This ensures that the factory provides the proper cables for the attachment. One FC 9020 is required for each attached B18, B10, or B20 VTS. If the B18 VTS has FC 5264 (64 Additional Virtual Drives) installed, or if a B10 VTS or B20 VTS is being attached, then FC 9021 (Virtual Drives Enhancement) must also be installed on the L1x Frame (and on the HA1 Frames, if present).

The following corequisites apply to FC9020:

- FC 5232 (Attachment Concentrator) must also be installed on the L1x Frame when FC 9020 is installed.
- FC 9046 (PCI Library Manager) or FC 5046 (PCI Library Manager Upgrade) must also be installed on the L1x Frame (and on the 3494 Model HA1, if present) with the addition for the first FC 9020 on the Model L1x.

Virtual Drives Enhancement

FC 9021 indicates that one of the following is attached to the L1x Frame:

- B18 VTS with FC 5264 (64 Additional Virtual Drives)
- B10 VTS
- B20 VTS

One FC 9021 is required on the L1x Frame (and on the HA1 Frames, if present) for each attached VTS.

High Availability Attachment

FC 9040 provides connection between the Library Manager in the L1x Frame and the Library Manager in the HA1 Frames right service bay. It ensures that the appropriate hardware and interface cables in the control unit are shipped. This feature is required for new orders and when adding Model HA1 Frames to an existing Model L1x configuration.

When adding FC 9040 to an installed Model L1x, FC 9046 (PCI Library Manager) or FC 5046 (PCI Library Manager) is required on the Model L1x.

High Availability Direct Attach (Withdrawn from Marketing)

FC 9041 must be specified if HA1 Frames are in the library with direct attachment for library control (AS/400, iSeries, RS/6000, pSeries, or a VSE/LAN). This feature must be specified on all frames of the library.

PCI Library Manager

FC 9046 is a factory installation of a Library Manager with PCI architecture. This includes a 1.2 Ghz processor and a mirrored dual disk drive. FC 9046 is for new machine orders only, and should be on every machine shipped after February 28, 2003. For currently-installed machines, refer to FC 5046.

Model A60 Attachment to 3494 Concentrator

FC 9060 indicates that the 3590 Model A60 Controller connects to the Library Manager through FC 5232 (Attachment Concentrator). Each 3590 Model A60 Controller installed in the library requires one FC 9060 or 9061. A maximum of 15

FC 9060 applies to the L1x Frame. A maximum of one FC 9060 applies to D14 Frames that contain the 3590 Model A60 Controller.

Model A60 Attachment to 3494 RS-422

FC 9061 indicates that the 3590 Model A60 Controller connects to the Library Manager through an RS-422 port. When connected this way, the 3590 Model A60 Controller uses one controller serial communication path (see “Library Manager Communication Paths” on page 32). Each 3590 Model A60 Controller installed in the library requires one FC 9060 or 9061. A maximum of 15 FC 9061 applies to the L1X Frame. A maximum of one FC 9061 applies to D14 Frames that contain the 3590 Model A60 Controller.

Adjacent Frame Drives Factory Installation

FC 9062 on an L12 or L14 Frame or D12 Frame causes the factory to install the hardware needed to attach 3590 tape drives to the 3590 Model A60 Controller in an adjacent D14 Frame. The adjacent D14 Frame must have four 3590 tape drives installed and be attached to the 3590 Model A60 Controller. FC 4060 (Adjacent Frame Support) must be specified on the adjacent D14 Frame.

Attach to AS/400, pSeries

FC 9104 must be specified if the library is to be attached to an AS/400 or iSeries.

Attach to RS/6000, zSeries

FC 9106 must be specified if the library or VTS is to be attached to an RS/6000 or pSeries.

ES/9000 Processor Attachment

FC 9109 must be specified if the library or VTS is to be attached to an ES/9000, ES/3090, S/390, or zSeries.

Open System Device Drivers

FC 9200 provides device drivers to support SCSI attachment of the B18 VTS to RS/6000, pSeries, Hewlett-Packard, Sun, Microsoft Windows NT, and Microsoft Windows 2000 processors. It also provides device drivers to permit these systems to attach and drive the library over a LAN or RS-232 connection. An RS-232 cable (if required) is ordered separately with FC 5217. A maximum of 32 host LAN attachments is allowed. A processor attachment (FC 9106, 9210, 9211, or 9212) must be specified.

VTS Open System Device Drivers

FC 9201 provides device drivers to support FC 3422 (SCSI Host Attachment) on the B18, B10, and B20 VTSs for RS/6000, pSeries, Hewlett-Packard, Sun, Microsoft Windows NT, and Microsoft Windows 2000 servers. The device drivers allow application programs for library-attached 3490E drives (3490E Models C1A, C2A, and F1A) to operate in a VTS without change. FC 9201 does not provide support for FC 4000 (Advanced Function) with SCSI-attached hosts.

Attachment of the tape library over a LAN or RS-232 connection is also provided. An RS-232 cable (if required) is ordered separately under FC 5217 (Extended RS-232 Cable). A maximum of 32 host LAN attachments is allowed.

FC 3422 and one or more processor attachments (FC 9106, 9210, 9211, or 9212) must be specified. You may reorder FC 9201 to obtain the most recent open systems device drivers.

Virtual Storage Extended LAN Device Driver (Withdrawn from Marketing)

Note: The device driver support can now be ordered with VSE/ESA Version 2 Release 4 and later.

FC 9203 provides the function for an ES/9000 to support native VSE/ESA over a LAN. One driver is required for each host attachment. A maximum of 32 host LAN attachments is allowed.

Sun Device Driver (Withdrawn from Marketing)

FC 9204 permits all Sun Sparc processors operating with Solaris OS Version 2 Release 3 or later to attach and drive the library over the RS-232 or LAN. One driver is required for each host attachment. An RS-232 cable (if required) is ordered separately with FC 5217. A maximum of 32 host LAN attachments is allowed.

HP-UX Attachment

FC 9210 indicates that Hewlett-Packard servers are attached and drive the library over a LAN or RS-232 connection. An RS-232 cable (if required) is ordered separately with FC 5217. A maximum of 32 host LAN attachments is allowed. FC 9210 also indicates that a VTS has a SCSI attachment to a Hewlett-Packard (HP) 9000 L-Class, N-Class, or V-Class Enterprise Server that is running HP-UX 11.0.

Sun Attachment

FC 9211 indicates that Sun processors are attached and drive the library over a LAN or RS-232 connection. An RS-232 cable (if required) is ordered separately with FC 5217. A maximum of 32 host LAN attachments is allowed. FC 9211 also indicates that a VTS has a SCSI attachment to a Sun server. VTS SCSI cables must be ordered separately.

Attached to Windows

FC 9212 indicates that Microsoft Windows NT or Windows 2000 processors are attached and drive the library over a LAN connection. A maximum of 32 host LAN attachments is allowed. FC 9212 also indicates that a VTS is attached to an Intel-compatible server running Microsoft Windows NT or Microsoft Windows 2000.

Factory Install Fibre Drive

FC 9510 causes the factory to install a 3590 Model E1A tape drive with the Fibre Channel Attachment feature into a new L12 Frame or D12 Frame. If the tape drive has FC 9510 (Fibre Channel Attachment - Plant Install), then FC 9510 must be specified for the frame instead of FC 9663 (3590 Model E1A Drive Factory Installation). One FC 9510 is required on the frame for each 3590 Model E1A tape drive with the Fibre Channel Attachment feature that is to be factory-installed in that frame.

The total of FC 9510, 9663, 4663, 9631, 9630, and 4630 installed on an L12 Frame can be a maximum of two. The total of these FCs installed on a D12 Frame can be a maximum of six.

FC 9510 cannot be ordered with FC 9062 (Adjacent Frame Drives Factory Installation) or field MES FC 4062.

Factory Install Fibre Drive

FC 9511 causes the factory to install a 3590 Model E1A tape drive with the Fibre Channel Attachment feature into a new D14 Frame. The tape drive must have FC 9510 (Fibre Channel Attachment) specified instead of FC 9663 (3590 Model E1A Drive Factory Installation).

The 3590 Model A60 Controller in the D14 Frame must have one 3590 FC 9059 (3590 Tape Drive Attached) specified for each tape drive attached.

FC 9511 cannot be ordered with FC 9630, 9631, or 9663.

No Data Cartridges

FC 9540 must be specified if no cartridges are to be shipped with a 3494 model frame.

3490E Model CxA Drive Factory Installation

FC 9601 causes the factory to install one 3490E Model CxA in an L10 Frame or D10 Frame.

3490E Model F1A Factory Installation

FC 9602 causes the factory to install the hardware needed to allow the factory installation of one or two 3490E Model F1A tape drives in an L10 Frame or D10 Frame. A quantity of one or two can be ordered.

Field Merge Drives

FC 9630 causes the factory to install the hardware needed to allow the field merge of one 3490E Model CxA in an L10 Frame. In an L12 or L14 Frame, or D12 or D14 Frame, FC 9630 causes the factory to install the hardware needed to allow the field merge of one 3590 Model B1A or E1A. If FC 9630 is ordered for an L14 Frame or D14 Frame, one FC 9655, 9656, 9665, or 9666 must also be ordered.

3590 Model B1A Drive Installation

FC 9631 causes the factory to install one 3590 Model B1A in an L12 or L14 Frame or D12 or D14 Frame. If you order FC 9631 for an L14 Frame or D14 Frame, you must also order one of the following:

- FC 9636 for a 3590 Model A00 Controller (withdrawn from marketing)
- FC 9656 for a 3590 Model A50 Controller (withdrawn from marketing)
- FC 9666 for a 3590 Model A60 Controller

3490E Model F1A Attachment Hardware for Field Merge

FC 9632 causes the factory to install the hardware needed to allow the field merge of one or two 3490E Model F1A tape drives in an L10 Frame or D10 Frame. A quantity of one or two can be ordered.

3490E Model F1A FC 3000 Controller for Field Merge (Withdrawn from Marketing)

FC 9633 allows the field merge of a 3490E Model F1A FC 3000 Controller in an L10 Frame or D10 Frame. This feature notifies the factory to leave a mounting slot available and to provide the hardware for the field merge of the 3490E Model F1A FC 3000 Controller before completion of installation.

3490E Model F1A FC 3000 Controller Factory Installation (Withdrawn from Marketing)

FC 9634 causes the factory to install a 3490E Model F1A FC 3000 Controller in an L10 Frame or D10 Frame.

3590 Model A00 Attachment Hardware for Field Merge (Withdrawn from Marketing)

FC 9635 causes the factory to install the hardware needed to allow the field merge of one 3590 Model A00 Controller in an L14 Frame or D14 Frame.

3590 Model A00 Controller Factory Installation (Withdrawn from Marketing)

FC 9636 causes the factory to install one 3590 Model A00 Controller in an L14 Frame or D14 Frame.

3490E Model F1A FC 3500 Controller for Field Merge

FC 9645 allows the field merge of a 3490E Model F1A FC 3500 Controller in an L10 Frame or D10 Frame. This feature notifies the factory to leave a mounting slot available and to provide the hardware for the field merge of the 3490E Model F1A FC 3500 Controller before completion of installation.

3490E Model F1A FC 3500 Controller Factory Installation

FC 9646 causes the factory to install a 3490E Model F1A FC 3500 Controller in an L10 Frame or D10 Frame.

3590 Model A50 Attachment Hardware for Field Merge (Withdrawn from Marketing)

FC 9655 causes the factory to install the hardware needed to allow the field merge of one 3590 Model A50 Controller in an L14 Frame or D14 Frame.

3590 Model A50 Controller Factory Installation (Withdrawn from Marketing)

FC 9656 causes the factory to install one 3590 Model A50 Controller in an L14 Frame or D14 Frame.

3590 Model E1A Drive Factory Installation

FC 9663 causes the factory to install one 3590 Model E1A in an L12 or L14 Frame or D12 or D14 Frame. If you order FC 9663 for an L14 Frame or D14 Frame, you must also order one of the following:

- FC 9656 for a 3590 Model A50 Controller (withdrawn from marketing)
- FC 9666 for a 3590 Model A60 Controller

3590 Model A60 Attachment Hardware for Field Merge

FC 9665 causes the factory to install the hardware needed to allow the field merge of one 3590 Model A60 Controller in a D14 Frame.

3590 Model A60 Controller Factory Installation

FC 9666 causes the factory to install one 3590 Model A60 Controller in a D14 Frame.

3590 Model H1A SCSI Tape Drive Factory Installation

FC 9669 allows the factory installation of a new Model H1A Tape Drive without the Fibre Channel Attachment feature (FC 9510 or 3510) into a D12 Frame, D14 Frame, or L12 Frame.

3590 Model H1A Fibre Channel Tape Drive Factory Installation

FC 9670 allows the factory installation of a new Model H1A Tape Drive with the Fibre Channel Attachment feature (FC 9510 or 3510) into a D12 Frame, D14 Frame, or L12 Frame.

Field Merge 3590 Model H1A Tape Drive

FC 9671 allows the field merge of a 3590 Model H1A Tape Drive into a D12 Frame, D14 Frame, or L12 Frame coming from the plant. It notifies the factory to leave a mounting slot available for a field merge of the tape drive prior to completion of installation.

Field Merge AX0

FC 9690 causes the factory to install the hardware needed to allow the field merge of one AX0 in a CX0.

Factory Installation AX0

FC 9691 causes the factory to install one AX0 in a CX0. This feature applies only to AX0s and CX0s.

No FICON Cable from Plant

FC 9700 is specified if FC 3415 or 3416 is ordered and a FICON cable is not shipped with the adapter.

Interposer, Double-Byte Wide

FC 9702 provides connection from an industry standard high-density 68-pin (HD-68) connector to a 68-pin ribbon connector host system adapter, such as the RS/6000 FC 2412 (Enhanced SCSI-2 Differential Fast/Wide Adapter/A).

Extended Media Support

FC 9780 must be specified on the L1x Tape Library Base Frame for any 3494 that contains 3590 **K**-type (EHPCT) cartridges. FC 9780 must also be specified on all D12 and D14 Tape Drive Expansion Frames in the library that contain 3590 tape drives with Extended Media Support.

Inline SCSI Terminator

FC 9798 is required on a B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment) to attach a Hewlett-Packard V-Class Enterprise Server with an HP

Fast/Wide Differential SCSI-2 Host Adapter (HP A4800A). FC 9798 is required to terminate the connection at the server properly.

VHDCI Cable/Interposer

FC 9799 provides an interposer to connect an industry standard high-density 68-pin cable connector, typically supplied for Fast/Wide devices, to a VHDCI connector. Examples are the SUN PCI Dual-Channel Differential Ultra SCSI host adapter and the Adaptec AHA-2944UW PCI Differential Ultra SCSI adapter. The assembly is less than 0.3 m (1 ft) long and requires the use of a SCSI cable with a high-density 68-pin (HD-68) connector.

Chicago Power Cable

FC 9986 provides a special 1.8-m (6-ft) power cable for 3494 installations in Chicago, Illinois, U.S.A.

Field MES Features

Table 28 shows the field MES features for adding tape drives, controllers, or VTS controllers to, or removing them from, frames in the 3494.

Table 28. 3494 Field MES Features

Feature Code	Description
FC 4062	FC 4062 on an L12 or L14 Frame or D12 Frame provides the hardware needed to attach 3590 tape drives to the 3590 Model A60 Controller in an adjacent D14 Frame. The adjacent D14 Frame must have four 3590 tape drives installed and attached to the 3590 Model A60 Controller. FC 4060 (Adjacent Frame Support) must be specified on the adjacent D14 Frame. If another controller is installed in the L14 Frame, it will be nonfunctional.
FC 4630	FC 4630 provides the hardware needed to allow the field installation of one 3490E Model C1A or C2A in an L10 Frame or D10 Frame or one 3590 Model B1A or E1A tape subsystem in an L12 or L14 Frame or D12 or D14 Frame. If you order FC 4630 for an L14 Frame or D14 Frame, one of the following must have been installed previously or must be ordered: • FC 4635 • FC 9635 • FC 9636 • FC 4655 • FC 9655 • FC 9656 • FC 4665 • FC 9665 • FC 9666
FC 4632	FC 4632 provides the hardware needed to allow the field installation of one 3490E Model F1A tape drive. FC 4632 is ordered for the L10 Frame or D10 Frame (maximum of two). A prerequisite on the L10 Frame or D10 Frame is FC 9602 or 9632.
FC 4633	FC 4633 provides the hardware needed to replace a 3490E Model C1A or C2A tape drive in a D10 Frame with a 3490E Model F1A tape drive. There is maximum quantity of one.
FC 4634 (Withdrawn)	FC 4634 allows the field installation of a 3490E Model F1A FC 3000 Controller in an L10 Frame or D10 Frame. There is a maximum quantity of one for FC 9633, 9634, or 4634.
FC 4635 (Withdrawn)	FC 4635 provides the hardware needed to allow the field installation of one 3590 Model A00 Controller in an L14 Frame or D14 Frame. If you order FC 4635 for an L14 Frame or D14 Frame, you must also order FC 4630.
FC 4646	FC 4646 allows the field installation of a 3490E Model F1A FC 3500 Controller in an L10 Frame or D10 Frame. There is a maximum quantity of one for FC 9645, 9646, or 4646.
FC 4650 (Withdrawn)	FC 4650 provides the hardware needed to replace a 3590 Model A00 Controller with a 3590 Model A50 Controller in an L14 Frame or D14 Frame.
FC 4655 (Withdrawn)	FC 4655 provides the hardware needed to allow the field installation of one 3590 Model A50 Controller in an L14 Frame or D14 Frame. If you order FC 4655 for an L14 Frame or D14 Frame, you must also order FC 4630.
FC 4660	FC 4660 provides the hardware needed to replace a 3590 Model A00 or A50 Controller with a 3590 Model A60 Controller in a D14 Frame.

Table 28. 3494 Field MES Features (continued)

Feature Code	Description
FC 4663	FC 4663 is required to replace a 3590 Model B1A tape drive with a 3590 Model E1A tape drive in a currently installed 3494 frame. The Model B1A and E1A tape drives cannot be attached to the same VTS or the same 3590 Model A50 or A60 Controller; therefore both types of drives cannot be installed together in the L14 Frame or D14 Frame.
FC 4665	FC 4665 provides the hardware needed to allow the field installation of one 3590 Model A60 Controller in a D14 Frame. If you order FC 4665 for a D14 Frame, you must also order FC 4630.
FC 4670	FC 4670 provides the mounting changes needed to replace a 3590 B1A or E1A tape drive with a 3590 H1A tape drive in a currently installed D12 Frame, D14 Frame, or L12 Frame. The maximum number of features is six for the D12, four for the D14, and two for the L12.
FC 4671	FC 4671 is required on a D12 Frame, D14 Frame, or L12 frame in order to add a 3590 Model H1A tape drive to a D12 Frame, D14 Frame, or L12 Frame. There is a maximum of six FC 9630, 9631, 9663, 9669, 9670, 9671, 4630, 4663, 4670, or 4671 on a D12 Frame. This maximum is four for the D14 Frame and two for the L12 Frame.
FC 4690	FC 4690 provides the hardware needed to allow the field installation of one AX0 in a CX0.
FC 4700	FC 4700 removes a 3490E Model F1A FC 3000 or FC 3500 Controller from an L10 Frame or D10 Frame.
FC 4701	FC 4701 removes a 3490E Model F1A tape drive from an L10 Frame or D10 Frame.
FC 4730	FC 4730 removes a 3590 tape drive from an L12 or L14 Frame or D12 or D14 Frame.
FC 4734	FC 4734 removes the 3490E Model F1A FC 3000 or FC 3500 Controller mounting hardware from an L10 Frame or D10 Frame.
FC 4735	FC 4735 removes a 3590 Model A00 Controller from an L14 Frame or D14 Frame.
FC 4755	FC 4755 removes a 3590 Model A50 Controller from an L14 Frame or D14 Frame.
FC 4765	FC 4765 removes a 3590 Model A60 Controller from a D14 Frame.
Note: You must order the 3590 Model B1A or E1A tape subsystems, the 3490E Model CxA or F1A tape drives, or the 3590 Model A50 or A60 Controllers separately.	

Model and Feature Conversions

The following feature and model conversions are supported for the 3494:

- FC 3200 to FC 3412
- FC 3302 to FC 3412
- FC 3302 to FC 3418
- FC 3412 to FC 3418
- FC 3412 to FC 3415 or 3416
- FC 3415 to FC 3416
- FC 3416 to FC 3415
- FC 3418 to FC 3412
- FC 3418 to FC 3415 or 3416

- FC 3702 to FC 3704
- FC 3702 to FC 3705
- FC 3703 to FC 3704
- FC 3703 to FC 3705
- FC 3704 to FC 3705
- FC 4000 to FC 4001, 4002, 4003, or 4004
- FC 5300 to FC 5302
- FC 5300 to FC 5304
- FC 5500 to FC 5502
- FC 5500 to FC 5503
- FC 5500 to FC 5504
- FC 5502 to FC 5503
- FC 5502 to FC 5504
- L10 Frame to L12 Frame
- L10 Frame to L14 Frame
- L12 Frame to L14 Frame
- L14 Frame to L12 Frame
- D10 Frame to D12 Frame
- D10 Frame to D14 Frame
- D12 Frame to D14 Frame
- D14 Frame to D12 Frame
- B16 VTS to D12 Frame
- B10 VTS to B20 VTS
- B18 VTS to B20 VTS
- 3590 Model B1A to 3590 Model H1A
- 3590 Model E1A to 3590 Model H1A

If a conversion is not listed, you must request it through the Request for Price Quotations (RPQ) process. Features cannot be upgraded to models. You must request through the RPQ process any model upgrades that are not listed.

Special Features

Table 29 shows the special features for the 3494. You can order these features from the factory, or they can be field installed.

Table 29. 3494 Special Features

Feature Code	Maximum Quantity	Description
FC 0201	8	9 micron LC/LC 31 meter
FC 0202	8	9 micron LC/SC 31 meter
FC 0203	8	50 micron LC/LC 31 meter
FC 0204	8	50 micron LC/SC 31 meter
FC 0205	8	62.5 micron LC/LC 31 meter
FC 0206	8	62.5 micron LC/SC 31 meter
FC 2710	1 (see note 1)	Remote Support Facility
FC 2711	1 (see note 1)	Remote Support Switch
FC 2712	1 (see note 1)	Remote Support Attachment
FC 2713	1 (see note 1)	Master Console For Service

Table 29. 3494 Special Features (continued)

Feature Code	Maximum Quantity	Description
FC 2714	1 (see note 1)	Console Expansion
FC 2715	1 (see note 1)	Console Attachment
FC 2716	1	Console Additional Modem
FC 2717	1	Console A60 Enablement
FC 3000	1	FICON Enablement
FC 3200	1	ESCON High Performance Option (Withdrawn)
FC 3302	1	Additional Enhanced ESCON Channel Attachment (Withdrawn)
FC 3400	1	Extended High Performance Option
FC 3412	2	Extended Performance ESCON Channels
FC 3415		FICON Channels (long-wave)
FC 3416		FICON Channels (short-wave)
FC 3418	2	Activate Additional ESCON Channels
FC 3511	6 (see note 20)	Install Fibre Channel Drive
FC 3422	4	SCSI Host Attachment
FC 3464	1	Fibre Drive Attached Model A60
FC 3701	4 (see note 12)	36 GB Disk Storage Capacity for Tape Volume Cache, Model B16 (Withdrawn)
FC 3702	4 (see note 13)	Disk Storage Capacity (Withdrawn)
FC 3703	1 (see note 19)	72 GB Disk Storage (Withdrawn)
FC 3704	1	144/216 GB Disk Storage
FC 3705	4	288/432 GB Disk Storage
FC 4000	1	Advanced Function
FC 4001	1	Advanced Policy Management up to 250 GB
FC 4002	1	Advanced Policy Management up to 500 GB
FC 4003	1	Advanced Policy Management up to 1000 GB
FC 4004	1	Advanced Policy Management up to 2000 GB
FC 4010	1	Peer-to-Peer Copy Base
FC 4011	1	Peer-to-Peer Copy Increment 1
FC 4012	1	Peer-to-Peer Copy Increment 2
FC 4013	1	Peer-to-Peer Copy Increment 3
FC 4060	1	Adjacent Frame Support
FC 4064	1	Multiframe Fibre Drives
FC 5001	8 (see note 24)	4.5-Meter SCSI Cable
FC 5002	8 (see note 24)	10-Meter SCSI Cable
FC 5003	8 (see note 24)	20-Meter SCSI Cable
FC 5004	8 (see note 24)	10-Meter SCSI VHDCI Cable
FC 5045	1 (see note 17)	Enhanced Library Manager (Withdrawn)
FC 5046	1 (see note 25	PCI Library Manager Upgrade
FC 5050	1 (see note 16)	Dual Active Accessors
FC 5210	1 (see note 11)	10-Cartridge Convenience I/O Station
FC 5211	8 (see note 2)	AS/400 Host Attachment
FC 5212	8 (see note 2)	RS/6000 Host Attachment (Withdrawn)
FC 5213	8 (see notes 2 and 5)	Extended Length RS-232 Host Attachment for AS/400
FC 5214	1 (see note 10)	Second Disk Drive for Library Manager

Table 29. 3494 Special Features (continued)

Feature Code	Maximum Quantity	Description
FC 5215	1 (see note 9)	Dual Gripper
FC 5216	1	Remote Power Sequence for AS/400
FC 5217	8	RS-232 15-m (50-ft) Extension Cable
FC 5219	1 (see notes 6 and 9)	Token-Ring Adapter
FC 5220	1 (see notes 6 and 9)	Ethernet Adapter
FC 5224	16 (see note 3)	AIX Parallel Channel Tape Attachment/6000 (Withdrawn)
FC 5226	1	Remote Library Manager Console
FC 5227	1 (see notes 9 and 21)	32 Port Attachment
FC 5228	2 (see note 8)	Tape Control Unit Expansion
FC 5229	1 (see notes 6, 8, and 9)	Expansion Attachment Card
FC 5230	1 (see note 11)	30-Cartridge Convenience I/O Station
FC 5232	1 (see notes 14 and 18)	Attachment Concentrator
FC 5233	1	SCSI Extender
FC 5234	1	18-Meter SCSI Cables (Withdrawn)
FC 5235	2 (see note 22)	20-Meter SCSI Drive Cables
FC 5236	1	Performance Accelerator
FC 5237	1	Additional VTS Drives
FC 5244	1	Mirrored VTS Boot Disk
FC 5250	1	FICON Performance Accelerator
FC 5264	2 (see note 23)	64 Additional Virtual Drives
FC 5300	7 (see notes 4 and 7)	Additional Drive Unit Frame (similar to D10 Frame) (Withdrawn)
FC 5302	7 (see notes 4 and 7)	Additional Drive Unit Frame (similar to D12 Frame)
FC 5304	7 (see notes 4 and 7)	Additional Drive Unit Frame (similar to D14 Frame)
FC 5400	7 (see notes 4 and 7)	Additional Storage Unit Frame (similar to S10 Frame) (Withdrawn)
FC 5500	1 (see notes 4, 7, and 15)	Additional Storage Unit (similar to D12 Frame without 3590 Model B1As)
FC 5502	1 (see notes 4, 7, and 15)	Drive Unit for B18
FC 5503	1 (see notes 4, 7, and 15)	SCSI Drive Unit
FC 5504	1 (see notes 4, 7, and 15)	ESCON Drive Unit
FC 8002	10	One 3590 Cleaning Cartridge
FC 8005	10	One 3490E Cleaning Cartridge
FC 8410	1	210 Cartridges (3490E Data Cartridges) (Withdrawn)
FC 8420	1	420 Cartridges (3490E Data Cartridges) (Withdrawn)
FC 8510	2	210 Cartridges (3590 Data Cartridges)
FC 8520	1	420 Cartridges (3590 Data Cartridges) (Withdrawn)
FC 8610	2	210 Cartridges (3590 Extended Length Cartridges)

Table 29. 3494 Special Features (continued)

Feature Code	Maximum Quantity	Description

Notes:

1. Each L1x Frame, HA1 Frames, or B16 VTS must specify one of FC 2710, 2711, or 2712.

   Each B18, B10, or B20 VTS or AX0 must specify one of FC 2710, 2711, or 2712.

   Each B10 or B20 VTS must specify one of FC 2713, 2714, or 2715. AX0s associated with a B10 or B20 VTS in a PtP VTS must have one of these features installed. A B18 VTS or AX0 associated with a B18 VTS in a PtP VTS may optionally have one of these features installed.
2. Any combination of FC 5211, 5212, and 5213 can total no more than eight with FC 5229. If the LAN attachment is used, up to 32 host processors can be attached with the appropriate drive switching equipment.
3. Licensing is required for each attached RS/6000 or pSeries. In addition, up to eight RS/6000 or pSeries features are available to permit AIX ESCON Tape Attachments.
4. A maximum 3494 configuration consists of 16 frames: one L1x and any combination of up to 15 additional frames, not including service bays.
5. Four attachments are standard (up to eight attachments with FC 5229).
6. Expansion attachment card and either Token-Ring or Ethernet may be selected.
7. A maximum of 15 FC 5300, 5302, 5304, 5400, 5500, 5502, 5503, 5504, 9002, 9003, 9004, 9005, 9006, and 9007 can be configured.
8. FC 5228 and 5229 are required when a B16 VTS is installed in the library.
9. If FC 5215, 5219, 5220, 5227, or 5229 exist in the Library Manager, they also need to be ordered for the HA1 Frames.
10. If a B16, B18, B10, or B20 VTS or HA1 Frames is in the library, FC 5214 is required on the L1x Frame. FC 5214 does not apply to L1x Frames manufactured after October 1999.
11. Either FC 5210 or 5230 may be selected.
12. FC 3701 provides for 36 GB of usable storage capacity for the tape volume cache in a B16 VTS. A quantity of two or four must be ordered.
13. FC 3702 must be ordered in a quantity of one, two, three, or four for the B18 VTS or when converting a B16 VTS to a B18 VTS. A quantity of two or four FC 3702 is required when FC 5236 is ordered for an existing B18 VTS.
14. FC 5232 must be ordered for the L1x Frame when a B18, B10, or B20 VTS or FC 9060 is present.
15. FC 5500, 5502, 5503, or 5504 must be ordered for the L1x Frame when converting a B16 VTS to a B18 VTS.
16. FC 5050 is available only when the library includes HA1 Frames. This feature is available only for systems with at least four frames, not including service bays and B18, B10, or B20 VTSs.
17. If HA1 Frames are installed and FC 5045 is ordered, it must be ordered for **both** the L1x Frame and HA1 Frames.
18. If the L1x Frame was shipped before August 1998, FC 9020, 9040, or 5045 is a prerequisite.
19. FC 3703 is not available for a B18 VTS with FC 5236.
20. The maximum of six FC 3511 applies to any D12 Frame that contains Fibre Channel-attached 3590 Model E1A tape drives. For L12 Frames that contain Fibre Channel-attached 3590 Model E1A tape drives, the maximum of FC 3511 is two.
21. If the L1x Frame was shipped before September 1997, FC 9020, 9040, or 5045 is a prerequisite.
22. The maximum of two FC 5235 applies only to the B20 VTS. For the B10 VTS, the maximum is one.
23. You must order FC 5264 in a quantity of two for the B20 VTS. For the B18 VTS, the maximum is one.
24. The maximum of eight FC 5001, 5002, 5003, or 5004 applies only to B10 VTSs and B20 VTSs. For B18 VTSs, the maximum is four.
25. If HA1 Frames are installed and FC 5046 is ordered, it is **strongly** recommended that FC 5046 be ordered for **both** the L1x Frame and HA1 Frames for performance purposes. However, the intermix of a FC 5045 400 MHz processor speed LM and a FC 5046 1.2 GHz processor speed LM is supported.

Notes:

1. The following feature codes are available only as field conversions:
   - FC 5045 • FC 5214 • FC 5302 • FC 5304
   - FC 5500 • FC 5502 • FC 5503 • FC 5504
   - FC 2716 • FC 5244
2. The following feature codes are available only by factory order:
   - FC 8410 • FC 8420 • FC 8510 • FC 8520 • FC 8610
3. All other feature codes are available as field conversions, or they can be factory-installed.

9 micron LC/LC 31 meter

FC 0201 provides a 31 meter long, 9 micron FICON cable with LC/LC connectors. One can be ordered for every FC 3415 ordered.

9 micron LC/SC 31 meter

FC 0202 provides a 31 meter long, 9 micron FICON cable with LC/SC connectors. Once can be ordered for every FC 3415 ordered.

50 micron LC/LC 31 meter

FC 0203 provides a 31 meter long, 50 micron FICON cable with LC/LC connectors. One can be ordered for every FC 3415 (with mode conditioner patch cable) or FC 3416 ordered.

50 micron LC/SC 31 meter

FC 0204 provides a 31 meter long, 50 micron FICON cable with LC/SC connectors. One can be ordered for every FC 3415 (with mode conditioner patch cable) or FC 3416 ordered.

62.5 micron LC/LC 31 meter

FC 0205 provides a 31 meter long, 62.5 micron FICON cable with LC/LC connectors. One can be ordered for every FC 3415 (with mode conditioner patch cable) or FC 3416 ordered.

62.5 micron LC/SC 31 meter

FC 0206 provides a 31 meter long, 62.5 micron FICON cable with LC/SC connectors. One can be ordered for every FC 3415 (with mode conditioner patch cable) or FC 3416 ordered.

Remote Support Facility

FC 2710, 2711, and 2712 (the Remote Support features) provide rapid diagnostic and remote support capability. The same modem and switch may be shared between the following units:

- 3494 Model B16, B18, B10, or B20 VTSs, AX0s, HA1 Frames, L1x Frames
- 3590 Model A00, A50, or A60 Controller
- 3490E Model F1A FC 3000 or FC 3500 Controller

Each B18, B10, or B20 VTS, AX0, and 3590 Model A60 Controller requires two unit connections. All other units require only one unit connection.

You should specify one of the Remote Support features based on the number of unit connections in the installation.

FC 2710 provides a cable and connectors for connection to an IBM-supplied modem to enable remote diagnostic support. This feature should be specified only on the first unit of each set of 14 unit connections in an installation. Each B16, B18, B10, or B20 VTS, AX0 Virtual Tape Controller, L1x Tape Library Base Frame, and HA1 High Availability Frame must specify one of FC 2710, 2711, or 2712. FC2710 requires a customer-provided external outlet for 115Vac. See Chapter 6, “Physical Planning and Specifications”, on page 131.

Remote Support Switch

FC 2711 provides cables, connectors, and a switch for the attachment of multiple unit connections through the switch to a modem. This feature code should be ordered for the second unit attached to the modem in an installation. One switch should be specified for each set of 14 unit connections in an installation site. Each B16, B18, B10, or B20 VTS, AX0 Virtual Tape Controller, L1x Tape Library Base Frame, and HA1 High Availability Frame must specify one of FC 2710, 2711, or 2712. FC2711 requires a customer-provided external outlet for 115Vac. See Chapter 6, “Physical Planning and Specifications”, on page 131.

Remote Support Attachment

FC 2712 provides an additional cable and connector to attach to FC 2711 (Remote Support Switch). This feature code should be ordered on the third through the fourteenth unit attached to the Remote Support Switch in an installation site. Each B16, B18, B10, or B20 VTS, AX0 Virtual Tape Controller, L1x Tape Library Base Frame, and HA1 High Availability Frame must specify one of FC 2710, 2711, or 2712.

Master Console For Service

FC 2713, 2714, and 2715 provide connection to an IBM TotalStorage Master Console. These features allow remote monitoring of each attached unit to enable early detection of unusual conditions. The same master console for service may be shared between the following units:

- AX0, B18, B10, or B20 VTS
- A60 Controller

One of the IBM TotalStorage master console facility features is required on each B10 VTS or B20 VTS. These features are optional on B18 VTSs, AX0s, and A60s. However, AX0s associated with a B10 VTS or B20 VTS in a PtP VTS must have one of these features installed. To connect an A60 Controller to a Master Console, one of these features must be selected on the A60 Controller based on the number of units attached to that master console facility in the installation. FC 2717 Console A60 Enablement is required when connecting to an A60 Controller.

Note: These features cannot be installed if the A60 Controller has:

- Two FC 3412. Dual ESCON Attachment **and**
- Two of any combination of FC 3432. FICON Attachment — Long Wavelength **or** FC 3433. FICON Attachment — Short Wavelength

FC 2713 (Master Console for Service) provides the IBM TotalStorage Master Console, an Ethernet hub, a cable, and connectors for attachment of a B18, B10, or B20 VTS, or AX0 to an IBM-supplied modem. FC 2713 includes a second

IBM-supplied modem. If FC 2713 was purchased before this function was added, a second modem can be obtained with FC 2716.You should specify this feature code on the first unit connected to a master console facility in an installation. The Ethernet hub provides 14 additional connections for cables supplied with FC 2714 and 2715. FC 2713 requires a customer-provided external outlet for 115V ac. See Chapter 6, “Physical Planning and Specifications”, on page 131.

Console Expansion

FC 2714 provides an Ethernet hub and attachment cable for connecting a B18, B10, or B20 VTS, or AX0 to the master console facility. This expands the number of units that can be attached to FC 2713. FC 2714 provides up to 14 additional connections, which allow connection of FC 2715 (Console Attachment) or another FC 2714. A maximum of two of FC 2714 may be included in a single master console facility providing a total maximum of 43 unit connections.

One of the master console facility features (FC 2713, 2714, 2715) is required on each B10 or B20 VTS. These features are optional on B18 VTSs, AX0s and the A60 Controller. AX0s associated with a B10 or B20 VTS in a PtP VTS must have one of these features installed. FC 2717 Console A60 Enablement is required when connecting to an A60 Controller. FC 2714 requires a customer-provided external outlet for 115V ac. See Chapter 6, “Physical Planning and Specifications”, on page 131.

Console Attachment

FC 2715 provides an attachment cable for connecting a B18, B10, or B20 VTS, or AX0 Virtual Tape Controller to the Ethernet hub that FC 2713 (Master Console for Service) or FC 2714 (Console Expansion) provides.

One of the master console facility features (FC 2713, 2714, 2715) is required on each B10 or B20 VTS. These features are optional on B18 VTSs, AX0s, and the A60 Controller. AX0s associated with a B10 or B20 VTS in a PtP VTS must have one of these features installed. FC 2717 Console A60 Enablement is required when connecting to an A60 Controller.

Console Additional Modem

FC 2716 now includes a second IBM-supplied modem. If FC 2713 was purchased before this function was added, FC 2716 allows a second modem to be installed.

Console A60 Enablement

FC 2717 provides a network interface card installed within the A60 Controller to enable attachment to a Master Console.

The following corequisites apply to FC 2717:

- FC 2713. Master Console For Service **or**
- FC 2714. Console Expansion **or**
- FC 2715. Console Attachment

FC 2717 should only be ordered on an A60 Controller whenever FC 2713, 2714, or 2715 is ordered on the A60.

Note: FC 2717 cannot be installed if the A60 Controller has:

- Two FC 3412. Dual ESCON Attachment **and**

- Two of any combination of FC 3432. FICON Attachment — Long Wavelength **or** FC 3433. FICON Attachment — Short Wavelength

FICON Enablement

FC 3000 enables the attachment of FICON channels to a VTS Model B10 or Model B20. This feature is mutually exclusive with the Peer-to-Peer Copy Base feature (FC 4010) or the SCSI Host Attachment feature (FC 3422).

ESCON High Performance Option (Withdrawn from Marketing)

FC 3200 for the B18 VTS provides data compression capability for improved performance with two enhanced ESCON host channel attachments. Two additional enhanced ESCON host channel attachments are available with FC 3302. This feature also enables virtual addressing of 64 tape drives when more than 72 GB of disk storage capacity is installed.

Additional Enhanced ESCON Channel Attachments (Withdrawn from Marketing)

FC 3302 for the B18 VTS provides two additional enhanced ESCON host channel attachments with two 30-m (100-ft) ESCON cables. A quantity of one FC 3302 may be ordered (factory or field). FC 3200 (ESCON High Performance Option) is a prerequisite.

Extended High Performance Option

FC 3400 for the B18 VTS enables data compression capability, which provides larger effective disk capacities and improved performance. This feature also enables virtual addressing of 64 tape drives when more than 72 GB of disk storage capacity is installed.

Table 30. B18/B10/B20 Attachment Configurations

Model	**FC 3412**	**FC 3418**	**FC 3422**	**FC 3415/3416** (see note)
B18	1	1	1	
B18	1	1	2	
B18			1	
B18			2	
B10 (see note)	2			
B10	1	1	2	
B10	1			
B10			4	
B10 (see note)				4
B10	1			2
B10				2
B20	4	4		
B20	4			
B20	2	2	4	
B20				8
B20				4
B20	2			4
B20	2	2		4
Note: Any combination of FC 3415 and 3416 are allowed up to the configuration limit.				

Extended Performance ESCON Channels

FC 3412 provides two Extended Performance ESCON Channel attachments and includes two 30.5-m (100-ft) ESCON cables.

For the B18 VTS, either FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) is a prerequisite. You may order one FC 3412 with FC 3200 or a maximum of two FC 3412 with FC 3400.

For the B10 and B20 VTS, please see Table 30 on page 74 above for the supported configurations for this feature.

FICON Channels (long-wave)

FC 3415 provides a single long wave FICON channel attachment. Up to 128 logical channels can be supported per channel attachment. No cables are provided with this feature. For each FC 3415 ordered, one of the cable features FC 0201 to 0206 or FC 9700 must be specified.

For the B10 and B20 VTS, please see Table 30 on page 74 above for the supported configurations for this feature.

FICON Channels (short-wave)

FC 3416 provides a single short wave FICON channel attachment. Up to 128 logical channels can be supported per channel attachment. No cables are provided with this feature. For each FC 3416 ordered, one of the cable features FC 0201 to 0206 or FC 9700 must be specified.

For the B10 and B20 VTS, please see Table 30 on page 74 above for the supported configurations for this feature.

Activate Additional ESCON Channels

FC 3418 provides two additional Extended Performance ESCON Channel attachments by activating ESCON channels on FC 3412 (Extended Performance ESCON Channels) or FC 3200 (ESCON High Performance Option). FC 3418 includes two 30.5-m (100-ft) ESCON cables. If you order FC 3418, the quantity ordered must equal the total quantity of FC 3412 and FC 3200.

For the B18 VTS, FC 5236 (Performance Accelerator) is a prerequisite. If one FC 3412, or one FC 3200 and two FC 3422 are present, you may order a maximum of one FC 3418. If two FC 3412, or FC 3200 and one FC 3412 are present and FC 3418 is required, you may order only two FC 3418. When the B18 VTS is in a Peer-to-Peer VTS (FC 4010) configuration and FC 5264 (64 Additional Virtual Drives) has been specified, you must order two FC 3418. Four additional ESCON attachments are available with two of FC 3418.

For the B10, B18, and B20 VTS, please see Table 30 on page 74 above for the supported configurations for this feature.

SCSI Host Attachment

FC 3422 provides two SCSI bus host attachments to SCSI adapters on open systems hosts. Each bus provides up to 16 virtual tape drives and emulates 3490E tape drives. Each FC 3422 supports a maximum of 16 virtual tape drives. FC 3422 is available for the B18, B10, and B20 VTSs. It is also supported on selected RS/6000, pSeries, Hewlett-Packard HP-UX, Sun, and Intel-compatible servers that run

Microsoft Windows NT or Microsoft Windows 2000 Build 2195 and later. You should select SCSI cables of the appropriate length for your installation environment from those available as 3494 features.

For the B18 VTS, FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) is a prerequisite. FC 3302 (Additional Enhanced ESCON Channel Attachment), FC 4010 (Peer-to-Peer Copy Base), or a second FC 3412 (Extended Performance ESCON Channels) must not be installed.

For the B10, B18, and B20 VTS, please see Table 30 on page 74 above for the supported configurations for this feature.

Fibre Drive Attached Model A60

FC 3464 is required on D14 Frames that contain a 3590 Model A60 Controller that supports Fibre Channel-attached 3590 tape drives. FC 3464 provides the hardware and instructions required to install an IBM 2109 Model S16 SAN Fibre Channel Switch in the D14 Frame. This includes the associated Ethernet hub and cabling between the Model A60 and the hub, the switch, and the drives in the D14 Frame. Up to ten 3590 tape drives in the D14 Frame and an adjacent L12 Frame or D12 Frame can be attached to the 3590 Model A60 Controller.

An IBM 2109 Model S16 SAN Fibre Channel Switch must be installed in the D14 Frame that contains the 3590 Model A60 Controller.

The 3590 Model A60 Controller must have FC 3463 (Fibre Drive Attachment) installed.

All 3590 tape drives that are attached to the 3590 Model A60 Controller must have either FC 3510 or 9510 installed.

You cannot order FC 3464 with FC 4060 (Adjacent Frame Support). When FC 3464 is installed, FC 4060 must be removed.

Install Fibre Channel Drive

FC 3511 must be installed on L12 Frames and D12 Frames that contain 3590 Model E1A tape drives with the Fibre Channel Attachment feature. The quantity of FC 3511 must be equal to the number of installed Fibre Channel-attached drives. This feature provides a Fibre Channel patch panel and the Fibre Channel cables from Fibre Channel-attached drives to the patch panel.

One FC 3511 is required for each installed Fibre Channel-attached drive in the frame.

FC 3511 cannot be ordered with FC 9062 (Adjacent Frame Drives Factory Installation) or field MES FC 4062.

FC 3511 is not available for the L14 Frame; to install Fibre Channel drives, you must first convert the L14 Frame to a L12 Frame.

36 GB Disk Storage Capacity for Tape Volume Cache in Model B16 (Withdrawn from Marketing)

FC 3701 provides the disk storage arrays for 36 GB of usable storage capacity for the tape volume cache in the B16 VTS. A quantity of two or four must be ordered.

Disk Storage Capacity (Withdrawn from Marketing)

FC 3702 provides the disk storage arrays for 72 GB of usable storage capacity for the tape volume cache in a B18 VTS. You must order FC 3702 in quantities of one, two, three, or four for the B18 VTS and for the B16 VTS to B18 VTS conversion. You must order FC 3702 in quantities of two or four when you order FC 5236 (Performance Accelerator) for an existing B18 VTS FC 3702 is not available for a B18 VTS with FC 3703 (72 GB Disk Storage), FC 3704 (144/216 GB Disk Storage), or FC 3705 (288/432 GB Disk Storage) installed.

72 GB Disk Storage

FC 3703 provides the disk storage arrays for 72 GB of usable storage capacity for the tape volume cache in a B18 VTS. You can order FC 3703 in a quantity of one for the B18 VTS and for the B16 VTS to B18 VTS conversion. FC 3703 is not available for a B18 VTS with FC 3702 (Disk Storage Capacity), FC 3704 (144/216 GB Disk Storage), FC 3705 (288/432 GB Disk Storage), or FC 5236 (Performance Accelerator) installed.

144/216 GB Disk Storage

FC 3704 provides the disk storage arrays for 144 GB of usable storage capacity for the tape volume cache in a B18 VTS without FC 5236 (Performance Accelerator). In a B18 VTS with FC 5236 and in a B10 VTS, this feature provides 216 GB of usable storage capacity.

You can order FC 3704 in a quantity of one for the B18 VTS and for the B16 VTS to B18 VTS conversion. FC 3704 is not available for a B18 VTS with FC 3702 (Disk Storage Capacity), FC 3703 (72 GB Disk Storage), or FC 3705 (288/432 GB Disk Storage) installed.

You can order FC 3704 in a quantity of one for the B10 VTS. FC 3704 is not available for a B10 VTS with FC 3705 (288/432 GB Disk Storage) installed.

FC 3704 is not available for the B20 VTS.

288/432 GB Disk Storage

FC 3705 provides the disk storage arrays for 288 GB of usable storage capacity for the tape volume cache in a B18 VTS without FC 5236 (Performance Accelerator). In a B18 VTS with FC 5236 and in a B10 VTS or B20 VTS, this feature provides 432 GB of usable storage capacity.

You can order FC 3705 in quantities of one, two, or four for the B18 VTS. However, if you specify two or more FC 3705, then you must also specify FC 5236. FC 3705 is not available for a B18 VTS with FC 3702 (Disk Storage Capacity), FC 3703 (72 GB Disk Storage), or FC 3704 (144/216 GB Disk Storage) installed.

You can order FC 3705 in a quantity of one for the B10 VTS. FC 3705 is not available for a B10 VTS with FC 3704 (144/216 GB Disk Storage) installed.

You can order FC 3705 in quantities of two or four for the B20 VTS.

Advanced Function

FC 4000 provides two functions: Export and Import of logical volumes using physical stacked volumes and tape volume cache management. A service representative can use the Library Manager service menus to disable the functions

of, and prerequisites for, the export and import of logical volumes. If FC 4010 (Peer-to-Peer Copy Base) is installed, the Export and Import functions must be disabled. If the Export and Import functions are enabled, FC 5210 (10-Cartridge Convenience I/O Station) or 5230 (30-Cartridge Convenience I/O Station) is required.

For the B18 VTS, FC 3200 (ESCON High Performance Option) or FC 3400 (Extended High Performance Option) with FC 3412 (Extended Performance ESCON Channels) is a prerequisite. A minimum of four 3590 Model B1A, E1A, or H1A tape drives associated with the VTS is required when the Export and Import functions are enabled.

For the B10 VTS and B20 VTS, FC 3412 is a prerequisite for FC4000 Advanced Function.

Advanced Policy Management

FC 4001 to FC 4004 provide host controlled functions for logical volumes in the VTS as follows:

- Simple Tape Volume Cache Management
- Tape Volume Cache Management
- Physical Volume Pooling
- Selective Dual Copy
- Peer-to-Peer Selective Copy Mode
- Import/Export (see note below)

Note: The Import/Export function of this feature is not supported with FC 4010 (Peer-to-Peer Copy Base). Your service representative must disable the Import/Export function using the Enable/Disable function of Utilities on the Service menu of each tape library in the PtP configuration. Cartridges inserted into the convenience I/O station will not move into the Unassigned category when the Import/Export feature is disabled.

Advanced Policy Management (FC 4001–4004) must be installed on both VTSs of a PtP VTS configuration.

This feature has the following prerequisites:

- A minimum of four 3590 tape drives associated with the VTS
- If the Import/Export functions are to be used, FC 5210 or 5230, the 10–cartridge or 30–cartridge Convenience Input/Output Station feature must also be installed
- If any of the outboard policy management controlled functions are to be used, FC 5236 Performance Accelerator must be installed on a B18 VTS.
- A minimum cache configuration of 216 GB.
- FC 5244 is required for B18s without FC 3703, FC 3704, or FC 3705.

Disk Capacity feature requirements with their associated Advanced Policy Management features are:

Table 31. Advanced Policy Management Disk Capacity Feature Requirements

Disk Capacity	Disk Features	Advanced Policy Management Features
Up to 250 GB	(1) FC 3704 or (3) FC 3702	FC 4001
Up to 500 GB	(1) FC 3705 or (4) FC 3702	FC 4001, FC 4002
Up to 1000 GB	(2) FC 3705	FC 4001, FC 4002, FC 4003

Table 31. Advanced Policy Management Disk Capacity Feature Requirements (continued)

Up to 2000 GB	(4) FC 3705	FC 4001, FC 4002, FC 4003, FC 4004

Peer-to-Peer Copy

FC 4010 to FC 4013 enable a B18, B10, or B20 VTS to function in a PtP VTS configuration. When Advanced Function (FC 4000) or Advanced Policy Management (FC 4001–4004) is installed, a service representative must use the Library Manager service menus of both Peer-to-Peer distributed libraries to disable the export and import of logical volumes. You may not order FC 3422 (SCSI Host Attachment) with FC 4010. If FC 3422 is installed, it must be removed before FC 4010 is installed. A B18, B10, or B20 VTS with FC 4010 can be used only in a PtP VTS configuration.

For the B18 VTS, FC 5236 (Performance Accelerator) is a prerequisite. When FC 4010 is installed without FC 5264 (64 Additional Virtual Drives), FC 3418 (Activate Additional ESCON Channels) will be disabled. When FC 4010 is installed with FC 5264, two FC 3418 must be installed. The PtP VTS configuration must contain eight AX0s.

For the B10 VTS, FC 4010 requires two FC 3412 (Extended Performance ESCON Channels). The PtP VTS configuration must contain four AX0s.

For the B20 VTS, FC 4010 requires four FC 3412 (Extended Performance ESCON Channels). When FC 4010 is installed, FC 3418 (Activate Additional ESCON Channels) will be disabled. The PtP VTS configuration must contain eight AX0s.

Disk capacity feature requirements with their associated Peer-to-Peer Copy features are:

Table 32. Peer-to-Peer Copy Disk Capacity Feature Requirements

Disk Capacity	**Disk Features**	**Peer-to-Peer Copy Features**
Up to 250 GB	(1) FC 3704 or (3) FC 3702	FC 4010
Up to 500 GB	(1) FC 3705 or (4) FC 3702	FC 4010, FC 4011
Up to 1000 GB	(2) FC 3705	FC 4010, FC 4011, FC 4012
Up to 2000 GB	(4) FC 3705	FC 4010, FC 4011, FC 4012, FC 4013

Adjacent Frame Support

FC 4060 supports the attachment of 3590 tape drives in one L12 or L14 Frame or D12 Frame to the 3590 Model A60 Controller in an adjacent D14 Frame. The adjacent D14 Frame must have four 3590 tape drives installed and attached to the 3590 Model A60 Controller. FC 4060 supports a maximum of ten 3590 tape drives. FC 4062 or 9062 must be specified on the associated L12 or L14 Frame or D12 Frame. This feature provides the required hardware, microcode, and cross-frame cables to support this attachment. If another controller is installed in the L14 Frame, it will be nonfunctional.

Multiframe Fibre Drives

FC 4064 is required on L12 Frames and D12 Frames to support the attachment of Fibre Channel 3590 tape drives to the 3590 Model A60 Controller in an adjacent

D14 Frame. In a multiframe fibre attachment, you can attach up to ten 3590 tape drives to the Model A60 Controller: four in the adjacent D14 Frame and up to six in the L12 Frame or D12 Frame.

The L12 Frame or D12 Frame must have at least one 3590 tape drive installed. Each tape drive must have FC 3511 installed.

The adjacent D14 Frame must have four 3590 tape drives installed and attached to the 3590 Model A60 Controller. FC 3464 (Fibre Drive Attached Model A60) must be installed.

All 3590 tape drives that are attached to the 3590 Model A60 Controller must have either 3590 FC 3510 or 9510.

FC 4064 is not available for the L14 Frame; to install Fibre Channel drives, you must first convert the L14 Frame to an L12 Frame.

You cannot order FC 4064 with FC 9062 (Adjacent Frame Drives Factory Installation) or field MES FC 4062.

4.5-Meter SCSI Cable

FC 5001 provides one 4.5-m (15-ft) SCSI cable for host attachment to a B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment). The cable has an HD-68 standard 68-pin straight housing connector for host attachment and a VHDCI 0.8-mm connector for B18, B10, or B20 VTS attachment.

For the B18 VTS, the maximum is four. For the B10 or B20 VTS, the maximum is eight.

10-Meter SCSI Cable

FC 5002 provides one 10-m (33-ft) SCSI cable for host attachment to a B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment). The cable has an HD-68 standard 68-pin straight housing connector for host attachment and a VHDCI 0.8-mm connector for B18, B10, or B20 VTS attachment.

For the B18 VTS, the maximum is four. For the B10 or B20 VTS, the maximum is eight.

20-Meter SCSI Cable

FC 5003 provides one 20-m (66-ft) SCSI cable for host attachment to a B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment). The cable has an HD-68 standard 68-pin straight housing connector for host attachment and a VHDCI 0.8-mm connector for B18, B10, or B20 VTS attachment.

For the B18 VTS, the maximum is four. For the B10 or B20 VTS, the maximum is eight.

10-Meter SCSI VHDCI Cable

FC 5004 provides one 10-m (33-ft) SCSI cable with VHDCI 0.8-mm connectors on both ends for daisy-chaining two B18, B10, or B20 VTS to each other on one host SCSI bus.

FC 5002 provides one 10-m (33-ft) SCSI cable for host attachment to a B18, B10, or B20 VTS with FC 3422 (SCSI Host Attachment). The cable has an HD-68 standard

68-pin straight housing connector for host attachment and a VHDCI 0.8-mm connector for B18, B10, or B20 VTS attachment.

For the B18 VTS, the maximum is four. For the B10 and B20 VTS, the maximum is eight.

Enhanced Library Manager

FC 5045 is an MES that provides an enhanced Library Manager for performance improvement in the L1x Frame of a 3494. If HA1 Frames is installed and FC 5045 is ordered, it must be ordered for **both** the L1x Frame and the HA1 Frames.

PCI Library Manager Upgrade

FC 5046 provides a Library Manager with PCI architecture that includes a 1.2 Ghz processor and a mirrored dual disk drive. If this feature is added to a 3494 that includes Model HA1 Frames, FC 5046 must be ordered for both the Model HA1 Frames and the Model L10, L12, or L14. This feature code is for currently-installed units only.

Dual Active Accessors

FC 5050 allows both accessors in an HA1 Frames configuration to be active at the same time. This feature is available only for systems with at least four frames, not including service bays, CX0s, and B18, B10, or B20 VTSs.

10-Cartridge Convenience I/O Station

FC 5210 allows an operator to add or remove up to ten tape cartridges from the 3494 without interrupting normal operations. Installation of this feature reduces the cartridge capacity in the L1x by 30 cartridges.

AS/400 Host Attachment

FC 5211 or 5213 is required when AS/400 or iSeries are attached to the 3494 using RS-232 and using OS/400 software earlier than Version 3 Release 6. FC 5211 provides communication between the AS/400 or iSeries and the Library Manager by using a 15-m (50-ft) cable. This feature includes the Media Library Device Driver (MLDD) for OS/400 (Program 5798-RZH).

The AS/400 LAN Device Driver is included as part of this feature and provides the function for AS/400 and iSeries to drive the 3494 over the LAN. One driver is required for each AS/400 or iSeries. A maximum of 32 host LAN attachments is allowed.

RS/6000 Host Attachment (Withdrawn from Marketing)

Note: FC 9200 has replaced this feature code.

FC 5212 provides communication of library commands between the host RS/6000 and the Library Manager using RS-232 or LAN attachments. This optional feature also includes the library device driver for AIX. A maximum of 32 host LAN attachments is allowed.

The RS/6000 LAN Device Driver is included as part of this feature and provides library attachment support through a LAN connection.

Extended Length RS-232 Host Attachment

FC 5213 for AS/400 and iSeries allows the RS-232 link to be extended to 122 m (400 ft). This feature includes the Media Library Device Driver (MLDD) for OS/400 (Program 5798-RZH). This feature is used in place of FC 5211 when the host is located more than 15 m (50 ft) from the 3494. A maximum of 32 host LAN attachments is allowed.

The AS/400 LAN Device Driver is included as part of this feature and provides the function for AS/400 and iSeries to drive the 3494 over a LAN. One driver is required for each AS/400 or iSeries.

Second Disk Drive for Library Manager

FC 5214 allows a backup copy of the Library Manager database to be maintained. Do not order FC 5214 for L1x Frames manufactured after October 1999. You may order FC 5214 as a field MES for L1x Frames manufactured in October 1999 and earlier.

Dual Gripper

FC 5215 allows an additional gripper to be mounted on the accessor. This feature eliminates the need for the accessor to store a demounted cartridge before mounting the next cartridge, thereby increasing performance and data availability. This capability is particularly useful with 3494 configurations of more than three frames. Tape storage capacity is reduced slightly when the Dual Gripper feature is installed (see Table 18 on page 21).

Remote Power Sequence for AS/400

FC 5216 permits power-on and power-off sequencing by attached AS/400 and iSeries.

Note: When FC 5216 is installed in a shared host environment, the AS/400 or iSeries is the only host that controls power to the 3494.

Extended RS-232 Cable

FC 5217 adds a 15-m (50-ft) RS-232 cable to the 3494.

Token-Ring Adapter

FC 5219 allows the connection of the 3494 to a Token-Ring LAN. A maximum of 32 host LAN attachments is allowed.

Ethernet Adapter

FC 5220 allows the connection of the 3494 Library Manager to an Ethernet LAN at up to 100 Mb/sec. TCP/IP and APPC protocols are supported. AS/400 support prior to OS/400 Version 5 Release 2 was APPC protocol only. A maximum of 32 host LAN attachments is allowed.

AIX Parallel Channel Tape Attachment/6000 (Withdrawn from Marketing)

FC 5224 is a device driver that, together with the System/370™ Channel Emulator/A adapter (RS/6000 FC 2759), allows attachment of 3490E Models C1A and C2A to RS/6000 or pSeries. FC 5224 also allows attachment of the RS/6000 SP processor to the 3494.

Remote Library Manager Console

FC 5226 allows remote access to the Library Manager functions and data when a LAN attachment feature is installed.

The Remote Library Manager Console feature allows the customer to control or monitor the operations and status of the Library Manager from a remote location through a local area network (LAN) attachment feature. The remote terminal can be located anywhere on a customer-supplied IBM Token-Ring LAN Attachment or Ethernet LAN Attachment. Connection to the Library Manager is password-controlled. The remote terminal can control or monitor the status of up to 16 Library Managers at a time. A separate feature is required for each 3494 that is connected to the LAN. If the HA1 Frames are installed, the software must be installed on both Library Managers.

The installation process for the Remote Library Manager Console feature requires the customer's LAN administrator to provide the LAN addressing to the service representative before the Remote Library Manager Console feature is installed.

To install a Remote Library Manager Console feature, the customer is responsible for providing the following:

- An IBM Token-Ring or Ethernet local area network (LAN) that meets one of the following specifications:
  - SNA logical unit type 6.2 TCP/IP, or Advanced Program-to-Program Communication (APPC).
  - Token-Ring LAN that meets IEEE 802.5 specifications. See the *IBM Token-Ring Network Introduction and Planning Guide* for the cable distance.

    OR
  - Ethernet LAN that meets IEEE 802.3 specifications. See the IEEE 802.3 standard for the cable distance.
- A personal computer dedicated to the Remote Library Manager Console feature that has the following minimum configuration:
  - Processor capable of running Operating System/2® (OS/2®) Version 2.1, WARP 3.0, or WARP 4.0
  - 12 MB of random access memory (RAM)
  - 60 MB hard disk
  - LAN attachment card
  - Network Transport Services (NTS/2) LAN Adapter and Protocol Support (LAPS) software, Release 1.1 or later, or Multi-Protocol Transport Services (MPTS)
  - OS/2 Version 2.1, WARP 3.0, or WARP 4.0
  - Communication Manager (CM) Version 2.0 or later, or IBM Communications Server for OS/2 WARP®

Supporting information is available in the following publications:

- *CM/2 Network Administration and Subsystem Management Guide*
- *CM/2 Message Reference*
- *CM/2 Problem Determination Guide*
- *NTS/2 LAN Adapter and Protocol Support Configuration Guide*
- *NTS/2 Message and Problem Determination Guide*
- *DCAF Target User's Guide*

- *DCAF Installation and Configuration Guide*
- *DCAF User's Guide*
- *IBM TotalStorage Enterprise Automated Tape Library Operator Guide*

32 Port Attachment

FC 5227 provides 16 additional RS-422 attachment ports. FC 5229 (Expansion Attachment Card) and FC 5045 (Enhanced Library Manager) are prerequisites. If the L1x Frame was shipped before September 1997, FC 9020, 9040, or 5045 is a prerequisite.

FC 5227 and FC 5229 together provide 24 RS-422 and eight RS-232 attachment ports. FC 5227 and two FC 5228 (Tape Control Unit Expansion) allow up to 32 SCSI- or Fibre Channel-attached 3590 Model B1A or E1A tape drives or 16 control units or 3490E Model C1A or F1A tape drives in the library. If the 3490E Model F1As are ESCON- or OEMI-attached, the maximum number of tape drives is 21. When two FC 5228 are installed, FC 5219 (Token-Ring Adapter) or FC 5220 (Ethernet Adapter) must also be installed to provide library control from a SCSI host.

Tape Control Unit Expansion

FC 5228 converts up to four RS-232 host attachment ports on either the base Library Manager or the Expansion Attachment Card (FC 5229) to four RS-422 control unit attachment ports. Use of two of these features (along with the Expansion Attachment Card) provides for a total of 16 control unit attachment ports. This feature allows you to install up to 16 SCSI-attached 3590 Model B1A or E1A tape drives or 3490E Model C2A or F1A tape drives in the library. If the Model F1A tape drives are ESCON- or OEMI-attached, the maximum number of Model F1A tape drives that you can install is ten. You must also install FC 5219 or 5220 (LAN attachment) to provide for library control from a SCSI host when the library has two FC 5228 installed. For additional information, see Table 20 on page 33.

Expansion Attachment Card

FC 5229, when added to the Library Manager, allows up to four additional RS-232 host attachments and four additional RS-422 control unit attachments, bringing the total for each to eight. FC 5229 allows the library to support the following maximum numbers of tape drives:

- Sixteen 3490E Model C2A tape drives
- Eight 3490E Model C1A or SCSI Model F1A tape drives
- Five 3490E Model F1A ESCON-attached tape drives
- Eight SCSI-attached 3590 Model B1A or E1A tape drives
- Thirty 3590 Model B1A or E1A tape drives and the 3590 Model A00, A50, or A60 Controller
- When FC 4060 (Adjacent Frame Support) is installed, an 3494 can have a maximum of seventy-six 3590 Model B1A or E1A tape drives attached to eight 3590 Model A60 Controllers.

The preceding maximum numbers do not include any 3590 tape drives associated with the B18 VTS. For additional information, see "Tape Control Unit Expansion".

30-Cartridge Convenience I/O Station

FC 5230 allows an operator to add or remove up to 30 tape cartridges from the 3494 without interrupting normal operations. Installation of this feature reduces the cartridge capacity in the Tape Library Base Frame by 80 cartridges.

Attachment Concentrator

FC 5232 provides the required LAN attachment to the Library Manager when a B18, B10, or B20 VTS is attached to a 3494. The 3590 Model A60 Controller may also attach to the library through the Attachment Concentrator. One FC 9060 is required on the L1x Frame for each B18, B10, or B20 VTS or 3590 Model A60 Controller attached to the concentrator. If the L1x Frame was shipped before August 1998, FC 9020, 9040, or 5045 is a prerequisite.

SCSI Extender

FC 5233 must be specified for a D12 Frame when attaching to the B18 VTS.

18-Meter SCSI Cables

FC 5234 provides two 18-m (59-ft) SCSI cables for attachment of a B18 VTS to up to six 3590 Model B1A or E1A tape drives in a D12 Frame. You must specify one feature for the B18 VTS or one for a B16 VTS to B18 VTS conversion. You may not order FC 5234 with FC 5235 (20-Meter SCSI Drive Cables).

20-Meter SCSI Drive Cables

FC 5235 provides two 20-m (65-ft) SCSI cables with VHDCI 0.8-mm connectors and HD-68 standard 68-pin straight housing connectors. These cables attach a B10 VTS or B20 VTS to up to six 3590 Model B1A or E1A tape drives in a D12 Frame.

For the B10 VTS, you must specify one FC 5235. The maximum permitted is one.

For the B20 VTS, you must specify a minimum of one FC 5235. The maximum permitted is two.

Performance Accelerator

FC 5236 provides a high performance streaming file system and enables new levels of performance for the B18 VTS. For FC 5236 the following are prerequisites:

- Four, five, or six 3590 Model B1A, E1A, or H1A tape drives in the associated D12 Frame
- FC 3704, or FC 3705, or two or four FC 3702
- One of the following:
  - FC 3200 and FC 3412
  - Two FC 3412
  - Two FC 3422

If two or more FC 3705 are specified, then FC 5236 must be specified on a B18.

Additional VTS Drives

FC 5237 allows up to twelve 3590 tape drives to be attached to a B18, B10, or B20 VTS. The two D12 Frames associated with this feature must be located next to each other physically.

When FC 5237 is installed, FC 9011 (Additional Drives Support) is required on one D12 Frame (or the L1x Frame with FC 5502). FC 9012 (Attach Additional Drives) is required on the other D12 Frame.

Mirrored VTS Boot Disk

FC 5244 replaces the current 4.5 GB SCSI boot disk with a 9.0 GB SCSI drive. It also adds a redundant 9.0 GB SCSI boot drive. This is required for all B18 VTSs without FC 3703, 3704, or 3705 in order to install any features shipped after August 30, 2002.

FICON Performance Accelerator

FC 5250 enables a higher level of data rate performance for the B20 when four or more FICON channel attachments are installed. The feature can be factory ordered or field installed on a Model B20 without FICON channel attachments, but its benefits are only realized with sufficient FICON channels.

Note: Ordering/installing FC 5250 on a non-FICON B20 minimizes the conversion outage on future conversions to FICON.

64 Additional Virtual Drives

FC 5264 provides 64 additional virtual tape drives for a B18 or B20 VTS.

There is a maximum of one FC 5264 for the B18 VTS. This provides a total of 128 virtual tape drives. For each B20 VTS, you must order two FC 5264. These provide a total of 256 virtual tape drives.

The following are prerequisites for installing FC 5264 on a B18 VTS:

- FC 5236 (Performance Accelerator)
- 288 GB or more available disk storage (four FC 3702 or one or more FC 3705)

When FC 5264 is installed on a B18 VTS, FC 9021 (Virtual Drives Enhancement) is required on the L1x Frame and also on the HA1 Frames (if installed).

In addition to the preceding, the following are prerequisites for installing FC 5264 in a PtP VTS configuration (VTSs with FC 4010 (Peer-to-Peer Copy Base) installed):

- If a PtP configuration of B18s is to have access to 128 virtual tape drives, then each B18 must have the following features installed:
  - FC 5264
  - Two FC 3412 (Extended Performance ESCON Channels)
  - Two FC 3418 (Activate Additional ESCON Channels)
- If a PtP configuration of B20s is to have access to 256 virtual tape drives, then each B20 must have the following features installed:
  - Two FC 5264
  - Four FC 3412 (Extended Performance ESCON Channels)
- If a PtP composed of a B18 and B20 is to have access to 128 virtual devices, then the B18 VTS must have the following features installed:
  - FC 5264
  - Two FC 3412 (Extended Performance ESCON Channels)
  - Two FC 3418 (Activate Additional ESCON Channels)

All of the preceding configurations would require 8 AX0s to support the extended device configurations.

Additional Drive Unit Frame (Withdrawn from Marketing)

Each FC 5300 permits the attachment of an additional D1x (up to a maximum of seven frames) to the 3494. If more than four tape subsystems are specified, the Expansion Attachment Card feature is also required. Each frame can contain a tape subsystem (see “Tape Subsystems” on page 38) and additional cartridge storage for 300 tape cartridges. The D10 Frame has replaced FC 5300. FC 5300 can be upgraded to FC 5302 or 5304 for use with 3590 subsystems.

Additional Drive Unit Frame (Similar to D12 Frame)

FC 5302 upgrades FC 5300 and provides the necessary hardware and installation instructions to install one or two 3590 Model B1A or E1A tape drives. The 3590 tape drives must be ordered separately. This frame contains cartridge storage for up to 335 tape cartridges. An RPQ should be submitted to prepare FC 5302 to accept the third and fourth 3590 tape drives. An RPQ should be submitted also to prepare FC 5302 to accept the fifth and sixth 3590 tape drives.

Additional Drive Unit Frame (Similar to D14 Frame)

FC 5304 upgrades FC 5300 and provides the necessary hardware and installation instructions to install one or two 3590 Model B1A or E1A tape drives and one 3590 Model A00 Controller. The 3590 tape drives must be ordered separately. This frame contains cartridge storage for up to 345 tape cartridges. An RPQ should be submitted to prepare FC 5304 to accept the third and fourth 3590 tape drives. An RPQ can also be submitted to prepare FC 5304 to accept a 3590 Model A50 or A60 Controller instead of the Model A00 Controller.

Additional Storage Unit Frame (Withdrawn from Frame Marketing)

Each FC 5400 permits the attachment of a storage unit frame (up to a maximum of seven frames) to the 3494. Each frame contains additional storage for 400 tape cartridges. The S10 Frame and D1x Frames have replaced FC 5400.

Additional Storage Unit

FC 5500 must be ordered on an MES for the L1x Frame when a B16 VTS is upgraded to a B18 VTS and the B16 VTS is to be converted to a storage unit, which becomes a feature on the L1x Frame. This storage unit is a frame that contains additional cartridge storage (up to 400 cartridges) and attaches to the 3494. When this feature is installed, FC 9006 or 9007 must be removed from the L1x Frame. This feature is for field installation only (when a B16 VTS is upgraded to a B18 VTS). FC 5500 can be converted to FC 5502, 5503, or 5504.

Drive Unit for B18

FC 5502 must be ordered on an MES for the L1x Frame when a B16 VTS is upgraded to a B18 VTS and the B16 VTS frame is converted to a D1x Frame for the B18 VTS. The converted frame becomes a feature (FC 5502) on the L1x Frame. This D1x Frame contains additional cartridge storage (up to 290 cartridges) and provides the necessary hardware for installation of three or four 3590 Model B1A or E1A tape drives and SCSI Extender hardware for attachment to a B18 VTS. You must submit an RPQ for hardware and instructions to prepare FC 5502 to accept the fifth and sixth 3590 Model B1A or E1A tape drives. The fifth or sixth 3590

Model B1A or E1A tape drives are optional for the B18 VTS. When this feature is installed, FC 9006 or 9007 must be removed from the L1x Frame. FC 5502 can be converted to FC 5503 or 5504.

SCSI Drive Unit

FC 5503 must be ordered on an MES for the L1x Frame when a B16 VTS VTS is upgraded to a B18 VTS and the B16 VTS is converted to a SCSI Tape Drive Expansion Frame (similar to a D12 Frame). The converted frame becomes a feature (FC 5503) on the L1x Frame. This Tape Drive Expansion Frame contains additional cartridge storage (up to 290 cartridges) and provides the necessary hardware for installation of up to four 3590 Model B1A or E1A tape drives. You must submit an RPQ for hardware and instructions to prepare FC 5503 to accept the fifth and sixth 3590 Model B1A or E1A tape drives. When this feature is installed, FC 9006 or 9007 must be removed from the L1x Frame.

ESCON Drive Unit

FC 5504 must be ordered on an MES for the L1x Frame when a B16 VTS is upgraded to a B18 VTS and the B16 VTS frame is converted to an ESCON Tape Drive Expansion Frame (similar to a D14 Frame). The converted frame becomes a feature (FC 5504) on the L1x Frame. This Tape Drive Expansion Frame contains additional cartridge storage (up to 345 cartridges) and provides the necessary hardware for installation of up to two 3590 Model B1A or E1A tape drives and one 3590 Model A50 Controller. You must submit an RPQ for hardware and instructions to prepare FC 5504 to accept the third and fourth 3590 Model B1A or E1A tape drives. When this feature is installed, FC 9006 or 9007 must be removed from the L1x Frame.

Corequisite Features

When the B16 VTS is installed, the features shown in Table 33 may also be required for the 3494.

Table 33. Corequisite Features for B16 VTS

Feature Code	Description
FC 5214	Second Disk Drive for Library Manager
FC 5228	Tape Control Unit Expansion
FC 5229	Expansion Attachment Card
FC 9006	VTS < 9 frames
FC 9007	VTS > 8 frames
FC 9010	Attached to a VTS

When a B16 VTS is converted to a B18 VTS, one of the features shown in Table 34 may be required for the 3494 frame. This feature reflects the converted function of the B16 frame.

Table 34. Corequisite Features for B16 VTS to B18 VTS Conversion

Feature Code	Description
FC 5500	Additional Storage Unit
FC 5502	Drive Unit for B18
FC 5503	SCSI Drive Unit
FC 5504	ESCON Drive Unit

When the B18 VTS is installed, the features shown in Table 35 may be required for the 3494.

Table 35. Corequisite Features for B18 VTS

Feature Code	Description
FC 5232	Attachment Concentrator
FC 5233	SCSI Extender
FC 9010	Attached to a VTS
FC 9011	Additional Drives Support
FC 9012	Attach Additional Drives
FC 9020	B20, B10, or B18 VTS Attachment
FC 9021	Virtual Drives Enhancement

Notes:

1. Four AX0s in one or two CX0s are required for the following PtP VTS configurations:
   - Two B18 VTSs, each with FC 4010
   - One B18 VTS and one B10 VTS, each with FC 4010
2. Eight AX0s in two, three, or four CX0s are required for the following PtP VTS configurations:
   - Two B18 VTSs, each with FC 4010 and 5264
   - One B18 VTS with FC 4010 and 5264 and one B20 VTS with FC 4010

When the B10 VTS is installed, the features shown in Table 36 are also required for the 3494.

Table 36. Corequisite Features for B10 VTS

Feature Code	Description
FC 5232	Attachment Concentrator
FC 5233	SCSI Extender
FC 9010	Attached to a VTS
FC 9011	Additional Drives Support
FC 9020	B20, B10, or B18 VTS Attachment
FC 9021	Virtual Drives Enhancement
Note: Four AX0s in one or two CX0s are required for the following PtP VTS configurations: • Two B10 VTSs, each with FC 4010 • One B10 VTS and one B18 VTS, each with FC 4010	

When the B20 VTS is installed, the features shown in Table 37 are also required for the 3494.

Table 37. Corequisite Features for B20 VTS

Feature Code	Description
FC 5232	Attachment Concentrator
FC 5233	SCSI Extender
FC 9010	Attached to a VTS
FC 9011	Additional Drives Support
FC 9020	B20, B10, or B18 VTS Attachment
FC 9021	Virtual Drives Enhancement
Note: Eight AX0s in two, three, or four CX0s are required for the following PtP VTS configurations: • One B20 VTS with FC 4010 and one B18 VTS with FC 4010 and 5264 • Two B20 VTSs, each with FC 4010 • Two B20 VTSs, each with FC 4010 and two FC 5264	

Cleaning Cartridge Features

3590 Cleaning Cartridge

FC 8002 supports one cleaning cartridge for the 3590 tape drive.

3490E Cleaning Cartridge

FC 8005 supports one cleaning cartridge for the 3490E tape drive.

Data Cartridge Features

If the following features are specified, the factory ships data storage cartridges with the ordered frame type. Users can also order labeled and initialized cartridges using machine type 3499 or 3599.

Note: The following feature codes do not provide pre-labeled or initialized cartridges.

210 Cartridges (3490E Data Cartridges) (Withdrawn from Marketing)

If FC 8410 is specified, the factory ships 210 cartridges (3490E Enhanced Capacity Cartridge System Tape) with the ordered frame. One and only one of the following features must be specified: FC 9540, 8410, or 8420.

420 Cartridges (3490E Data Cartridges) (Withdrawn from Marketing)

If FC 8420 is specified, the factory ships 420 cartridges (3490E Enhanced Capacity Cartridge System Tape) with the ordered frame. One and only one of the following features must be specified: FC 9540, 8410, or 8420.

210 Cartridges (3590 Data Cartridges)

If FC 8510 is specified, the factory ships 210 cartridges (3590 High Performance Cartridge Tape) with the ordered frame. One and only one of the following features must be specified: FC 9540 (maximum of one), FC 8510 (maximum of two), or FC 8610 (maximum of two).

420 Cartridges (3590 Data Cartridges) (Withdrawn from Marketing)

If FC 8520 is specified, the factory ships 420 cartridges (3590 High Performance Cartridge Tape) with the ordered frame. One and only one of the following features must be specified: FC 9540, 8510, or 8520.

210 Cartridges (3590 Extended Length Cartridges)

If FC 8610 is specified, the factory ships 210 cartridges (3590 Extended High Performance Cartridge Tape) with the ordered frame. One and only one of the following features must be specified: FC 9540 (maximum of one), FC 8510 (maximum of two), or FC 8610 (maximum of two).

Chapter 3. Programming Support

Programming support for the 3494 includes the following programs at the version and release levels given, as well as all later releases and future program upgrades.

Support for the 3494 is provided in the following operating environments:

- OS/390 and z/OS
- VM and z/VM
- TPF
- VSE
- OS/400
- RS/6000, pSeries, and RS/6000 SP (AIX)
- Sun (Solaris)
- Hewlett-Packard HP-UX
- Microsoft Windows NT
- Microsoft Windows 2000

3590 Tape Subsystem Support

Support for the 3590 tape subsystem in the 3494 environment is available in the following minimum software release levels:

OS/390 and z/OS Support

3590 Model B1A

- OS/390 Version 2 Release 6 or later releases plus its associated level of DFSMS/MVS
- z/OS Version 1 Release 1 or later releases
- Basic Tape Library Support (BTLS) for DFSMS/MVS 1.4.0 or later releases
- EREP Version 3 Release 5 plus Program Temporary Fixes (PTFs)

3590 Model E1A

- OS/390 Version 2 Release 6 or later releases plus its associated level of DFSMS/MVS and Program Temporary Fixes (PTFs) as appropriate
- z/OS Version 1 Release 1 or later releases
- Basic Tape Library Support (BTLS) for DFSMS/MVS 1.4.0 or later releases plus PTFs as appropriate
- EREP Version 3 Release 5 plus PTFs

3590 Model H1A

- OS/390 Version 2 Release 8 or 9 with DFSMS/MVS Version 1 Release 5 and Program Temporary Fixes (PTFs) as appropriate
- OS/390 Version 2 Release 10 and the associated level of DFSMS and PTFs as appropriate
- z/OS Version 1 Release 1, and subsequent releases, and their associated levels of DFSMS
- DFSMS/VM® Function Level 221 plus Program Temporary Fixes (PTFs) (for native VM support)

- EREP Version 3 Release 5 plus PTFs

VM/ESA and z/VM Support

- VM/ESA Version 2 Release 3 or later releases plus APAR VM62710 (for native VM support)
- VM/ESA Version 2 Release 3 or later releases (for guest VM support). APAR VM62090 is required for Version 2 Release 3.
- z/VM Version 3 Release 1 or later releases plus APAR VM62710 (for native VM support)
- z/VM Version 3 Release 1 or later releases (for guest VM support)
- DFSMS/VM Function Level 221 plus Program Temporary Fixes (PTFs) (for native VM support)
- EREP Version 3 Release 5 plus PTFs

Transaction Processing Facility (TPF) Support

- TPF Version 4 Release 1 or later releases plus Program Temporary Fixes (PTFs) (for 3590 Model B1A only)

VSE/ESA Support

- VSE/ESA Version 2 Release 3 or later releases
- DFSMS/VM Function Level 221 plus Program Temporary Fixes (PTFs) and VM/ESA Version 2 Release 3 or later releases (APAR VM62090 required), or z/VM Version 3 Release 1 or later releases (for VSE guest support)
- FC 9203 (Virtual Storage Extended LAN Device Driver) Version 3 (for VSE native support)

  Note: The device driver support can now be ordered with VSE/ESA Version 2 Release 4 or later releases.
- EREP Version 3 Release 5 plus PTFs

OS/400 Support

3590 Model B1A

- OS/400 Version 3 Release 2 or later releases plus Program Temporary Fixes (PTFs)
  - FC 5211 (AS/400 Host Attachment) needed for releases earlier than Version 3 Release 6
  - Version 4 Release 4 needed for HA1 Frames configurations
- BRMS/400 Version 3 Release 1 or later releases (optional but recommended)
- R/DARS Version 1 Release 3 or later releases
- AS/400 adapters:
  - FC 2729
  - FC 2749
  - FC 6501
  - FC 6534

3590 Model E1A

- OS/400 Version 4 Release 1 or later releases plus Program Temporary Fixes (PTFs)

  - Version 4 Release 4 needed for HA1 Frames configurations
- BRMS/400 Version 3 Release 1 or later releases (optional but recommended)
- R/DARS Version 1 Release 3 or later releases
- AS/400 adapters:
  - FC 2729
  - FC 2749
  - FC 6501
  - FC 6534

3590 Model H1A

- OS/400 Version 4 Release 5 or later releases plus Program Temporary Fixes (PTFs)
- BRMS/400 Version 3 Release 1 or later releases (optional but recommended)
- R/DARS Version 1 Release 3 or later releases
- AS/400 adapters:
  - FC 2729
  - FC 2749
  - FC 6534

RS/6000, pSeries, and RS/6000 SP Support (AIX)

3590 Model B1A, E1A and H1A Tape Drives (SCSI attached) require the following:

- Micro Channel SCSI Adapters
  - RS/6000 or pSeries FC 2412 (Enhanced SCSI-2 Differential Fast/Wide Adapter/A)
  - RS/6000 or pSeries FC 2416 (SCSI-2 Differential Fast/Wide Adapter/A)
  - RS/6000 or pSeries FC 2420 (SCSI-2 Differential High-Performance External I/O Controller) [limited to seven SCSI IDs]
- PCI SCSI Adapters
  - RS/6000 or pSeries FC 2409 (PCI SCSI-2 Differential Fast/Wide Adapter)
  - RS/6000 or pSeries FC 6209 (PCI SCSI-2 Fast/Wide Differential Adapter)
  - RS/6000 or pSeries FC 6207 (PCI Differential Ultra SCSI Adapter)
  - RS/6000 or pSeries FC 6204 (PCI Universal Ultra SCSI Adapter)
- AIX 4.1.5 or later releases
- FC 9200 (Open System Device Drivers) and FC 9106 (RS/6000 Processor Attachment)
- Tivoli® Storage Manager for AIX Version 2.1 plus PTF 12, Tivoli Storage Manager Version 3

3590 Model E1A Tape Drives (Fibre Channel attached) require the following:

- AIX 4.3.3 or later releases
- RS/6000 or pSeries FC 6227 (Gigabit Fibre Channel Adapter)

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Sun Support

- Sun Microsystems Differential SCSI-2 adapter or compatible
- Solaris 2.6, 7, 8
- FC 9200 (Open System Device Drivers) and FC 9211 (Sun Attachment)

- Tivoli Storage Manager for Sun Solaris Version 2.6 plus Program Temporary Fix (PTF) 12, Tivoli Storage Manager Version 3

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Hewlett-Packard Support

- Hewlett-Packard HP-PB Fast/Wide Differential SCSI-2 A4800A Adapter
- Hewlett-Packard HP-UX 10.2 through 11.0
- Hewlett-Packard HP-UX 11.0 (for Hewlett-Packard 9000 L-Class, V-Class, and N-Class Enterprise servers)
- FC 9200 (Open System Device Drivers) and FC 9210 (HP-UX Attachment)

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Microsoft Windows NT Support

3590 Model B1A and E1A (SCSI-attached):

- Adaptec AHA-2944UW PCI Differential Ultra SCSI Adapter
- Microsoft Windows NT 4.0 with Service Pack 3 or later
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

3590 Model E1A (Fibre Channel-attached):

- QLogic QLA2200F or Netfinity® 00N6881
- Microsoft Windows NT 4.0 with Service Pack 6A or later
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

Microsoft Windows 2000 Support

3590 Model B1A and E1A (SCSI-attached):

- Adaptec AHA-2944UW PCI Differential Ultra SCSI Adapter
- Microsoft Windows 2000 Build 2195 or later
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

3590 Model E1A (Fibre Channel-attached):

- QLogic QLA2200F or Netfinity 00N6881
- Microsoft Windows 2000 Build 2195 or later
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

3490E Tape Subsystem Support

Support for the 3490E tape subsystem in the 3494 environment is available in the following minimum software release levels:

OS/390 and z/OS Support

- OS/390 Version 2 Release 6 or later releases plus its associated level of DFSMS/MVS
- z/OS Version 1 Release 1 or later releases
- Basic Tape Library Support (BTLS) for DFSMS/MVS 1.4.0 or later releases
- EREP Version 3 Release 5 plus PTFs

VM/ESA and z/VM Support

- VM/ESA Version 2 Release 3 or later releases (for guest operating system support)
- DFSMS/VM Function Level 221 plus Program Temporary Fixes (PTFs) (for native VM support)
- EREP Version 3 Release 5 plus PTFs

Transaction Processing Facility (TPF) Support

- TPF Version 4 Release 1 plus Program Temporary Fixes (PTFs)

VSE/ESA Support

- VSE/ESA Version 2 Release 3 or later releases plus Program Temporary Fixes (PTFs)
- DFSMS/VM Function Level 221 plus PTFs and VM/ESA Version 2 Release 3 or later releases for VSE guest support
- FC 9203 (Virtual Storage Extended LAN Device Driver) Version 2 for VSE native support

  Note: The device driver support can now be ordered with VSE/ESA Release 2 Release 4 or later releases.
- EREP Version 3 Release 5 plus PTFs

OS/400 Support

- OS/400 Version 2 Release 3 or later releases
  - FC 5211 (AS/400 Host Attachment) needed for releases before Version 3 Release 6
- BRMS/400 Version 2 Release 3 or later releases (optional but recommended)
- R/DARS Version 1 Release 3 or later releases

RS/6000, pSeries, and RS/6000 SP Support (AIX)

- Micro Channel Adapters
  - RS/6000 or pSeries FC 2412 (Enhanced SCSI-2 Differential Fast/Wide Adapter/A)
  - RS/6000 or pSeries FC 2416 (SCSI-2 Differential Fast/Wide Adapter/A)
  - RS/6000 or pSeries FC 2420 (SCSI-2 Differential High-Performance External I/O Controller) [limited to seven SCSI IDs]
  - RS/6000 or pSeries FC 2759 (S/370 Channel Emulator/A Adapter)
  - RS/6000 or pSeries FC 2754 (S/390 and zSeries ESCON Channel Emulator)
- PCI SCSI Adapters
  - RS/6000 or pSeries FC 2409 (PCI SCSI-2 Differential Fast/Wide Adapter)
  - RS/6000 or pSeries FC 6209 (PCI SCSI-2 Fast/Wide Differential Adapter)
  - RS/6000 or pSeries FC 6207 (PCI Differential Ultra SCSI Adapter)
  - RS/6000 or pSeries FC 6204 (PCI Universal Ultra SCSI Adapter)
- AIX 4.1.1 or later releases
- FC 9200 (Open System Device Drivers) and FC 9106 (RS/6000 Attachment)
- FC 5224 (AIX Parallel Channel Tape Attachment/6000) for use with RS/6000 FC 2759

- RS/6000 RPQ 8A1016 (ESCON Channel Tape Attachment) for use with RS/6000 FC 2754
- Tivoli Storage Manager for AIX Version 2.1 plus Program Temporary Fixes (PTFs), Tivoli Storage Manager Version 3

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Virtual Tape Server Support

Support for the VTS in the 3494 environment is available in the following minimum software release levels:

OS/390 and z/OS Support

- OS/390 Version 2 Release 8 or later releases plus its associated level of DFSMS/MVS
- z/OS Version 1 Release 1 or later releases
- Basic Tape Library Support (BTLS) for DFSMS/MVS 1.4.0 or later releases
- EREP Version 3 Release 5 plus Program Temporary Fixes (PTFs)

VM/ESA and z/VM Support

- VM/ESA Version 2 Release 4 or later releases for guest operating system support
- z/VM Version 3 Release 1 or later releases for guest operating system support
- DFSMS/VM Function Level 221 plus Program Temporary Fixes (PTFs) required for native VM support
- EREP Version 3 Release 5 plus PTFs

Transaction Processing Facility (TPF) Support

- TPF Version 4 Release 1 plus Program Temporary Fixes (PTFs)

VSE/ESA Support

Note: Supported only as a guest under VM/ESA.

- VSE/ESA Version 2 Release 4 or later releases plus Program Temporary Fixes (PTFs)
- DFSMS/VM Function Level 221 plus PTFs
- EREP Version 3 Release 5 plus PTFs

RS/6000, pSeries, and RS/6000 SP Support (AIX)

- Micro Channel SCSI Adapters
  - RS/6000 or pSeries FC 2412 (Enhanced SCSI-2 Differential Fast/Wide Adapter/A)
- PCI SCSI Adapters
  - RS/6000 or pSeries FC 6209 (PCI SCSI-2 Fast/Wide Differential Adapter)
  - RS/6000 or pSeries FC 6207 (PCI Differential Ultra SCSI Adapter)
  - RS/6000 or pSeries FC 6204 (PCI Universal Ultra SCSI Adapter)
- AIX 4.3.2 or later releases for attachment using SCSI adapters on RS/6000 and pSeries
- AIX 4.3.3 or later releases for attachment using Fibre Channel adapters on RS/6000 and pSeries

- FC 9201 (VTS Open System Device Drivers) and FC 9106 (RS/6000 Processor Attachment)
- Tivoli Storage Manager for AIX Version 2.1 plus Program Temporary Fixes (PTFs), Tivoli Storage Manager Version 3

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Sun Support

- Sun Microsystems Differential SCSI-2 adapter or compatible
- Solaris 2.6, 7, or 8, FC 9201 (VTS Open System Device Drivers), and FC 9211 (Sun Attachment)
- Tivoli Storage Manager for Sun Solaris Version 2.6, 7, or 8 plus Program Temporary Fix (PTF) 12, Tivoli Storage Manager Version 3

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Hewlett-Packard Support

- Hewlett-Packard HP-PB Fast/Wide Differential SCSI-2 A4800A Adapter
- Hewlett-Packard HP-UX 11.0 (PCI, 64-bit) for Hewlett-Packard 9000 L-Class, V-Class, and N-Class Enterprise Servers
- FC 9201 (VTS Open System Device Drivers) and FC 9210 (HP-UX Attachment)

Note: Contact IBM for the current list of non-IBM software supporting the 3494.

Microsoft Windows NT Support

- Adaptec AHA-2944UW PCI Differential Ultra SCSI Adapter
- Microsoft Windows NT 4.0 with Service Pack 6
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

Microsoft Windows 2000 Support

- Adaptec AHA-2944UW PCI Differential Ultra SCSI Adapter
- Microsoft Windows 2000 Build 2195 or later
- FC 9201 (VTS Open System Device Drivers) and FC 9212 (Attached to Windows)

Peer-to-Peer Virtual Tape Server Support

Software support for the PtP VTS is provided for the OS/390 and z/OS platforms. Enhancements to DFSMS/MVS allow the host to recognize that a library is a PtP VTS. The host is aware of the distributed, or peer, VTSs, as well as the composite library image that contains virtual drives and logical volumes. The operations staff can request the status of distributed VTS libraries, as well as to the composite library image. With the enhanced software, the host can identify the originating distributed library related to events and status changes so that the operations staff sees useful messages when intervention is required. In addition, the host logs hourly statistical records from distributed libraries, as well as from the composite library image.

OS/390 and z/OS software support is provided as an SPE for DFSMS/MVS 1.4 and 1.5. For later releases, support is packaged in OS/390 and z/OS. Toleration PTFs are provided for DFSMS/MVS 1.2.0 and later releases. At least one host attached to the PtP VTS must be at DFSMS/MVS 1.4.0 or later (full support) so

that library reliability and serviceability features in the software can be enabled. All other OS/390 and z/OS hosts attached to a PtP VTS must have a minimum level of DFSMS/MVS 1.2 with the toleration PTFs installed, if the support SPE is not available or is not installed.

Native VM/ESA or z/VM hosts and VSE/ESA guest hosts of VM/ESA or z/VM attached to a PtP VTS are supported in an environment where an OS/390 or z/OS host with full support of PtP VTS is also attached to the library. The OS/390 or z/OS host provides essential visibility to the status of distributed PtP VTS components, while a VM/ESA or z/VM host has awareness only of the composite library image.

Software requirements for VM/ESA, or z/VM, and VSE/ESA for PtP VTS are the same as those for other libraries.

When an existing VTS is made part of a PtP VTS, the Hardware I/O Configuration Definition (HCD) for the 64, 128, or 256 virtual tape drives may need to be modified so that four, eight, or sixteen independent 16-drive subsystems are configured.

Operating System/400® for Application System/400®

3494 support for the AS/400 IMPI Technology (SISC Architecture) is supplied in the Media Library Device Driver (MLDD). For systems with AS/400 64-bit PowerPC® Technology (RISC Architecture), support is provided as part of the OS/400 operating system. Both technologies provide a set of library functions that allow control of the 3494 by either media management software or through command invocation by a library administrator.

Backup Recovery Media Services/400 (BRMS/400) uses the 3494 interface to serve library operations for applications for end users. This approach provides optimum, unattended use of the library.

3494 cartridge category definitions are used to improve control over media sharing when a specific library is connected to multiple hosts. This feature enables the designation of a specific cartridge to any attached AS/400 or iSeries or limitation to a specific host.

The command interface supports the following tasks associated with 3494 usage:

- Defining the 3494

  RS-232 and LAN interfaces are supported between the Library Manager and AS/400 or iSeries.
- Requesting library information

  Requested library information includes the following:
  - Libraries known to the AS/400 or iSeries, their associated units, and associated status
  - Tape cartridges in a specific library (for a specific cartridge, a list of cartridges, or all cartridges in a specific category or logical group)
  - Operation status of a specific 3494
  - Categories currently defined
  - LAN configuration information
- Selecting user-defined categories

The user defines categories that are owned by specific systems. Sharing of categories by any set of AS/400 or iSeries attached to a library is possible. Placement of volumes, in user-defined categories for specific purposes, is also permissible. A tape management system (such as BRMS/400) coordinates access to volumes shared between systems.

- Controlling cartridge accessibility

  Specific cartridges change from shared (by multiple attached hosts) to non-shared or a user-defined category.

- Mounting and demounting cartridges

  The user can request specific cartridge mounts on a specific drive. Although the cartridge demount is typically handled automatically by the 3494 after an unload operation, explicit requests for a cartridge demount on a specific tape unit is supported.

- Managing cartridge inventory in the 3494

  For new cartridges placed in the library, the Insert function designates cartridges for shared use among all attached AS/400 and iSeries or reserves them for use only by the AS/400 or iSeries or a user-defined category issuing the Insert request.

  An Eject function specifies ejection of cartridges.

- Mounting of transient tape cartridges

  The 3494 function supports special usage of the convenience I/O station for tapes that are not part of the library cartridge inventory. In this special-use mode, cartridges (with or without external labels) placed in the convenience I/O station are sequentially mounted, used (read or written), demounted, and returned to the convenience I/O station. Transient cartridges are intended for one-time usage and are not intended to remain in the library.

- Using the unlabeled tape cartridge facility

  This facility allows the insertion of tape cartridges without an external or non-machine readable label into the library for temporary use. Unlabeled tape operations are designed to allow the operator to add occasional volumes that do not have a machine-readable label to the library. These volumes are mounted and ejected in the same manner that regular, properly labeled volumes are handled. Do not use this facility for a large number of cartridges or for cartridges that are stored in the library for long periods. See “Unlabeled Tape Facility” on page 31 for additional information.

- Running in automatic cartridge load mode

  Although the tape drives in the library do not have automated cartridge loaders, it is possible to mount tapes in a predefined sequence or in a random order, into a specific library tape drive. Function is available to support the assignment to cartridges to a special category, assignment of a specific tape drive for restricted use with the special category, and ending the restricted use of a tape drive.

Based on user-defined policies, BRMS/400 with Media Storage Extensions (MSE) installed automatically recalls database files from tape drives to disk storage. No change is required to the requesting application, which resumes after restoration of the file on disk storage. This capability is especially useful with tape automation as provided by the 3494, which provides the capability for unattended operation and improves end-user access time to archived information.

The automatic migration of database files between disk storage and tape drives essentially treats removable tape media as an extension of disk storage (from an application point of view). Vast amounts of additional data are available at a lower

cost per megabyte than disk storage but at a reduced performance level. New mass storage applications now become more affordable than previous applications.

Fast search is supported by BRMS/400 for the IBM 3490E and 3590 tape drives in the 3494. The location of a file on tape is kept with the BRMS/400 tape inventory, allowing these tape drives to do a fast forward to the location of the requested file. The total time required to restore data from tape is reduced.

Advanced Interactive Executive (AIX)

AIX support for the 3494 is available on the following processor platforms:

ES/9000	Native support in the AIX operating system
RS/6000 and pSeries	Support in the IBM AIX operating system with the RS/6000 and pSeries
RS/6000 SP	Support in the IBM AIX operating system

Note: Some non-IBM processors can attach to the 3494 and control the library by communicating through the RS/6000 or pSeries.

For all AIX platforms, user-supplied programs control the 3494 through a defined application programming interface (API) for device driver functions. The AIX software supports the integration of a tape management system (TMS) for controlling the library.

The AIX application programming interface supports the following:

- Mounting and demounting cartridges

  A mount function requests that a specified cartridge be mounted on a specified library tape drive, or that the next sequential cartridge in a scratch category (pool) be mounted. Cartridge demount is handled by an AIX function for an explicit cartridge demount request from a specified tape unit.
- Requesting library information

  Information can be requested for the following:
  - Specified volumes
  - Library statistics
  - Library inventory
  - Specific category inventory
- Placing a cartridge in a logical group (category)

  An interface function assigns specified cartridges to a specified library category.
- Managing asynchronous communication with the 3494

  An interface function allows the user to check on the progress of an asynchronous request such as a mount operation.

Basic Tape Library Support Program (OS/390 and z/OS)

Basic Tape Library Support (BTLS) enables OS/390 and z/OS users to benefit from the 3494 automation capabilities on their existing MVS/DFP™ or DFSMS/MVS software levels and can be used as an aid in the migration to DFSMS, if desired. BTLS is available for selected levels of DFSMS/MVS and MVS/DFP. Contact your IBM representative for detailed support information. Existing tape applications can use the 3494 without change. See the *Basic Tape Library Support User's Guide and Reference* for details.

BTLS support uses catalog records to describe each library configuration and to define allocation rules. Each volume in a library is also defined by a catalog record that names the library in which the volume resides. BTLS uses these catalog records to ensure that the appropriate device is allocated to mount a volume.

For specific volume requests (private volumes), if the volume is cataloged as a library volume, then only devices in the library are used to satisfy the allocation. If the volume is not cataloged as a library volume, then the volume is assumed to reside outside of a library, and only non-library devices are used to satisfy the allocation.

For non-specific requests (scratch volumes), BTLS scratch allocation rules are used to determine whether a library device or a non-library device is used to satisfy the allocation. Library definitions, volume records, and allocation rules are established using the LIBRARY command.

BTLS adds the new access method services LIBRARY command. The LIBRARY command performs the following functions:

- Changes volume status from private to scratch
- Defines library devices
- Defines allocation rules for library devices
- Obtains lists of library volumes from the library
- Creates or deletes catalog records for library volumes
- Performs library functions such as mount, demount and ejection of cartridges

OS/390 or z/OS System-Managed Tape

OS/390 or z/OS programming support for the 3494 is provided in the appropriate versions and releases of the following prerequisite products:

- OS/390 and its associated level of DFSMS/MVS or z/OS
- Environmental Record Editing and Printing Program (EREP)

Note: See the PSP bucket for D/T 3494 for the latest required and recommended software PTFs.

The following optional components of the DFSMS/MVS program product also support the 3494:

- DFSMSdss™
- DFSMShsm
- DFSMSrmm™

OS/390 or z/OS support for the 3494 is fully integrated with system-managed tape cartridges residing within the library. Programming, cataloging of tape data sets, and job control language (JCL) statements do not need to be changed. Drive allocations for new data sets created on tape are controlled by user-written automatic class selection (ACS) routines. Specific requests for existing data sets within the library are allocated to tape drives in the library. Mount and demount commands are directed to the appropriate library rather than to a host operator's console.

The prerequisite products provide the following general functions:

- Managing the tape library
- Managing volumes

- Managing tape drives

Managing the Tape Library

The library management function recognizes automated tape drives and associates them with the 3494 that they reside in. All tape drives must be defined by using Hardware Configuration Definition (HCD) dialog. With the SMS display or SMS vary commands, the operator can request the following information about the library:

- Configuration status
- Operational status
- Storage contents summary

Access method services provide the storage administrator commands to create and maintain the tape configuration database. Interactive Storage Management Facility (ISMF) panels allow the storage administrator to interactively change and display volume attributes and to set processing defaults. An interface allows tape management systems to change the category of volumes so that the volumes can be mounted in response to a request for a scratch volume. Environmental Record Editing and Printing Program (EREP) formats and prints 3494 environmental and error information stored in the SYS1.LOGREC data set.

Managing Volumes

Volumes that are resident in a 3494 require new management functions because the tape volumes and tape drives are located in an enclosure with normal operator activities performed automatically. The operator messages normally associated with tape mount and demount actions for volumes residing in a library are directed to a log rather than to the operator's console.

When cartridges are inserted in either the convenience I/O station or in any available cell within the library, the tape configuration database (TCDB) is updated to indicate the presence of the inserted volumes in the library. Similarly, when a volume is moved to either the convenience I/O station or the high-capacity I/O facility, the volume's TCDB entry is kept or purged based on what is specified in the parameters set during installation.

When a tape cartridge (without an internal label) is inserted in a 3494, the software labels it as a scratch volume on its first use. An interface allows a tape management system to change a volume's status (in the TCDB and 3494) from scratch to private, or private to scratch. It may also be used to eject a volume from the library.

Managing Tape Drives

Allocation of new data sets to drives within the 3494 is controlled by user-written automatic class selection (ACS) routines to assign a tape storage group to one or more libraries. Requests for existing data sets stored on volumes in a 3494 are allocated to a tape drive in the appropriate library. The allocation process searches the inventory for the volume in a 3494 and limits the list of eligible tape drives to the automated tape drives in the library. Dynamic drive reconfiguration (DDR) is also aware of automated tape drives and prevents tape drive swapping between automated and non-automated tape drives or between automated tape drives in different libraries.

DFSMShsm

DFSMShsm is an optional functional component of the DFSMS/MVS program product that supports the 3494. The following DFSMShsm functions can direct output to tape drives in a 3494:

- Migration
- Backup
- Spill
- Backup of DFSMShsm control data sets
- Recycle
- Full volume dump
- Aggregate backup
- Copy of DFSMShsm tape volumes

DFSMSrmm

DFSMSrmm is an optional functional component of DFSMS/MVS program product and provides the functions of a tape management system. DFSMSrmm software keeps track of DFSMS/MVS configurations that contain either system-managed or non-system-managed tape libraries. DFSMSrmm includes the following functions:

- Scratch tape management
- Automatic tape record keeping
- Vital record management
- Control of tape movement between sites
- Registration of software product tapes
- Installation exit support

Virtual Machine/Enterprise System Architecture (VM/ESA) or z/VM

Virtual Machine/Enterprise System Architecture (VM/ESA) and z/OS programming includes support for guest operating systems and native VM environments.

Note: See the PSP bucket for D/T 3494 for the latest required and recommended software PTFs.

Support for Guest Operating Environments

VM/ESA and z/VM software provides basic support for a guest operating system, such as OS/390 or z/OS, that issues its own Start Subchannel (SSCH) commands to control the tape library. The VM host can support multiple guest operating environments that use the 3494, with the tape library drives generated as supported tape drives.

Multiple operating system guests and multiple libraries are supported by a VM host. The ability to share a 3494, when running as a guest, is determined by the native-sharing capabilities of the operating environment.

Note: The 3494 can be shared only if all OS/390 or z/OS guests are in the same DFSMS/MVS configuration.

The VM/ESA and z/VM basic support for guest includes the following:

- CCW translation

- Attention message reflection
- Error recovery
- Library authorization checking

The guest operating environment is expected to provide its own full error recovery.

Support for the Native VM Environment

VM/ESA and z/VM software for the native VM environment provides a high-level interface to the 3494 to make hardware functions accessible to CMS users and service machines or guest operating systems, such as VSE. This interface is in the DFSMS/VM Removable Media Services (RMS) component. The interface is designed to connect the user's tape management software to the capabilities of the 3494 or to allow individual users to request library cartridge mounts.

A high-level interface is packaged as both a set of interactive commands and a set of callable services library (CSL) routines. These interface functions shield the VM user and the tape management system from the details of the hardware interface. The DFSMS/VM software handles all communication with the 3494, including management of asynchronous library protocols and full library error recovery operations. With VM/ESA Version 2 Release 3, synchronous library commands (for example, querying the library or setting volume categories) do not require attachment of a free tape drive for library-control communication.

The DFSMS/VM RMS interface functions support the following tasks associated with 3494 usage. See the *VM/ESA: DFSMS/VM FL221 Removable Media Services User's Guide and Reference* for details about the following capabilities and supported functions:

- Mounting and demounting cartridges

  A mount function requests that a specified cartridge be mounted on a specified library tape drive, or that the next sequential cartridge in a scratch category (pool) be mounted. Although the cartridge demount is typically handled automatically by the 3494 when a volume is unloaded, RMS allows an explicit request for a cartridge on a specified tape unit to be demounted.
- Changing the category assignments of volumes

  A set-volume-category function assigns a specified cartridge or a list of cartridges to a specified scratch category or removes cartridges from a scratch category. Up to 16 scratch categories (pools) may be used.
- Assigning cartridge categories to tape drives

  A set-tape drive-category function allows a specified scratch category (pool) to be associated with a specified tape drive in the 3494.
- Requesting information from the library

  The query function returns information about the following:
  - Specified volumes
  - Library tape drives
  - Inventory by specific category or for the entire library
  - Operational status of the library
- Managing the library's cartridge inventory with the set-volume-category function:
  - Incoming (inserted) cartridges can be either assigned to scratch pools or retained as private volumes.
  - Library cartridges can be directed to a 3494 output facility (ejected).

The set-volume-category function can operate on a list of volumes specified in a named file. Insert processing can also be set up to run automatically, according to predefined target category specifications.

The interface functions for controlling 3494 operations are intended to work with a tape management system without duplicating normal tape management tasks. Because a variety of tape management systems with a diversity of functions are in use by VM users, DFSMS/VM RMS support is flexible and can be customized to meet individual needs. For a user without a tape management system, DFSMS/VM RMS can function as a hub for tape-mount requests and provide a platform for accessing individual tape management functions through user exits.

Virtual Storage Extended/Enterprise System Architecture (VSE/ESA)

Virtual Storage Extended/Enterprise System Architecture (VSE/ESA) programming includes support for native and VM/ESA or z/VM guest operating environments. The application programming interface (API) for 3494 functions is provided by VSE/ESA. The API is a front end for both native and guest library control architectures and is designed to allow tape management products to use the library functions and to maintain cartridge inventory synchronization between tape management catalogs and the library.

Note: See the PSP bucket for D/T 3494 for the latest required and recommended software PTFs.

Native Support

Native VSE support for the 3494 uses the LAN attachment to the library for control by one or more VSE hosts. The VSE 3494 control device driver (LCDD) runs as a VTAM® application in its own partition. The library control commands are transmitted on the LAN as packets to the Library Manager by using LU6.2 advanced program-to-program communication (APPC). The channel attachment to the library control unit provides the tape data path.

The VSE/ESA Enterprise API is the main programming interface for controlling the library through the LCDD. In addition, LCDD supports a full set of interactive functions for operations use.

Both native and guest VSE/ESA systems attached to library subsystems may use the LAN library control connection and use the LCDD support application.

Note: Native VSE hosts are capable of accessing only 32 ports and must attach to subsystems associated with port IDs within the first 32 ports configured on the 3494.

See the *IBM 3494 Tape Library Dataserver User's Guide: Library Control Device Driver for VSE/ESA* for more information.

Guest Support

The capabilities of DFSMS/VM RMS extend 3494 support to VSE/ESA guests of VM/ESA or z/VM. VSE guest support for the 3494 includes scratch pool exploitation, inventory management operations, and library information retrieval.

The DFSMS/VM RMS component provides library control through the library tape subsystem's host channel attachment, which is also the tape data path.

DFSMS/VM provides a VSE/ESA guest server (VGS) virtual machine to facilitate VSE guest usage of CMS interfaces for DFSMS/VM with RMS. The VSE/ESA Enterprise API is the programming interface for controlling the library through VGS. Operator commands for controlling the 3494 interactively are available through DFSMS/VM RMS, as well as through VSE attention routines.

Functional Summary

The following functions and features are available for VSE/ESA control of the 3494 with both the native and the guest library control architectures:

- Mount services

  Specific volume serial numbers and scratch mounts are supported. When support is provided for guest by VM/ESA or z/VM, the 16 scratch pools supported by DFSMS/VM RMS are available for use. With the library control device driver, 32 scratch pools are available.
- Inventory management

  Options in both the library control device driver and DFSMS/VM RMS allow inserted volumes to be assigned automatically to a designated category (for example, a scratch pool). Or, disposition of inserted volumes can be handled by explicit requests from operations staff or under program control by the tape management product.

  Vaulting or scratching of cartridges can be handled by individual explicit requests or by requesting that a list of volsers be processed.
- Library information retrieval

  Query functions return status information about tape units and cartridges in the library, as well as status of the Library Manager. In addition, cartridge count information or complete lists of cartridges with status information can be requested by category or for the entire library.

3494 Resource Sharing

The 3494 can be accessed concurrently by multiple operating environments. The library resources must be shared by the hosts according to the following guidelines:

- An individual tape drive (virtual or real) must be dedicated to one system at any one time. The tape drives are varied offline from one system and varied online to another system as processing workloads change.
- Similar groups of cartridges or volumes (virtual or real) are owned by individual attached hosts, but access is available to other systems through tape inventory management practices by the host. DFSMS/MVS provides the capability for multiple hosts to share attached libraries within a single DFSMS/MVS environment.

Support for the 3494 is provided in OS/390, z/OS, VM, z/VM, VSE, AIX, OS/400, TPF, Hewlett-Packard HP-UX, Sun (Solaris), Microsoft Windows NT, and Microsoft Windows 2000 operating environments. Typically, a shared 3494 is attached to a subset of these operating environments or to multiple hosts within the same operating environment.

In addition to the platform attachments described previously, some non-IBM processors can attach to the library tape subsystems and control the library by communicating with an RS/6000, pSeries, VM/ESA, or z/VM system.

For information about sharing and partitioning IBM tape libraries, see the *Guide to Sharing and Partitioning IBM Tape Library Dataservers*.

Software Tools

The following software tools are available to plan for (and optimize) the 3494 installation:

Volume Mount Analyzer

The volume mount analyzer is available as a component of DFSMS/MVS software. It provides reports on data sets by size and frequency of use to determine if tape is the best storage media for the analyzed data sets and if its frequency of access warrants it residing within a tape library.

Hands-on Network Environment

Hands-on network environment (HONE) is an aid to ensure that 3494 configurations are ordered with correct features.

Configuration Aids

The CFAS400, CFSystem, and CFRS6000 configuration aids are available to eligible users through IBMLink to help evaluate a user workload and desired level of automation. They also provide accurate 3494 configurations to get the desired throughput and response times.

Chapter 4. Site Planning and Preparation

This chapter describes the planning requirements for installing the 3494. See Chapter 6, “Physical Planning and Specifications”, on page 131 for physical planning specifications.

Additional information is available in the planning manuals associated with the various processors and operating systems. These manuals describe the physical environmental characteristics required for installing the processors and related tape drives. See “Related Information” on page xiv for a list of these manuals.

Physical Characteristics

The physical structure of the 3494 is built on the following frames:

- L1x Frame
- D1x Frame
- S10 Frame
- B1x VTS
- CX0
- HA1 Frames (service bays)

Height Requirements

The minimum floor-to-ceiling clearance required for the library is 2 m (78.7 in.) including all installation, operating, and service clearances.

Each frame is moved on casters and has four leveling pads. Each frame has a nominal height of 1815 mm ±15 mm (71.5 in. ±0.6 in.) from the bottom of the leveling pads to the top of the frame. The frame height can be varied up to 30 mm (1.2 in.) by using the leveling pads. The leveling pads are completely raised when the frame is shipped so that it can roll on its casters. The shipping height of the frame on its casters is 1.8 m (70.9 in.).

The B18, B10, and B20 VTS and CX0 are stand-alone frames with a nominal height of 1.8 m (70.9 in.). The frames move on casters and do not require leveling pads.

Floor Requirements

A 3494 can be installed on a raised or solid floor that meets the minimum leveling and floor-loading capacity requirements. The floor under the library must have a smooth surface and must not have ventilation panels under the leveling pads.

If the floor is carpeted, the carpeting must be approved for use in the computer room (low electrostatic discharge).

Floor Level Requirements

The 3494 can be adjusted to account for unevenness in the floor where the library is being installed. The maximum out-of-level condition must not exceed 25.4 mm (1 in.) over the entire length and width of any library.

Note: IBM strongly recommends that stringers be installed between all corner posts. In addition, a post should be placed under the areas where the

library's leveling pads sit. As an alternative to placing posts under the leveling pads, a post may be placed at the midpoint of the stringers in the areas where the library sits.

Weight Distribution and Floor Loading

If the 3494 is installed on a raised floor, the raised floor should be stabilized to prevent a horizontal shift of the raised floor structure. The minimum overall floor load rating should be 256 kg/m² (52.6 lb/ft²). However, IBM recommends a floor load rating of 341 kg/m² (70 lb/ft²). These ratings do not include additional loading by people and equipment traffic.

In addition, the floor must support point loads, exerted by the leveling pads, of up to 4.8 kg/cm² (68.4 lb/in²). The library has four point loads on each frame.

Site Preparation

Use the following information to prepare a physical location for the installation of the 3494.

Prepare a floor plan that includes the following information:

- Operator area that shows work areas for the Library Manager, I/O station, and access doors
- Power outlet types, locations, and power ratings
- Locations of emergency power-off (EPO) switches (see "Emergency Power-Off Switches" on page 116)
- Frame locations
- Operator and service clearances
- Dimensions of the total area for the library

Before actual hardware installation can start, the local installation planning representative must verify that all installation planning and preparation is completed.

Additional user responsibilities include planning for the following:

- Cabling and wiring for connections to the host processor
- Cabling for connection of the Remote Library Manager Console feature
- Cooling and heating
- Telephone service
- Safety and security
- Fire detection and suppression
- Floor, raised or not raised, that meets the operational and structural requirements imposed by the 3494
- Associated tape library cartridge storage for non-automated tape library activities

Lighting Considerations

The 3494 is designed for lights-out operation. No special lighting considerations are required.

Upgrade Considerations

Consider future growth or upgrades for the 3494 during initial installation planning. Consider the allowable frame considerations and addition of service bays

for the HA1 Frames. See “Multiple Frame Subsystems” on page 123 for allowable HA1 Frames configurations and “3494 Subsystem” on page 135 for overall physical dimensions.

Consult your IBM representative for current planning information about upgrading the 3494.

Earthquake Effects

There is no guarantee against equipment damage as a result of an earthquake. Many factors influence the seismic forces experienced by the computer equipment, including the following:

- Intensity and duration of an earthquake
- Structural strength and fragility of equipment
- Building type and soil conditions
- Location of equipment in a building
- Equipment installation method

Guarantees of equipment reliability cannot be made for all earthquakes and conditions. The damaging effects of an earthquake are minimized by appropriate installation and planning techniques.

Significant sliding and rocking of equipment during an earthquake may directly or indirectly result in damage. Minimize the damage potential by taking the following steps:

- Position equipment sufficiently far from walls or other equipment to minimize damage from collision.
- Ensure that power and accessory cables to equipment are long enough to accommodate some sliding of the equipment during an earthquake. Also, check that cable clamps or other strain reliefs are secured properly to the equipment.
- Improve the stability of tall equipment that can overturn in a severe earthquake by tying several units together to form a stable structure.
- Use a flexible restraint that allows a limited amount of movement, approximately 75 mm to 150 mm (3 in. to 6 in.), to de-couple the earthquake energy.

3494 Installation Requirements

The following section describes installation requirements and clearances for the 3494.

Operator and Service Clearances

Clearances are required around the library for the operator to perform operator tasks and for the service representative to perform service. Operator and service clearances are required on all sides of the library. See Table 38 on page 114 for specific clearance requirements and Chapter 6, “Physical Planning and Specifications”, on page 131 for additional information about each frame type.

Table 38. Operator and Service Clearance Requirements

Area Description	Area Size (Width x Depth, see note 1)
L1x, Front	1092 mm x 1016 mm (43 in. x 40 in.)
L1x, Rear (see notes 2 and 3)	750 mm x 1016 mm (29.5 in. x 40 in.)
HA1 Frames	750 mm x 1016 mm (29.5 in. x 40 in.)
HA1 Frames	1092 mm x 1016 mm (43 in. x 40 in.)
D1x Frame, Front and Rear (see note 2)	750 mm x 1016 mm (29.5 in. x 40 in.)
B16, B18, B10, and B20 VTSs and CX0, Front and Rear (see note 6)	750 mm x 1016 mm (29.5 in. x 40 in.)
S10 Frame, Front (see note 2)	750 mm x 1016 mm (29.5 in. x 40 in.)
S10 Frame, Rear (see note 4)	None required
All Units, Side (see note 5)	762 mm x 610 mm (30 in. x 24 in.)

Notes:

1. Size is described by the depth from the outside of the frame and width along the library. The width is on a frame-to-frame basis; space required in front or behind each frame is additive. The access space for the individual frames overlaps.
2. L1x Frames and D1x Frames that contain 3590 tape drives require additional left- and right-rear service clearances of 610 mm x 1016 mm (24 in. x 40 in.). Left-rear and right-rear service clearances may overlap when frames are placed side by side.
3. Operator clearance is the space required for the operator to have access to the frames to perform required tasks.
4. No operator or service clearance is required behind the S10 Frames.
5. No operator or service clearance is required at the right side of the subsystem unless the subsystem contains three or more frames. In this case, a right-side service clearance (equal to the left-side service clearance) must be added.
6. Additional weight distribution areas are required for the following frames:
   - B18 VTS stand alone frame: 330 mm x 1036 mm (13 in. x 40.8 in.) on both sides
   - B10 VTS stand alone frame: 229 mm x 1036 mm (9 in. x 40.8 in.) on both sides
   - B20 VTS stand alone frame: 483 mm x 1036 mm (19 in. x 40.8 in.) on both sides
   - CX0: 127 mm x 1036 mm (5 in. x 40.8 in.) on both sides

   These areas must not overlap.

Aisle and Door Clearances

It is recommended that two people be available to move the library frames between locations in a building. The following are the minimum aisle and door dimensions for moving frames from the unloading area to the installation site:

Roof height 1830 mm (72 in.)

Width 864 mm (34 in.)

Corner radius 2237 mm (88 in.)

Ramp inclines 15°

Fire-Suppression Provisions

The 3494 allows for mechanical connections to permit third-party installation of fire-suppression equipment. Implementation of this facility and selection of equipment is a user decision based on applicable local and national standards and regulations.

Each tape library unit frame has an allowable area on the top that may be cut to allow entrance of pipes, conduits, or other parts. Within the frame unit, a depth of 175 mm (6.9 in.) is available for installing pipes, sensors, sprinklers, or other components. Piping, conduits, and cabling can be positioned from frame to frame as long as they stay within the allowable area and do not interfere with library components.

Figure 13 shows the allowable area for mounting of fire-suppression equipment. The measurements are shown in millimeters.

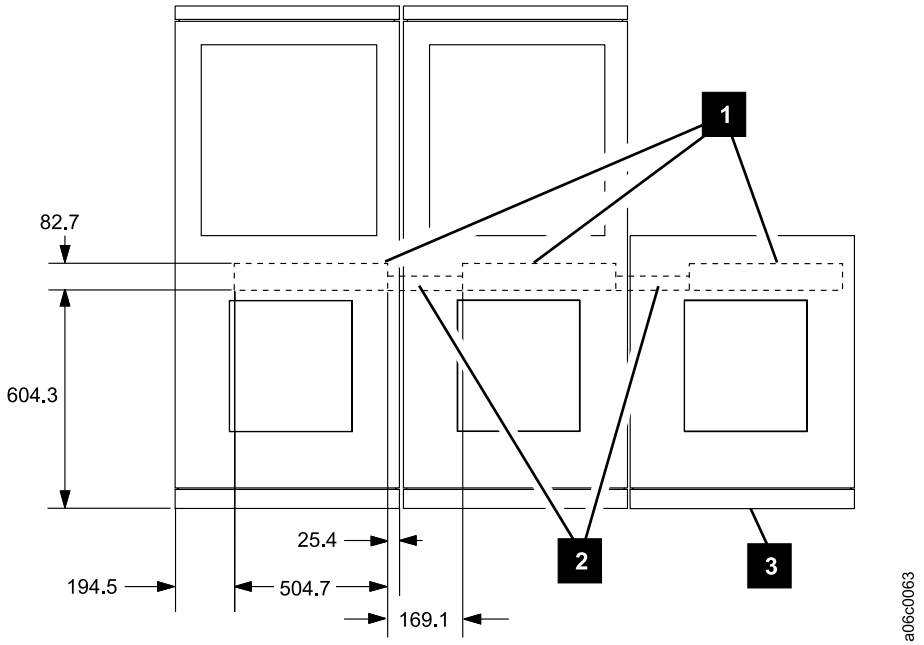


Figure 13. Fire-Suppression Facility (Top View of Frame Units)

1 shows the area available for entrance into the frame and to position the fire-suppression equipment. This area is 82.7 mm (3.3 in.) wide by 504.7 mm (19.8 in.) long. The equipment can extend through the top cover for a maximum intrusion of 175 mm (6.9 in.).

Note: The opening should not be cut larger than required for the entrance of the fire-suppression pipes, conduits, or cables.

2 shows the area available for positioning cables, wiring, and pipes between frames. This area is a triangular section 81 mm x 140 mm (3.2 in. x 5.5 in.), as shown at **1** in Figure 14 on page 116.

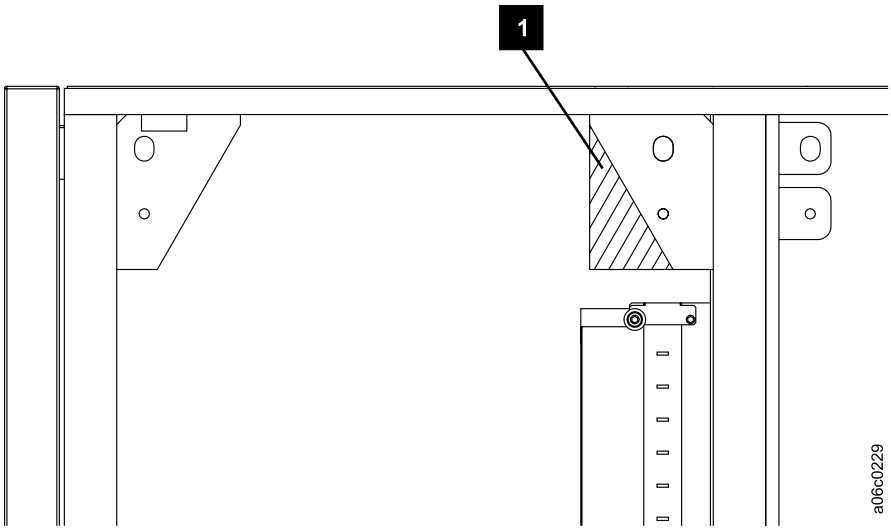


Figure 14. Location for Fire Suppression Facility between Frames

User fire-suppression mechanical equipment must fit within the allowable area designated or be installed outside the library.

All water systems must be external to the library enclosure with mechanical support for piping provided by the facility. Sprinkler heads that extend through the top of the frame must not extend more than 175 mm (6.9 in.) below the frame top.

Gaseous system piping with discharge nozzles can be routed on the top of the frames or inside the frames, just below the top of the frame within the 175-mm (6.9-in.) specification. The discharge nozzles can extend vertically no lower than 175 mm (6.9 in.) from the top of the frame. Gas cylinders and control equipment must be external to the library. IBM does not supply heat detectors.

Emergency Power-Off Switches

Two types of emergency power-off switches are used in the 3494 environment.

Emergency Power-Off (EPO) Switch

This switch removes all electrical power from a designated area of a building, except for the lights. Emergency power-off (EPO) switches are the user's responsibility.

Unit Emergency Switches

Setting the L1x Frame Unit Emergency switch to **O** (OFF) powers off the library immediately. Use this switch only in an emergency. Do not use it to power on or power off the library. Sudden removal of power in case of emergency may cause loss of data. The Unit Emergency switch must be in the | (ON) position to power on the library.

Notes:

1. If the library has more than eight frames or has the HA1 Frames service bays, a second Unit Emergency switch is located at the right end of the library. You can use either switch to power off the library immediately.
2. Setting the library Unit Emergency switches to **O** (OFF) does not power off B18, B10, or B20 VTSs, CX0s, or AX0s.

The stand alone B18, B10, and B20 VTSs each have one Unit Emergency switch, which removes power only to the B18, B10, or B20 VTS. The Unit Emergency switch on the B18, B10, and B20 VTSs should be set to **O** (OFF) only in an emergency. It must be set to | (ON) to allow remote control of the B18, B10, and B20 VTSs power by the tape library.

Each CX0 has one Unit Emergency switch, which removes power only to the CX0 and installed AX0s. The Unit Emergency switch on the CX0 should be set to **O** (OFF) only in an emergency. It must be set to | (ON) to allow service representatives to power on the installed AX0s manually. The 3494 does not control power on and power off of the CX0 remotely.

Power Requirements

The maximum power consumption is dependent on the number of tape subsystems in the configuration. See Chapter 6, “Physical Planning and Specifications”, on page 131 for details.

All service and circuit breakers must be installed according to national and country standards. The following are examples of certifiers:

- Canadian Standards Association
- Technischer Überwachungs-Verein
- Underwriters Laboratories
- Verband Deutscher Elecktrotechniker

UPS Considerations

The 3494 does not provide its own Uninterruptible Power Supply (UPS). However, users may provide their own UPS facilities to provide ac power to the library frames. In the case of battery backup UPS systems that have limited backup time, the user may want to supply an external signal to the library to request an orderly shutdown and ac power off. This user-supplied signal is equivalent to using the Unit Power On/Off switch on the library operator panel. Users choosing to supply this external signal should be aware of the following:

- Depending on subsystem configuration and operations in progress at the time the signal is applied, the library may take up to 20 minutes to complete the shutdown and turn off its internal ac power.
- Under certain error conditions, the Library Manager software may not be able to complete the subsystem shutdown and not be able to turn off internal ac power.
- The use of the following circuit requires that the Local Remote switch located on the library operator panel be switched to the Remote position.
- Malfunctions in the user circuit may cause unintentional library shutdown and power off sequences.
- If the user circuit opens and causes the library to shut down and power off, and the library Unit Emergency Off and Unit Power switches are left on, the library executes an ac power-on sequence as soon as the user circuit closes again.

The user-supplied external signal must be provided through a single pair of dedicated relay contacts. The library passes a 24 V dc, 10 mA signal through these contacts. When the contacts are closed, the library operates normally; when the contacts are opened, the Library Manager responds by executing a shutdown process that ultimately concludes by shutting off the library internal ac power distribution.

In addition to the relay contacts, the user must supply the cable and connector to plug into the library. See Figure 15 for a description of the required parts. The user cable plugs into connector P9 on the LPC card or on P9 of the DSW card if the library has the HA1 Frames. See the LOC section of the *IBM Magstar 3494 Tape Library Maintenance Information* for the location of the LPC or DSW cards.

Note that the P9 connector on the LPC or DSW card is normally filled with a jumper plug, IBM P/N 62G1175, which must be removed in order to install the user-supplied cable.

Note that a different interface cable is required if the library also has the Remote Power Control (RPC card) optional feature installed. Contact IBM Product Field Engineering for information on a fire-suppression electrical interface compatible with the RPC feature.

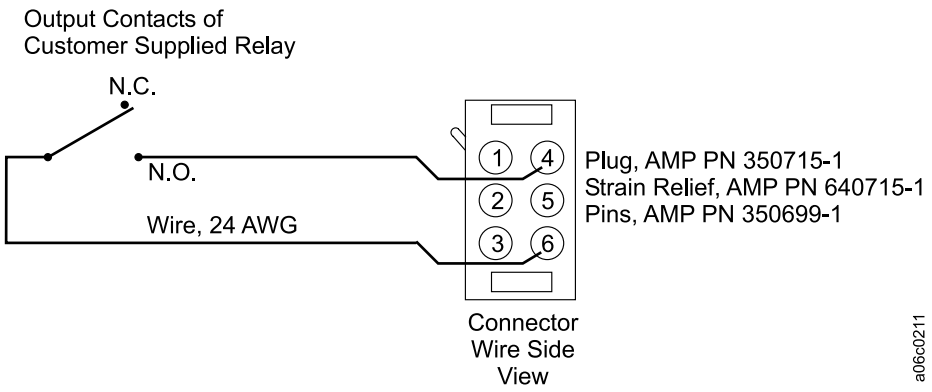


Figure 15. Schematic for User-Supplied Remote Power Control

Security Considerations

Controlling access to the 3494 and the tape cartridges in the library is the user's responsibility. Be sure to place the library in a controlled-access area to prevent unauthorized access to the library internal components and to prevent unauthorized removal of the tape cartridges.

Data security can be controlled by the Resource Access Control Facility (RACF®) program or a similar data-security program. See *Resource Access Control Facility General Information* for an overview of RACF and its requirements.

Chapter 5. Migration to the Automated Tape Environment

Migration from a non-automated tape environment to an automated tape environment involves the following tasks:

1. Select the appropriate library features to satisfy the performance requirements for the applications used.
2. Determine the software necessary for host control and to support the applications used with a 3494.
3. Plan for any application changes that may be necessary when used with a 3494.
4. Plan the physical environment for the installation of the 3494.
5. Plan for any operational changes that may be necessary in a 3494 environment.
6. Plan for the data migration from a non-automated tape environment to a 3494.

Planning for Operations

The following section contains operational information. Detailed operational information for the tape subsystems and the supported software products is included in the appropriate publications that support these products.

Planning requirements include modifications in physical layout, subsystem operations, and operator procedures. See Appendix C, “Planning for the 3494 and Task Allocation”, on page 171 for detailed planning information.

The operations department can play a significant role in subsystem migration. Operations and production control personnel can perform many of the tasks described in other sections of this guide, including data migration and media conversion.

Operations requirements can include equipment removal and installation, tape drive assignment schedules, cartridge external labeling, and cartridge initialization. Additional tasks include managing tape cartridges in the computer room, developing procedures where required, and providing training.

Maintenance and Drive-Cleaning Operations

Tape drive cleaning is an automated operation in the 3494 that the Library Manager controls. A cleaning schedule may be established during installation or at any other time. The cleaning schedule can be established on the Library Manager console. See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide* for details. Two cleaning schedules are available for selection:

Time of Week The library cleans the tape drives based on specific times of the day and specific days of the week.

Usage The library cleans the tape drives after a specified number of mounts, which it counts from the time you set the option.

Besides the cleaning schedule that the operator establishes, the tape subsystem control unit examines performance to determine if a tape drive needs cleaning. When the tape subsystem control unit determines that a tape drive needs cleaning based on the temporary read error count (degraded performance), the Library Manager schedules a clean operation for that tape drive.

The Library Manager screen is used to specify a value for the maximum uses of a cleaning cartridge before it is ejected from the library. The default value is 200, and the maximum is 500.

Note: Cleaning cartridges used in the 3494 for the 3490E and 3590 tape drives are different. The 3490E tape drive cleaning cartridge can be used only with 3490E tape drives, and the 3590 tape drive cleaning cartridge can be used only with 3590 tape drives. See "Identification of Cartridge System Tape Cartridges" on page 162 for more information.

After a cleaning operation is started, the Library Manager selects the cleaner volume based on a least-recently used algorithm and mounts it on the tape drive. When the clean operation completes, the cartridge is unloaded and returned to storage. Thus, all cleaning cartridges are used equally as they are rotated through clean operations. When the number of mounts on a cleaner cartridge exceeds the number of allowed uses, that cartridge is ejected automatically from the library.

Each L1x Frame or D1x Frame that contains tape drives provides one cleaning cartridge.

Care and Handling of Cartridges

General handling instructions, operational and storage environment, and cartridge cleaning considerations are described in the *Care and Handling of the IBM Magnetic Tape Cartridge*. For cartridge label requirements, see Appendix A, "Cartridge System Tape and Cartridge Labels", on page 159.

Planning for Supplies and Equipment

The following supplies and equipment are needed for the successful operation of the 3494:

- Order scratch cartridges.

  Have a three-month supply of tape cartridges available. Additional information is available in the planning manuals associated with the various processors and operating systems. See "Related Information" on page xiv for a list of these manuals.
- Order 3490E and 3590 cleaning cartridges for the 3494.
- Order additional cleaning cartridges, to ensure that one cartridge is always available for each frame that contains tape drives.
- Order labels for cartridges to populate the library. The labels contain the volume serial number that is assigned to the tape cartridge and, optionally, the media-type identifier.
- Order media-type labels (single character) for existing tape volumes if needed due to the presence of multiple media types in the same library.

  Note: Cartridges, including cleaning cartridges, can be ordered with bar code labels attached. See "Cartridge Labels" on page 163 for label details.

Planning for Library Operator Training

Training for tape library operators should start before the 3494 is installed. The training should be tested after the library is installed. Train the tape library operators for the following tasks:

- Using the operator's panel on the L1x Frame
- Using the Library Manager operator menu and help screens
- Inserting and removing tape cartridges from the high-capacity I/O facility
- Inserting and removing cartridges from the convenience I/O station
- Placing labels on tape cartridges
- Starting, stopping, and pausing the library
- Varying the library online and offline using the Library Manager
- Using the Library Manager to communicate with the host system
- Working on hardware inside the tape library frames
- Performing problem determination
- Handling operator intervention requests
- Performing Manual mode operations

See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide* for more information. Additional information is available in the manuals associated with the various processors and operating systems (see "Related Information" on page xiv).

Error Recovery Procedures

Ensure that the operators and system administrators know the error recovery and manual intervention procedures. See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide* for more information.

Hardware Migration

Hardware migration includes the following tasks:

1. Select a planning team with assigned responsibilities to ensure all pre-installation planning and migration tasks are completed.
2. Select the appropriate library configuration to satisfy the application requirements.
3. Prepare the physical environment for the 3494.
4. Determine required supplies, equipment, and training necessary to support the 3494 and proposed applications.

Additional information is available in the manuals associated with the various processors and operating systems (see "Related Information" on page xiv).

See Chapter 4, "Site Planning and Preparation", on page 111 for additional physical planning information.

Configuration Planning

The following section contains the information required to perform the configuration planning for the 3494. The 3494 includes all safety and appearance covers, access doors, top covers, and windows.

Configuring the Physical Library for Dual Active Accessors

The following physical configuration and setup suggestions minimizes accessor interference when the Dual Active Accessors feature is installed:

- Balance tape subsystems across both halves of the library, with the intent of having approximately the same mount activity for each half of the library. For example, do not put all tape drives in one half of the library and all S10 Frames in the other half.
- Intermix S10 Frames with the tape subsystems, or try to place at least one S10 Frame at the center of the library.
- Grouping 3490E tape drives at one end and 3590 tape drives at the other end helps migrate cartridges for these tape drives to the appropriate end of the library.
- If a host has access to only a subset of the tape subsystems in a library, attempt to keep all those subsystems in the same half of the library so that the volsers associated with the subsystems remain in the same zone.
- On initial loading of cartridges into the library, group the cartridges around the tape subsystems based on planned usage.
- For Inventory Update Inserts, place cartridges as near as possible to the tape subsystems on which they intend to issue mounts for those volsers. When adding 3590 cartridges that are used as stacked volumes for a particular VTS system, place them in cells close to those tape drives associated with the VTS.
- Place the high-capacity I/O facility near tape drives used for writing tapes that will be ejected.
- The Dual Gripper feature and floating home-cell mode of operation are highly recommended for systems with dual active accessors.
- If the system has only a single gripper, it should still be taught with floating home-cell mode.

Sample Library Configurations for Dual Active Accessors

The 3494 should be configured to enhance performance. Several examples of performance-enhancing configurations follow. In the examples, the first row shows the frame number, and the second row shows the frame type.

Note: In the following examples, **SU** indicates a storage unit (either an S10 Frame or a D1x Frame with no tape drives). For increased configuration flexibility, we recommend that these actually be D1x Frames without tape drives. **HIO** indicates a high-capacity I/O facility.

This configuration has all 3590 media, and every tape drive and every cartridge is accessible from every host image.

```
      1    2    3    4    5    6    7    8    9    10   11   12
 L14  SU   D14  SU   D14  SU   SU   D14  SU   D14  D14  SU
```

In this configuration the 3590 media is on the left half and the 3490E media is on the right half. All hosts are MVS.

```
1   2   3   4    5   6   7   8   9   10   11   12   13   14   15   16
L14 D14 SU  D14  SU  D14 SU  SU  SU  D10  SU   D10  SU   D10  D10  SU
        HIO
```

In this configuration the 3590 media is on the left half and the 3490E media is on the right half. All hosts are MVS.

```
1     2     3    4     5    6     7    8
L14   D12   SU   D14   SU   D10   D10  D10
      VTS              HIO
```

In this configuration the 3590 media is on the left half and the 3490E media is on the right half. The direct-attached host tape subsystems are grouped in the left half.

```
1     2     3    4     5    6     7    8
L12   D12   D12  D14   SU   D10   D10  D10
         HIO
AS400       RISC            MVS        MVS
      AS400      MVS              MVS
```

In this configuration there is a mix of media type and tape drives on the left half but only 3590 media on the right half. The direct-attached host tape subsystems are grouped in the right half.

```
1     2     3    4     5    6     7    8
L10   D12   D10  SU    SU   D12   D12  D12
      VTS              HIO
MVS         MVS              RISC       RISC
      MVS        MVS              RISC
```

Multiple Frame Subsystems

Without HA1 Frames, the 3494 can have a total of one to eight, 10, 12, or 16 frames. With HA1 Frames, the library can have a total of three, four, six, eight, 10, 12, or 16 frames plus the attached service bays in the HA1 Frames configuration. The library consists of an L1x Frame and combinations of D1x Frames, S10 Frames, and service bays.

Note: The preceding frame totals do not include the Model B18, B10, and B20 VTSs or the CX0; they are stand-alone frames.

If you plan to add additional tape drives to the library eventually, it is highly recommended that you include additional D1x Frames in the initial configuration. This eliminates the reconfiguration time associated with adding additional frames (especially important in the HA1 Frames configuration). The additional D1x Frames can be used as storage units until the additional tape drives are added.

Selectable Facilities

At installation time, the user must choose how to define the cartridge facilities. The service representative sets up the 3494 according to the user's choices.

High-Capacity I/O Facility

The 3494 has a high-capacity I/O facility that reserves a section of the cartridge storage area for inserting and ejecting cartridges. The user defines the amount of storage to reserve, and the service representative enables the reserved area in the L1x Frame during installation. See "High-Capacity I/O Facility" on page 26 for details.

One cartridge cell is reserved in the L1x Frame for ejecting cartridges if an optional convenience I/O station feature is not installed and the high-capacity I/O facility is not defined.

Home-Cell Mode

The 3494 operates in the fixed home-cell mode if neither the Dual Gripper feature nor the Dual Active Accessors feature is installed. If at least one of these features is installed, the user can select either fixed home-cell mode or floating home-cell mode:

Fixed home-cell mode	A tape volume is assigned a fixed storage-cell location when it is entered into the library. The volume is always returned to that location after it is used.
Floating home-cell mode	A tape volume is put into the most convenient storage-cell location to optimize performance.

Regardless of the selected mode, the library operates in fixed home-cell mode during Manual mode operations.

Password

The password function enables the user to password protect the service portion of the Library Manager.

Default Media Type

This option allows the user to set the default media type to standard Cartridge System Tape, Enhanced Capacity Cartridge System Tape, High Performance Cartridge Tape, Extended High Performance Cartridge Tape, or none. If there are only standard Cartridge System Tape or Enhanced Capacity Cartridge System Tape drives in the library and the default media type is set to Enhanced Capacity Cartridge System Tape, any standard Cartridge System Tape **must** have **1** as the seventh character on the external tape label. This prevents the system from trying to access beyond the end of the tape. If the library contains only High Performance Cartridge Tape drives, select the default media type of High Performance Cartridge Tape.

Note: Take care to label properly any of the cartridges added to the library that are not the default media type to avoid reporting the incorrect media type and possibly causing job abends.

A character following the volser on the external cartridge label identifies the cartridge type. This identifying character is one of the following:

- **1** for standard Cartridge System Tape
- **E** for Enhanced Capacity Cartridge System Tape
- **J** for High Performance Cartridge Tape
- **K** for Extended High Performance Cartridge Tape

Disable Inventory Update

This option allows the user to disable the inventory update process and speed up the process of changing modes after the doors on the library have been opened. The option is selected from the Commands window.

Notes:

1. This option is not recommended for users who open the library doors for adding and removing cartridges because no changes in the library inventory are recorded until an inventory update is performed. In addition, requesting an inventory update from the Commands window results in either a full or partial inventory update. Partial checks only frames whose doors have been opened (plus adjacent frames if selected).

2. During a cold start, the library inventory update process can be disabled, thereby speeding up the power-on process. The option is selected from the Library Manager initialization panel and is valid only for the duration up the power-on sequence.

Adjacent Frame Inventory Update

This option allows the library inventory update to include frames that are adjacent to the frame that had a door opened.

Tape Subsystem Support

The 3494 supports the following:

- 3490E Model C1A, C2A, and F1A Tape Drives
- 3590 Model B1A, E1A and H1A Tape Drives
- 3590 Model A00, A50, and A60 Controllers

See "Tape Subsystems" on page 38 for details.

- No additional channel paths are needed if existing tape subsystems are used.
- The 3494, by using ESCON channels, can be located up to 23 kilometers (14 miles) from the host with 3490E subsystems or up to 43 kilometers (27 miles) from the host with 3590 subsystems or VTS subsystems.

Table 39 and Table 40 show the tape drive and controller attachments for the 3494.

Table 39. Summary of 3490E Tape Drive and Controller Attachments

Type and Model	3494	
	L10 Frame	**D10 Frame**
3490E CxA	1–2 Drives	0–2 Drives
3490E F1A	1–2 Drives	0–2 Drives
3490E F1A FC 3000 or FC 3500	1–2 Drives	1–2 Drives
Note: One to eight, 10, 12, or 16 frames may be configured; one must be an L10 Frame. Others may be a mix of S10 Frames, D10 Frames, and B16 VTS, or FC 5300, 5302, 5304, or 5400. When HA1 Frames are installed, three, four, six, eight, 10, 12 or 16 frames may be configured. One must be an L10 Frame. Others may be a mix of S10 Frames, D10 Frames, and B16 VTS, or FC 5300, 5302, 5304, or 5400.		

Table 40. Summary of 3590 Tape Drive and Controller Attachments

Type and Model	3494			
	L12 Frame	**D12 Frame**	**L14 Frame**	**D14 Frame**
3590 B1A	0–2 Drives	0–6 Drives	0–2 Drives	0–4 Drives
3590 E1A	0–2 Drives	0–6 Drives	0–2 Drives	0–4 Drives
3590 H1A	0–2 Drives	0–6 Drives	0–2 Drives	0–4 Drives
3590 A00	–	–	0–1	0–1
3590 A50	–	–	0–1	0–1
3590 A60	–	–	–	0–1

Table 40. Summary of 3590 Tape Drive and Controller Attachments (continued)

Type and Model	3494			
	L12 Frame	**D12 Frame**	**L14 Frame**	**D14 Frame**

Notes:

1. One to eight, 10, 12, or 16 frames may be configured. One must be an L12 or L14 Frame. Others may be a mix of S10 Frames, D12 or D14 Frames, and B16 VTS, or FC 5300, 5302, 5304, or 5400.

   When HA1 Frames are installed, three, four, six, eight, 10, 12, or 16 frames may be configured. One must be an L12 or L14 Frame. Others may be a mix of S10 Frames, D12 or D14 Frames, and B16 VTS, or FC 5300, 5302, 5304, or 5400.
2. The 3590 Model A00 and A50 Controllers have been withdrawn from marketing.

The following examples are maximum tape drive configurations; other configurations are possible:

- The following are maximum ESCON-attached 3590 subsystem configurations:
  - With FC 5228 and 5229:
    - Sixty 3590 Model B1A or E1A tape drives with fifteen 3590 Model A60 Controllers
    - Sixty-two 3590 Model B1A or E1A tape drives with sixteen 3590 Model A00 or A50 Controllers
  - Without FC 5228 and 5229:
    - Sixteen 3590 Model B1A or E1A tape drives with four 3590 Model A00, A50, or A60 Controllers
- The following are maximum Fibre Channel- or SCSI-attached 3590 subsystem configurations:
  - With FC 5228 and 5229: sixteen 3590 Model B1A or E1A tape drives
  - With FC 5227, 5228, and 5229: thirty-two 3590 Model B1A or E1A tape drives
  - Without FC 5228 and 5229: four 3590 Model B1A or E1A tape drives
- The following are maximum SCSI-attached 3490E subsystem configurations:
  - With FC 5228 and 5229: sixteen 3490E Model F1A tape drives
  - With FC 5227, 5228, and 5229: thirty-two 3490E Model F1A tape drives
  - Without FC 5228 and 5229: four 3490E Model F1A tape drives

  When each 3490E Model F1A FC 3000 or FC 3500 Controller attaches two 3490E Model F1A tape drives, the library can contain a maximum of ten 3490E Model F1A tape drives.
- If the library uses only 3490E Model CxA subsystems, it can contain a maximum of 32 tape drives.
- When FC 4060 (Adjacent Frame Support) is installed, the library can have a maximum of seventy-six 3590 Model B1A or E1A tape drives attached to eight 3590 Model A60 Controllers. To obtain the maximum number of tape drives, a D14 Frame must be adjacent to the L12 or L14 Frame.

Host Processor Support

Host processors supported include the following:

- AS/400 and iSeries
- RS/6000 and pSeries
- RS/6000 SP
- ES/3090
- ES/3090-9000
- ES/9000
- Sun Microsystems
- Hewlett-Packard HP 9000 L-Class, N-Class, and V-Class
- Microsoft Windows NT
- Microsoft Windows 2000

See "Host Processor Support" on page 19 for details.

Software Support

See Chapter 3, "Programming Support", on page 93 for a description of available software. Contact your IBM representative for the current support, release schedules, and versions for the associated software product.

Software Migration

You should be familiar with the topics in one or more of the following host system publications. Contact your IBM representative to order IBM publications:

- For AIX publications, see "AIX®" on page xvi.
- For AS/400, iSeries, and OS/400 publications, see "IBM AS/400® and IBM @server iSeries" on page xvi.
- For RS/6000 and pSeries publications, see "IBM RS/6000® and IBM @server pSeries" on page xvi.
- For DFSMS/MVS, MVS/ESA, OS/390, and z/OS publications, see "MVS™, OS/390®, and z/OS" on page xvi.
- For VM/ESA and z/VM publications, see "VM/ESA® and z/VM" on page xvi.
- For VSE/ESA publications, see "VSE/ESA™" on page xvii.

Thorough testing of the revised software environment must be completed before full-scale data migration is implemented and the 3494 is brought online.

Host library control and tape management software require certain migration activities. These processes vary in kind and magnitude, depending on the specific operating environment, and include the following tasks:

- Reconciling the Library Manager's inventory with the host software inventory
- Pre-defining the handling of inserted volumes
- Customizing usage options and exits provided by the software

For example, software migration in an MVS, OS/390, or z/OS environment with SMS includes the following tasks:

1. Define the I/O configuration to the system by using the Hardware Configuration Definition (HCD) dialog.

2. Allocate the control data sets, by using access methods services (AMS), to contain the Storage Management Subsystem (SMS) configuration.
3. Define the tape configuration database by using AMS.
4. Define the 3494 by using the ISMF library management application. If B16, B18, B10, or B20 VTSs are installed, more than one library is defined.
5. Define tape storage groups by using the ISMF storage group application.
6. Modify and test the installation of data class, storage class, and storage group ACS routines to select tape storage groups for data sets that must reside in the 3494.
7. Define the data class for media type and IDRC requirements.
8. Write the cartridge entry by changing the use attribute and cartridge eject installation exits as part of the initial bring-up process.
9. Activate the SMS configuration containing the library definition.
10. Activate the Object Access Method (OAM) address space. If the 3494 drives are not online at IPL, then activate the I/O configuration.
11. Run a job stream that uses 3494 resident volumes.

For the tape drives inside a 3494 to be recognized by the host, the library and the tape drives must not be busy and its associated tape subsystems must be powered on. The library must be in the Online state when the host is in IPL status or I/O activation is performed. If a subsystem in a library was not recognized, I/O activation must be performed when it is subsequently powered on or not busy.

Migrating Data

Data migration in a tape environment is the process of moving volumes (data cartridges) from a non-automated tape environment to a 3494 environment.

The following section, although specific for DFSMS/MVS, describes the techniques for implementing a general migration strategy.

Analyzing the Library Composition

Most tape libraries consist of common categories of tapes that are defined by the characteristics of how they are used. Determining the common categories is the first step in developing a migration strategy.

Each category is unique because of special criteria applied to its use and handling in a data-processing environment. The criteria can include life-cycle, security requirements, special handling, or various application dependencies.

See the *IBM 3490 Planning and Migration Guide* or the *IBM TotalStorage 3590 Enterprise Tape System Introduction and Planning Guide* for details.

Coexistence

The 3494 can coexist with automated and non-automated tape libraries installed in the same host environment if the host system software to support the libraries is installed and operational.

Migration Approaches

Consider how to introduce your current tape processing to the new environment. You can either start processing with all scratch tapes or you can introduce some or all of your current tape volumes into the library and continue with your most current tapes.

Creating New Volumes in the 3494

Data migration can be achieved by processing existing data volumes on non-automated tape drives and populating the library with scratch cartridges:

1. Replace the label on existing scratch volumes (placed in the library) with one of the supported label types.
2. Populate the library with scratch volumes that have bar code volser and media-type labels.
3. Define the new volser range to the tape management system if required.
4. Initiate the cartridge inventory process.
5. Use the automatic class selection (ACS) routines in DFSMS/MVS, OS/390, or z/OS to direct the selected output data sets to the library.

Migration for a VTS Subsystem

If your 3494 has a VTS subsystem, only the scratch tape processing option is available for the volumes managed by the subsystem. This procedure also assumes the library that contains the VTS subsystem has been already defined. The following steps must be performed to set up the VTS subsystem for use:

1. Define the new volser range for the logical volumes that the VTS subsystem manages. If required, also add the volser range to the tape management system.
2. Define the new volser range of the 3590 cartridge tapes that the VTS subsystem manages.
3. Add the defined logical and 3590 cartridge tape ranges to the Library Manager inventory from a panel on the Library Manager console. The logical volumes are added to the inventory database and also uploaded to the host systems. The 3590 cartridge tape range does not add inventory records at this point. It only provides a range that the Library Manager checks when cartridges are added to the library. Any 3590 cartridge tape whose volser falls within the range when added to the library is added to the Library Manager's inventory as a stacked volume and is not reported to the host systems.
4. Add 3590 cartridge tape to the library with any volser that falls within the defined range.
5. Use the automatic class selection (ACS) routines in DFSMS/MVS, OS/390, or z/OS to direct the selected new output data sets to the 3494 that contains a VTS subsystem.

B18, B10, or B20 VTS to Peer-to-Peer Configuration

Installed B18, B10, and B20 VTSs can be upgraded with Peer-to-Peer Copy features and included with the AX0s in a PtP VTS configuration. When an existing VTS is made part of a PtP VTS, the Hardware I/O Configuration Definition (HCD) for the virtual tape drives may need to be modified so that independent 16-drive subsystems are configured. You can find information about the SMF Define Panels to describe the composite and distributed libraries in *z/OS Version 1 Release 1: Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*.

Contact your service representative for information found on the TECHDOC Web site regarding the processes for upgrading an existing VTS for a PtP VTS configuration.

Moving Existing Tape Volumes to the 3494

Data migration can be achieved by selecting a set of tape volumes with active data and moving the selected volumes into a 3494. Also, a set of scratch volumes should be moved into a 3494 to allow creation of new data in the library.

Migration of existing data to a 3494 includes the following tasks:

1. Select the volumes to be moved.

   The volumes to be moved into the library are chosen by using selected criteria (that is, all the volumes used by particular applications, such as DFSMShsm or all the volumes produced by a particular application).
2. Replace external labels with bar code labels for cartridges going into a 3494.

   Because the selected volumes are distributed throughout the existing non-automated library, volumes to be moved must be relabeled with one of the supported label types when they are moved. Supported bar code labels must be available for the entire range of volume serial numbers residing in the 3494. To save time, label the tape cartridges before the library is installed.

   Note: For DFSMS/MVS, OS/390, or z/OS, the internal labels of private and scratch volumes must match their external labels. For scratch volumes, the internal label is written when the volume is first opened for output.
3. Load the library with scratch cartridges, appropriately labeled, and start the inventory process. See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide* for details.
4. Change the ACS routines.

   In a DFSMS/MVS, OS/390, or z/OS environment, the ACS routines must be coded to direct selected output data sets to a 3494.

Verifying that the Data Migrated

Application programming personnel may need to perform several tasks when transferring data to the subsystem. Ensuring that the data is correctly transferred is the highest priority in the overall migration.

Application personnel may need to participate in some of the following activities:

1. Set up the data test plan so project control personnel can monitor the migration.
2. Process the test jobs with subsets of production jobs.
3. Verify the results with the actual production run of the same application.

A migration strategy may include a consideration of multiple recording formats and a choice of cartridge system tapes. See the *IBM 3490 Planning and Migration Guide* or the *IBM TotalStorage 3590 Enterprise Tape System Introduction and Planning Guide* for details about the following:

- Improved Data Recording Capability (IDRC)
- 18-track, 36-track, 128-track tapes, and 256-track tapes
- Standard Cartridge System Tape, Enhanced Capacity Cartridge System Tape, High Performance Cartridge Tape, and Extended High Performance Cartridge Tape

Chapter 6. Physical Planning and Specifications

The following section includes the cooling, power, environmental requirements, and the physical dimensions of the 3494 frames.

Cooling Requirements

The 3494 requires ambient room temperatures that are consistent with the environmental specifications. See “Environmental Specifications” on page 133 for additional information. The specifications starting with “L10, L12, and L14 Frames Specifications” on page 140 give the heat load for each frame in the library. The total heat load is the sum of all frames in the subsystem.

Power Requirements

The L1x Frame and the D1x Frames can contain either single- or multiple-drive tape subsystems. Table 44 on page 134 gives specifications for subsystems to be added to the library frame specification values, which start at “L10, L12, and L14 Frames Specifications” on page 140.

The library frames (except the S10 Frame) include power cables that connect to a user-supplied outlet.

B10 and B20 VTSs contain two primary control compartments. Each compartment has its own power cable. This allows connection of the frame to two power sources. Many B18s also have this capability. Field installation of FC 4010 (Peer-to-Peer Copy Base) on a B18 VTS may have only one primary control compartment and one power cable.

Note: A B18, B10, or B20 VTS that is connected to two power sources will continue operation from only one source when the HA1 Frames are included in the library.

The frame power supplies operate from a nominal 200 to 240 V single-phase 30-amp ac service at 50 or 60 Hz. The minimum voltage input is 180 V ac RMS; the maximum voltage input is 259 V ac RMS.

The ac power for the tape subsystems contained in the L1x Frame and D1x Frames is provided by the ac power distribution compartment located in the individual frame.

The Library Managers, located in the L1x Frame or in the right service bay, receive ac power from the ac distribution box in the L1x Frame. The VTS controller and its associated disk storage drawers located in the VTS receive ac power from the ac distribution box.

FC 2710 (Remote Support Facility), FC 2711 (Remote Support Switch), FC 2713 (Master Console for Service), and FC 2714 (Console Expansion) have the power requirements shown in Table 41 on page 132.

Table 41. Power Requirements for FC 2710, 2711, 2713, and 2714

Feature Code	Description	Input Voltage[1]	Hertz	Power Usage (watts)	Dimensions (H x W x D)
2710	Remote Support Facility	90 V ac - 130 V ac or 230 V ac	50 or 60 Hz	16 w	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
2711	Remote Support Switch	115 V ac or 230 V ac	50 or 60 Hz	5 w	51 mm x 436 mm x 173 mm (2 in. x 17.15 in. x 6.8 in.)
2713	Master Console Service PC	Minimum 110 V ac Maximum 265 V ac	Minimum 47 Hz Maximum 63 Hz	Minimum 80 w Maximum 300 w	140 mm x 425 mm x 425 mm (5.5 in. x 16.7 in. x 16.7 in.)
	Monitor	Minimum 100 V ac Maximum 240 V ac	Minimum 50 Hz Maximum 60 Hz	Minimum 15 w Maximum 70 w	432 mm x 420 mm x 420 mm (17 in. x 16.5 in. x 16.5 in)
	LAN Hub	Minimum 100 V ac Maximum 240 V ac	Minimum 50 Hz Maximum 60 Hz	Minimum 50 w Maximum 120 w	43 mm x 330 mm x 127 mm (2 in. x 13 in. x 8 in.)
	Modem	90 V ac - 130 V ac or 230 V ac	50 or 60 Hz	16 w	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
	Modem	90 V ac - 130 V ac or 230 V ac	50 or 60 Hz	16 w	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
2714	LAN Hub	Minimum 100 V ac Maximum 240 V ac	Minimum 50 Hz Maximum 60 Hz	Minimum 50 w Maximum 120 w	43 mm x 330 mm x 127 mm (2 in. x 13 in. x 8 in.)

Notes:

1. Internal voltage must be supplied by a customer-provided external outlet.

When service of the AX0s is likely to be performed using the IBM mobile service terminal (MoST), a customer-provided external outlet of country-specific voltage (100–240 V ac) is required at the cable exit area of the CX0 that houses the AX0s. The MoST uses approximately 150 watts of power.

Acoustic Specifications

The 3494 is classified as a Category 1 product as defined in IBM Corporate Specification 1710-006. Table 42 shows the acoustic specifications for the 3494.

Table 42. Acoustic Specifications

L_{WAd}		$<L_{pA}>_m$	
Operating (bels)	Idling (bels)	Operating (dB)	Idling (dB)
6.8	6.5	48	47
Note: For definitions of levels, see the *IBM General Information Manual: Installation Manual–Physical Planning* for details.			

Environmental Specifications

The temperature and humidity ranges for the 3494 vary according to environmental conditions.

The environments shown in Table 43 apply to the components of the 3494 (not to the tape and cartridges). For specifications on the environmental limits of the media, see the following:

- *Tape and Cartridge Requirements for the IBM Magnetic Tape Cartridge Drives*
- *Tape and Cartridge Requirements for the IBM Enhanced Capability Magnetic Tape Cartridge Drives*

Table 43. Environmental Specifications

Condition	Temperature	Relative Humidity	Maximum Wet Bulb
Operating (not CX0, B18, B10, or B20 VTS)	10°C to 38°C (50°F to 100.4°F)	20% to 80%	23°C (73.4°F)
Operating (only CX0, B18, B10, or B20 VTS)	10°C to 32°C (50°F to 89.6°F)	20% to 80%	23°C (73.4°F)
Non-operating	10°C to 52°C (50°F to 125.6°F)	8% to 80%	27°C (80°F)
Storage	1°C to 60°C (34°F to 140°F)	5% to 80%	29°C (84°F)
Shipping	-40°C to 60°C (-40°F to 140°F)	5% to 100% (excluding precipitation)	29°C (84°F)

Cabling Information

All of the cables for each of the following features are included as part of the feature:

- FC 5216 (Remote Power Sequence for AS/400)
- FC 5211 (AS/400 Host Attachment) and FC 5213 (Extended Length RS-232 Host Attachment)
- FC 5212 (RS/6000 Host Attachment)

See Chapter 2, "Specify and Special Features", on page 53 for additional information on the 3494 features. For additional host system cable attachment information, see "ESCON Cabling for 3494 VTS" on page 50.

Specifications Reference

For each tape drive or controller mounted in a frame, add the values shown in Table 44 (for 3490E models) or Table 45 (for 3590 models).

Table 44. 3490E Specifications Reference

3490E Model	Weight: kg (lb)	Heat Output: kw (kBtu/hr)	Air Flow: m^3/min (cfm)	Power: kV·A Maximum
C1A	96.4 (212)	0.7 (2.38)	6.2 (210)	0.7
C2A	106 (234)	0.7 (2.38)	9.9 (350)	0.7
F1A	27.2 (60)	0.3 (1.02)	0.9 (30)	0.48
F1A with FC 3000 or FC 3500	20 (44) (maximum)	0.21 (0.7)	–	0.25

Table 45. 3590 Specifications Reference

3590 Model	Weight: kg (lb)	Heat Output: kw (kBtu/hr)	Air Flow: m^3/min (cfm)	Power: kV·A Maximum
B1A	28.6 (58)	0.3 (1.02)	1.3 (45)	0.3
E1A	30 (66)	0.225 (0.77)	3.4 (120)	0.225
H1A	30 (66)	0.225 (0.77)	3.4 (120)	0.225
A00	28.3 (52)	0.3 (1.02)	–	0.3
A50	18 (40)	0.25 (0.8)	–	0.4
A60	75 (165)	0.5 (1.7)	1.4 (49)	0.75

3494 Subsystem

Figure 16 shows the plan view of a representative 3494 configuration with the optional D1xs and S10 Frames. Table 46 on page 136 shows the total length for dual accessor libraries of up to 18 frames, including the required service clearance at both ends of the library. This is the distance A in Figure 16. Table 47 on page 137 shows the total length for single accessor (non-HA1 Frames) libraries of up to 16 frames, including the required service clearance at both ends of the library and the EPO switch end panel, which is required for single accessor libraries with a length of nine frames or more. Figure 17 on page 138 shows a representative 3494 configuration with the HA1 Frames installed.

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.

Note: See "Operator and Service Clearances" on page 113 and Appendix B, "Physical Planning Template", on page 167 when planning the layout of your 3494 subsystem.

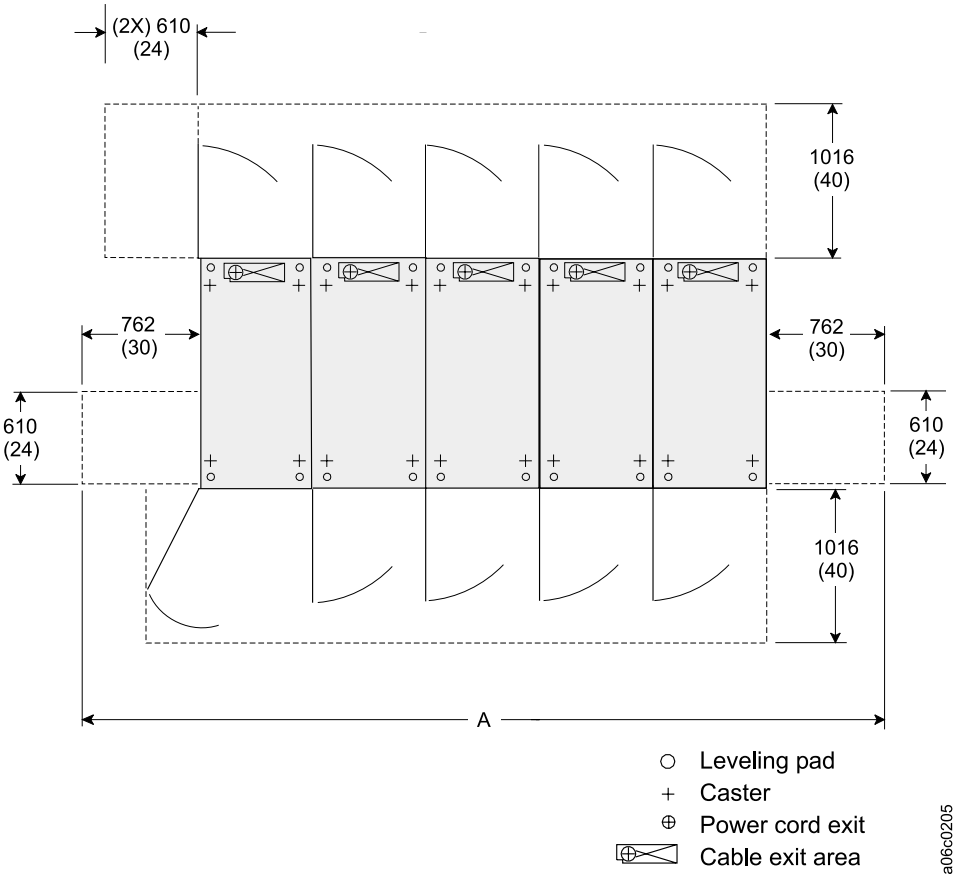


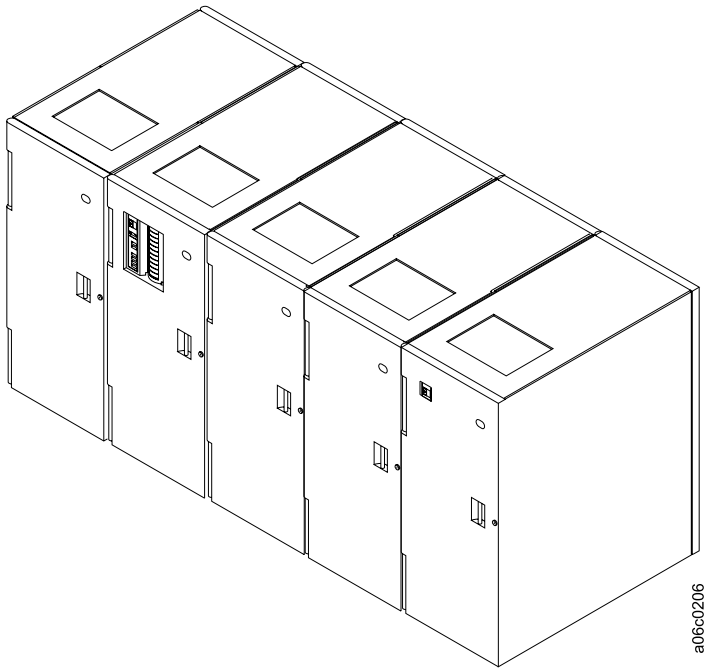
Figure 16. 3494 Plan View with Clearance Requirements

Table 46. Total Required Length for 3494 with Dual Accessor

Number of Frames	Length A (mm)	Length A (in.)
1	2249	88.5
2	3004	118.3
3	3759	148.0
4	4514	177.7
5	5269	207.4
6	6024	237.2
7	6779	266.9
8	7534	296.6
9	8289	326.3
10	9044	356.1
11	9799	385.8
12	10554	415.5
13	11309	445.2
14	12064	475.0
15	12819	504.7
16	13574	534.4
17	14329	564.1
18	15084	593.9

Table 47. Total Required Length for 3494 with Single Accessor

Number of Frames	Length A (mm)	Length A (in.)
1	2249	88.5
2	3004	118.3
3	3759	148.0
4	4514	177.7
5	5269	207.4
6	6024	237.2
7	6779	266.9
8	7534	296.6
9	8375	330.1
10	9130	359.9
11	9885	389.6
12	10640	419.3
13	11395	449.0
14	12150	478.8
15	12905	508.5
16	13660	538.2



Service Bays Attached

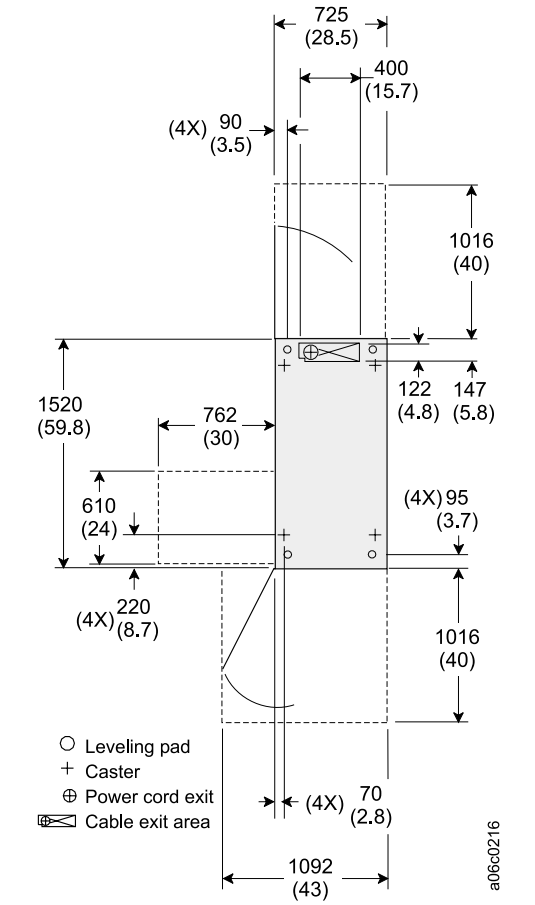
Figure 17. 3494 with HA1 Frames

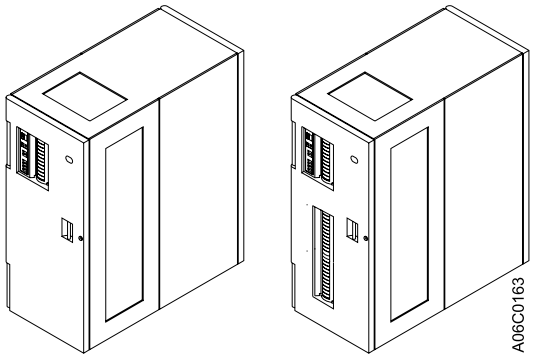
Tape Library Base Frame

L10, L12, or L14 Frames

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





L10, L12, and L14 Frames Specifications

The following specifications are for the L1x Frame only. To calculate total weights, power requirements, and so on, you must add the equivalent values for each tape subsystem mounted in the frame. The illustrations to the left show the two configurations of the convenience I/O stations.

Dimensions:

	Front[6]	Side[7]	Height
mm	725	1520	1800
(in.)	(28.5)	(59.8)	(70.9)

Operator/Service Clearances:

	Front	Rear[1]	Side[2]
mm	1092 x 1016	750 x 1016	762 x 610
(in.)	(43 x 40)	(29.5 x 40)	(30 x 24)

Weight without Drives and Controllers:[3]

kg	444 (see Table 44 on page 134)
(lb)	(999)

Heat Output:

kw	0.3 (see Table 44 on page 134)
(kBtu/hr)	(1.0)

Air Flow: (see Table 44 on page 134)

Power Requirements:

kV·A	0.3 (add values from Table 44 on page 134)
Phases	1

Frame Power Attachments:[4, 5]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

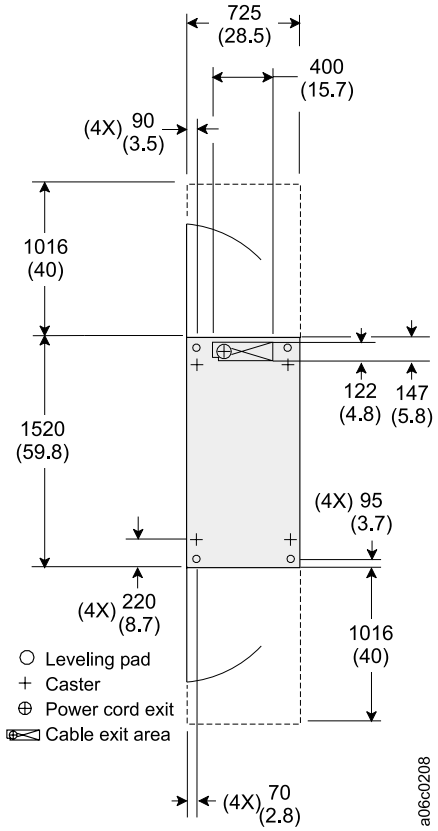
1. L1x Frames using 3590 drives require left and right rear service clearances of 610 mm x 1016 mm (24 in. x 40 in.). Left and right rear service clearances may overlap when frames are placed side by side.
2. Only a left-side service clearance is required.
3. With 210 cartridges, add 50 kg (110 lb). Each cartridge weighs 0.24 kg (0.52 lb).
4. The appropriate power cable is attached at the factory based on the order destination country code.
5. Chicago, Illinois, U.S.A. requires FC 9986.
6. This is frame width only. Additional interframe spacing of 30 mm (1.2 in.) is required.
7. Dimension includes front and rear doors.

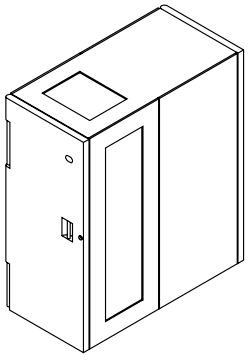
Tape Drive Expansion Frame

D10, D12, or D14 Frames (see notes 6 and 9)

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





D10, D12, and D14 Frames Specifications

The following specifications are for D1x Frames only. To calculate total weights, power requirements, and so on, you must add the equivalent values for each tape subsystem mounted in the frame.

Dimensions:

	Front[7]	Side[8]	Height
mm	725	1520	1800
(in.)	(28.5)	(59.8)	(70.9)

Operator/Service Clearances:

	Front	Rear[1]	Side[2]
mm	750 x 1016	750 x 1016	762 x 610
(in.)	(29.5 x 40)	(29.5 x 40)	(30 x 24)

Weight without Drives and Controllers:[3]

kg	320 (add values from Table 44 on page 134)
(lb)	(704)

Heat Output:

kw	0.1 (add values from Table 44 on page 134)
(kBtu / hr)	(0.34)

Air Flow: (see Table 44 on page 134)

Power Requirements:

kV·A	0.1 (add values from Table 44 on page 134)
Phases	1

Frame Power Attachments:[4, 5]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

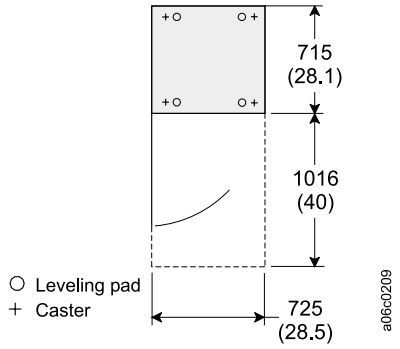
1. D1x Frames using 3590 tape drives require left and right rear service clearances of 610 mm x 1016 mm (24 in. x 40 in.). Left and right rear service clearances may overlap when frames are placed side by side.
2. No side service clearance is required unless the subsystem consists of three or more frames. In this case, a right-side service clearance of 762 mm x 610 mm (30 in. x 24 in.) is required.
3. With 300 cartridges, add 72 kg (159 lb). Each cartridge weighs 0.24 kg (0.52 lb).
4. The appropriate power cable is attached at the factory based on the order destination country code.
5. Chicago, Illinois, U.S.A. requires FC 9986.
6. FC 5300, 5302, and 5304 are similar to D10, D12, and D14 Frames.
7. This is frame width only. Additional interframe spacing of 30 mm (1.2 in.) is required.
8. Dimension includes front and rear doors.
9. FC 5500 and 5502 are similar to the D12 Frame.

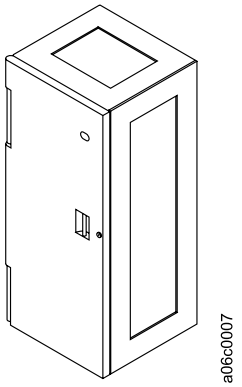
Tape Storage Frame

S10 Frame (see note 4)

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





S10 Frame Specifications

Dimensions:

	Front[5]	Side[6]	Height
mm	725	715	1800
(in.)	(28.5)	(28.1)	(70.9)

Operator/Service Clearances:

	Front	Rear[1]	Side[2]
mm	750 x 1016	–	762 x 610
(in.)	(29.5 x 40)	–	(30 x 24)

Weight:[3]

kg	281
(lb)	(618)

Heat Output: None

Air Flow: None

Power Requirements: None

Notes:

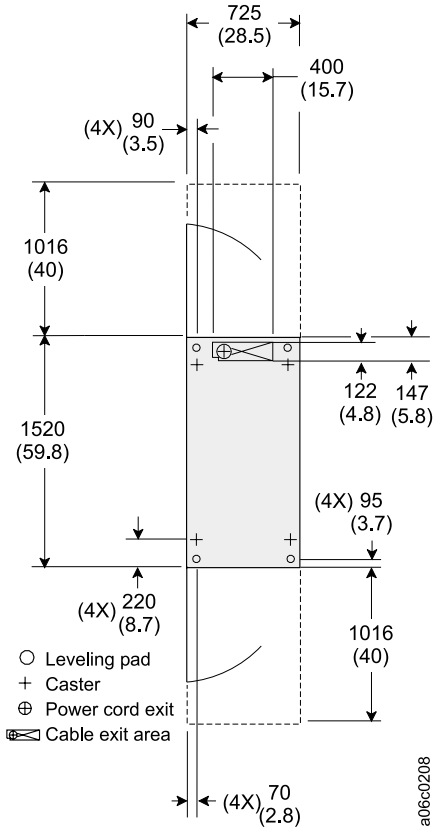
1. No rear service clearance is required.
2. No side service clearance is required unless the subsystem consists of three or more frames. In this case, a right-side service clearance of 762 x 610 mm (30 in. x 24 in.) is required.
3. With cartridges, add 95 kg (210 lb). Each cartridge weighs 0.24 kg (0.52 lb).
4. FC 5400 is similar to the S10 Frame.
5. This is frame width only. Additional interframe spacing of 30 mm (1.2 in.) is required.
6. Dimension includes front door and rear cover.

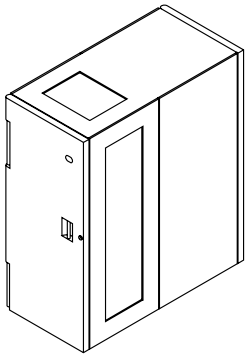
Virtual Tape Server

B16 VTS

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





B16 Virtual Tape Server Specifications

Dimensions:

	Front[5]	Side[6]	Height
mm	725	1520	1800
(in.)	(28.5)	(59.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side[1]
mm	750 x 1016	750 x 1016	762 x 610
(in.)	(29.5 x 40)	(29.5 x 40)	(30 x 24)

Weight:[2]

	Disk storage capacity features	
	2	4
kg	450	524
(lb)	(990)	(1150)

Heat Output:

	Disk storage capacity features	
	2	4
kw	1.95	3.03
(kBtu / hr)	(6.55)	(10.17)

Power Requirements:

	Disk storage capacity features	
	2	4
kV·A	2.16	3.45
Phases	1	1

Frame Power Attachments:[3, 4]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

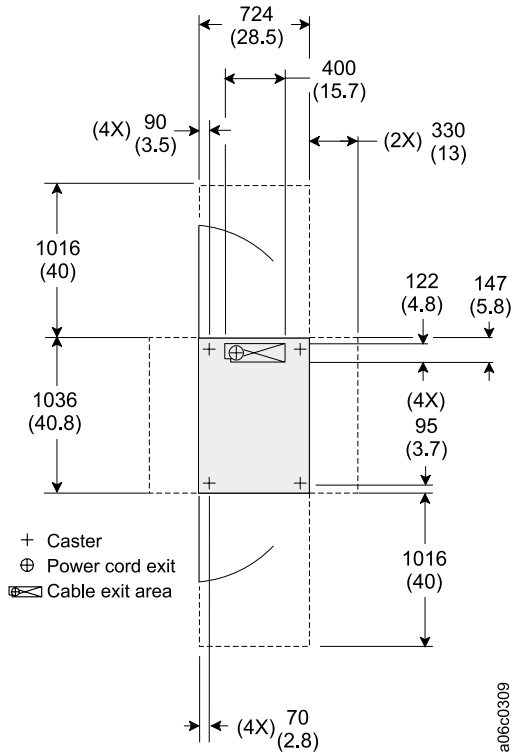
1. No side service clearance is required unless the subsystem consists of three or more frames. In this case, a right-side service clearance of 762 mm x 610 mm (30 in. x 24 in.) is required.
2. With 400 cartridges, add 95 kg (210 lb). Each cartridge weighs 0.24 kg (0.52 lb).
3. The appropriate power cable is attached at the factory based on the order destination country code.
4. Chicago, Illinois, U.S.A. requires FC 9986.
5. This is frame width only. Additional interframe spacing of 30 mm (1.2 in.) is required.
6. Dimension includes front and rear doors.

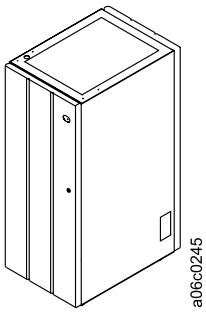
Virtual Tape Server (Stand-Alone)

B18 VTS

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





B18 Virtual Tape Server Specifications

Dimensions:

	Front	Side[2]	Height
mm	724	1036	1800
(in.)	(28.5)	(40.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side[1]
mm	750 x 1016	750 x 1016	330 x 1036
(in.)	(29.5 x 40)	(29.5 x 40)	(13 x 40.8)

Weight (maximum):

kg	650
(lb)	(1430)

Heat Output (maximum):

kw	2.43
(kBtu / hr)	(8.29)

Power Requirements (maximum):

kV·A	2.7
Phases	1

Frame Power Attachments:[3, 4, 5, 6]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO

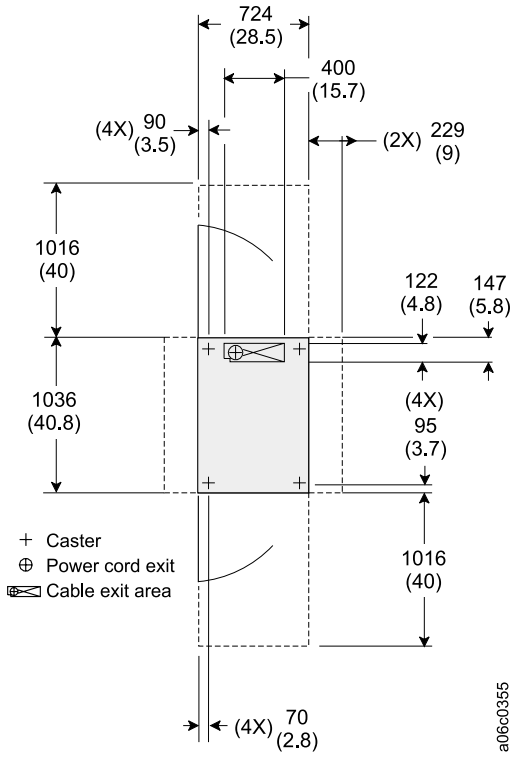
Notes:

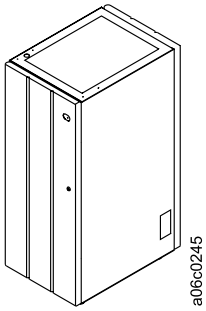
1. Clearance on each side is required for weight distribution to meet the IBM-recommended floor loading of 341 kg / m^2 (70 lb / ft^2). These areas may not overlap.
2. Dimension includes front and rear doors.
3. The appropriate power cable is attached at the factory based on the order destination country code.
4. Chicago, Illinois, U.S.A. requires FC 9986.
5. B18 VTSs shipped from the factory with two primary control compartments and two power cables allow connection to two power sources.
6. B18 VTSs with FC 4010 (Peer-to-Peer Copy Base) are shipped from the factory with two power cables; however, field installation of FC 4010 does not provide two power cables.

B10 Virtual Tape Server

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





B10 Virtual Tape Server Specifications

Dimensions:

	Front	Side[2]	Height
mm	724	1036	1800
(in.)	(28.5)	(40.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side[1]
mm	750 x 1016	750 x 1016	229 x 1036
(in.)	(29.5 x 40)	(29.5 x 40)	(9 x 40.8)

Weight (maximum):

kg	540
(lb)	(1188)

Heat Output (maximum):

kw	1.8
(kBtu / hr)	(6.2)

Power Requirements (maximum):

kV·A	2.0
Phases	1

Frame Power Attachments:[3, 4, 5]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

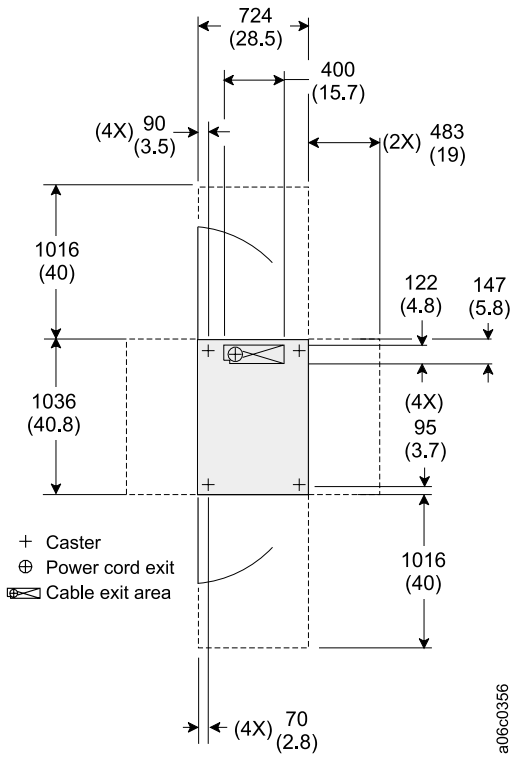
Notes:

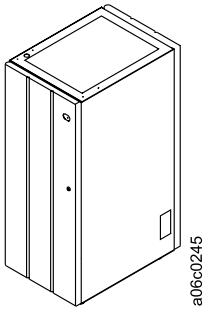
1. Clearance on each side is required for weight distribution to meet the IBM-recommended floor loading of 341 kg / m^2 (70 lb / ft^2). These areas may not overlap.
2. Dimension includes front and rear doors.
3. The appropriate power cable is attached at the factory based on the order destination country code.
4. Chicago, Illinois, U.S.A. requires FC 9986.
5. The B10 VTS has two primary control compartments and two power cables to allow connection to two power sources.

B20 Virtual Tape Server

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.





B20 Virtual Tape Server Specifications

Dimensions:

	Front	Side[2]	Height
mm	724	1036	1800
(in.)	(28.5)	(40.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side[1]
mm	750 x 1016	750 x 1016	483 x 1036
(in.)	(29.5 x 40)	(29.5 x 40)	(19 x 40.8)

Weight (maximum):

kg	757
(lb)	(1668)

Heat Output (maximum):

kw	3.6
(kBtu / hr)	(12.4)

Power Requirements (maximum):

kV·A	4.0
Phases	1

Frame Power Attachments:[3, 4, 5]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

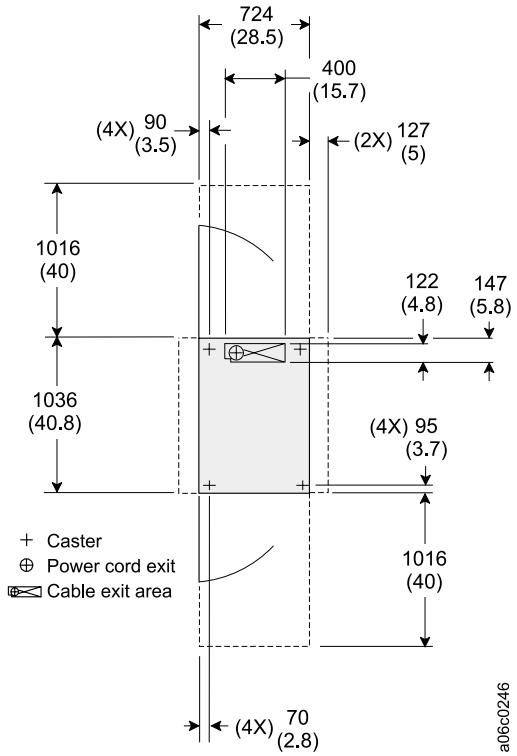
1. Clearance on each side is required for weight distribution to meet the IBM-recommended floor loading of 341 kg / m^2 (70 lb / ft^2). These areas may not overlap.
2. Dimension includes front and rear doors.
3. The appropriate power cable is attached at the factory based on the order destination country code.
4. Chicago, Illinois, U.S.A. requires FC 9986.
5. The B20 VTS has two primary control compartments and two power cables to allow connection to two power sources.

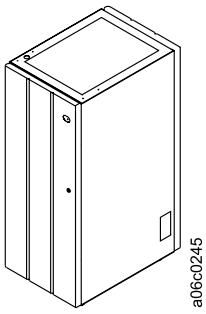
Virtual Tape Frame (Stand-Alone)

CX0

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are in parentheses.





CX0 Specifications

Dimensions:

	Front	Side[2]	Height
mm	724	1036	1800
(in.)	(28.5)	(40.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side[1]
mm	750 x 1016	750 x 1016	127 x 1036
(in.)	(29.5 x 40)	(29.5 x 40)	(5 x 40.8)

Weight:

	Model AX0s installed	
	2	4
kg	400	450
(lb)	(880)	(990)

Heat Output:

	Model AX0s installed	
	2	4
kw	0.36	0.72
(kBtu / hr)	(1.23)	(2.46)

Power Requirements:

	Model AX0s installed	
	2	4
kV·A	0.4	0.8
Phases	1	1

Frame Power Attachments:[3, 4, 5]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

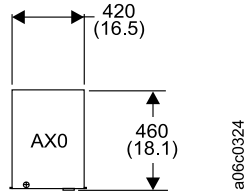
1. Clearance on each side is required for weight distribution to meet the IBM-recommended floor loading of 341 kg / m^2 (70 lb / ft^2). These areas may not overlap.
2. Dimension includes front and rear doors.
3. The appropriate power cables are attached at the factory based on the order destination country code.
4. Chicago, Illinois, U.S.A. requires FC 9986.
5. The CX0 has two primary control compartments and two power cables to allow connection to two power sources.

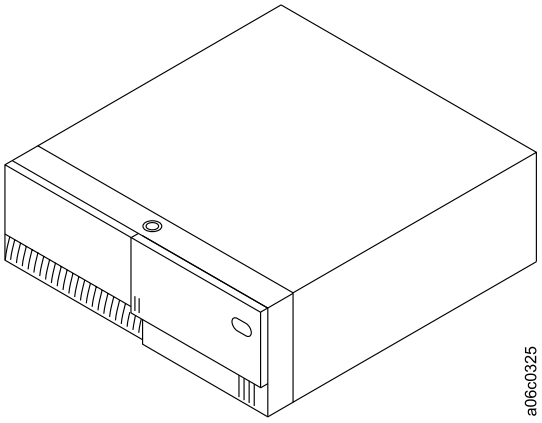
Virtual Tape Controller

AX0

Plan View (Figure is not to scale)

English measurements are in parentheses.





AX0 Specifications

Dimensions:

	Front	Side	Height
mm	420	460	165
(in.)	(16.5)	(18.1)	(6.5)

Operator/Service Clearances:

See the CX0 specifications in “Virtual Tape Frame (Stand-Alone)” on page 153 for clearances.

Weight:

kg	25
(lb)	(55)

Heat Output:

kw	0.18
(kBtu / hr)	(0.61)

Power Requirements:

kV·A	0.2
Phases	1

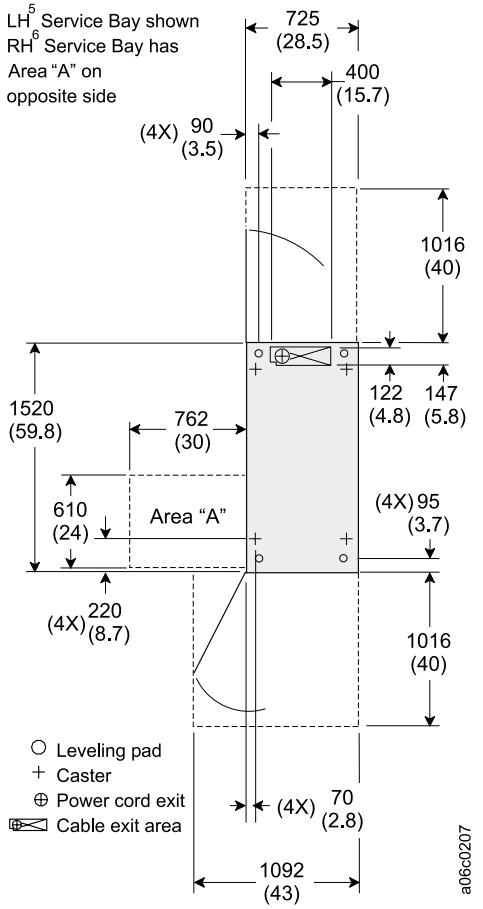
Note: The appropriate power cable to obtain power from the primary control compartment of the CX0 is attached at the factory based on the order designation country code, except for FC 9986, 6 foot Chicago Power cord.

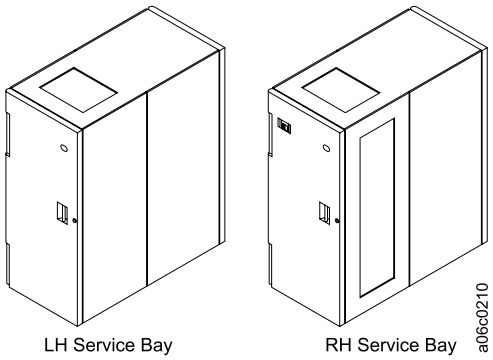
High Availability Frames

HA1 Frames

Plan View (Metric Scale: 10 mm = 0.5 m)

English measurements are shown in parentheses.


LH[5] Service Bay shown
RH[6] Service Bay has
Area “A” on
opposite side
725
(28.5)
400
(15.7)
(4X) 90
(3.5)
1016
(40)
1520
(59.8)
762
(30)
122
(4.8)
147
(5.8)
610
(24)
Area “A”
(4X) 95
(3.7)
(4X) 220
(8.7)
1016
(40)
Leveling pad
Caster
Power cord exit
Cable exit area
(4X) 70
(2.8)
1092
(43)
a06c0207


LH Service Bay
RH Service Bay
a06c0210

HA1 Frames Specifications

Dimensions:

	Front[3]	Side[4]	Height
mm	725	1520	1800
(in.)	(28.5)	(59.8)	(70.9)

Operator/Service Clearances:

	Front	Rear	Side
mm	1092 x 1016	750 x 1016	762 x 610
(in.)	(43 x 40)	(29.5 x 40)	(30 x 24)

Weight:

	Left[5]	Right[6]
kg	366	484
(lb)	(805)	(1065)

Heat Output:

	Left	Right
kw	0.1	0.3
(kBtu / hr)	(0.3)	(1.0)

Air Flow:

	Left	Right
m^3 / min	—	1.5
(cfm)	—	(55)

Power Requirements:

	Left	Right
kV·A	0.1	0.3
Phases	1	1

Frame Power Attachments:[1, 2]

Plug Type (U.S. default)	R&S 3750DP
Receptacle Type (U.S. default)	R&S 9R33UOW or 3753
Inline Connector (U.S. default)	R&S 9C33UO or 3933

Notes:

1. The appropriate power cable is attached at the factory based on the order destination country code.
2. Chicago, Illinois, U.S.A. requires FC 9986.
3. This is frame width only. Additional interframe spacing of 30 mm (1.2 in.) is required.
4. Dimension includes front and rear doors.
5. Service bay is attached to the left end of the 3494.
6. Service bay is attached to the right end of the 3494.

Appendix A. Cartridge System Tape and Cartridge Labels

The 3494 automates the storage and movement of the IBM Cartridge System Tape or its American National Standards Institute (ANSI) or world trade equivalent. The 3494 supports the following data cartridges:

- Cartridge System Tape (only with the 3490E tape subsystem)
- Enhanced Capacity Cartridge System Tape (only with the 3490E tape subsystem)
- High Performance Cartridge Tape (only with the 3590 tape subsystem)
- Extended High Performance Cartridge Tape (only with the 3590 tape subsystem)

All tape cartridges in the library should have an external label that is operator-readable and machine-readable. The label identifies the volume serial number (volser) of the cartridge and identifies the cartridge to the 3494. All communication with the control program relating to a specific cartridge uses the volser that is read from the external label. Also, for the 3494, a separate, single-character external media-type label identifies the cartridge as standard Cartridge System Tape, Enhanced Capacity Cartridge System Tape, High Performance Cartridge Tape, or Extended High Performance Cartridge Tape.

The number **1** on the media-type label identifies the standard Cartridge System Tape. The letter **E** on the media-type label identifies the Enhanced Capacity Cartridge System Tape. The letter **J** on the media-type label identifies the High Performance Cartridge Tape. The letter **K** on the media-type label identifies the Extended High Performance Cartridge Tape.

In the absence of the media-type label, the cartridge is assumed to be the default media type. This function causes all library cartridges without the media-type labels to have their media type set to the default value. Take care not to insert cartridges without a media-type label into the library unless they are of the same type as the default value. The unlabeled tape facility can be used to insert cartridges with media-type labels that do not match the default media type. See “Unlabeled Tape Facility” on page 31 for additional information.

The volser ranges are used to determine a volser media type when it is inserted into the library. When a range is added or modified, the system automatically combines overlapping ranges with the same media type and checks for range conflicts.

When a volser range changes, the media types for existing volumes in the library do not change. Volumes that are inserted subsequently reflect the new set of ranges and associated media types.

The volser media type is determined according to the following rules:

- The media type returned by the vision system is the first choice unless **J** or **K** is present.
- If the media type is **J** or **K** and there are multiple partitions, the volser ranges are checked to determine whether to assign the volser to a VTS or a non-VTS partition.

- The volser ranges are used to determine a volser media type if the vision system can not determine it. If the volser being inserted appears within one of the ranges, the range's associated media type is used. The search of the ranges is an inclusive search.
- The system uses the default media type defined during the teach process to determine the media type if the volser does not fall into one of the ranges.
- If there is no default media type, the volser is ejected, and an operator intervention is set.

Unlabeled tape cartridges can be used in a library, but they must be carefully controlled. See "Unlabeled Tape Facility" on page 31 for additional information.

Cleaning cartridges must also have operator-readable and machine-readable external labels that uniquely identify the volume and media type. See "Cartridge Labels" on page 163 for a description of the labeling requirements.

Cartridge System Tape

The Cartridge System Tape cartridge, shown in Figure 18 on page 161, contains the magnetic tape for the tape subsystems. The cartridge is closed by a leader block **1** (attached to the end of the tape) to protect the tape from contamination when the cartridge is out of the tape drive. When the cartridge is inserted in a tape drive, the threading mechanism uses the leader block to pull the tape out of the cartridge, across the read/write head, and onto a non-removable machine reel.

Note: Do not attempt to pull the leader block away from the cartridge. You can damage the tape and reduce the reliability of the cartridge.

Each tape cartridge includes a file-protect selector **2** that, when set to the file-protect position, prevents data from being written on or erased from the tape. Place all volumes in the 3494 in non-file-protect mode and use the software file-protect facility for dynamic control.

A tape cartridge can be identified visually by a volume serial number label on the edge of the cartridge **3**. Also, a customer information label **4** can be used on the top of the cartridge.

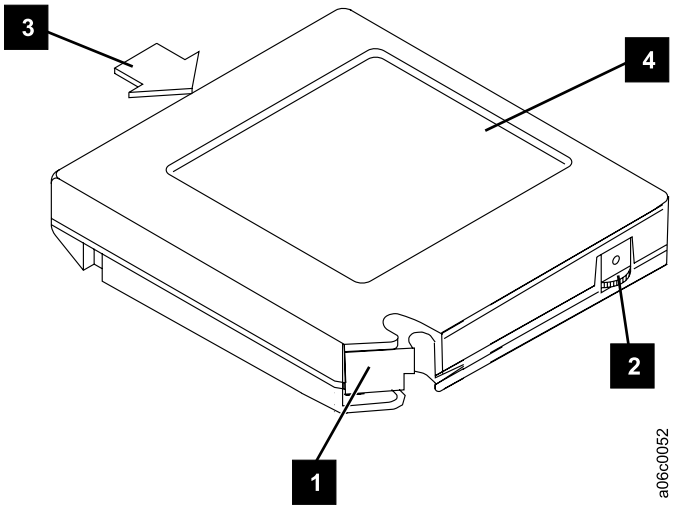


Figure 18. IBM Cartridge System Tape

Identification of Cartridge System Tape Cartridges

The 3494 supports an intermix of standard Cartridge System Tape, Enhanced Capacity Cartridge System Tape, and, with 3590 tape subsystems, High Performance Cartridge Tape and Extended High Performance Cartridge Tape.

In addition to the external labels, the Enhanced Capacity Cartridge System Tape has a unique two-tone case that allows the 3494 operator to identify it. The High Performance Cartridge Tape data cartridge has a black case, a blue leader block, and two blue inserts with identification notches on the edge of the cartridge case. The Extended High Performance Cartridge Tape data cartridge has a black case, a green leader block, and two green inserts with identification notches on the edge of the cartridge case. The 3590 cleaning cartridge has gray inserts with identification notches that are offset from the position of the notches on the data cartridge. See Figure 19 for the location of the identification notches on the 3590 tape subsystem data cartridges and cleaning cartridges.

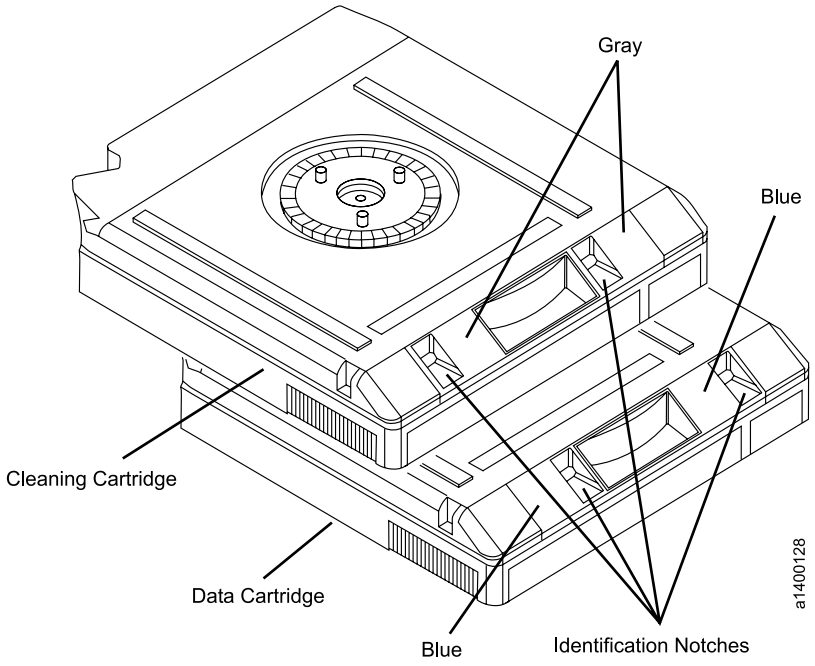


Figure 19. High Performance Cartridge Tape Identification

Note: For the Extended High Performance Cartridge Tape, the data cartridge inserts are green.

The vision system identifies the type of cartridge during an inventory operation by reading the separate, media-type label to distinguish between the various cartridges.

Figure 20 on page 163 shows the standard Cartridge System Tape **1**, the Enhanced Capacity Cartridge System Tape **2**, the High Performance Cartridge Tape **3**, and the Extended High Performance Cartridge Tape **4** cartridges. Note the distinctive case coloring of the cartridges and the placement of the media-type labels.

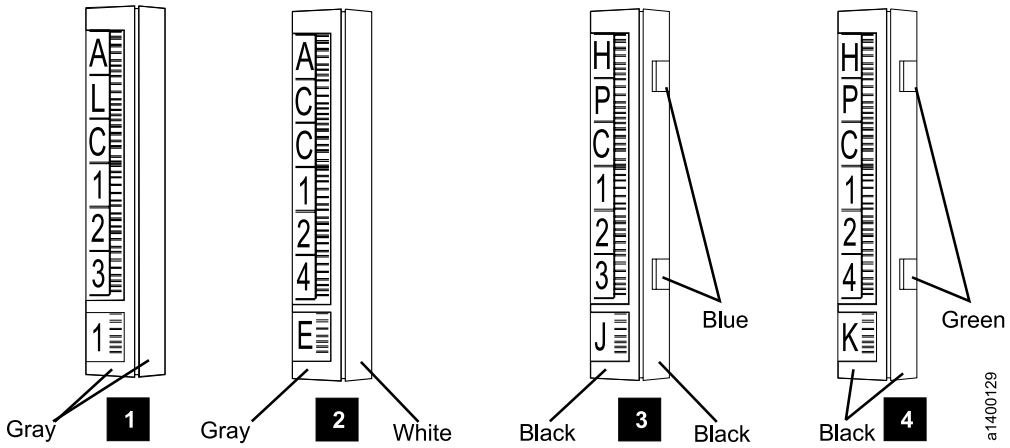


Figure 20. Tape Cartridge Identification

Cartridge Labels

Most operating systems require the volser label to correspond to the internally written label on the volume. The 3494 uses the external volser bar code to identify cartridges in the library during inventory operations.

Currently, the 3494 supports the labels that three U.S.A. label manufacturers supply. Printing your own labels is not recommended. Contact your IBM representative for manufacturers in other countries. The three labels have similar characteristics and can be intermixed in a library. See "Label Manufacturer Information" on page 165 for the addresses of the following label manufacturers:

- Engineered Data Products (EDP) Tri-Optic
- Wright Line Tri-Code
- Information Data Storage

Figure 21 shows a sample label.

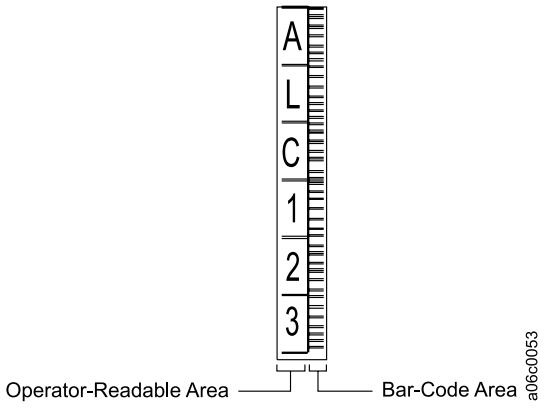


Figure 21. External Volume Serial Number Label

Supported Characters for External Labels

The external bar code label for the 3494 contains up to six characters. The volser can be from one to six characters, with blanks that are padded on the right for a volser with fewer than six characters. Characters can be uppercase A–Z and numerics 0–9.

The separate media-type label that identifies the tape data cartridges uses the following characters:

1 Standard Cartridge System Tape (3480 or 3490)

E Enhanced Capacity Cartridge System Tape (3490E)

J High Performance Cartridge Tape (3590)

K Extended High Performance Cartridge Tape (3590)

Service Volume Labels

Service volumes are shipped with the 3494. Service volumes in the library have a unique volser label that distinguishes them from any other type of volume. The service volumes have the prefix CE followed by a blank, then the number of the service volume. For example, CE 005 is a valid volser for a service volume.

Note: Typically, an embedded blank in a volser label results in the volume being flagged as having an invalid volser. However, a blank in the service volume label ensures that it does not conflict with a customer volume label.

Cleaning Volume Labels

You can order cleaner cartridges that have labels installed from your normal supplier. You can also order cleaner cartridge labels from one of the suppliers in "Label Manufacturer Information" on page 165.

After a 3494 is installed, an inventory operation must be performed before the library is placed in the Online state. Before an inventory operation can start, one or more masks identifying the volsers that are cleaning volumes must be defined from the Library Manager console. The option to define the cleaner masks is presented whenever one of the following selections is made from the Library Manager console:

- The **Cleaner masks** option is selected from the Commands window.
- **Inventory new storage** is selected, and none of the components in the library configuration have been inventoried.
- **Re-inventory complete system** is selected.

A dialog box is displayed on the Library Manager console with ten cleaner mask entry fields. When the masks are presented for the first time, the first mask is set to a default value of CLN***. The other nine masks are set to blanks. The CLN prefix is not required; any valid volser is acceptable. The customer should select a valid volser that the operator can remember easily. The asterisk (*) character can be used in the mask and is interpreted as a wild card (pattern matching) character. When the masks are set, any volser labels that match any of the masks are considered cleaning volumes. See the *IBM TotalStorage Enterprise Automated Tape Library Operator Guide* for details.

Cleaner cartridges are assumed to be 3490E cleaners unless a media-type label indicates a **J**-type cleaner, which the 3590 tape subsystems use.

Note: The 3490E cleaner cartridges can be used only with 3490E tape subsystems. The 3590 cleaner cartridges can be used only with 3590 tape subsystems.

Label Colors

The color of the characters is black on a white, pastel, or bright background.

Label Placement Requirements

The volser label must be placed totally within the label recess on the cartridge. The label must be flat to within 0.5 mm (0.02 in.) over the length of the label. It can have no folds, no missing pieces, no tears, or any extraneous markings. Failure to follow the placement requirements results in degraded label verification reliability.

Optional Label Requirements

Optional customer labels are restricted to the label area on the top surface of the cartridge and must not contain bar codes. Labels must be contained entirely within the label recess and not interfere with the cartridge gripper's ability to engage the front lip of the label recess.

Label Manufacturer Information

For specific information about the labels, contact the appropriate manufacturer or contact your IBM representative for manufacturers in other countries.

Engineered Data Products Corp.
2550 West Midway Blvd.
Broomfield, CO 80020, U.S.A.

Wright Line Inc.
160 Gold Star Blvd.
Worcester, MA 01606, U.S.A.

Information Data Storage
Bldg. 224 - SN - 38
P.O. Box 33224
St. Paul, MN 55133, U.S.A.

Appendix B. Physical Planning Template

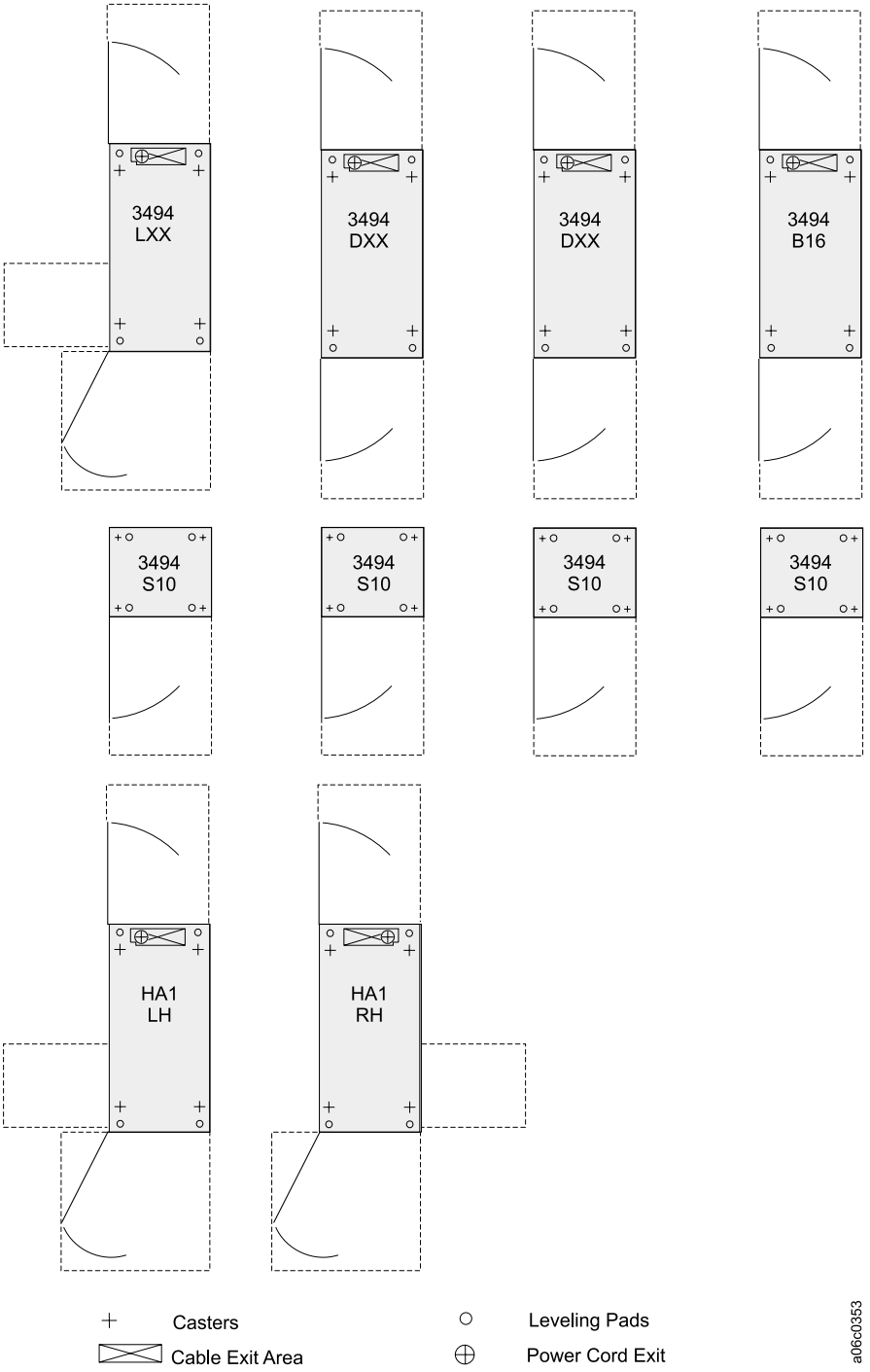
During initial physical planning activities, these templates will help you to determine the appropriate layout for the subsystem and space requirements.

The template illustrations can be copied as transparent foils and used in the same manner as the actual templates. However, some copiers do not produce exact-sized copies that can cause your templates to be slightly oversized or undersized.

Physical Planning Template

3494

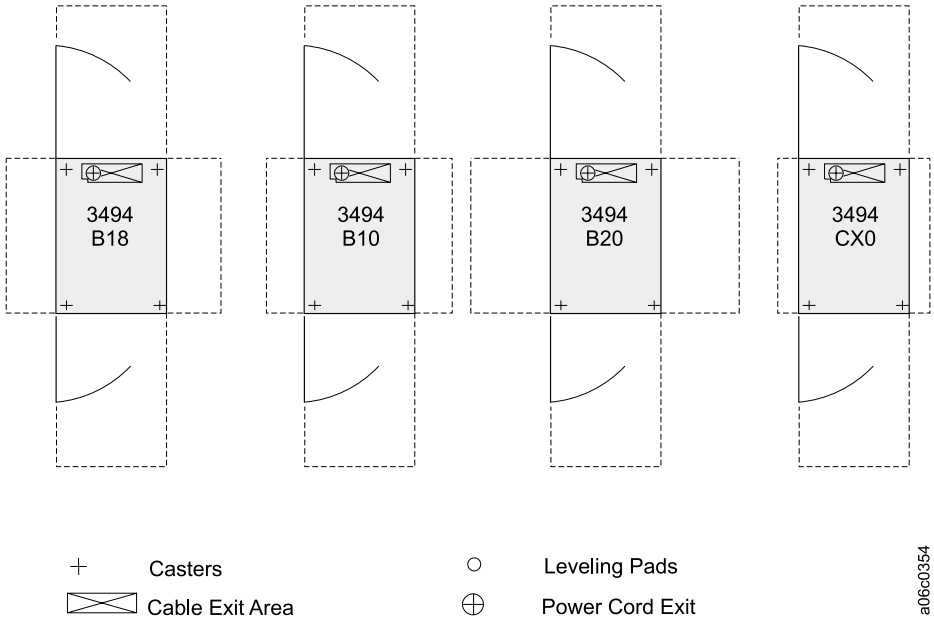
METRIC SCALE: 10 mm = 0.5 m
ENGLISH SCALE: 1/4 inch = 1 foot



Physical Planning Template

3494

METRIC SCALE: 10 mm = 0.5 m
ENGLISH SCALE: 1/4 inch = 1 foot



Appendix C. Planning for the 3494 and Task Allocation

The following section describes the organization of the planning team and the allocation of tasks and activities to achieve a successful migration to a 3494 environment. An individual or a team may perform these tasks; the important thing is to ensure that all the tasks are done.

Migration from a non-automated tape library environment to an automated tape library environment involves the following tasks:

- Select a planning team with assigned responsibilities to ensure that all installation planning and migration tasks are completed. See “Select a Planning Team”.
- Select the appropriate library model and features to satisfy the requirements of the applications used (see Chapter 1, “Introduction”, on page 1).
- Plan for the migration of tape subsystems into the 3494 (see “Tape Subsystems” on page 38).
- Determine the software necessary to support the control of the library and applications used with the library (see Chapter 3, “Programming Support”, on page 93).
- Plan the physical environment for the installation of the 3494 (see “3494 Installation Requirements” on page 113).
- Plan for any operational changes that may be necessary in the 3494 environment (see “Planning for Operations” on page 119).
- Determine required supplies and equipment necessary for host control and to support the 3494 and proposed applications (see “Planning for Supplies and Equipment” on page 120).
- Plan for the data migration from a non-automated tape library to the 3494 (see “Migrating Data” on page 128).

Select a Planning Team

To ensure an efficient 3494 installation, migration process, and operations, select a planning team or individual and define the required tasks. Suggested members (or skills that are required) include the following:

- Planning coordinator
- Physical planner
- System and application programmers
- Storage administrator
- Tape library operator

Planning Coordinator

The planning coordinator is responsible for ensuring that all planning and ordering activities proceed smoothly and on schedule. This person should work closely with your IBM representative.

Physical Planner

The physical planner is responsible for determining the location of the 3494. This person ensures that the correct environmental, electrical, and space requirements are met. This person should work closely with your IBM representative.

System and Application Programmers

The system and application programmers are responsible for choosing the licensed programs for the host system. The system programmer installs and tests the licensed programs to be used with the 3494. The system programmer also works with the storage administrator to define an installation's storage-management policy.

The application programmer creates and modifies specific application programs as needed. This person should work closely with your IBM representative.

Storage Administrator

The storage administrator defines a storage-management policy and plans for data migration.

See "Software Migration" on page 127 to locate information about the following:

- Planning your migration of data
- Analyzing your business environment
- Analyzing your processing environment
- Estimating your resource requirements

A plan must be completed to describe and control the steps necessary to complete migration. Also, a plan must be completed to migrate tape subsystems into the 3494 environment.

Tape Library Operator

The 3494 operator is responsible for the daily operation of the 3494. The operator is typically not involved in the planning tasks and is not included in "Task Assignments" on page 173.

Typical tasks include loading and unloading tape cartridges from the library I/O facility. During Manual mode operations, the operator mounts and demounts cartridges from library tape drives. For additional operator tasks, see "Planning for Library Operator Training" on page 121.

Task Assignments

Tables 48 through 55 identify many of the tasks associated with installation planning and migrating to a 3494. Individuals responsible for tasks are identified.

Table 48. Tasks before Ordering the 3494

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Select team members.	●				
Determine the 3494 configuration. Identify host attachments and the channel cable layout.	●	●	●	●	●
Plan for how to migrate the tape subsystems into the 3494 environment.	●	●	●	●	●
Identify the location for the 3494 and arrange for any site modification.		●			
Identify the delivery route to the planned location of the 3494.		●			
Identify the staging area for the components of the 3494.		●			
Prepare the physical layout (floor plan) diagram.		●			
Determine required licensed programs.			●	●	
Determine cable requirements.	●	●			
Determine electrical requirements.		●			
Determine cooling requirements.		●			
Determine fire suppression requirements.		●			
Consider end-user requirements.	●	●	●	●	●
Determine the required number of tape cartridges.			●		●
Determine the required number of cleaning cartridges.			●		●
Determine cartridge label requirements.			●		●
Determine high-capacity I/O facility requirements.			●		●

Table 49. Tasks at Order Time

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Order the 3494.	●				
Order the conversion features needed.	●				
Order the language group feature if other than English.	●				
Order the specify features.	●				
Order the special features.	●				
Order units as necessary for tape subsystem migration.	●				
Order supplies (labels, cartridges, and cleaners).	●				
Conduct a systems assurance review with the IBM account team.	●	●	●	●	●
Order licensed programs.	●				

Table 50. Tasks 15 Weeks before Delivery

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Upgrade the operating system with IBM and appropriate original equipment manufacturer (OEM) support.			●		
Define storage management policies, and plan for data conversion and migration.			●		●
Identify applications for migration to the 3494.			●	●	●
Determine the installer of the electrical wiring and outlets.		●			
Confirm the 3494 and the supplies orders.	●				

Table 51. Tasks 10 Weeks before Delivery

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Contact your IBM representative to discuss any concerns about the planning process.	●	●	●	●	●
Arrange for the installation of the electrical wiring and outlets.		●			●

Table 52. Tasks 6 Weeks before Delivery

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Review the progress of the installation with your IBM representative. Identify and resolve any scheduling problems.	●	●	●	●	●
Customize the software installation, for example, object access method (OAM) exits and automatic class selection (ACS).			●		
Start the installation of electrical wiring and outlets.		●			

Table 53. Tasks 4 Weeks before Delivery

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Complete the installation and testing of the electrical wiring and outlets.		●			
Complete the site preparation.		●			
Have your installation planning representative verify the site preparation.		●			
Complete the software test, and test on the production host processors.			●	●	
Train the 3494 operator.	●				●
Complete regression testing of the operating system and application software.			●	●	
Complete configuration worksheets for the Tape Library Specialist and the Peer-to-Peer VTS Specialist. Provide library names, sequence numbers, user interface selection, mode selection, and interface switching addresses (see “Peer-to-Peer Virtual Tape Server Configuration Information” on page 44).	●				

Table 54. Tasks at Arrival Time of the 3494

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Ensure that the 3494 is placed as close to final location as possible.		●			
Arrange for the service representative to install the hardware.	●				

Table 55. Tasks after Installation of the 3494

Activity	Planning Coordinator	Physical Planner	System Programmer	Application Programmer	Storage Administrator
Load test cartridges in library.	●				●
Verify tape library operator training.	●				●
Identify data volumes to load in library.	●				●
Identify scratch volumes to load in library.	●				●
Load production cartridges in library.	●				●
Set the drive-cleaning schedule.	●				●
Set the preventive maintenance (PM) schedule.	●				●
Install fire suppression equipment as required.		●			
Conduct a post review of the planning process to identify problems that can be avoided with future installations.	●	●	●	●	●

Appendix D. Peer-to-Peer VTS Specialist Worksheet

Enter the network names and addresses required for installation of the Peer-to-Peer VTS Specialist in the following tables (see “Peer-to-Peer VTS Specialist” on page 46).

AX0 0	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 1	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 2	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 3	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 4	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 5	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 6	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

AX0 7	Customer Input
HOSTNAME	
Internet ADDRESS	
Network MASK (or Subnet Mask)	
NAMESERVER Internet ADDRESS	(optional)
NAMESERVER DOMAIN Name	(optional)
Default GATEWAY Address	(optional)

Appendix E. Specialist Worksheet

Enter the network names and addresses required for installation of the Tape Library Specialist in the following tables (see “Tape Library Specialist Connection” on page 34).

Library 1, Library Manager A	Customer Input
TCP/IP Host Name	
TCP/IP Address	
Subnet Mask (or Network Mask)	
Router Address (or Gateway Address)	(optional)
Domain Name	(optional)
Nameserver Address	(optional)

Library 1, Library Manager B	Customer Input
TCP/IP Host Name	
TCP/IP Address	
Subnet Mask (or Network Mask)	
Router Address (or Gateway Address)	(optional)
Domain Name	(optional)
Nameserver Address	(optional)

Library 2, Library Manager A	Customer Input
TCP/IP Host Name	
TCP/IP Address	
Subnet Mask (or Network Mask)	
Router Address (or Gateway Address)	(optional)
Domain Name	(optional)
Nameserver Address	(optional)

Library 2, Library Manager B	Customer Input
TCP/IP Host Name	
TCP/IP Address	
Subnet Mask (or Network Mask)	
Router Address (or Gateway Address)	(optional)
Domain Name	(optional)
Nameserver Address	(optional)

Notices

This information was developed for products and services that are offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries/regions. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any of IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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

IBM Director of Licensing
IBM Corporation
North Castle Drive
Armonk, NY 10504-1785
U.S.A.

The following paragraph does not apply to the United Kingdom or any other country/region where such provisions are inconsistent with local law:

INTERNATIONAL BUSINESS MACHINES CORPORATION PROVIDES THIS PUBLICATION "AS IS" WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR A PARTICULAR PURPOSE. Some states/regions do not allow disclaimer of express or implied warranties in certain transactions, therefore, this statement may not apply to you.

This information could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be incorporated in new editions of the publication. IBM may make improvements and/or changes in the product(s) and/or program(s) described in this publication at any time without notice.

Any references in this information to non-IBM Web sites are provided for convenience only and do not in any manner serve as an endorsement of those Web sites. The materials at those Web sites are not part of the materials for this IBM product and use of those Web sites is at your own risk.

IBM may use or distribute any of the information you supply in any way it believes appropriate without incurring any obligation to you.

Any performance data contained herein was determined in a controlled environment. Therefore, the results obtained in other operating environments may vary significantly. Some measurements may have been made on development-level systems and there is no guarantee that these measurements will be the same on

generally available systems. Furthermore, some measurement may have been estimated through extrapolation. Actual results may vary. Users of this document should verify the applicable data for their specific environment.

Information concerning non-IBM products was obtained from the suppliers of those products, their published announcements, or other publicly available sources. IBM has not tested those products and cannot confirm the accuracy of performance, compatibility, or any other claims related to non-IBM products. Questions on the capabilities of non-IBM products should be addressed to the suppliers of those products.

This information is for planning purposes only. The information herein is subject to change before the products described become available.

Trademarks

The following terms are trademarks of International Business Machines Corporation in the United States, other countries/regions, or both:

AIX	IBM	RACF
Application System/400	IBMLink	RISC System/6000
AS/400	iSeries	RS/6000
DFSMSdfp	Micro Channel	Scalable POWERparallel Systems
DFSMSdss	MVS	SP
DFSMShsm	MVS/DFP	System/370
DFSMSrmm	MVS/ESA	S/370
DFSMS/MVS	Netfinity	S/390
DFSMS/VM	Operating System/2	Tivoli
@server	Operating System/400	TotalStorage
Enterprise Storage Server	OS/2	VM/ESA
ESCON	OS/2 WARP	VSE/ESA
ES/3090	OS/390	VTAM
ES/4381	OS/400	zSeries
ES/9000	PowerPC	400
FICON	pSeries	StorWatch

Intel is a trademark of Intel Corporation in the United States, other countries/regions, or both.

Java, JavaScript, and all Java-based trademarks are trademarks of Sun Microsystems, Inc. in the United States, other countries/regions, or both.

Microsoft, Windows, Windows NT, Windows 2000, and the Windows logo are trademarks of Microsoft Corporation in the United States, other countries/regions, or both.

UNIX is a registered trademark of The Open Group in the United States and other countries/regions.

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

IBM Agreement for Licensed Internal Code

You accept the terms of this IBM Agreement for Licensed Internal Code ("Agreement") by your initial use of a machine that contains IBM Licensed Internal Code (called "LIC"). These terms apply to LIC used by certain machines IBM or your reseller specifies ("Specific Machines").

If you do not agree to the terms of this Agreement, you may return LIC and the Specific Machine in the same condition in which they were delivered to you to the party (either IBM or its reseller) from whom you acquired the Specific Machine for a refund of the amount you paid if 1) you are the original user and 2) you do so within 15 days of the Specific Machine's delivery to you and prior to completion of the first initialization (for example, the first initial program load or the first initial microcode load) of the Specific Machine.

LIC is Machine Code used by Specific Machines. LIC does not include programs and code provided under separate license agreements, including but not limited to open source license agreements.

Machine Code is microcode, basic input/output system code (called "BIOS"), utility programs, device drivers, and diagnostics delivered with an IBM Machine.

The term "Specific Machine" includes any of the Specific Machine's features, conversions, upgrades, elements or accessories, or any combination of them. A Specific Machine may include computing resources or capabilities that are to remain inactive, or whose use is restricted, until the right to access and use the resources or capabilities is acquired from IBM (called "Built-in-Capacity"). Examples of such computing resources and capabilities include but are not limited to processors, memory, storage, processing capacity identified as interactive processing capacity, and workload specific resources or capabilities (such as a specific operating system, programming language or application to which use of the Machine is limited).

International Business Machines Corporation or one of its subsidiaries (collectively "IBM") owns copyrights in LIC or has the right to license LIC. IBM or a third party owns all copies of LIC, including all copies made from them. IBM licenses LIC to only one rightful possessor at a time.

If you are the rightful possessor of a Specific Machine, IBM grants you a nonexclusive license to use LIC (or any replacement IBM provides) on, or in conjunction with, only the Specific Machine for which IBM provided it, and only to the extent of IBM authorizations you have acquired for access to and use of Built-in-Capacity. If your use of Built-in-Capacity exceeds the IBM authorizations you have acquired for the Specific Machine, you agree to pay IBM for the full price of permanent, unrestricted use of the Built-in-Capacity at IBM's then current price. You are not authorized to use such Built-in-Capacity until such payment is made.

Under each license, IBM authorizes you to do only the following:

1. Execute LIC to enable the Specific Machine to function according to its Official Published Specifications (called "Specifications") and to use only the Built-in-Capacity for which you are authorized and for which payment is received by IBM;
2. Make a reasonable number of copies of LIC to be used solely for backup or archival purposes, provided you reproduce the copyright notice and any other

legend of ownership on any such copies. You may use the copies only to replace the original, when necessary; and

3. Execute and display LIC as necessary to maintain the Specific Machine.

You agree to acquire any replacement for, or additional copy of, LIC directly from IBM in accordance with IBM's standard policies and practices. You also agree to use that LIC under these terms.

You may transfer possession of LIC and its media to another party only with the transfer of the Specific Machine on which LIC is authorized. If you do so, you must 1) destroy all your copies of LIC that were not provided by IBM, 2) either give the other party all your IBM-provided copies of LIC or destroy them, and 3) give the other party a copy of these terms and provide all user documentation to that party. IBM licenses the other party when it accepts these terms. These terms apply to all LIC you acquire from any source.

Your license for LIC terminates when you no longer rightfully possess the Specific Machine.

No other rights under this license are granted.

You agree to use LIC only as authorized above. You may not do, for example, any of the following:

1. Otherwise copy, display, transfer, adapt, modify, or distribute (electronically or otherwise) LIC, except as IBM may authorize in the Specific Machine's Specifications or in writing to you;
2. Reverse assemble, reverse compile, or otherwise translate LIC unless expressly permitted by applicable law without the possibility of contractual waiver;
3. Sublicense or assign the license for LIC; or
4. Lease LIC or any copy of it.

Built-in-Capacity is protected by certain technological measures in LIC. As a condition of your license to use LIC under this Agreement, you may not circumvent such technological measures, or use a third party or third party product to do so, or otherwise access or use unauthorized Built-in-Capacity. In the event IBM determines that changes are necessary to the technological measures designed to limit access to, or use of, Built-in-Capacity to that which has been authorized, IBM may provide you with changes to such technological measures. As a condition of your license to use LIC under this Agreement, you agree, at IBM's option, to apply or allow IBM to apply such changes.

The terms of IBM's Statement of Limited Warranty (Z125-4753), which is incorporated into this Agreement by reference, apply to LIC. Please refer to that warranty for any questions or claims regarding performance or liability for LIC.

If there is a conflict between the terms of this Agreement and those of any other agreement for LIC, the terms of this Agreement prevail to the extent of the conflict, unless otherwise expressly provided in the other agreement.

Communications Statements

The following communications statements apply to operation of the 3494 in the United States and other countries/regions.

Federal Communications Commission (FCC) Class A Statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

IBM is not responsible for any radio or television interference caused by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A Emission Compliance Statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conform à la norme NMB-003 du Canada.

European Union (EU) Electromagnetic Compatibility Directive

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any failure to satisfy the protection requirements resulting from a non-recommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Germany Electromagnetic Compatibility Directive

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richtlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist die IBM Deutschland Informationssysteme GmbH, 70548 Stuttgart.

Informationen in Hinsicht EMVG Paragraph 3 Abs. (2) 2: Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden: ″Warnung: dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.″

EN 50082-1 Hinweis: ″Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern.″

Anmerkung: Um die Einhaltung des EMVG sicherzustellen, sind die Geräte wie in den IBM Handbüchern angegeben zu installieren und zu betreiben.

Japan VCCI Class A ITE Electronic Emission Statement

この装置は、情報処理装置等電波障害自主規制協議会（ＶＣＣＩ）の基準に基づくクラスＡ情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。 vcci

Taiwan Class A Electronic Emission Statement

警告使用者:
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。 taiemi

Glossary

This glossary defines the special terms, abbreviations, and acronyms used in this publication. If you do not find the term you are looking for, see the index or the *Dictionary of Computing*, New York: McGraw-Hill, 1994.

Numerics

3490E. The term used to mean a 3490E tape subsystem.

3494. IBM TotalStorage Enterprise Automated Tape Library (3494)

3590. The term used to mean a 3590 tape subsystem.

A

abend. The abnormal end of a task; the termination of a task before its completion because of an error condition that cannot be resolved by recovery facilities while the task is executing.

Advanced Interactive Executive. IBM's implementation of the UNIX® operating system. The RS/6000 and pSeries, among others, run the AIX operating system.

advanced program-to-program communication. A protocol that allows systems or tape drives to be attached to the token-ring network so that they may communicate and process the same programs.

APAR. See *authorized program analysis report*.

APPC. See *advanced program-to-program communication*.

AIX. See *Advanced Interactive Executive*.

authorized program analysis report. A report of a problem caused by a suspected defect in a current unaltered release of a program.

automatic cartridge loader. A device that allows multiple cartridges to be loaded and unloaded from a tape drive without operator intervention.

available. The term used to mean that a component is available for use by the Library Manager. Components in the tape library (cartridge accessor, grippers, I/O facilities, and tape drives) are either available or unavailable for use. Compare with *online*. Contrast with *unavailable*.

B

backstore. The physical tape devices used to store VTS data.

borrow. When a storage pool is out of scratch stacked volumes, scratch volumes will be borrowed from the Common Scratch Pool.

C

cartridge. The term used to mean the IBM Cartridge System Tape, the IBM Enhanced Capacity Cartridge System Tape, the IBM High Performance Cartridge Tape, or the IBM Extended High Performance Cartridge Tape.

cartridge accessor. The physical mechanisms within the tape library that identify, retrieve, and move tape cartridges. It consists of a gripper, vision system, picker, and accessor mechanism.

cartridge automation. The process where the tape library performs actions for inserting, ejecting, mounting, demounting, loading, and unloading of tape cartridges automatically.

cartridge system tape. The base tape cartridge media that is used with 3480, 3490, and 3490E tape subsystems.

category. A grouping of volumes with a common attribute, such as volumes to eject, volumes newly added to the library, and volumes to clean tape drives.

cell. See *storage cell*.

code. The term used to mean the internal programs that comprise the Library Manager application.

command. A control signal that initiates an action or the start of a sequence of actions.

component. A part of a functional unit. For example, the gripper mechanism is a component of the cartridge accessor.

construct. A storage group, storage class, management class, or data class name and associated actions. Used by the host to control volumes.

control program. The program in the host system that schedules and supervises the execution of application programs.

convenience input. The term used when loading small numbers of tape cartridges into the tape library using the convenience I/O station. See *convenience I/O station*.

convenience I/O station. An optional feature of the tape library used to load or unload small numbers of cartridges into or out of the tape library. The station supports only one type of operation at a time, either input or output.

convenience output. The term used when unloading small numbers of tape cartridges from the tape library using the convenience I/O station. See *convenience I/O station*.

CST. See *cartridge system tape.*

D

DAA. See *dual active accessors.*

database. A collection of data that can be accessed by a data processing system for a specific purpose.

demount. A host command to unload a cartridge from a tape drive.

DFSMS. Data Facility Storage Management Subsystem.

DFSMSdfp™. Data Facility Storage Management Subsystem Data Facility Product.

DFSMSdss. Data Facility Storage Management Subsystem Data Set Services.

DFSMShsm. Data Facility Storage Management Subsystem Hierarchical Storage Manager.

DFSMSrmm. Data Facility Storage Management Subsystem Removable Media Manager.

disk drive. See *hard disk.*

diskette. A thin, flexible magnetic disk and a protective jacket, in which the disk is permanently enclosed. Contrast with *hard disk.*

dual active accessors. A feature that allows both cartridge accessors to be active at the same time.

dump. To record data, at a particular instant, for the purpose of safeguarding or analyzing.

E

ECCST. See *enhanced capacity cartridge system tape.*

EHPCT. See *extended high performance cartridge tape.*

eject. The operation of moving a cartridge to an output station in the tape library. Contrast with *insert*.

emergency power off. A switch that removes all power from the equipment in the Enterprise Tape Library but does not affect power to lighting circuits.

enable. To provide the means or opportunity. The modification of system, control unit, or tape drive action through the change of a software module or a hardware switch (circuit jumper) position.

enhanced capacity cartridge system tape. Cartridge system tape with increased capacity that can be used only with 3490E enhanced capability models. Visually identified by a two-tone cartridge case.

Enterprise. An automated tape library consisting of mechanical components, cartridge storage frames, IBM tape subsystems, and controlling hardware and software. The tape library performs tape cartridge mounts and demounts without operator intervention.

Enterprise Systems Connection. A set of IBM and vendor products that interconnect S/390 computers with each other and with attached storage, locally attached workstations, and other devices using optical fiber technology and dynamically modifiable switches called ESCON Directors.

EPO. See *emergency power off.*

ESCON. See *Enterprise Systems Connection*.

Ethernet. A local area network (LAN) that allows multiple stations to access a data transmission without previous coordination.

export. The VTS Export operation allows logical volumes to be moved from a VTS to another VTS. The destination VTS can be in the same tape library or in a different tape library.

exported stacked volume. A physical volume managed by a VTS that contains logical volumes that can be removed from the VTS.

extended high performance cartridge tape. Cartridge system tape with increased capacity that can be used only with 3590 tape subsystems. Visually identified by a green leader block and two green inserts with identification notches on the edge of the cartridge case.

F

FC. Feature code or feature codes.

FCP. See *Fibre Channel Protocol.*

Fibre Channel Protocol. The connection of 3590 tape drives to a 3590 Model A60 Controller through a Fibre Channel connection.

Fiber Connectivity (FICON). A high-speed input/output (I/O) interface for mainframe computer connections to storage devices.

FICON. See *Fiber Connectivity*.

file-protected. Pertaining to a tape volume that data can only be read from. Data cannot be written on or erased from the tape.

frame. (1) A housing for machine or device elements. (2) The hardware support structure, covers, and all parts mounted therein that are packaged as one entity for shipping.

G

gripper. A part attached to the picker mechanism of the cartridge accessor, which loads, unloads, and moves cartridges between storage cells, tape drives, and the convenience I/O station.

H

hard disk. A rigid, non-removable disk residing in the Library Manager.

high availability unit. A second Library Manager, a second accessor, and service bays, which improve library availability.

high performance cartridge tape. Cartridge system tape with increased capacity that can be used only with 3590 tape subsystems. Visually identified by a blue leader block and two blue inserts with identification notches on the edge of the cartridge case.

host system. A data processing system that is used to prepare programs and the operating environments for use on another computer or controller.

HPCT. See *high performance cartridge tape*.

I

IDRC. See *improved data recording capability*.

import. The VTS Import operation allows logical volumes to be moved to a VTS from another VTS. The source VTS can be in the same tape library or in a different tape library.

improved data recording capability. A data recording mode that, if installed and enabled on the 3490E Magnetic Tape Subsystem, can increase the effective cartridge data capacity and the effective data rate if started.

initial program load. The initialization procedure that causes an operating system to start operation.

insert. The operation of adding cartridges to the tape library. Contrast with *eject*.

inventory. The operation of identifying the location of each tape cartridge contained in the tape library.

invoke. To start a command, procedure, or program. The request for a feature or function to be used in future processing activities through the use of software or hardware commands.

IPL. See *initial program load*.

K

Keep. When a stacked physical volume is borrowed from the Common Scratch Pool (CSP) and it is not to be returned to the CSP when it is reclaimed.

L

LAN. See *local area network*.

Library Manager. The controller for the Enterprise Tape Library. It manages the location of tape cartridges, monitors performance, issues commands to the hardware, displays status, and performs other functions. It communicates with host systems through the tape control unit in each library or, in AS/400 and iSeries, directly through the RS-232 interface. The Library Manager also provides operator and service panel functions.

load. (1) The process, performed by an operator or by the cartridge accessor, of placing a cartridge into a location within the tape library for later use or retrieval. (2) The term used when describing the action of the tape transport when it removes the leader block from a cartridge and threads the media through the internal tape path.

local area network. A computer network located on a user's premises within a limited geographical area. Communication within a LAN is not subject to external regulations; however, communication across a LAN boundary may be subject to regulation.

M

manual mode. A mode of operation, where the operator, under the direction of the Library Manager, locates and moves tape cartridges to and from storage cells and tape units manually. This mode allows data to be retrieved when normal tape library operations are interrupted by unexpected conditions.

MES. Miscellaneous Equipment Specification.

migrate. Move virtual volume data from the VTS cache to a physical stacked tape.

mount. A host command to load a cartridge into a tape unit.

mount from input station. A function available through the Commands window on the Library Manager. It allows transient cartridges outside the library to be mounted on devices within the library. It is used to support stand-alone programs that do not require the support of a full operating system.

N

NEMA. National Electrical Manufacturers' Association.

No Borrow. When a storage pool is out of scratch stacked volumes, no volumes will be borrowed from the Common Scratch Pool.

non-user interface VTS. The VTS in a Peer-to-Peer VTS configuration that was not selected as the user interface VTS. The non-user interface VTS is the secondary VTS in the configuration. User applications do not recognize the non-user interface VTS.

O

OEMI. See *original equipment manufacturers interface.*

offline. Pertaining to the operation of a unit when not under the direct control of a host system. Compare with *unavailable.* Contrast with *online.*

online. Pertaining to the operation of a unit when under the direct control of a host system. Compare with *available.* Contrast with *offline.*

original equipment manufacturers interface. A common communication interface that allows connection from a host to a tape drive.

P

Peer-to-Peer VTS. A VTS configuration in which copies of data in newly created or updated tape volumes are created or updated automatically in each of two interconnected VTSs. This dual-volume copy functionality improves data availability and data recovery, while being transparent to user applications and host processor resources.

program temporary fix. A temporary solution to, or bypass of, a defect in a current release of a licensed program.

PTF. See *program temporary fix.*

R

recall. Move data from a stacked physical tape to the VTS cache.

reclaim. Move active data onto fewer physical tapes and allow extra tapes to be reused.

reconcile. The process of determining what is active data and what is inactive data.

reduced instruction set computer. A computer that uses a small, simplified set of frequently used instructions for rapid execution.

remote Library Manager console. The Remote Library Manager Console feature permits control or monitoring of the Enterprise Tape Library from a location that is remote from the library.

reserved storage cell. A cell in the Tape Library Base Frame that is reserved for use by the service representative or for error recovery operations.

return. When a stacked physical volume is borrowed from the Common Scratch Pool (CSP) and it is to be returned to the CSP when it is reclaimed.

RISC. See *reduced instruction set computer.*

S

SCSI. See *small computer system interface.*

setup. The preparation of a computing system to perform a job or job step.

small computer system interface. An adapter that supports the attachment of various storage devices to the system unit.

storage. (1) A device in which recorded information can be entered, retained, and processed, and from which recorded information can be retrieved. (2) The action of placing data into a storage device. (3) A facility in which data can be retained.

storage cell. A location in the tape library where a cartridge can be loaded or unloaded. This includes the storage cells in a storage frame and the convenience I/O station.

T

tape cartridge. A container holding magnetic tape that can be processed without separating it from the container.

tape drive. A device that is used for moving magnetic tape and includes the mechanisms for writing and reading data to and from tape. See also *tape unit* and *transport.*

tape library. (1) The term used to mean a collection of tape cartridges. 3494 describes the set of cartridges contained within the 3494 enclosure. (2) An automated tape library (for example, the Enterprise Automated

Tape Library) that consists of cartridge storage frames, tape subsystems, and controlling hardware and software as well as tape cartridges. The tape library performs host-directed tape cartridge mounts and demounts without operator intervention.

tape management software. A program that controls the scratch status of tape volumes.

tape subsystem. A tape unit that includes the logic interface hardware necessary to operate with a host processor, for example, 3490E Model CxA.

tape unit. A device that contains tape drives and their associated power supplies and electronics.

TCP/IP. See *Transmission Control Protocol/Internet Protocol*.

token-ring network. A local area network (LAN) that uses ring topology, where tokens are passed from node to node. A node that is ready to send can capture a token and insert data for transmission.

transient mount. See *mount from input station*.

Transmission Control Protocol/Internet Protocol. A set of communication protocols that supports peer-to-peer connectivity functions for both local and wide area networks.

transport. The mechanism inside a tape drive that moves tape media. It is comprised of loading, threading, and guiding mechanisms and motors.

U

UEPO. See *unit emergency power off*.

unavailable. The term used to mean that a component in the tape library (for example, the cartridge accessor) is not available for use by the Library Manager. Compare with *offline*. Contrast with *available*.

unit. (1) An entity that can accomplish a specific purpose, for example, a 3490E tape drive. (2) An individual piece of the tape library that can be added or deleted from a tape library configuration, for example, 3490E control unit, 3490E tape unit, storage frame, or convenience I/O station.

unit emergency power off. A red switch on product frame that, when operated in an emergency, causes all subsystem frames to be disconnected from the ac power source.

unit power off. A switch that removes all power from a specific unit of the Enterprise Tape Library.

unload. To remove cartridges from a device in the Enterprise Tape Library.

UPO. See *unit power off*.

user interface VTS. During the library installation Teach operation, the service representative selects one of the VTSs in a Peer-to-Peer VTS configuration to be the user interface VTS. This is the VTS that the user has designated to perform library console operations, such as logical volume volser creation.

V

vision system. A Class II laser bar code reader that is mounted on the cartridge accessor picker. It is used to read the bar code labels on the tape cartridges.

volser. Volume serial identifier. The physical label on the cartridge. Also, the same or different identifier encoded on the magnetic tape.

Index

Numerics

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

Z

Readers' Comments — We'd Like to Hear from You

IBM TotalStorage™
Enterprise Automated Tape Library (3494)
Introduction and Planning Guide

Publication No. GA32-0448-02

Overall, how satisfied are you with the information in this book?

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Overall satisfaction	☐	☐	☐	☐	☐

How satisfied are you that the information in this book is:

	Very Satisfied	Satisfied	Neutral	Dissatisfied	Very Dissatisfied
Accurate	☐	☐	☐	☐	☐
Complete	☐	☐	☐	☐	☐
Easy to find	☐	☐	☐	☐	☐
Easy to understand	☐	☐	☐	☐	☐
Well organized	☐	☐	☐	☐	☐
Applicable to your tasks	☐	☐	☐	☐	☐

Please tell us how we can improve this book:

Thank you for your responses. May we contact you? ☐ Yes ☐ No

When you send comments to IBM, you grant IBM a nonexclusive right to use or distribute your comments in any way it believes appropriate without incurring any obligation to you.

Name _____ Address _____

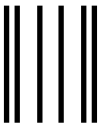
Company or Organization _____

Phone No. _____

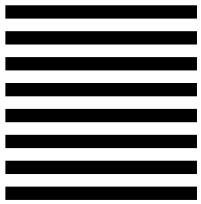
Readers' Comments — We'd Like to Hear from You
GA32-0448-02

Cut or Fold
Along Line

Fold and Tape | **Please do not staple** | Fold and Tape



NO POSTAGE
NECESSARY
IF MAILED IN THE
UNITED STATES



BUSINESS REPLY MAIL

FIRST-CLASS MAIL PERMIT NO. 40 ARMONK, NEW YORK

POSTAGE WILL BE PAID BY ADDRESSEE

IBM
Department GZW
9032 S Rita Road
Tucson AZ 85775-4706

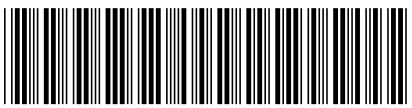
Fold and Tape | **Please do not staple** | Fold and Tape

GA32-0448-02

Cut or Fold
Along Line

Printed in U.S.A.

GA32-0448-02



Spine information:

IBM TotalStorage™
Enterprise Automated Tape Library
(3494)

3494 Introduction and Planning Guide