

IBM Magstar 3590 Tape Subsystem



# Introduction and Planning Guide



IBM Magstar 3590 Tape Subsystem



# Introduction and Planning Guide

**Note**

Before using this information and the product it supports, be sure to read the general information under “Notices” on page 127.

**Thirteenth Edition (May 2001)**

This edition of the *IBM Magstar 3590 Tape Subsystem Introduction and Planning Guide*, GA32-0329-12, obsoletes and replaces GA32-0329-11. Changes or additions are indicated by a vertical line in the left margin.

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# Safety

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## Material Handling Safety



### CAUTION:

- Products weighing between 18 kg (39.7 lb) and 32 kg (70.5 lb) and require 2 or more persons for safe handling.
- Products weighing between 32 kg (70.5 lb) and 55 kg (121.2 lb) and require 3 or more persons for safe handling.
- Products weighing above 55 kg (121.2 lb) are non-portable equipment.

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## Laser Safety and Compliance

These products contain components that comply with performance standards that are set by the U.S. Food and Drug Administration. This means that these products belong to a class of laser products that do not emit hazardous laser radiation. This classification was accomplished by providing the necessary protective housings and scanning safeguards to ensure that laser radiation is inaccessible during operation or is within Class 1 limits. External safety agencies have reviewed these products and have obtained approvals to the latest standards as they apply to this product type.



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# Preface

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## Related Publications

The following publications provide related information about the IBM SCSI tape drive, medium changer, and library device drivers:

### IBM 3590 Publications

- *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12, and C14 Introduction, Planning, and User Guide*, GA32-0366
- *IBM Magstar 3590 Tape Subsystem Operator Guide*, GA32-0330
- *IBM Magstar 3590 Tape Subsystem Hardware Reference*, GA32-0331
- *IBM Magstar 3590 Tape Subsystem Maintenance Information, Model C12/C14*, SA37-0405
- *IBM Magstar 3590 Tape Subsystem Operator's Quick Guide*, GA32-0354
- *IBM Magstar 3590 High Performance Tape Subsystem: Multiplatform Implementation*, SG24-2594
- *IBM 3591 Model A01 Tape Control Unit Introduction, Planning, and User's Guide*, GA32-0358
- *IBM 3590 Tape Subsystem Models B11, B1A, E11, and E1A Maintenance Information*, SA37-0301
- *IBM 3590 Tape Subsystem Maintenance Information A60 Controller*, SA37-0421
- *IBM General Information Installation Manual—Physical Planning*, GC22-7072
- *Magstar 3590 Silo Implementation Guide*, SG24-2239

### IBM 3490 Publications

- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Hardware Reference*, GA32-0219
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models C10, C11, C1A, C22, and C2A Maintenance Information*, SA37-0299
- *IBM 3490 Magnetic Tape Subsystem Enhanced Capability Models E01 and E11 User's Guide*, GA32-0298

### IBM 3494 Publications

- *IBM Magstar 3494 Tape Library Introduction and Planning Guide*, GA32-0279
- *IBM Magstar 3494 Tape Library Maintenance Information*, SA37-0270
- *IBM Magstar 3494 Tape Library Operator's Guide*, GA32-0280

## **RS/6000 Publications**

For additional information about RS/6000® systems, see:

- *RS/6000 Getting Started: Using RS/6000*, GC23-2521
- *RS/6000 Getting Started: Managing RS/6000*, GC23-2378
- *RS/6000 Problem Solving Guide*, SC23-2204
- *RS/6000 V4 Problem Solving Guide*, SC23-2606
- *RS/6000 V4 Message Guide & Reference*, SC23-2641
- *RS/6000 Planning for System Installation*, SA38-0508
- *RS/6000 7017 Rack Installation and Service Guide*, SA48-0548

## **AS/400 Publications**

For additional information about AS/400® systems, see:

- *AS/400 Physical Planning Reference*, SC41-5109
- *AS/400 Control Language Reference*, SC41-5720
- *AS/400 Basic System Operation, Administration and Handling*, SC41-5206
- *AS/400 Security-Basic*, SC41-5301
- *AS/400 Automated Tape Library Planning and Management Guide*, SC41-5309
- *AS/400 Backup and Recovery*, SC41-5304
- *AS/400 Hierarchical Storage Management*, SC41-5351
- *AS/400 Backup Recovery and Media Services*, SC41-5345
- *AS/400 System API Programming*, SC41-5800
- *AS/400 API Reference*, SC41-5801
- *AS/400 Tape and Diskette Device Programming*, SC41-5716

## **S/390 Publications**

- *S/390® System Overview Parallel Enterprise Server — Generation 5*, GA22-7158
- *S/390® System Overview Parallel Enterprise Server — Generation 6*, GA22-1030

## **IBM Fibre Channel Fabric Publications**

- *Fibre Channel Storage Hub IBM 2103 Model H07 Installation, Service, and User's Guide*, SC26-7289
- *IBM 2109 S08 Switch User's Guide*, SC26-7349
- *IBM 2109 S08 Switch Service Guide*, SC26-7350
- *BM 2109 S16 Switch User's Guide*, SC26-7351
- *IBM 2109 S16 Switch Service Guide*, SC26-7352
- *IBM Fiber-Optic Channel Link Planning and Installation*, GA32-0367

## **IBM ESCON Publications**

- *IBM AIX Parallel and ESCON Channel Tape Attachment/6000 Installation and User's Guide*, GA32-0311

## IBM FICON Publications

- *Planning for: Fiber Optic Links (ESCON, FICON, Coupling Links, and Open system Adapters)*, GA23-0367
- *Maintenance Information for: Fiber Optic Links (ESCON, FICON, Coupling Links, and Open system Adapters)*, SY27-2597
- *Fiber Channel Connection (FICON) I/O Interface Physical Layer*, SA24-7172
- *Planning for the ED-5000 Enterprise Fibre Channel Director*, SA22-7456
- *FICON (FCV Mode) Planning Guide*, SG24-5445 (available at [www.redbooks.ibm.com](http://www.redbooks.ibm.com))

## Related Software Publications

For information regarding software related to the IBM 3590 Tape Subsystem, refer to:

- *IBM SCSI Tape Drive, Medium Changer, and Library Device Drivers Installation and User's Guide*, GC35-0154
- *IBM Ultrium Device Drivers Installation and User's Guide*, GA32-0430
- *AIX/ESA Device Driver Developer's Guide*, SC23-3085
- *AIX/ESA Diagnosis Guide*, SC23-3079
- *AIX Parallel and ESCON Channel Tape Attachment/6000 Installation and User's Guide*, GA32-0311
- *Basic Tape Library Support User's Guide and Reference*, SC26-7016
- *Environmental Record Editing and Printing (EREP) Program User's Guide and Reference*, GC28-1378
- *DFSMS/MVS Software Support for IBM Magstar 3590 Model E1x Tape Drive*, SC26-7316
- *DFSMS/MVS Version 1 Release 1: General Information*, GC26-4900
- *DFSMS/MVS Version 1 Release 1: Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*, SC26-3051
- *DFSMS/MVS Version 1 Release 1: Object Access Method Application Programmer's Reference*, SC26-4917
- *DFSMS/MVS Version 1 Release 1: Guide and Master Index*, GC26-4904
- *Multiple Virtual Storage/Enterprise System Architecture Library Guide for System Product*, GC28-1601
- *MVS/ESA Storage Management Library: Storage Management Reader's Guide*, GC26-3122
- *Virtual Machine/Enterprise System Architecture Library Guide and Master Index*, GC24-5518
- *Virtual Machine/Enterprise System Architecture Library Guide and Master Index for System/370*, GC24-5436
- *Virtual Machine/Enterprise System Architecture General Information*, GC24-5550

## HP Publications

- *HP-UX Reference, Volumes 1, 2, and 3* Hewlett-Packard Company, Part B2355-90033
- *System Administration Tasks, HP-UX Release 9.0* Hewlett-Packard Company, Part B2355-90040

## SUN Publications

- *Solaris 2.x: Adding and Maintaining Peripherals*
- *SunOS 5.x: User's Guide to System Administration*
- *SunOS 5.x: Reference Manual (Sections 1 through 9)*

## Other Publication

- *American National Standard Institute Small Computer System Interface X3T9.2/86-109 X3.180, X3B5/91-173C, X3B5/91-305, X3.131-199X Revision 10H, and X3T9.9/91-11 Revision 1*

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## Online Access

### IBM Storage Media support

This web site provides access to current regional and country-specific IBM telephone numbers.

- [http://www.storage.ibm.com/media/how\\_buy.html](http://www.storage.ibm.com/media/how_buy.html)

### IBM 3590 Tape Subsystem Support

The following web sites provide you access to current information related to 3590 Tape Subsystems.

#### Device Driver support

You can download this software.

- <ftp://ftp.software.ibm.com/storage/devdrv/>

#### IBM Global Services' Product Support Services

This site provides information about connects and the integration of cabling systems.

- <http://www.as.ibm.com/asus/connectivity.html>

**Where can I get a current copy of this document?** Go to the "IBM Storage Products" web site listed below.

#### IBM Storage Products

This site furnishes IBM Hardware product documents in a PDF format for viewing and printing.

- <http://www.storage.ibm.com/hardsoft/tape/pubs/prodpubs.html>

### **McDATA Switch**

Lists the IBM McDATA Enterprise Fibre Channel Director.

- <http://www.storage.ibm.com/ibmsan/director1.htm>

### **FICON**

The following Web site has the most current information on the FICON processor, FICON switch, and operating system levels supported with the Magstar 3590 Model A60 with native FICON:

- <http://www.storage.ibm.com/hardsoft/tape/3590/ficon.html>

### **Open Systems support**

This site describes hardware and software for Midrange and Open Systems Connectivity for Magstar 3590.

- <http://www.storage.ibm.com/hardsoft/tape/3590/3590opn.html>

### **Redbooks**

Lists the IBM Redbooks.

- <http://www.redbooks.ibm.com/>

### **Vendor support**

Lists Independent Software Vendors for IBM storage products.

- <http://www.storage.ibm.com/hardsoft/tape/isvmenu.html>

## **Non-IBM Support**

This URL provides access to INRANGE SAN switches.

- <http://www.inrange.com>

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## Summary of Changes

This summary of changes includes specific release updates to this book.

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### Thirteenth Edition

This edition introduces FICON shortwave and 3590 Fibre Channel drive attachment with a 3590 A60 control unit. The Fibre Channel drive attachment provides for up to 12 Fibre attached E1x drives or up to eight SCSI attached drives to an A60 control unit. It also provides information on new SCSI multi-frame attachment for the A60 control unit to A14, C10, and stand-alone rack environments.

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### Twelfth Edition

This edition provides corrected cable information in “ESCON Host Attachment” on page 103, and a new table, “FICON Host Attachment” on page 108. It also corrects the minimum AIX level listed in “RS/6000 or pSeries Environment for SCSI” on page 96.

---

### Eleventh Edition

This edition introduces Multiframe Support on the 3590 C12 and C14 Silo-Compatible Frames. Because this feature doubles the number of drives attachable to a Model A60 control unit, you can now support up to sixteen Magstar 3590 tape drives from a single Model C10 frame using Multiframe attachment with two A60s. One A60 supports eight drives.

Also, this edition introduces two FICON attachments supported on each Model A60 control unit. This attachment allows drive sharing between FICON and ESCON environments to S/390 hosts and provides an increased distance to 100 km and an increased channel link speed up to 100 MB per second.

---

### Tenth Edition

This release includes information on Fibre Channel attachment features. With Fibre Channel attachment, 3590 Model E is now capable of delivering a data rate of 42 MB/sec maximum sustained data rate (with 3:1 data compression) and up to 100 MB/sec maximum instantaneous data rate. Fibre Channel attachment has increased the maximum host to tape drive distance to 500 meters. It is possible to extend the maximum distance to 10 kilometers using fibre components.

---

## **Ninth Edition**

This release includes information on Extended High Performance Cartridge Tape, an increase of the 3590 Model A60 to eight ESCON channel attachments, and a Call Home service support which automatically opens a service alert when a problem occurs. The Extended High Performance Cartridge Tape increases both the IBM Magstar 3590 E Model 256-track serpentine format capacity to 40GB and the IBM Magstar 3590 B Model 128-track serpentine format capacity to 20GB. The A60 control unit has an increased drive attachment capacity from four to ten. The Call Home function automatically opens a service alert when a problem occurs.

A new section, “Planning for 3590 Model B-to-E Migration” on page 67, has been added to provide the required planning for this model change. Two tables have been added to “Preformatted Data Cartridges” on page 59; they present 3599 ordering information for High Performance Cartridge Tape and Extended High Performance Cartridge Tape respectively.

---

## **Eighth Edition**

This release includes information on increased flexibility to attach the 3590 Tape Subsystem in stand-alone and automated configurations. Also, the physical specifications of the 3590 Model A60 control unit is changed from 10 EIA units to 8 EIA units. This modification allows up to four 3590 Model B11 or B1A tape drives to be installed with a Model A60 control unit in a standard 19 inch rack.

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## **Seventh Edition**

This release includes information on the new control unit, Model A60 and its supporting silo-environment frame, Model C10. The A60 provides ESCON attachment for up to four Models B11, B1A, E11, and E1A tape drives. The A60 provides multiple data transfer path with one or two ESCON channel adapters.

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## **Sixth Edition**

This release includes information on two new Magstar 3590 tape drives, Models E11 and E1A. With these models, the native data transfer rate is improved by more than 50% and cartridge capacity is doubled to a 256-track serpentine format. Models E11 and E1A tape drives can read and write data in the 256-track serpentine format, and both Exx and Bxx models read data in the 128-track serpentine format only. Model Bxx tape drives write in the 128-track serpentine format only.

The 256-track serpentine results in a tape capacity of 20GB of uncompressed data on the IBM 3590 High Performance Cartridge Tape. Prior model investments are protected with upgrade capability available.

See Table 1 on page 3 for a summary of Models E11 and E1A attachments. “Tape Drives” on page 10 provides a description of environments in which Models E11 and E1A are supported and also provides an overview of the characteristics and specifications of the drive models.

“Control Units” on page 13 describes the tape controller environment in which Models E11 and E1A can operate.

“Frames” on page 15 and “Racks” on page 16 list their respective environment limitations for Models E11 and E1A.

Specific to automated tape library dataserwer support, “IBM 3494 Tape Library Considerations” on page 17 lists the various frames into which Models E11 and E1A are compatible.

Various supported operating environments are listed in “Software and Operating Systems Support” on page 19.

“Chapter 8. S/390 or zSeries Operational Considerations” on page 115 helps you understand the kinds of situations that require special attention or may potentially pose usage restrictions with emulation-mode operation.



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## Chapter 1. Introduction

The IBM 3590 High Performance Tape Subsystem provides high capacity, performance, reliability, and a wide range of host connectivity. The IBM 3590 has the following functions:

- The 3590 creates tapes for archival files.
- The 3590 backs up and restores systems in case of system or disk storage problems.
- The 3590 stores high-speed, high-capacity sequential application data sets.
- The 3590 stores temporary data sets.
- The 3590 satisfies off-site data storage for disaster recovery.
- The 3590 provides data interchange with other systems that use 3590 subsystems.
- The 3590 meets data acquisition needs.

The IBM 3590 High Performance Tape Subsystem comes in different models and offers several attachment options to meet your needs. Each drive can have an automatic cartridge facility (ACF) with a 10-cartridge magazine. The drives have a small computer system interface (SCSI) attachment or Fibre Channel attachment. Only the 3590 Model E is attachable to Fibre Channel. Each drive can connect to an IBM 3590 tape controller for Enterprise Systems CONnection (ESCON) or Fibre CONnections (FICON) attachment of a 3590. Large scale automation offerings, which include the IBM 3494 Tape Library and StorageTek™ Silo, support the 3590.

The 3590 Bxx tape drives read and write data on 128-track format on IBM 3590 High Performance Cartridge Tape. This read, and write function results in a 10GB uncompressed data tape capacity. Model Exx tape drives read and write data on the 256-track format on IBM High Performance Cartridge Tape. This read, and write function results in a 20GB tape. The Extended High Performance Cartridge Tape increases the IBM Magstar 3590 E Model 256-track serpentine format capacity to 40GB. It also increases the IBM Magstar 3590 B Model 128-track serpentine format capacity to 20GB.

At 3 to 1 compression on the High Performance Cartridge Tape, the capacity increases to 60GB on E models and 30GB on B models. The Extended High Performance Cartridge Tape doubles the compressed capacities to 120GB on E models and 60GB on B models. E models have a 14MB per second device data rate, and B models have a 9MB per second transfer rate.

With data compression, the 3590 drives can more effectively utilize the full capability of the Fibre Channel data rate. Data compression also enhances the SCSI Ultra/wide data rate and the ESCON or FICON data rate. The Fibre

Channel attachment data rate is an instantaneous 100MB per second. Also, the SCSI Ultra/wide instantaneous data rate is up to 40MB per second. For ESCON, the channel-instantaneous rate is 20MB per second, and for FICON it is 100MB per second.

## Model Attachment

Table 1 summarizes models and attachments in the 3590 series.

Table 1. IBM 3590 Models

Model	Attachment
B11 <i>tape drive</i>	<ul style="list-style-type: none"> <li>• Up to four drives in IBM 9309, IBM 7015-R00, IBM 7014-S00 Rack, IBM 7014-T00, IBM 7014 T42, or customer-supplied racks for SCSI-host attachment</li> <li>• Two B11 units require 12 EIAs of vertical space in a 9309, 7202, 7014-S00, 7014-T00, or 7015-R00 rack</li> <li>• Up to four drives and, one A00, one A50 with one A00, or one or two A50 control units in an A14 frame</li> <li>• Up to four drives and an A60 control unit in an A14 frame for a stand-alone tape subsystem</li> <li>• Up to four drives in an A14 frame without a control unit.</li> </ul>
B1A <i>tape drive</i>	<ul style="list-style-type: none"> <li>• Four drives in an A14 frame for attachment to an IBM 3495 Virtual Tape Server Control Unit<sup>1</sup></li> <li>• Up to six drives in IBM 3494 Model D12<sup>1</sup></li> <li>• Up to two drives in IBM 3494 Model L12<sup>1</sup></li> <li>• Up to four drives and one A00, A50, or A60 control unit in IBM 3494 Model D14<sup>1</sup></li> <li>• Up to two drives and one A00 or A50 control unit in IBM 3494 Model L14<sup>1</sup></li> <li>• Up to four drives in a Model C12 frame with an external IBM 3591 Model A01 control unit for attachment to a StorageTek library<sup>2, 3</sup></li> <li>• Up to four drives in a Model C12 frame with an optional external Model A00 or A50 control unit for attachment to a StorageTek library<sup>2</sup></li> <li>• Up to four drives in a Model C14 frame with an internal Model A00 or A50 control unit for ESCON or FICON attachment to a StorageTek library<sup>2</sup></li> <li>• Up to four drives in a Model C12 or Model C14 frame, attached through a 3590 A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System.</li> </ul>

Table 1. IBM 3590 Models (continued)

Model	Attachment
E11 <i>tape drive</i>	<ul style="list-style-type: none"> <li>• Up to four drives in IBM 9309, IBM 7015-R00, IBM 7014-S00 Rack, IBM 7014-T00, IBM 7014 T42, or customer-supplied racks for SCSI-host attachment, or up to four drives for Fibre Channel attachment</li> <li>• Two E11 units require 12 Electronic Industries Associations (EIA) of vertical space in a 9309, 7202, 7014-S00, 7014-T00, or 7015-R00 rack</li> <li>• Up to four drives and one or two A50 control units in an A14 frame</li> <li>• Up to four drives with an A60 control unit in an A14 frame for a stand-alone tape subsystem</li> <li>• Up to four SCSI-attached drives with an A60 control unit in an IBM 9309, IBM 7015-R00, IBM 7014-S00, IBM 7014-T00, or IBM 7014-T42 rack</li> <li>• Up to four Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in an IBM 7014-T00 (1.8m) or IBM 7014-T42 rack (2.0m)</li> <li>• Up to two Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in 1.6m racks such as the IBM 9309, IBM 7015-R00, and IBM 7014-S00 racks</li> <li>• Up to four drives in an A14 frame without a control unit.</li> </ul>
E1A <i>tape drive</i>	<ul style="list-style-type: none"> <li>• Up to six drives in IBM 3494 Model D12<sup>1</sup></li> <li>• Up to two drives in IBM 3494 Model L12<sup>1</sup></li> <li>• Up to four drives and one A50 or A60 control unit in IBM 3494 Model D14<sup>1</sup></li> <li>• Up to two drives and one A50 control unit in IBM 3494 Model L14<sup>1</sup></li> <li>• Up to four drives in an Model C12 frame with an optional external Model A50 control unit for attachment to a StorageTek™ library<sup>2</sup></li> <li>• Up to four drives in a Model C14 frame with one or two internal Model A50 control units for attachment to a StorageTek library<sup>2</sup></li> <li>• Up to four drives in a Model C12 or Model C14 frame, attached through a 3590 A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System.</li> </ul>
A00 ESCON <i>control unit</i>	<ul style="list-style-type: none"> <li>• In a 3494 Model L14 with up to two B1A drives<sup>1</sup></li> <li>• In a 3494 Model D14 with up to four B1A drives<sup>1</sup></li> <li>• In a 3590 A14 frame with four B1A or B11 drives</li> <li>• Externally attached to a C12 model with four B1A drives<sup>2</sup></li> <li>• In a 3590 C14 frame with:<sup>2</sup> <ul style="list-style-type: none"> <li>– One control unit with up to four B11 drives</li> <li>– Two control units with each control unit having up to two B11 drives</li> </ul> </li> <li>• E models are not supported</li> </ul>

Table 1. IBM 3590 Models (continued)

Model	Attachment
<p>A50 ESCON control unit</p>	<ul style="list-style-type: none"> <li>• In a 3494 Model L14 with up to two B1A drives<sup>1</sup> or two E1A drives</li> <li>• In a 3494 Model D14 with up to four B1A drives<sup>1</sup> or four E1A drives</li> <li>• In a 3590 A14 frame               <ul style="list-style-type: none"> <li>– One control unit with up to four B11 or four E11 drives</li> <li>– Two control units with each control unit attaching to up to two B11 or two E11 drives</li> </ul> </li> <li>• Externally attached to a C12 model<sup>2</sup></li> <li>• In a 3590 C14 frame with:<sup>2</sup> <ul style="list-style-type: none"> <li>– One control unit with up to four B1A or four E1A drives</li> <li>– Two control units with each control unit having up to two B1A or two E1A drives</li> </ul> </li> </ul>
<p>A60 ESCON/ FICON control unit</p>	<ul style="list-style-type: none"> <li>• In a 3494 Model D14<sup>1</sup> with up to four B1A drives or four E1A drives</li> <li>• In an A14 frame:               <ul style="list-style-type: none"> <li>– One control unit with up to four B11 or four E11 drives</li> </ul> </li> <li>• In a 3590 C10 frame:<sup>2</sup> <ul style="list-style-type: none"> <li>– One or two A60 control units for attachment to B1A or E1A drives in a C12 or C14 frame</li> </ul> </li> <li>• In a stand-alone rack:               <ul style="list-style-type: none"> <li>– Up to eight SCSI attached drives with an A60 control unit in an IBM 9309, IBM 7015-R00, IBM 7014-S00, IBM 7014-T00, or IBM 7014-T42 rack</li> <li>– Up to 12 Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in an IBM 7014-T00 (1.8m) or IBM 7014-T42 rack (2.0m) rack</li> <li>– Up to two Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in 1.6m racks such as the IBM 9309, IBM 7015-R00, and IBM 7014-S00 racks</li> </ul> </li> </ul>
<p>3591 A01 ESCON control unit<sup>3</sup></p>	<ul style="list-style-type: none"> <li>• Rack-mounted with up to four B11 drives for 3490E emulation</li> <li>• Associated with two or four B1A drives for C12 frame attachment</li> <li>• E models are not supported</li> </ul>
<p>A14 frame</p>	<ul style="list-style-type: none"> <li>• Four B1A drives and, one A00 or one A50 control units for attachment to IBM 3495 library</li> <li>• Up to four B11 drives and up to two A00 or A50 controllers. One A00 or one A60 control unit, and one A50, two A50s, or one A60 control units for a stand-alone tape subsystem</li> <li>• Up to four E11 drives and one or two A50s or one A60 control units for a stand-alone tape subsystem</li> </ul>

Table 1. IBM 3590 Models (continued)

Model	Attachment
C10 frame <sup>2</sup>	<ul style="list-style-type: none"> <li>• One or two internal 3590 Model A60 ESCON/FICON control units for attachment to 3590 B1A or E1A drives in a C12 or C14 frame</li> <li>• Multiframe support to an A60 for up to twelve E1A drives with Fibre attachment</li> <li>• Multiframe support to an A60 for up to eight drives with SCSI attachment</li> </ul>
C12 frame <sup>2</sup>	<ul style="list-style-type: none"> <li>• Up to four E1A drives for direct attach to SCSI or Fibre Channel server</li> <li>• Up to four B1A drives for direct attach to SCSI servers</li> <li>• Up to four B1A or E1A SCSI drives, or up to four E1A Fibre drives attached through a 3590 A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System</li> <li>• Up to four B1A drives with one or two associated external 3591 Model A01 ESCON controllers for attachment to a StorageTek Automated Cartridge System</li> <li>• Up to four B1A drives with one or two associated external A00 or A50 controllers for attachment to a StorageTek Automated Cartridge System</li> <li>• Up to four E1A drives with one or two associated external 3590 Model A50 ESCON controllers for attachment to StorageTek Automated Cartridge System</li> <li>• Four B1A drives with two external A00 or A50 controllers each for attachment to StorageTek Automated Cartridge System</li> <li>• Four E1A drives with two external A50 controllers each for attachment to StorageTek Automated Cartridge System</li> </ul>
C14 frame <sup>2</sup>	<ul style="list-style-type: none"> <li>• Up to four B1A or E1A drives, attached through an A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System</li> <li>• Up to four B1A drives with one or two internal A00 or A50 ESCON controllers for attachment to StorageTek Automated Cartridge System</li> <li>• Up to four E1A drives with one or two internal A50 ESCON controllers for attachment to StorageTek Automated Cartridge System</li> </ul>

Table 1. IBM 3590 Models (continued)

<b>Model</b>	<b>Attachment</b>
<p><b>Notes:</b></p> <ol style="list-style-type: none"><li>1. See “IBM 3494 Tape Library Considerations” on page 17 for a description of IBM 3494 models.</li><li>2. Refer to <i>Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide</i> for more information.</li><li>3. Refer to <i>IBM 3591 Model A01 Tape Control Unit Introduction, Planning, and User's Guide</i> for more information.</li></ol>	

Figure 1 illustrates Models B11, B1A, E11, and E1A.

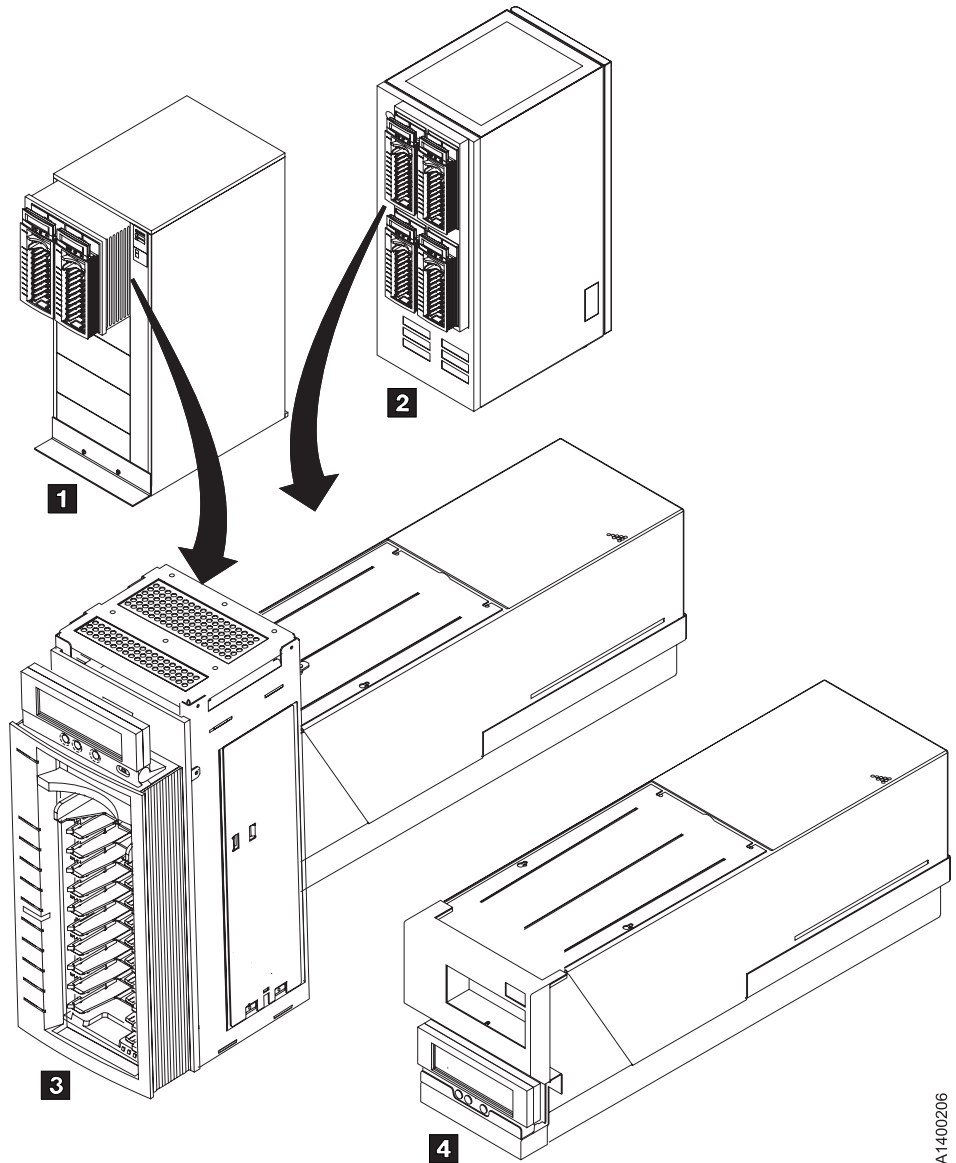


Figure 1. IBM 3590 Subsystem Components

- 1** Rack
- 3** B11/E11

- 2** A14 Frame
- 4** B1A/E1A

A1400206

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## Host System Attachment

### SCSI Attach

The subsystem attaches to the following host systems:

- AS/400
- RS/6000 SP
- RS/6000
- HP
- iSeries
- pSeries
- Sun
- Microsoft Windows NT
- Microsoft Windows 2000
- xSeries

### ESCON Attach

The following host systems through ESCON channels:

- ES/3090-J, ES/3090-9000T
- ES/9000™
- S/390™
- zSeries

### FICON Attach

The following host systems through FICON channels:

- 9672 Enterprise G5 or G6 Servers
- zSeries

### Fibre Channel Attach

The subsystem attaches to the following host systems:

- RS/6000 SP
- RS/6000
- Sun
- Windows NT
- Windows 2000

For more information on IBM and non-IBM systems, see “Software and Operating Systems Support” on page 19.

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## Tape Subsystem Description

This section describes models available in the IBM Magstar 3590 High Performance Tape Subsystem.

### Tape Drives

**Models B11 and E11** are drives with a 10-cartridge Automated Cartridge Facility (ACF) and five modes of operation. Model B11 has two SCSI-2 differential 2 SCSI Ultra/wide ports. Model E11 has two SCSI-3 differential 2-byte SCSI Ultra/wide SCSI ports or two Fibre Channel ports. In an ESCON- or FICON-attached environment, Models E11 and B11 support the ACF in all modes except random. Models E11 and B11 are supported by ESCON with the A00, A50, and A60 and supported by FICON with the A60 when attached to any of the following:

- For Model E11:
  - Model A50 or A60 controller in an IBM 3590 A14 frame.
  - Model A50 or A60 controller in a rack.
- For Model B11:
  - Model A00, A50, or A60 controller in an IBM 3590 A14 frame.
  - Model A00, A50, or A60, and 3591 Model A01 controller in a rack.

**Model B1A** is a single-cartridge tape drive with two SCSI-2 differential SCSI Ultra/wide ports. **Model E1A** is a single-cartridge tape drive with two SCSI-3 differential 2-byte SCSI Ultra/wide ports or two Fibre Channel ports. Models E1A and B1A are supported by ESCON with the A00, A50, and A60 and supported by FICON with the A60 when attached to any of the following:

- For Model E1A:
  - Model A50 control unit in an IBM 3590 C14 frame, or an A50 control unit external to a C12.
  - Model A60 control unit in an IBM 3590 C10 frame or in a 3494 D14 frame.
  - Model A50 controller in an IBM 3494 D14 or L14 frame.
- For Model B1A:
  - Model A00 or A50 controller in an IBM 3590 A14 or C14 frame, or an A50 control unit external to a C12.
  - 3591 Model A01 external to a C12 frame.
  - Model A00 or A50 controller in an IBM 3494 D14 or L14 frame.
  - Model A60 control unit in an IBM 3590 C10 frame or in a 3494 D14 frame.

Table 2 on page 11 and Table 3 on page 12 show 3590 drive characteristics with Extended High Performance Cartridge Tape.

Table 2. 3590 Drive Characteristics with High Performance Cartridge Tape

Characteristics	Specifications	
	3590 Model Exx	3590 Model Bxx
Display Panel	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display
Media	3590 High Performance Cartridge Tape	3590 High Performance Cartridge Tape
Cartridge Loader	10-cartridge capacity ACF	10-cartridge capacity ACF
Host Attachment	ESCON via 3590 A50 or A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A60	ESCON via 3590 A00, 3590 A50 or A60, or 3591 A01 or SCSI direct attach; FICON via 3590 A60
Data Capacity	20GB per uncompressed cartridge	10GB per uncompressed cartridge
Device Data Rate (Native)	14MB per second	9MB per second
Data Transfer Rate (Maximum) (Instantaneous)	20MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with Fibre Channel attachment, 100 MB per second with FICON	20MB per second with ESCON, 40MB per second with Ultra SCSI, 100 MB per second with FICON
Data Search Rate	332MB per second	166MB per second
Tape Read/Write Access Speed	3.14m/sec (124 in./sec)	2m/sec (79 in./sec)
Tape Length	300m	300m
Search/Rewind Speed	5m/sec (198 in./sec)	5m/sec (198 in./sec)
Average Cartridge Load Time	23.5 sec	23.5 sec
Full Cartridge Rewind Time (at end-of-volume)	2 sec	2 sec
Maximum Cartridge Rewind Time	60 sec	60 sec
Device Data Rate (3:1 compression) (Sustained)	34/MB per second with SCSI Ultra/wide SCSI and 42MB per second with Fibre Channel attachment	27MB per second with SCSI Ultra/wide SCSI

Table 3. 3590 Drive Characteristics with Extended High Performance Cartridge Tape

Characteristics	Specifications	
	3590 Model Exx	3590 Model Bxx
Display Panel	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display
Media	3590 Extended High Performance Cartridge Tape	3590 Extended High Performance Cartridge Tape
Cartridge Loader	10-cartridge capacity ACF	10-cartridge capacity ACF
Host Attachment	ESCON via 3590 A50 or A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A60	ESCON via 3590 A00, 3590 A50 or A60, SCSI direct attach, FICON via 3590 A60
Data Capacity	40GB per uncompressed cartridge	20GB per uncompressed cartridge
Device Data Rate (Native)	14MB per second	9MB per second
Data Transfer Rate (Maximum) (Instantaneous)	20MB per second with ESCON, 40MB/sec with Ultra SCSI, 100MB per second with Fibre Channel attachment, 100MB per second with FICON	20MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON
Data Search Rate	332MB per second	166MB per second
Tape Read/Write Access Speed	3.14m/sec (124 in./sec)	2m/sec (79 in./sec)
Tape Length	600m	600m
Search/Rewind Speed	5m/sec (198 in./sec)	5m/sec (198 in./sec)
Average Cartridge Load Time	26 sec	26 sec
Full Cartridge Rewind Time (at end-of-volume)	2 sec	2 sec
Maximum Cartridge Rewind Time	120 sec	120 sec
Device Data Rate (3:1 compression) (Sustained)	34MB per second with SCSI Ultra/wide SCSI and 42MB per second with Fibre Channel attachment	27MB per second with SCSI Ultra/wide SCSI

Ultra SCSI is standard for 3590 drive models, B11, B1A, E11, and E1A by providing two SCSI Ultra/wide SCSI ports. An optional feature code is

available for Fibre Channel attachment on Models E11 and E1A. For B11/B1A, the Ultra SCSI is FC9790. See “Ultra SCSI Attachment (FC9790)” on page 26 for more information.

## Control Units

**Model A00** is a tape control unit that provides ESCON attachment for Models B1A and B11. It is installable in a 3590 Model A14, C14 frame, or 3494 Model L14 or D14 tape library, or external to a 3590 Model C12 or rack. Model A00 provides a single data transfer path with one (FC3311) or two (FC3311 and FC3312) ESA/390 ESCON channel attachment adapters. It supports up to four 3590 Model B11 or B1A drives. The controller can be at a maximum channel distance of 43 kilometers (27 miles) from the host when using fiber-optic cable between ESCON directors. Model A00 is usable in an automated environment with B1A drives in IBM 3494 or 3495 tape libraries. It is also usable in a stand-alone environment with 3590 Model B11 drives in an A14 frame. Model A00 are installable in an STK Silo with C12 or C14 frames in supported racks. A mixture of A00 and A50 can be in an A14 to provide two controllers in a single enclosure.

The A00 controller is configurable to operate in either 3590 native mode or in 3490E emulation mode. See “Chapter 8. S/390 or zSeries Operational Considerations” on page 115 for considerations when operating in 3490E emulation mode.

**Note:** A00 does not support Exx Models.

**Model A50** provides ESCON attachment for Models E11, E1A, B1A, and B11. Model A50 is installable in a 3590 Model A14, or C14 frame, 3494 Model L14, or D14 tape library or rack. It is externally attachable to a 3590 C12. Model A50 provides a single data transfer path with one (FC3311) or two (FC3311 and FC3312) ESA/390 ESCON channel attachment adapters. It supports either up to four Model E1A and E11 drives, or up to four Model B1A and B11 drives. The controller can be at a maximum channel distance of 43 kilometers (27 miles) from the host when using fiber-optic cable between ESCON directors. Model A50 is usable in a stand-alone environment with B11 drives in an A14 frame and supported racks. Model A50 is usable with B1A in an STK Silo with C12 or C14 frames. In a C12, the control unit must be external to the unit. Up to two A50s, or an A50 in combination with an A00, are installable in an A14.

The A50 controller is configurable to operate in either 3590 native mode or in 3490E emulation mode. See “Chapter 8. S/390 or zSeries Operational Considerations” on page 115 for considerations when operating in 3490E emulation mode.

**Model A60** may contain any of the following combination features:

- One to four dual-ported ESCON attachments
- One to two FICON attachments
- Up to three dual-ported ESCON and one FICON attachments
- Up to two dual-ported ESCON and two FICON attachments

Thus, an A60 can support either of the following:

- Up to eight ESCON channels
- Up to two FICON channels
- Up to six ESCON channels and one FICON channel
- Up to four ESCON channels and two FICON channels

The A60 has the following attachment capability. More than four drives are attachable when using an adjacent-frame or multi-frame support feature. For details of the A60 maximum attachments, see Table 6 on page 34.

- Up to 10 model B1A or E1A drives in a 3494 configuration
- Up to eight SCSI-attached model B1A or E1A drives in an STK Silo solution
- Up to 12 fiber-attached model E1A's in an STK Silo solution
- Up to eight model B11 or E11 SCSI attached drives in an A14 frame or rack solution
- Up to 12 fiber-attached E11 drives in an A14 frame or in either a 1.8m or 2.0m rack solution
- Up to 10 fiber-attached E11 drives in a 1.6m rack solution

Model A60 is installable in a 3494 Model D14 tape library. It is also installable in a 3590 Model A14 Frame, a 3590 Model C10 Silo-Compatible Frame, or a standard 19 inch rack. The controller can be at a maximum channel distance of 43 kilometers (27 miles) from the host when using fiber-optic cable between ESCON directors. FICON attachment is available via either shortwave or longwave. The A60 is directly attachable via a FICON long wavelength attachment to host systems up to a 10km distance or up to 20km with RPQ8P1984. The A60 is also directly attachable up to 100km away with a FICON/Fibre Channel Switch with appropriate repeaters. With FICON short wavelength attachment, the A60 is directly attachable to a host system or FICON/Fibre Channel switch at a distance up to 500m.

See “Chapter 8. S/390 or zSeries Operational Considerations” on page 115 for considerations when operating in 3490E emulation mode.

**3591 Model A01** is a tape control unit that provides attachment of four 3590 Model B1A or B11 tape devices. It enables the host operating system to communicate with the 3590 drive as if it was a 3490E device.

The controller provides an interface between the 3590 drive SCSI adapters and the ESCON channels on the host. While one 3590 SCSI port attaches to an ESCON host through the 3591, the other 3590 SCSI port is attachable to a SCSI host. Up to four rack-mountable 3590 Model B11 drives attach to the Model A01 controller. The 3590 Model C12 frame supports 3591 Model A01; it provides Model B1A ESCON attachment in a StorageTek Automated Cartridge System (ACS).

**Note:** 3591 does not support Exx Models or Extended High Performance Cartridge Tape.

## Call Home

The Call Home function automatically opens a service alert if a problem occurs with a 3590 Model A50 or A60 control unit. These messages notify multiple people for information purposes, and a service representative can respond to evaluate the problem. The existing Remote Support FC2710, FC2711, or FC2712 implements this function. Your service representative can activate this function at the installation of the A50 or A60. Service menus provide means to deactivate the Remote Support.

Models A50 and A60 in standalone frames, the Silo environment, and the 3494 Tape Library support Call Home.

## Frames

**Model A14** contains the following solutions:

- Up to four B11 or E11 drives with one or two A50 or A00 control units for ESCON host attachment
- Up to four B11 or E11 drives with one A60 control unit for ESCON or FICON host attachment
- Up to four B1A drives for attachment to a 3495 tape library

**Note:** An A14 3495 environment does not support the A60 or the Exx models.

**Model C10** contains one or two A60 control units, each attached to B1A or E1A drives in C12 or C14 frames.

**Model C12** attaches B1A or E1A drives to a StorageTek Automated Cartridge System as follows:

- Up to four B1A or E1A drives for direct attachment to SCSI hosts
- Up to four E1A drives for direct attachment to Fibre Channel hosts
- Up to four B1A or E1A drives attached to an A60 in a C10 frame for ESCON or FICON host attachment

**Model C14** attaches B1A or E1A drives to a StorageTek Automated Cartridge System as follows:

- Up to four B1A or E1A drives with one or two A00 or A50 control units for ESCON attachment
- Up to four B1A or E1A drives attached to an A60 in a C10 frame for ESCON or FICON host attachment

Refer to *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12, and C14 Introduction, Planning, and User Guide* for additional information.

## Racks

For planning purposes, the number of installed drives determines rack space allocation. An Electronic Industry Association (EIA) unit of measure is the distance between the center point of each rack mounting hole. Each E11 and B11 unit requires twelve EIAs. Note that two drives can be placed side by side.

For example, two B11 or two E11 units require 12 EIAs of vertical space in a 9309, 7202, 7014-S00, or 7015-R00 rack.

B11 and E11 models are installable in the same rack.

Model A60 control units require 9 EIA units. However, when an A60 is mounted in a rack with SCSI attached 3590 drives, the front rack space is only 8 EIA units. This is because the rear portion of the A60 will fit under the tape drives. Thus, a model A60 and four 3590 tape drives will fit in a 1.6m rack such as the 9309. Only two 3590 Fibre Channel attached drives and one A60 will fit into a 1.6m rack, because additional EIA units are required for the IBM 2109 S16 Fibre Channel switch.

Consider the following elements when planning for rack installations:

1. Elevated operating temperature: Ensure that the operating ambient temperature is not compromised in enclosed racks.
2. Reduced air flow: Install the equipment such that the amount of air flow necessary for safe operation is not restricted.
3. Mechanical loading: Ensure that the rack will not tip.
4. Circuit overload: Ensure adequate protection for overcurrent in the circuitry.
5. Reliable mechanical grounding: Ensure proper grounding for rack-mounted equipment.

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## Automated Tape Library Dataserver Support

For fully automated tape operation, IBM 3590 Models E1A, E11, B1A, and B11 can be integrated into IBM 3494 Automated Tape Library Dataservers. (Only Model B1A can be integrated into 3495 Automated Tape Library Dataservers.) In the IBM 3494 library, the 3590 drives can coexist with IBM 3490 enhanced

models. In the IBM 3495 library, the 3590 B model drives can coexist with both the IBM 3490 base models and 3490E enhanced models.

**Note:** For details on specific configurations, see Table 1 on page 3.

Cartridges used by the 3590 and 3490/3490E drives are the same in physical size. They are not interchangeable because the 3590, and 3490/3490E drives use different media recording techniques. Host system software can distinguish between the cartridge types to ensure that the correct cartridge mounts on the proper drive.

Refer to *IBM Magstar 3494 Tape Library Introduction and Planning Guide* for additional information.

## **IBM 3494 Tape Library Considerations**

The IBM 3494 library has three components:

### **Drive unit frame**

Contains tape drives and storage cells, with an optional ESCON or FICON controller.

### **Control unit frame**

Contains the library manager, cartridge storage cells, up to two drives, I/O station, accessor, with an optional ESCON or FICON controller.

### **Storage unit frame**

IBM 3590 drives are installable in the following IBM 3494 models:

**D12** Model D12 is a drive unit frame that contains up to six B1A or E1A SCSI attached drives or six E1A Fibre Channel-attached drives. When attached to open systems servers, any combination of B1A SCSI, E1A SCSI, or E1A Fibre Channel-attached drives are allowed.

The B1A or E1A drives are attachable to an A60 control unit in an adjacent D14 frame. All drives attached to a single A60 must be the same model (either all B1A or all E1A) and have the same attachment capability (either SCSI or Fibre Channel).

All drives must be attached directly to an open systems server or to an A60 control unit or connected to a 3494 virtual tape server.

**D14** Model D14 is a drive unit frame that contains an A00, A50, or A60 control unit with up to four B1A drives or an A50 or A60 control unit with up to four E1A drives. B1A and E1A drives are not intermixable in this frame.

With SCSI adjacent frame support, SCSI attached B1A or E1A drives in an adjacent D12, L12, or L14 frame are attachable to an A60 in the D14 frame. With Fibre Channel adjacent frame support, Fibre Channel attached E1A drives in an adjacent D12 or L12 frame are attachable to

an A60 in the D14 frame. Adjacent frame support requires four drives in the D14 frame. All drives attached to a single A60 must be the same model (either all B1A or all E1A) and have the same attachment capability (either SCSI or Fibre Channel).

**L12** Model L12 is a control unit frame that contains up to two B1A or E1A SCSI-attached drives or two E1A Fibre Channel-attached drives. When attached to open systems servers, any combination of B1A SCSI-, E1A SCSI-, or E1A-Fibre Channel attached drives are allowed.

B1A or E1A drives are attachable to an A60 control unit in an adjacent D14 frame. All drives attached to a single A60 must be the same model (either all B1A or all E1A) and have the same attachment capability (either SCSI or Fibre Channel).

All drives are required to be directly attached to an open systems server or to an A60 control unit.

**L14** Model L14 is a control unit frame that contains an A00 or A50 control unit and up to two B1A drives, or an A50 with up to two E1A drives. B1A and E1A drives are not intermixable in this frame.

With SCSI adjacent frame support, SCSI-attached B1A or E1A drives are attachable to an A60 in an adjacent D14 frame. The drives in the L14 and D14 frame must be the same model. When adjacent frame support is used, an A50 or A00 control unit in the L14 frame is no longer operational. A 3590 drive with Fibre Channel attachment is not installable in an L14 frame.

With Model E1A, the 3494 library capacity ranges from 4.8TB to 248TB (14.4TB to 750TB with 3:1 compression). With Model B1A, 3494 library capacity ranges from 2.4TB to 124TB (7.2TB to 372TB with 3:1 compression).

A 3494 library configures with up to 16 IBM 3590 Model A00 or A50 control units and up to 62 Model B1A or E1A drives. A 3494 library is configureable with up to 15 IBM 3590 Model A60 control units and up to 62 Model B1A or E1A drives. With adjacent frame support, up to 76 Model B1A and E1A drives can be attached using eight 3590 Model A60 control units.

## **IBM 3495 Tape Library Considerations**

Installing 3590 Model B1A drives in an IBM 3495 library Model L20, L30, L40, and L50 requires an IBM 3590 Model A14 frame. IBM 3590 drives installed in a 3495 library attach to a host through ESCON channels only. For 3495 installation, the A14 frame contains a 3590 Model A00 or A50 tape controller and four 3590 Model B1A drives. Up to four A14 frames are installable adjacent to each other.

**Note:** A 3495 does not support Exx Models or Extended High Performance Cartridge Tape.

An IBM 3495 library with 3590 High Performance Cartridge Tapes has a capacity range of 56.6TB to 189.4TB (169.8TB to 568.2TB that is compressed). A 3495 library is configurable with up to 32 B1A drives.

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## Software and Operating Systems Support

### 3590 Operating Systems and Platforms

The 3590 High Performance Tape Subsystem supports a variety of environments, some of which are listed below:

- S/390 and zSeries
- TPF
- AS/400 and iSeries
- AIX/6000™
- RS/6000 and pSeries
- VM/ESA
- VSE/ESA
- z/VM
- OS/390
- z/OS
- HP-UX™
- Microsoft Windows NT™
- Microsoft Windows 2000
- xSeries
- Sun Solaris™

For more information on operating systems and platforms, see “SCSI Attachment Planning” on page 93, “ESCON Attachment Planning” on page 101, “FICON Attachment Planning” on page 108, and “Fibre Channel attachment Planning” on page 110.

For current information on 3590 open systems support, see the Web site listed at “Open Systems support” on page xv.

## Independent Software Vendors

The Independent Software Vendors (ISV) listed below have announced support for the IBM Magstar 3590 tape subsystem. Contact the individual application vendors for specific information and availability dates. The list represents our best knowledge at the time of publication and does not imply completeness.

- IBM Backup Recovery and Media Services/400 (BRMS/400)
- IBM Sysback/6000
- R/DARS
- CA-ARCserveIT and ARCserve 2000
- Sterling Alexandria
- Legato NetWorker
- SCH REELlibrarian
- SCH REELbackup
- Tivoli Storage Manager™ (formerly ADSM)
- Veritas NetBackup
- Veritas Backup Exec

A supplemental list of vendor suppliers is listed the URL: “Vendor support” on page xv.

At the URL make your selection.

**Note:** It is recommended that you contact your software vendor when attaching to non-IBM platforms with non-IBM software. Your software vendor will provide you with a matrix that contains hardware, software, firmware revision, and adapter cards that will work with these tape products.

## Device Drivers

A device driver that is shipped provides specific Magstar device support with the unit for the following operating environments:

- HP-UX systems
- RS/6000 and pSeries systems
- Sun SPARC and Ultra/Enterprise architecture systems
- Microsoft Windows NT, Microsoft Windows 2000, and xSeries systems

Device support is available for downloading at the URL listed at “Device Driver support” on page xiv.

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## Chapter 2. Standard Features

This chapter describes device attachment features and frame, cable, and language features. They are represented in the following sections:

- “Model B11, B1A, E11, and E1A Drive Features”
- “Models A00, A50, and A60 Control Features” on page 27
- “Frame Features” on page 35
- “SCSI Cable Features” on page 41
- “Fibre Channel Cable Features” on page 44
- “Language” on page 45

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### Model B11, B1A, E11, and E1A Drive Features

The following table shows device attachment, installation, and media feature codes for Model B11, B1A, E11, and E1A drives of the 3590 subsystem.

#### Feature Description

Feature codes, using the term “Field merge”, instruct the plant to leave a mounting slot available in the frame. This allows for merging of a tape drive at the customer site. Feature codes using the term “Field install” indicate that a mounting slot is to be made available in an existing frame at the customer site.

*Table 4. Feature Codes for Model B11, B1A, E11, and E1A Drives*

Feature Code	Description	Exx Models	Bxx Models
2003	3590 Model C12/C14 Attachment	E1A	B1A
2004	Field Install Silo Attachment	E1A	B1A
2005	Remove Silo Attachment for 3494	E1A	B1A
2006	Remove Silo Attachment for A14	E1A	B1A
3510	Field Install Fibre Channel attachment	E11/E1A	
5780	Extended High Performance Cartridge Tape MES		B11/B1A
5781	Extended High Performance Cartridge Tape MES	E11/E1A	
5790	(Withdrawn as of 12/00)		B11/B1A
9000	ES/9000, ES/3090, S/390, or zSeries Attachment	E11/E1A	B11/B1A
9066	Pearl White Cover (default color)	E11	B11
9068	Raven Black Cover	E11	B11
9200	Open System Device Drivers	E11	B11
9210 <sup>1</sup>	HP-UX Attachment	E11/E1A	B11/B1A
9211	SUN Attachment	E11/E1A	B11/B1A

Table 4. Feature Codes for Model B11, B1A, E11, and E1A Drives (continued)

Feature Code	Description	Exx Models	Bxx Models
9212	Windows or xSeries Attachment	E11/E1A	B11/B1A
9213 <sup>1</sup>	Other non-IBM Attachment	E11	B11
9221 <sup>2,3</sup>	First B11/E11 plus rack shelf installed in a rack	E11	B11
9222 <sup>2,4</sup>	Second or fourth B11/E11 installed in a rack	E11	B11
9223 <sup>2,5</sup>	Third B11/E11 plus rack shelf installed in a rack	E11	B11
9400	AS/400 or iSeries Attachment	E11/E1A	B11/B1A
9410	AS/400 or iSeries Interposer (6501 only)	E11/E1A	B11/B1A
9510	Fibre Channel attachment - Plant Install	E11/E1A	
9600	RS/6000, pSeries, or RS/6000 SP Attachment	E11/E1A	B11/B1A
9631	Plant install drive		B11/B1A
9632	Attach B11 to 3591 Model A01 control unit		B11
9638	Plant install in IBM 3590 A14 frame		B1A
9663	Plant Install Drive	E11/E1A	
9701	Interposer, single-byte wide RS/6000, pSeries, or SP2		B11/B1A
9702	Interposer, double-byte wide RS/6000, pSeries, or SP2	E11/E1A	B11/B1A
9790	Ultra SCSI Attachment (plant install)		B11/B1A
9798	Inline SCSI Terminator	E11/E1A	B11/B1A
9799	VHDCI Cable/Interposer	E11/E1A	B11/B1A
<p><b>Notes:</b></p> <ol style="list-style-type: none"> <li>Several non-IBM systems vendors support attachment of the Magstar 3590 Tape Drive. The customer should check with the non-IBM system vendor for specifics on hardware and software support requirements. Any device drivers needed to support attachment to these systems must be provided by the non-IBM vendor.</li> <li>Feature codes 9221, 9222, and 9223 are required for Model B11 and Model E11 installation in both a new or existing 9309-2, 7015-R00, IBM 7017 Rack, or 7202 rack. This applies to both plant installation or field installation.</li> <li>The first drive that is installed in the rack should specify FC9221 which includes the mounting hardware for the first two drives.</li> <li>The second and fourth rack-installed drives should specify FC9222.</li> <li>The third drive that is installed in the rack should specify FC9223 which includes the mounting hardware for the third and fourth drives.</li> </ol>			

## Feature Definition

### 3590 Model C12/C14 Attachment (FC2003)

Installing a B1A/E1A in the C12/C14 frame requires this feature.

**Field Install Silo Attachment (FC2004)**

An existing B1A/E1A requires this feature. It provides the drive changes necessary to convert it for installation in the C12/C14 frame. This is for field installation only.

**Remove Silo Attachment for 3494 (FC2005)**

An existing B1A/E1A requires this feature. It provides the drive changes necessary to remove it from a C12/C14 frame. It provides conversion for reinstallation in a 3494 Tape Library. This is for field installation only.

**Remove Silo Attachment for A14 (FC2006)**

An existing B1A/E1A requires this feature. It provides the drive changes necessary to remove it from a C12/C14 frame. It provides conversion for reinstallation in an A14 frame. This is for field installation only.

**Field Install Fibre Channel attachment (FC3510)**

This feature replaces the standard Ultra SCSI differential interface with a dual port Fibre Channel attachment. Maximum quantity is one. Field installation only.

**Extended High Performance Cartridge Tape MES for B11/B1A (FC5780)**

Ordering field install FC5780 upgrades B11/B1A drives shipped prior to March 3, 2000. This performance upgrade feature will enable the drive to support Extended High Performance Cartridge Tapes.

**Extended High Performance Cartridge Tape MES for E11/E1A (FC5781)**

Ordering field install FC5781 upgrades E11/E1A drives shipped prior to March 3, 2000. This performance upgrade feature will enable the drive to support Extended High Performance Cartridge Tapes.

**Ultra SCSI Attachment Field Install (FC5790) (Withdrawn as of 12/00)**

Ordering field install FC5790 provides the upgrade requirements for existing drives. This performance upgrade feature doubles the SCSI burst rate of a 3590 drive when connected to SCSI Ultra/wide host SCSI adapters. Drives with these feature codes may still be operated on existing Fast/Wide SCSI adapters. Some subsystems and attachments require prerequisite engineering changes for installation and operation of drives with these features. *These requirements may affect install planning, install time, and system availability during installation.* The following subsystems and attachments require prerequisite changes:

- AS/400 or iSeries systems, using adapters FC6534 or FC2729, require a program temporary fix (PTF) for proper operation of 3590 drive models with Magstar Ultra feature codes. Refer to Info APAR II11472.
- 3494 B16/B18 Virtual Tape Systems or A50/A00 Controllers may require subsystem microcode updates by your service representative. The updates are for proper installation and operation of 3590 drives with Magstar Ultra

features in your subsystems. The Service Representative can refer to *IBM 3590 Tape Subsystem Models B11, B1A, E11, and E1A Maintenance Information* for detailed information.

**ES/9000, ES/3090, S/390, or zSeries Attachment (FC9000)**

This attachment feature code identifies the system type and determines the distribution method for microcode updates.

**Pearl White Cover (FC9066)**

This feature is for Model E11 automated cartridge facility in a rack.

**Raven Black Cover (FC9068)**

This feature is for Model E11 automated cartridge facility in a rack.

**Open System Device Drivers (FC9200)**

Device driver-includes HP-UX, SUN Solaris, Windows NT and Windows 2000 or xSeries. Specify a system attachment feature code.

**HP-UX Attachment (FC9210)**

A device driver is available with FC9200, Open Systems Device Driver.

**SUN Attachment (FC9211)**

A device driver is available with FC9200, Open Systems Device Driver.

**Windows or xSeries Attachment (FC9212)**

A device driver is available with FC9200, Open Systems Device Driver.

**Other non-IBM Attachment (FC9213)**

Several non-IBM systems vendors support attachment of the 3590 Tape Drive. The customer should check with the non-IBM system vendor for specifics on hardware and software support requirements. Device drivers supporting attachment to these systems must be provided by the non-IBM vendor.

**First B11/E11 Installed in Rack (FC9221)**

The first drive installed in a rack requires this feature code. It includes the mounting for the rack's first two drives.

**Second or Fourth B11/E11 Installed in Rack (FC9222)**

Specify this feature code for the second and fourth drives installed in the rack.

**Third B11/E11 Installed in Rack (FC9223)**

The rack's third drive requires this feature code. It includes the mounting for the remaining two drives that install in the rack.

**AS/400 or iSeries Attachment (FC9400)**

Attach to an AS/400 or iSeries server.

**AS/400 or iSeries Interposer (FC9410)**

Interposer for an AS/400 or iSeries server.

**Fibre Channel Attach - Plant Install (FC9510)**

This feature replaces the standard Ultra SCSI differential interface with a dual port Fibre Channel attachment. Any tape drive with this feature, that is installed in a 3590 Model C12 frame or 3494 Model L12 or D12 frame, requires one FC3511 on that frame. The FC3511 supplies the necessary attachment hardware. This feature can be added to new 3590 Model E11 or E1A tape drives or with a model conversion of a 3590 B Model to an E Model. Maximum is one for either plant or field installation. Prerequisite is one FC3511 on any of the above-mentioned frames in which a tape drive with this feature is installed.

Orderable Fibre Channel cables are FC5805, FC5812, FC5825, FC5861, or PN 54G3391.

**Factory Install Fibre Drive (FC9511)**

This feature tells the factory to install one IBM Magstar 3590 Model E1A Tape Drive with the Fibre Channel Attachment feature into a new 3590 Model A14 frame coming from the plant. The tape drive must have a corresponding feature #9510 (Fibre Channel Attachment - Plant Install), specified instead of feature #9663 (Factory Install E1A) for the plant to install the proper tape drive. The quantity of feature #9511 on the 3590 Model A14 frame order must equal the number of 3590 Model E1A Tape Drives with Fibre Channel Attachment that are being installed by the factory in that frame.

This feature is mutually exclusive with features 2 #9630, #9631, and #9663.

**RS/6000, pSeries, or RS/6000 SP Attachment (FC9600)**

A device driver is available with FC9200, Open Systems Device Driver.

**Plant Install B11/B1A Drives (FC9631)**

This specify code allows the factory installation of a B11 into an A14 frame or a B1A into a 3494 library.

**B11 to 3591 Model A01 Attachment (FC9632)**

Marketing does not support this drive.

**Plant Install B1A in A14 Frame (FC9638)**

This specify code directs the factory installation of a B1A drive into an A14 frame.

**Plant Install E11/E1A Drives (FC9663)**

This specify code allows the factory installation of an E11 into an A14 frame or an E1A into a 3494 library.

**Single-Byte Wide Interposer (FC9701)**

Single-byte wide interposer for RS/6000 or pSeries.

**Double-Byte Wide Interposer (FC9702)**

Double-byte wide interposer for RS/6000 or pSeries.

**Ultra SCSI Attachment (FC9790)**

All Model B11 and B1A tape drives have the Ultra SCSI attachment and related enhancements. Specify FC9790 on all orders for tracking purposes to identify this capability. Models B1A and B11 ship with FC9790 as a standard component. It provides two Magstar SCSI Ultra/wide SCSI ports. Maximum quantity is one.

**Inline SCSI Terminator (FC9798)**

This inline terminator provides the required connection of a SCSI cable from the 3590 tape drive. It utilizes an industry standard high-density 68-pin (HD68) cable connector. The HD68 then connects to an HP F/W Differential SCSI 2 adapter (A4800A) on an HP V-Class system.

**VHDCI Cable/Interposer (FC9799)**

This is a VHDCI cable connector that attaches to an HD/68 host device adapter.

## Models A00, A50, and A60 Control Features

The following figure shows device attachment, installation, and media feature codes for Model A00, A50, and A60 control units.

### Feature Descriptions

Feature codes using the term *Field merge* instruct the plant to leave a mounting slot available in the frame for merging of a device at the customer site. Feature codes using the term *Field install* indicate that an existing frame at the customer site requires a mounting slot.

Table 5. Feature Codes for Models A00, A50, and A60 Control Units

Feature Code	Description	Models
0103	FICON Long Wave to ESCON 50um Mode Conditioner Patch Cable	A60
0106	FICON Long Wave to ESCON 62.6um Mode Conditioner Patch Cable	A60
0109	ESCON to 62.5um Multimode SC Duplex Cable	A60
2710 <sup>1</sup>	Remote Support Facility	A00, A50, A60
2711 <sup>2</sup>	Remote Support Switch	A00, A50, A60
2712 <sup>3</sup>	Remote Support Attachment	A00, A50, A60
3311	First ESCON/SCSI adapter card	A00, A50
3312	Second ESCON/SCSI adapter card	A00, A50
3412	Dual ESCON Attachment	A60
3432	FICON Attachment Long Wave	A60
3433	FICON Attachment, Short Wave	A60
3463	Fibre Drive Attachment	A60
3465	Fibre Drive Attached Rack	A60
4065	Multi-frame SCSI Rack Attach	A60
4300	Field install 3490E emulation mode	A00, A50
4301	Field install 3590 native mode	A00, A50
4641	Field install A00/A50/A60 in a rack	A00, A50, A60
5000	Floor standing A50 for attaching to a C12	A00, A50
9000	ES/9000, ES/3090, S/390, or zSeries Attachment	A00, A50, A60
9059	3590 Drive Attached	A60
9060	Multi-frame SCSI A14	A60
9300	Withdrawn	A00, A50
9301	Withdrawn	A00, A50
9511	Factory Installed Fibre Drive	A60
9651	Field merge A50 in C14	A50
9652	Withdrawn	A50
9655	Field merge A50 in 3494	A50

Table 5. Feature Codes for Models A00, A50, and A60 Control Units (continued)

Feature Code	Description	Models
9656	Withdrawn	A50
9657	Withdrawn	A50
9658	Field merge A50 in A14 frame	A50
9661	Field merge A60 in a C10 frame	A60
9662	Plant install A60 in a C10 frame	A60
9665	Field merge A60 in a 3494	A60
9666	Plant install A60 in a 3494	A60
9667	Plant install A60 in an A14	A60
9668	Field Merge A60 in A14	A60
<p>1. FC2710 supplies a cable, modem, and connectors to attach the modem to the Model A00, A50, or A60 for remote diagnostic support. Specify this feature on the first Model A00, A50, or A60 in an installation.</p> <p><b>Note:</b> The first FC2710 requires an <b>analog</b> phone line in the installation. The same modem and switch may be shared between the following units:</p> <ul style="list-style-type: none"> <li>• Models A00, A50, and A60</li> <li>• 3494 Models B16, HA1, L10, L12, L14, or B18</li> <li>• 3490E Model F1A or FC0 with FC3000</li> </ul> <p>2. FC2711 provides a switch, cables, and connectors for the attachment of multiple Model A00, A50, and A60 controllers to FC2710. Order this feature on the second Model A00, A50, or A60 in an installation.</p> <p>3. FC2712 provides an additional cable and connector to attach to FC2711. Specify this feature on the third through fourteenth Model A00, A50, or A60 in an installation.</p>		

## Feature Definitions

### Mode Conditioner Patch Cable, 50 Micron (FC0103)

This feature provides a FICON Long Wave to ESCON 50 micron Mode Conditioner Patch (MCP) cable to permit ESCON trunk fibre reuse for FICON attachment. The MCP cable has one male SC Duplex connector on one end and one ESCON receptacle on the other end. Each link requires two MCP cables. One cable goes between the control unit FC3432 and the ESCON cable, and the other goes between the host channel and ESCON cable. A Fibre Channel switch requires four MCPs. This attachment is not used to attach to an ESCON port on a director, control unit, or channel card. The MCP cables allow using existing 50 micron multimode fibre cables at reduced distances. The total cable length cannot exceed 550 meters.

### Mode Conditioner Patch Cable, 62.5 Micron (FC0106)

This feature provides a FICON Long Wave to ESCON 62.5 micron Mode Conditioner Patch (MCP) cable to permit ESCON trunk fibre reuse for FICON attachment. The MCP cable has one male SC Duplex connector on one end and one ESCON receptacle on the other end. Each link requires two of these MCP cables, one between the control unit FC3432 and the ESCON cable, and

one between the host channel and ESCON cable. A Fibre Channel switch requires four MCPs. This attachment is not usable for an ESCON port on a director, control unit, or channel card. The MCP cables allow using existing 62.5 micron multimode fibre cables at reduced distances. The total cable length cannot exceed 550 meters.

**ESCON to 62.5um Multimode SC Duplex Cable (FC0109)**

This feature provides a FICON short wavelength to ESCON 62.5 micron jumper cable to permit the use of installed 62.5 micron ESCON trunk fibre cables for FICON short wavelength attachment. The cable has one male SC Duplex connector on one end and one ESCON receptacle on the other end. Two of these cables are required on each link (one between the control unit feature #3433 and the ESCON cable, and one between the ESCON cable and the host or director short wavelength channel connection). This cable enables use of existing 62.5 micron multimode fibre cables at reduced distances. The total cable length cannot exceed 250 meters (820 feet).

**Remote Support Facility (FC2710)**

This feature supplies a cable and connectors for attachment to an IBM supplied modem which enables remote diagnostic support. This feature is orderable on the first unit in an installation. Each A00, A50, and A60 must specify either FC2710, FC2711, or FC2712, which are either plant or field installable.

**Remote Support Switch (FC2711)**

This feature provides a switch, cables, and connectors for the attachment of units through the switch to a modem. This feature is orderable on the second unit in an installation. Each A00, A50, and A60 must specify either FC2710, FC2711, or FC2712, which are either plant or field installable.

**Remote Support Attachment (FC2712)**

This feature provides an additional cable and connector to attach to the Remote Support Switch (FC2711). It should be ordered on the third through fourteenth unit attached to the Remote Support Switch in an installation site. Each A00, A50, and A60 must specify either FC2710, FC2711, or FC2712, which are either plant or field installable.

**First ESCON/SCSI Adapter Card (FC3311)**

This feature provides one SCSI adapter for attachment of the 3590 tape drives. It also provides one ESCON adapter, and one 30.5m (100 ft.) ESCON cable for attachment of those drives to host system ESCON channels. The ESCON adapter can connect to up to 64 logical channels and, using ESCON Directors, can be up to 43 kilometers from the host system. All A00/A50 control units require this feature which is for plant installation only.

**Second ESCON/SCSI Adapter Card (FC3312)**

This feature provides a second SCSI adapter for attachment of the 3590 tape drives. The feature also provides a second ESCON adapter and one 30.5m (100 ft.) ESCON cable for attachment of those drives to host system ESCON channels. This feature is optional and is for either plant or field installation.

**Dual ESCON Attachment (FC3412)**

This feature provides for attachment of Models B11, B1A, E11, or E1A tape drives through an A60 to two ESCON host system channels. Each ESCON adapter can connect to up to 64 logical channels and, using ESCON directors, can be up to 43 kilometers from the host system. Maximum number of FC3412s is four.

**FICON Long Wave Attachment (FC3432)**

This feature provides Magstar 3590 Tape Drives attachment, through the A60 to a FICON host system long wave channel. It utilizes 9 micron single mode fibre cable with SC Duplex connectors. Each FICON attachment can connect up to 64 logical channels. Maximum number of FC3432s or 3433s is two.

**FICON Attachment, Short Wave (FC3433)**

This feature provides E11, E1A, B11, or B1A tape drive attachment through the A60 to FICON host system channels. It utilizes 50um multi-mode fibre cable with SC duplex connectors. Each FICON port can connect to up to 64 logical channels. One each of either FC3412, FC3432, or FC3433 is required on all A60 control units. The total cable length must not exceed 500m. This is a field or factory installation. Maximum number of FC3432s or 3433s is two.

**Fibre Drive Attachment (FC3463)**

All configurations that attach Fibre Channel Drives to a Magstar 3590 Model A60 Controller require this feature. This feature replaces the Ultra SCSI tape drive attachment with two Fibre Channel adapters, for attachment of Magstar 3590 E Model Tape Drives with Fibre Channel attachment capability. In addition, one IBM 2109 Model S16 SAN Fibre Channel Switch is required for each Model A60 that attaches 3590 Fibre Channel Drives. Additional features are required on the 3494 Tape Library frames, 3590 Model C12 frame, 3590 Model C10 frame, 3590 Model A14 Frame, and 3590 Model A60 (for stand-alone racks) for attaching fibre channel drives.

**Fibre Drive Attached Rack (FC3465)**

This feature supplies the required hardware to support attachment of 3590 Tape Drives with Fibre Channel Attachment (FC3510 or FC9510) to a Magstar 3590 Model A60 Controller in a rack. It includes the mounting hardware and instructions for installing the IBM 2109 Model S16 SAN Fibre Channel Switch in the rack, including the associated Ethernet hub and cabling between the Model A60 and the hub and switch. Fibre Channel cables from the 3590 Tape Drives to the switch in the rack with the Model A60 are included by

specifying FC9059 (one for each tape drive). For multiframe attachment of 3590 Tape Drives in other racks to the switch, the cables should be ordered with the drives.

**Multi-frame SCSI Rack Attach (FC4065)**

This feature includes cables to connect the Model A60 Controller to tape drives in the second rack, and necessary drive-to-drive interconnection cables in that rack. Because of SCSI cable length restrictions, the two racks must be installed adjacent to each other.

**Field Install 3490E Emulation Mode (FC4300)**

This specify code enables changing the operation mode of the A00/A50 from native 3590 mode to 3490E emulation mode on an installed A00/A50. Either FC9300 or FC4300 is removed when installing this feature.

**Field Install 3590 Native Mode (FC4301)**

This specify code enables changing the operation mode of the A00/A50 from 3490E emulation mode to native 3590 mode on an installed A00/A50. Either FC9300 or FC4300 is removed when installing this feature.

**Field Install Control Units in Rack (FC4641)**

This optional feature provides the rack mounting hardware to install an A00/A50/A60 in a rack. The feature is plant or field installable.

**Floor Standing A00/A50 (FC5000)**

This feature enables the A00/A50 control unit to be a free-standing unit attached to B1A/E1A tape drive in a C12/C14 frame.

**ES/9000, ES/3090, S/390, or zSeries Attachment (FC9000)**

This attachment feature code identifies the system type and determines the distribution of microcode updates.

**A60 to 3590 Attachment (FC9059)**

One feature must be specified on the Model A60 for each attached tape in the rack that contains the Model A60.

**Multi-frame SCSI A14 (FC9060)**

This feature is required on the 3590 Model A60 controller to support SCSI multi-frame attachment of up to eight 3590 tape drives in two different 3590 Model A14 frames. The maximum distance between Model A14 frames is seven meters.

**Factory Install 3590E Emulation Mode (FC9300)**

FC9300 allows the factory specification of 3490E Emulation on a new order of A00/A50 control units. New orders require either FC9300 or FC9301.

**Factory Install 3590 Native Mode (FC9301)**

FC9301 allows the factory specification of 3590 native mode on a new order of A00/A50 control units. New orders require either FC9300 or FC9301.

**Factory Install Fibre Drive (FC9511)**

This feature tells the factory to install one IBM Magstar 3590 Model E1A Tape Drive with the Fibre Channel Attachment feature into a new 3590 Model A14 frame coming from the plant. The tape drive must have a corresponding feature #9510 (Fibre Channel Attachment - Plant Install), specified instead of feature #9663 (Factory Install E1A) for the plant to install the proper tape drive. The quantity of feature #9511 on the 3590 Model A14 frame order must equal the number of 3590 Model E1A Tape Drives with Fibre Channel Attachment that are being installed by the factory in that frame.

This feature is mutually exclusive with features 2 #9630, #9631, and #9663.

**Field Merge A50 in C14 (FC9651)**

This specify code allows the field merge of a new A50 control unit into an existing C14 frame.

**Plant Install A50 in C14 (FC9652)**

This specify code allows the factory merge of a new A50 control unit into a new C14 frame from the plant. This feature code must appear on both the A50 and C14 orders.

**Field Merge A50 in 3494 (FC9655)**

This specify code allows the field merge of a new A50 control unit into an existing 3494 library.

**Plant Install A50 in 3494 (FC9656)**

This specify code allows the factory merge of a new A50 control unit into a new 3494 library from the plant. This feature code must appear on both the A50 and 3494 orders.

**Plant Install A50 in A14 (FC9657)**

This specify code allows the factory merge of a new A50 control unit into a new A14 frame from the plant. This feature code must appear on both the A50 and A14 orders.

**Field Merge A50 in A14 (FC9658)**

This specify code allows the field merge of a new A50 control unit into an existing stand-alone A14 frame.

**Field Merge A60 in C10 (FC9661)**

This specify code allows the field merge of a new A60 into an installed C10.

**Plant Install A60 in C10 (FC9662)**

This specify code allows the factory install of a new A60 into a new C10. This code must appear on both the A60 and C10 orders.

**Field Merge A60 in 3494-D14 (FC9665)**

This specify code allows the field merge of a new A60 control unit into an installed 3494 library.

**Plant Install A60 in 3494-D14 (FC9666)**

This specify code allows the factory install of a new A60 control unit into a new 3494 library from the plant. This code must appear on both the A60 and 3494-D14 orders.

**Plant Install A60 in A14 (FC9667)**

This specify code allows the factory merge of an A60 control unit into an A14 from the plant. This code must appear on both the A60 and A14 orders. This feature is mutually exclusive with FC9637 or FC9657.

## Model A60 Attachment Capabilities

Model A60 attachment is dependent on the environment (A14, rack, Silo, 3494) and the selection of SCSI or Fibre Channel attachment. See Table 6 for A60 maximum attachment capabilities.

Table 6. Model A60 Attachment Capabilities

Environment	SCSI Drives (maximum allowable)	Fibre Channel Drives (maximum allowable)
One A14 with one A60	4	4
Two A14 Multi-frames with one A60	8	8
Three A14 Multi-frames with one A60	N/A	12
One 1.6M rack with one A60	4	2
Two 1.6M rack Multi-frames with one A60	8	6
Three 1.6M rack Multi-frames with one A60	N/A	10
One 1.8M rack with one A60	4	4
Two 1.8M rack Multi-frames with one A60	8	8
Three 1.8M rack Multi-frames with one A60	N/A	12
Silo with one C12 (one A60 in a C10)	4	4
Silo Multi-frame with two C12s (one A60 in a C10)	8	8
Silo Multi-frame with three C12s (one A60 in a C10)	N/A	12
3494 D14	4	4
3494 D12 and D14 with adjacent frame	10	10

## A60 Fibre Channel to Tape Drive Requirement

Each A60 control unit attaching Fibre Channel tape drives requires one IBM 2109 Model S16 SAN Fibre Switch, which must be ordered separately. The 2109 switch must be installed in the rack containing the A60 control unit. A 2109 switch has four short wavelength Gigabit Interface Convertors (GBICs), which connect to two A60 Fibre Channel attachments and two Fibre Channel tape drives. FC2110 (short wavelength GBIC) provides one additional GBIC; therefore, the quantity of this feature should at least equal the number of tape drives attached to the A60 minus two. FC6103 (Additional Power Supply) provides a redundant power source to minimize power outages. FC9205 (Non-Rack Install) should not be specified.

## 3591 Model A01 Control Unit

Refer to *IBM 3591 Model A01 Tape Control Unit Introduction, Planning, and User's Guide* for more information.

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## Frame Features

The following table shows device attachment and installation feature codes for a Model A14 frame.

### Model A14 Feature Description

Feature codes using the term “Field merge” instruct the plant to leave a mounting slot available in the frame for merging of a tape drive at the customer site. Feature codes using the term “Field install” indicate that a mounting slot is to be made available in an existing frame at the customer site.

*Table 7. Model A14 Frame Feature Codes*

<b>Feature Code</b>	<b>Description</b>
2010	Shortwave GBIC
3464	Fibre Drive Attached A60
4060	Multi-frame SCSI A14
4062	Multi-frame SCSI Drives
4064	Multi-frame Fibre Drives
4630	Field install IBM 3590 Model E11 or B11 drive
4638	Field install IBM 3590 Model B1A drive
4650	Replace A00 with A50
4657	Field install Model A50 in A14
4660	Replace A00/A50 with A60
4663	Replace B11 with E11
4730	Remove drive from A14
6103	Redundant Power supply
9000	ES/9000, ES/3090, S/390, or zSeries Attachment
9012	Plant install in 3495 library
9062	Multi-frame SCSI drives - Plant Install
9511	Factory Install Fibre Drive
9630	Field merge Model E11 or B11 drive
9631	Plant install Model B11 drive
9637	Plant install Model A00 controller
9638	Plant install Model B1A drive
9639	Field merge Model B1A drive
9657	Plant Install A50 in A14
9658	Field merge A50 in an A14
9663	Plant Install E11
9667	Plant Install A60 in A14
9668	Field merge A60 in an A14

Table 7. Model A14 Frame Feature Codes (continued)

Feature Code	Description
9780	Extended High Performance Cartridge Tape MES

## Model A14 Feature Definition

### Shortwave GBIC (FC2010)

This feature provides one additional Gigabit Interface Convertors (GBIC). The quantity of this feature should equal the number of tape drives to which each Model A60 attaches less two. (For example, if the A60 is attaching to 12 tape drives, the required number of GBICs is 10.

### Fibre Drive Attached A60 (FC3464)

This feature is required on the A14 frame that contains an A60 controller which supports attachment of 3590 tape drives with Fibre Channel Attachment (FC3510 or FC9510). It includes the required mounting hardware and instructions for installing the IBM 2109 Model S16 SAN Fibre Channel Switch in the Model A14, including the associated Ethernet hub and cabling between the Model A60 and the hub and switch and drives in that Model A14. Up to twelve 3590 Tape Drives in three Model A14 Frames can be attached to the Model A60 Controller.

### Multiframe SCSI A14 (FC4060)

To supports SCSI attachment of 3590 Tape Drives in two different A14 Frames, FC4060 (Multiframe SCSI A14) must be specified on the frame that contains the Model A60 Controller, and feature FC4062 (Multiframe SCSI Drives Field Install) or feature FC9062 (Multiframe SCSI Drives Plant Install) must be specified on the other Model A14 Frame. All hardware and required cables between the drives and the Model A60 are included in these features. Because of SCSI cable length restrictions, the two Model A14 Frames must be installed adjacent to each other.

The maximum distance between Model A14 frames is seven meters.

### Multiframe SCSI Drives (FC4062)

This feature provides the field installation to support SCSI attachment of 3590 Tape Drives in one 3590 Model A14 Frame to a Magstar 3590 Model A60 Controller in a different Model A14 Frame. In a multiframe SCSI attachment, up to eight 3590 Tape Drives can be attached to the Model A60, four in each Model A14 Frame. It includes SCSI cables between the two Model A14 Frames and allows for the proper drive-to-drive cables to be included based on the number of drives installed in this frame. Because of SCSI cable length restrictions, the two Model A14 Frames must be installed adjacent to each other. If another controller is installed in this Model A14 Frame, that controller will be non-functional.

**Multiframe Fibre Drives (FC4064)**

This feature provides the hardware and installation instructions to support attachment of 3590 Tape Drives with Fibre Channel Attachment (FC3510 or FC9510) in one 3590 Model A14 Frame to a Magstar 3590 Model A60 Controller in a different Model A14 Frame. In a multiframe fibre attachment, up to 12 Magstar 3590 E Model Tape Drives with Fibre Channel Attachment can be attached to the Model A60, four in each Model A14 Frame. This feature enables use for a Fibre Channel cable from each tape drive to the 2109 switch in the Model A14 Frame with the Model A60 Controller to be included based on the number of drives installed in this frame. The distance between the two Model A14 frames in this multiframe fibre configuration must be no more than 7m (23 ft). If another controller is installed in this Model A14 frame, that controller will no longer function.

**Field Install B11/E11 (FC4630)**

A currently installed A14 requires this feature to add a B11/E11 tape drive. All tape drives attached to a control unit in an A14 must be the same model. Use either all E or B Model tape drives. It provides the mounting hardware for the drive. It also provides proper cables to connect to the ESCON control unit. The cables are determined by FC4630, plus FC9630, plus FC9631, plus FC9663. This feature is uninstallable on an A14 with FC4638, FC9638, or FC9639. The maximum quantity of FC4630 plus FC9630 plus FC9631 plus FC9663 is four. Do not intermix Fiber and SCSI cables.

**Field Install B1A (FC4638)**

An installed A14 requires this feature to add a B1A tape drive. This feature is uninstallable on an A14 with FC4630, FC9630, or FC9631. The maximum number of FC4638 plus FC9638 plus FC9639 is four.

**Replace A00 with A50 (FC4650)**

The mounting changes to replace an A00 with an A50 in a currently installed model A14 frame requires this feature.

**Field Install A50 (FC4657)**

The mounting hardware to add an A50 to a currently installed A14 frame requires this feature. The maximum of FC4657, plus FC9637, plus FC9657, is two. This feature is not available if FC9012 is installed.

**Replace A00/A50 with A60 (FC4660)**

The mounting changes to replace an A00/A50 with an A60 in a currently installed model A14 frame require this feature. This required feature is mutually exclusive with FC9637 (withdrawn from marketing) or FC9657.

**Replace B11 with E11 (FC4663)**

The mounting hardware to replace a B11 with an E11 in a currently installed A14 frame requires this feature.

**Remove Drive from A14 (FC4730)**

You must use this feature to remove a B1A, B11, or E11 drive from a currently installed A14 frame and install it elsewhere. If you add this feature, you must remove at least one of FC4630, FC4638, FC9630, FC9631, FC9638, FC9639, FC9663, or FC9511 must be removed.

**Redundant Power Supply (6103)**

This feature provides an additional power supply enabling dual-power source configurations.

**ES/9000, ES/3090, S/390, or zSeries Attachment (FC9000)**

This attachment feature code identifies attachment to ES/9000, ES/3090, and S/390 or zSeries.

**Plant Install in 3495 Library (FC9012)**

This specify code allows the factory build of a new A14 in a 3495 library. This will provide an A14 with the proper panel for the four B1A drives in the A14, and provide the interface hardware to the 3495 library.

**Multi-frame SCSI drives - Plant Install (FC9062)**

This feature provides the plant installation to support SCSI attachment of 3590 Tape Drives in one 3590 Model A14 Frame to a Magstar 3590 Model A60 Controller in a different Model A14 Frame. In a multiframe SCSI attachment, up to eight 3590 Tape Drives can be attached to the Model A60, four in each Model A14 Frame. It includes SCSI cables between the two Model A14 Frames and allows for the proper drive-to-drive cables to be included based on the number of drives installed in this frame. Because of SCSI cable length restrictions, the two Model A14 Frames must be installed adjacent to each other.

The maximum distance between Model A14 frames is seven meters.

**Factory Install Fibre Drive (FC9511)**

This feature must be specified on the Model A14, instead of FC9663, one feature for each 3590 Tape Drive with FC9510 (Fibre Channel Attachment) installed in that Model A14 coming from the plant.

**Field Merge B11 or E11 (FC9630)**

The field merge of a B11/E11 tape drive into an A14 coming from the plant requires this feature. It notifies the factory to leave a mounting slot available for a field merge of the tape drive prior to installation completion. All tape drives attached to a controller in an A14 must be the same model (such as all of B Model or all of E Model). This feature is uninstallable on an A14 with FC4638, FC9638, or FC9639.

**Plant Install B11/B1A Drives (FC9631)**

This specify code allows the factory installation of a B11/B1A into an A14. This feature is uninstalleable with FC4638, FC9638, or FC9639. This feature code must appear on both the B11 and A14 orders.

**Plant Install B1A in A14 Frame (FC9638)**

This specify code allows the factory installation of a B1A into an A14. This feature is uninstalleable with FC4630, FC9630, or FC9631. This code must appear on both the B1A and A14 orders. The sum of features FC4638, FC9638, or FC9639 must be four.

**Field Merge B1A (FC9639)**

The field merge of a B1A tape drive into an A14 frame coming from the plant requires this feature. It notifies the factory to leave a mounting slot available for a field merge of the tape drive prior to installation completion. This feature is uninstalleable on an A14 with FC4630, FC9630, or FC9631.

**Plant Install A50 in A14 (FC9657)**

The factory installation of an A50 controller into an A14 frame requires this feature. This code must appear on both the A50 and A14 orders. The maximum number of A50 controllers installed in an A14 frame is two. Specifying FC9012 limits the maximum to one. The maximum number of FC4650 plus FC4657 plus FC9637 plus FC9657 plus FC9658 is two.

**Field Merge A50 in A14 (FC9658)**

The field merge of a customer supplied A50 controller into a new A14 frame requires this feature. The maximum number of FC4650 plus FC4657 plus FC9637 plus FC9657 plus FC9658 is two.

**Plant Install E11/E1A Drives (FC9663)**

This specify code enables the factory installation of E11/E1A drives into a 3494 library.

**Plant Install A60 in A14 (FC9667)**

This specify code enables the factory to merge an A60 control unit into an A14 frame at the plant. This code must appear on both the A60 and A14 orders. This feature is mutually exclusive with FC9637 or FC9657.

**Field Merge A60 in A14 (FC9668)**

This specify code allows the field merge of a new A60 control unit into an installed A14 frame.

**Extended High Performance Cartridge Tape MES (FC9780)**

This feature code provides the required updates to change from a High Performance Cartridge Tape environment to an Extended High Performance

Cartridge Tape environment on A14 frames. If any drive in an A14 has Extended High Performance Cartridge Tape capability, this feature code must also be on that frame.

### **2109 Switch (an A60 Fibre Channel to Tape Drive Requirement)**

Each A60 control unit attaching Fibre Channel tape drives requires one IBM 2109 SAN Fibre Channel Switch. A 2109 switch has four short wavelength Gigabit Interface Convertors (GBICs) which connect to two A60 Fibre Channel attachments and two Fibre Channel tape drives.

**Note:** Addition of the 2109 switch and associated GBICs changes your total power consumption within the frames in which they reside. Verify your total power requirements based on the cumulative power for the number of devices you install in each frame.

### **Rack Mount Frames**

#### **Fibre Drive Attached Rack (FC3465)**

This feature supplies the required hardware to support attachment of 3590 tape drives with Fibre Channel Attachment (FC3510 or FC9510) to an A60 control unit in a rack. It includes the mounting hardware and instructions for installing the IBM 2109 Model S16 SAN Fibre Channel Switch in the rack, including the associated Ethernet hub and cabling between the Model A60 and the hub and switch. Fibre Channel cables from the 3590 Tape Drives to the switch in the rack with the Model A60 are included by specifying FC9059 (one for each tape drive). For multiframe attachment of 3590 Tape Drives in other racks to the switch, you should order the cables with the drives.

### **Model C10, C12, and C14 Frames**

Refer to *IBM 3590 Silo-Compatible Frame Models C10, C12, and C14 Introduction, Planning, and User Guide* for information on features.

## SCSI Cable Features

### Feature Description

Cables are usable for fast/wide and SCSI Ultra/wide models. Table 8 shows the SCSI cable length feature codes for the subsystem.

Table 8. 3590 SCSI Cable Length Feature Codes

Feature Codes	Description <sup>1, 2</sup>	Model
5106 <sup>3, 4</sup>	0.6 m (1.9 ft) SCSI cable	B11, B1A, E11, E1A
5112	12 m (39.4 ft) SCSI cable	B11, B1A, E11, E1A
5118	18 m (59 ft) SCSI cable	B11, B1A, E11, E1A
5125 <sup>5</sup>	25 m (82 ft) SCSI cable	B11, B1A, E11, E1A
5128	2.8 m (9.2 ft) SCSI cable	B11, B1A, E11, E1A
5129 <sup>3</sup>	2.9 m (9.5 ft) SCSI cable	B11, B1A, E11, E1A
5134 <sup>3</sup>	3.4 m (11.1 ft) SCSI cable	B11, B1A, E11, E1A
5138 <sup>3</sup>	4.0 m (13.1 ft) SCSI cable	B11, B1A, E11, E1A
5145	4.5 m (14.8 ft) SCSI cable	B11, B1A, E11, E1A

#### Notes:

1. Differential SCSI cable with high-density 68-pin connectors.
2. Conversions from meters to feet are approximate and rounded to the nearest foot.
3. Feature codes 5106, 5129, 5134, and 5138 are recommended for drive-to-drive connecting. They have a “hammerhead” connector on each end that allows a drive to be disconnected from the SCSI bus without disconnecting all drives from the bus. The other cable features have a “hammerhead” connector on one end and a single straight connector on the other end for attachment to a host system. Use these cable feature codes to connect multiple 3590 Model B1A drives on the same SCSI bus in 3494 models D12, D14, L12, and L14.
4. The 0.6-m (1.9-ft) SCSI cable can be used when two Model B11 subsystems are immediately adjacent to each other and are attached to the same SCSI I/O controller. This cable should not be used when attaching to an AS/400 or iSeries server.
5. Cable lengths of 18 m (59 ft), or less, can be used with RS/6000 or pSeries FC2420; cable lengths greater than 18 meters cannot be used with RS/6000 or pSeries FC2420.

Two types of 3590 cables in various lengths are available for use with the 3590 tape drives: host-to-device cables and device-to-device cables for serial connections.

Some SCSI connectors have two connection points for each device interface. One is for the incoming cable. The other is for the multi-drop cable which attaches to the next device (target) or host (initiator) on the string.

For 3590 C10/C12/C14 models, refer to *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide*.

## Feature Definition

### **0.6m SCSI Cable (FC5106)**

This feature supplies a 0.6m (1.9ft) SCSI cable. It is to connect side by side 3590 drives to the same SCSI bus. The maximum number of features is two. This feature is optional and is for field or plant installation.

### **12meter SCSI Cable (FC5112)**

This feature supplies one 12m (39.4ft) SCSI cable. Use of the RS/6000 or pSeries FC2420 limits the total length of all device connections. The SCSI bus cannot exceed the 18m (59ft) cable limitation of FC2420. The maximum number of features is two. This feature is optional and is for field or plant installation.

### **18meter SCSI Cable (FC5118)**

This feature supplies one 18m (59ft) SCSI cable. This cable allows the tape drive location further away from the host system for greater flexibility. If FC2420 is used on RS/6000, pSeries, or SP2, a second 3590 drive, multi-connected to this one, must be located next to the first one. It requires connection with the 0.6m (1.9ft) cable to stay under the 18m (59ft) cable length maximum. The maximum number of features is two. This feature is optional and is for field or plant installation.

### **25meter SCSI Cable (FC5125)**

This feature supplies one 25m (82ft) SCSI cable. This is the maximum distance supported for a SCSI attachment with RS/6000 or pSeries FC2416. The 3590 drive does not support this feature when the 3590 drive attaches to feature code 2420 on RS/6000, pSeries, or SP. This is because it exceeds the maximum cable length allowed. The feature also supplies a SCSI cable for IBM 3590 Model A00 or 3591 Model A01 controllers. The maximum number of features is two. This feature is optional and is for field or plant installation.

### **2.8-meter SCSI Cable (FC5128)**

This feature supplies a 2.8-m (9.2-ft) SCSI cable. It is to connect a 3590 drive when it is in the same rack as the AS/400 or iSeries server, 9406, RS/6000, or pSeries processor. If the processor is in a different rack, this cable is too short. The maximum number of features is two. This feature is optional and is for either field or plant installation.

### **2.9-m SCSI Cable (FC5129)**

This feature supplies a 2.9-m (9.5-ft) SCSI cable to connect side by side 3590 drives. This applies when the drives are in a Model A14 frame or when they are vertically aligned in a rack.

### **3.4-meter SCSI Cable (FC5134)**

This feature supplies a 3.4-m (11.1-ft) SCSI cable. It is to used connect a 3590 drive to another 3590 drive horizontally within a 3494 tape library when

connecting those drives to the same SCSI bus. The maximum number of features is two. This feature is optional and is for field or plant installation.

**4-meter SCSI Cable (FC5138)**

This feature supplies a 4-m (13.1-ft) SCSI cable. It is to connect a 3590 drive to another vertically within a 3494 tape library when connecting those drives to the same SCSI bus. The maximum number of features is two. This feature is optional and is for field or plant installation.

**4.5-meter SCSI Cable (FC5145)**

This feature supplies one 4.5-m (14.8-ft) SCSI cable. This is the minimum length SCSI cable that is required to connect a 3590 drive to a SCSI port on a host system. The maximum number of features is two. This feature is optional and is for field or plant installation.

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## Fibre Channel Cable Features

### Feature Description

The following cables attach 3590 E model drives with the Fibre Channel attachment directly to open systems servers with shortwave multi-mode fiber. They are also used when attaching E model drives with the Fibre Channel attachment feature to the A60 control unit in the following situations:

- Attaching 3590 drives in a rack to an A60 in another rack
- Attaching 3590 drives in a C12 frame to an A60 in a C10 frame

See “FICON Attachment Planning” on page 108 for details on cables used with the A60 and FICON.

For 3590 C12 models, refer to *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide*.

The feature codes listed in Table 9 specify an appropriate cable length for a 3590 attachment.

Table 9. 3590 Fibre Channel Cable Length Feature Codes

Feature Code (IBM P/N)	Description	Model
5805	5-meter Fibre Channel Cable	E11/E1A
5813	13-meter Fibre Channel Cable	E11/E1A
5825	25-meter Fibre Channel Cable	E11/E1A
5861	61-meter Fibre Channel Cable	E11/E1A
54G3391	See “Custom Length Fibre Channel Cable (PN54G3391)” on page 45	E11/E1A

### Feature Definition

#### 5m Fibre Channel Cable (5805)

This feature supplies one 5m (16 ft.) 50.0/125 micrometer fiber-optic cable with duplex SC connectors. This feature is for field or plant installation. It is not recommended when attaching Fibre Channel drives to an A60.

#### 13m Fibre Channel Cable (5813)

This feature supplies one 13m (43 ft.) 50.0/125 micrometer fiber-optic cable with duplex SC connectors. This feature is for field or plant installation.

#### 25m Fibre Channel Cable (5825)

This feature supplies one 25m (82 ft.) 50.0/125 micrometer fiber-optic cable with duplex SC connectors. This feature is for field or plant installation.

**61m Fibre Channel Cable (5861)**

This feature supplies one 61m (200 ft.) 50.0/125 micrometer fiber-optic cable with duplex SC connectors. This feature is for field or plant installation.

**Custom Length Fibre Channel Cable (PN54G3391)**

All Fibre Channel cables for specific lengths, other than lengths with feature codes, are orderable to this part number. Maximum length is 500 meters for Fibre Channel attachment. Cable length is measured from the drive's Fibre port. If a drive is installed in a 3494 frame, or similar frame, a patch panel is available to ease installation. The three-meter Fibre cable from the drive Fibre port to the patch panel must be included in the total calculated cable length.

The maximum number of FC5805, plus FC5813, plus FC5825, plus FC5861, is five.

**Product Support Services**

IBM Global Services' Product Support Services can provide additional fiber optic components, and fiber optic cabling solutions. IBM Site and Connectivity Services (I/T Consulting and Implementation Services) provides structured, modular, fiber optic data center connectivity solutions. These solutions are part of its Fiber Transport Services (FTS) offering. Preterminated fiber optic trunk cables are available in standard lengths up to 138m (450ft). Fiber optic commodities and installation activities can be performed by Support Services personnel. Custom fiber optic cable lengths and installation are available. For more information contact your local IBM Services Sales Specialists or visit the Web site listed at "IBM Global Services' Product Support Services" on page xiv

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## Language

**Features**

Table 10 shows the language feature codes for the subsystem. English is the default language.

*Table 10. 3590 Language Feature Codes*

Feature Code	Description
2924	U.S. English
2929	German
2931	Spanish



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## Chapter 3. Standard Functions

This chapter describes standard functions of the IBM 3590.

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### Standard Functions

Standard functions of the IBM 3590 High Performance Tape Subsystem follow.

#### Read/Write Buffering

The integrated drive controller contains a 4MB read/write data buffer for fast/wide SCSI and 16MB for SCSI Ultra/wide SCSI. Note that all Exx models have 16MB buffers because they use only SCSI Ultra/wide SCSI. This buffer permits the subsystem to respond rapidly to read-and-write data requests, resulting in efficient channel use. The controller units that permit ESCON and FICON attachment add another layer of buffering.

#### Drive Assignment

The host operating system, through ESCON or FICON channels, issues the Drive Assign, and Unassign commands. This feature prevents simultaneous use by more than one host processor. Not issuing an Assign command permits use of that drive by any attached host processor.

The SCSI host operating systems use the SCSI Reserve and Release commands to enable device sharing. These commands prevent simultaneous use of a drive by more than one host. The drive also has an Auto-Share function. Enabling Auto-Share sets the other port offline function when a SCSI port receives a Reserve command. It returns online as the secondary port receives a Release command.

For Fibre Channel addressing, see “Address Assignments” on page 112.

The 3590 A00, A50, and A60 control units support managed device sharing by JES3, JES2, MVS Auto Switch, and MIM (Multiple Image Manager, a product of Computer Associates Inc.). The A00/A50/A60 controllers allow concurrent assignment management to multiple hosts. For information on the 3591 A01 controller, refer to *IBM 3591 Tape Control Unit Model A01 Introduction, Planning, and User's Guide*.

#### High-Speed Search

High-speed search, with appropriate software, permits a high-speed block search by the most direct path to position the tape to a selected block. After the search starts, the selected tape drive performs the search independently of the host processor channel control. The tape drive can logically disconnect

itself from the channel and free the channel for other work. With the subsystem, it takes only a single Locate command to position over as many blocks as necessary to find the desired data. The 3590 can search data at up to 166MB/sec for B models and 332MB/sec for E models.

## Message Display

Each 3590 drive has a message display as part of the operator's panel. Following is the information that is displayed:

- Status of the drive and of the tape cartridge that is mounted.

**Note:** Drive-initiated status messages are displayable in different languages.

- Volume identification number of the tape cartridge that is mounted, if supported by the operating system.
- Operator guidance instructions.
- Drive error messages.
- Drive cleaning request messages.
- Host processor messages, and error codes, if supported by the host operating system.

**Note:**

- The AS/400 or iSeries system supports only hardware-generated messages.
- S/390 or zSeries hosts cannot use the Automatic Cartridge Facility (ACF) in random mode.
- ESCON or FICON-attached hosts cannot use the Automatic Cartridge Facility (ACF) in random mode.

An optional large LED display is mountable on top of the Model A14 and C12/C14 frames, IBM 3494 library, or a rack. The display connects to the tape drives. IBM does not market the display. It is available from Texas Digital Systems, Inc. (TDS) of College Station, Texas 77845 U.S.A., telephone 409-693-9378. The TDS display features an 11-color LED display.

## Automatic Cartridge Facility

The automatic cartridge facility (ACF) accommodates up to 10 cartridges in a magazine (see Figure 2). ACF allows access to 100–1200GB of data in random-access operation mode (S/390 or zSeries attachment environment does not support random-access ACF). An eleventh position allows for insertion of specific mounts.

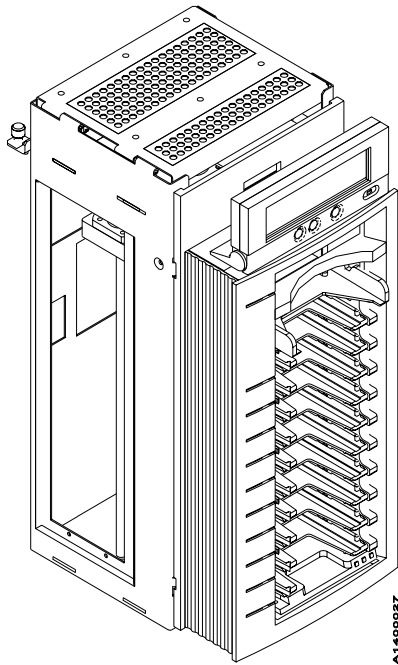


Figure 2. Automatic Cartridge Facility

The 3590 ACF allows for individual selection and automatic loading of premounted cartridge tapes or manually loading single cartridge tapes. A magazine loads into the ACF, with up to 10 premounted tape cartridges. The magazine has an *import* and *export* position for the cartridges. It also has a detent mechanism to hold the cartridges in position when the magazine is removed.

The ACF consists of four elements:

- A 10-cartridge magazine
- A *priority cell* that is integrated into the front of the ACF
- An LED for each cell that informs the operator of each cartridge status
- A transport mechanism that moves cartridges between the drive, the magazine, or the priority cell

Operators may tilt the operator panel and drive message display for optimum viewing. The operator panel ACF controls allow the operator to switch between the modes of operation for the 3590.

**Manual Mode**

The drive loader receives individual cartridges.

**Accumulate Mode**

The priority cell receives cartridges and unloads them into the magazine.

**Automatic Mode**

The magazine feeds its cartridges into the drive, processing the entire magazine.

**System Mode**

Cartridge feeding is under host system control, and the order of processing is the same as Automatic Mode.

**Random Mode**

Cartridges are all in the import position; any cartridge is selectable. Cartridge feeding is under host system control. An ESCON or FICON environment does not support this mode. This option is only available on Model B11.

**Random 2LUN Mode**

Cartridges are all in the import position. Any cartridge is selectable. Cartridge feeding is under host system control. An ESCON or FICON environment does not support this mode. This option is available on both Models E11 and B11.

**ACF Security Provisions**

The ACF provides data security while in random mode by disabling the manual eject switch function. A magazine transport lock secures the operator access side of the magazine. It prevents cartridge removal (or installation) by the operator until the magazine has been removed and unlocked.

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## Chapter 4. 3590 High Performance Cartridge Tape and Extended High Performance Cartridge Tape

The 3590 tape drive has a bidirectional read/write head with a recording format of 256 tracks for Exx models and 128 tracks for Bxx models. Both series of models concurrently processes 16 tracks per group. The bidirectional head writes 16 tracks from the load point to the physical end of tape. It then writes 16 tracks from the physical end of tape back to the load point. Fully written tapes that are always positioned at the load point eliminate the rewind operation.

## Tape Characteristics

High Performance Cartridge Tape and Extended High Performance Cartridge Tape are usable only on 3590 High Performance Tape Subsystems because only a 3590 subsystem can read tape cartridges that are written by a 3590 subsystem.. Neither the IBM 3590 High Performance Cartridge Tape nor the Extended High Performance Cartridge Tape are compatible with 3480, 3490, or 3490E drives. The 3590 subsystem detects cartridges that are written by 3490 or 3490E subsystems and cannot read those cartridges.

Use appropriate 3490/3490E subsystems to copy data from 3480 or 3490 standard cartridges or enhanced capacity (3490E) cartridges. The data is writable to 3590 High Performance Cartridge Tape or Extended High Performance Cartridge Tape cartridges which mount on a 3590 subsystem. Copying data from these cartridges, to enhanced capacity cartridges or to standard cartridges, may require multiple 3490/3490E volumes. This is because datasets may exceed the capacity of these cartridges.

Figure 3 is for illustration purposes only. Note that items **4** and **5** differ. The specific icon is dependent on the supply source.

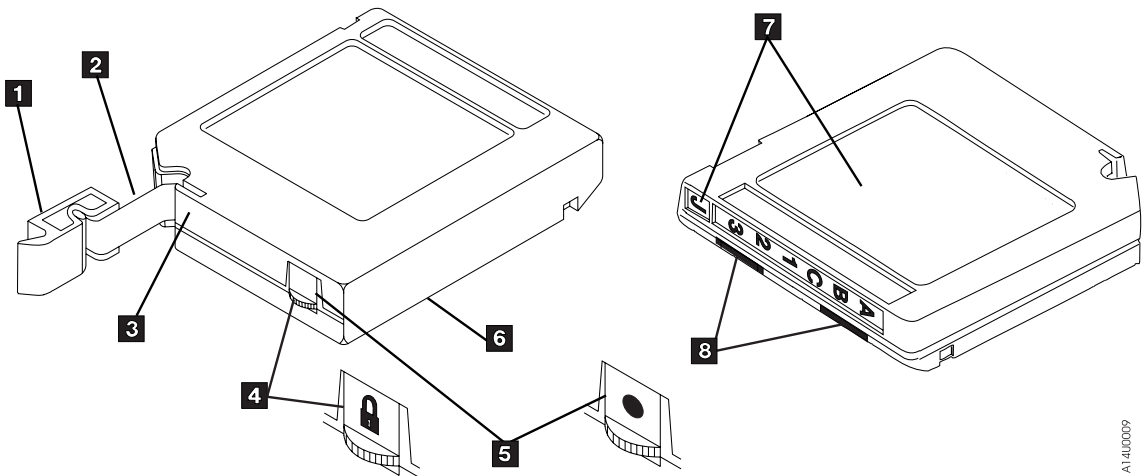


Figure 3. IBM 3590 High Performance Cartridge Tape

- **1** Leader block (blue for High Performance Cartridge Tape and green for Extended High Performance Cartridge Tape)
- **2** Reel of magnetic tape
- **3** Leader block latch
- **4** File-protect selector (dependent on supplier)
- **5** File-protect selector (dependent on supplier)

- **6** Cartridge case (black)
- **7** Labels
- **8** Identification notches (blue for High Performance Cartridge Tape and green for Extended High Performance Cartridge Tape)

**Note:** The leader block is shown unlatched (see item **1**). It has a tape length of tape which extends from the cartridge (see item **2**). This is for illustration purposes only. Do not unlatch the leader block from the cartridge.

The drive mechanism unlatches the tape leader block when inserting a cartridge into a tape drive. It then pulls the tape leader out of the cartridge, and threads the tape onto a non-removable machine reel in the drive for automatic load.

Each data cartridge includes a file-protect selector. When set, the selector prevents overwriting or erasing data from the tape by a tape device.

**Attention:** Do not degauss a cartridge tape. Degaussing the tape will erase the servo tracks and make the cartridge unusable. Run a Data Security Erase if the data on the tape needs to be physically erased. This physically overwrites the data on the tape without damaging the servo tracks.

In tape libraries, the library vision system identifies the types of cartridges during an inventory operation. The vision system reads a volume serial number (VOLSER) label on the edge of the cartridge. The VOLSER is a bar-code label that contains from one to six characters. It has blanks padded on the right for a VOLSER with fewer than six characters. An appended seventh character indicates the media type. For details, see Table 11 below.

*Table 11. Media Types*

Type	Seventh Character
3590 Extended High Performance Cartridge Tape	<b>K</b>
3590 High Performance Cartridge Tape	<b>J</b>
3490E Enhanced Capacity Cartridge System Tape	<b>E</b>
Standard 3480 Cartridge System Tape	<b>1</b>
<b>Note:</b> Use of a label <i>without</i> the seventh character <b>J</b> or <b>K</b> is recommended for Model C12 and C14 (refer to <i>IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide</i> for more information). Characters can be uppercase A-Z and numerics 0-9.	

**Note:** New cartridges for 3590 drives may be ordered preformatted for Model B or Model E drives. See “Managing Multiple Tape Formats and Lengths” on page 65 for a discussion why this may be useful for your installation.

Place the VOLSER label entirely within the label recess on the cartridge. It must be flat to within 0.5 mm (0.02 in.) over the length of the label and have no folds, missing pieces, tears, or any extraneous markings. Failure to follow these placement requirements will result in degraded readability.

The tape cartridges have blue insert identification notches for High Performance Cartridge Tape and green notches for Extended High Performance Cartridge Tape. The leader block assembly is blue for High Performance Cartridge Tape and green for Extended High Performance Cartridge Tape. The 3590 cleaning cartridge has gray insert identification notches and a gray leader block assembly.

## Tape Handling and Storage Advantages

Increased data capacity decreases magnetic tape storage and handling costs. Handling cost reductions are possible with a 3590 Model E11 or B11 drive that has an Automatic Cartridge Facility (ACF). Excluding priority slots, ten cartridges load into the ACF.

*Table 12. Cartridge Capacity*

Subsystem and Cartridge Selections	Capacity of a Single Cartridge	Capacity of 10 Cartridges in an ACF
3590 Bxx model subsystem with IBM 3590 High Performance Cartridge Tape uncompressed	10GB	100GB
3590 Bxx model subsystem with IBM 3590 Extended High Performance Cartridge Tape uncompressed	20GB	200GB
3590 Bxx model subsystem with IBM 3590 High Performance Cartridge Tape and a compression ratio of 2 to 1	20GB	200GB
3590 Bxx model subsystem with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 2 to 1	40GB	400GB
3590 Bxx model subsystem with IBM 3590 High Performance Cartridge Tape and a compression ratio of 3 to 1	30GB	300GB
3590 Bxx model subsystem with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 3 to 1	60GB	600GB
3590 Exx model subsystem with IBM 3590 High Performance Cartridge Tape uncompressed	20GB	200GB
3590 Exx model subsystem with IBM 3590 Extended High Performance Cartridge Tape uncompressed	40GB	400GB
3590 Exx model subsystem with IBM 3590 High Performance Cartridge Tape and a compression ratio of 2 to 1	40GB	400GB
3590 Exx model subsystem with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 2 to 1	80GB	800GB
3590 Exx model subsystem with IBM 3590 High Performance Cartridge Tape and a compression ratio of 3 to 1	60GB	600GB
3590 Exx model subsystem with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 3 to 1	120GB	1200GB



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## Chapter 5. Planning Considerations

This chapter describes the necessary planning for the IBM 3590 High Performance Tape Subsystem. A full planning schedule includes the following topics:

- “Planning for Supplies and Equipment”
- “Planning for Operator Training” on page 60
- “Planning for Applications Programming” on page 61
- “Planning for Data Migration” on page 63
- “Planning for 3590 Model B-to-E Migration” on page 67
- “Planning for SCSI to Fibre Channel Migration” on page 70
- “Planning Checklists for SCSI and Fibre Channel” on page 71

This chapter provides checklists to assist you in planning tasks.

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### Planning for Supplies and Equipment

A data cartridge and cleaner cartridge are supplied with the first 3590 device installed in a rack. The data cartridge and cleaner cartridge are also supplied for the first installed device in a 3494 frame. In addition, one cartridge magazine is supplied with each 3590 Model E11 and B11.

Refer to *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide* for supplies that are related to 3590 Model C12.

**Note:** A cartridge magazine must be in the Model E11 and B11 to operate the ACF. You are encouraged to order the following supplies:

- A spare magazine in case the original is accidentally damaged
- Three month’s supply of tape cartridges for storing data
- Labels for identifying the cartridge volume serial number
- Storage shelves for storing shelf-resident tape cartridges
- Additional ACF magazines for carrying and loading tape cartridges

**Note:** Do not use ACF magazines for shipping cartridges.

## 3590 Supplies

### Feature Description

The following supplies and equipment are recommended for the efficient operation of your 3590 tape subsystem; Table 13 shows available supply items.

Table 13. 3590 Supply Items

Feature Code (IBM P/N)	Supply Item	3590 Model
8001	Cartridge magazine	B11, E11
8002	Cleaner cartridge	B11, E11, C12, C14
8130	30 High Performance Cartridge Tapes	B11, E11
8140	30 Extended High Performance Cartridge Tapes	B11, E11
8210	210 Data cartridges (non-J label)	C12, C14
8240	210 Data cartridges (non-K label)	C12, C14
9590	No data cartridges	B11/E11

**Note:** See Table 14 on page 59 for alternative mechanism for ordering 3590 data cartridges.

### Feature Definition

**Cartridge Magazine (FC8001):** This specify code supplies one cartridge magazine that can be used in a B11/E11 ACF. This feature is either plant or field installable.

**Cleaner Cartridge (FC8002):** This specify code supplies one cleaner cartridge that can be used in a B11/C11 ACF. This feature is either plant or field installable.

**High Performance Cartridge Tape (FC8130):** This specify code supplies 30 High Performance Cartridge Tapes. Either FC8130, FC8140, or FC9590 must be ordered with each box.

**Extended High Performance Cartridge Tapes (FC8140):** This specify code supplies 30 Extended High Performance Cartridge Tapes. Either FC8130, FC8140, or FC9590 must be ordered with each box.

**Data Cartridge, non-J Label (FC8210):** This specify code supplies 210 High Performance Cartridge Tapes (non-J label) for tape drives in a C12/C14 frame attached to a StorageTek ACS. Either FC8210, FC8220, or FC9590 must be ordered with each box. This is for field installation.

**Data Cartridge, non-K Label (FC8240):** This specify code supplies 210 Extended High Performance Cartridge Tapes (non-K label) for tape drives in a

C12/C14 frame attached to a StorageTek ACS. Either FC8210, FC8220, or FC9590 must be ordered with each box. This is for field installation.

**No Data Cartridges (FC9590):** This feature indicates that no High Performance Cartridge Tapes ship with this box.

### Preformatted Data Cartridges

The 3590 data cartridges are orderable under machine type 3599 with either 128-track or 256-track preformatting (see Table 14). For installations that have only Model E11 or E1A drives, it is recommended that data cartridges with 256-track preformatting be ordered. See “Managing Multiple Tape Formats and Lengths” on page 65 for additional information.

Table 14. Preformatted 3590 Data Cartridges

Feature Code	Supply Item	3590 Model
9070	128 track preformatted High Performance Cartridge Tape	E11, E1A, B11, B1A
9071	256 track preformatted High Performance Cartridge Tape	E11, E1A, B11, B1A

Table 15. 3590 High Performance Cartridge Tape

Feature Code	Supply Item	Cartridge Quantity	3599 Model
0030	Labeled and Initialized	30	001
0210	Labeled and Initialized	210	001
1200	Labeled and Initialized	1200	001
2030	Label only	30	002
2210	Label only	210	002
1202	Label only	1200	002
3030	Standard	30	003
3210	Standard	210	003
1203	Standard	1200	003

Table 16. 3590 Extended High Performance Cartridge Tape

Feature Code	Supply Item	Cartridge Quantity	3599 Model
4030	Labeled and Initialized	30	004
4120	Labeled and Initialized	120	004
1204	Labeled and Initialized	1200	004
5030	Label only	30	005
5120	Label only	120	005
1205	Label only	1200	002

Table 16. 3590 Extended High Performance Cartridge Tape (continued)

Feature Code	Supply Item	Cartridge Quantity	3599 Model
6030	Standard	30	006
6120	Standard	120	006
1206	Standard	1200	006

## Cartridge Weights

Use cartridge weights for floor planning purposes only.

- High Performance Cartridge Tape weight is approximately 250 grams (0.55 lbs)
- Extended High Performance Cartridge Tape weight is approximately 250 grams (0.55 lbs)
- 3590 Cleaner cartridge weight is approximately 240 grams (0.53 lbs)

## Label Ordering

Labels are obtainable from the following suppliers:

Engineered Data Products Corporation 2550 West Midway Blvd.

Broomfield, CO 80020, U.S.A.

Wright Line Inc. 160 Gold Star Blvd. Worcester, MA 01606, U.S.A.

## Media Supply Contact

You may contact your IBM representative, or the call the specific country.

The following list includes the telephone numbers for each world region.

- 1-888-IBM-Media (1-888-426-6334) toll free in the United States and Canada
- +1-972-881-0733 (x 7530) in Latin America
- +31-433-502-756 in Europe, Middle East, and Africa
- +1-97286 in Japan
- +81-3-881-0733 in Asia/Pacific outside of Japan
- 1-300-655-333 in Australia and New Zealand

To access the current regional and country-specific telephone numbers, use the IBM Storage Media URL listed at “IBM Storage Media support” on page xiv.

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## Planning for Operator Training

Typical operator tasks are:

- Switching the tape subsystem on or off
- The inserting or removing of tape cartridges from the ACF
- The inserting or removing of cartridge magazines from the ACF
- Placing labels on the tape cartridge
- Setting or resetting the write-protect switch on the tape cartridge

- Initializing a tape volume
- Cleaning the drive with the cleaning cartridge
- Disposition of tape cartridges
- Analysing problems

Refer to *IBM Magstar 3590 Tape Subsystem Operator's Guide* for more information on the operator tasks.

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## Planning for Applications Programming

The following considerations apply to tape programming unique to applications.

### Data Security Erase

The erase function causes data on the tape following the current location to become unreadable by the 3590 drive. The 3590 drive will physically overwrite the data. Any attempt to read data in an erased area results in a status of tape void.

### Missing Interrupts

Most S/390 AND zSeries operating environments use a form of a time-dependent trap called a *missing interrupt handler* (MIH). When installing a 3590, review the time limits set for your operating system's missing interrupt handler.

When an operating system misses an interrupt, system processing may slow down or even cease operation. This is because critical software resource cannot be released until an I/O operation completes or is marked completed-in-error. To reduce the impact of a missing interrupt, most operating systems set a limit on the length of time that is considered *normal*. An *abnormal* I/O operation is one that exceeds the set time. When an abnormal situation occurs, the operating system can stop the I/O operation. This action frees resources for other tasks by marking the I/O operation as completed-in-error.

The 3590 A00, A50, and A60 set the MIH automatically, when in 3590 mode, by communicating with host software. Do **not** define this value in the operating system for software devices that are configured as 3590s. A definition in PARMLIB that includes the 3590 address range will override the automatic setting information supplied by the 3590 A00, A50, or A60.

Set the MIH in the software when operating the 3590 models Axx in 3490 mode.

PARMLIB values for MIH require changes be made for device specificity. No definition in PARMLIB is necessary for the 3590 as it is a self-defining device.

For devices that are configured as 3590s, the control unit will control both the primary and secondary MIH values. The primary MIH governs most commands, and the second MIH governs a small group of long running commands, such as LOCATE, and FORWARD SPACE FILE. A single MIH value governs devices that are configured as 3490s. MVS allows a display of the MIH value for 3490 and the primary MIH value for 3590. A display of the MIH value will show only the primary value for the 3590.

## Software Tools

### Volume Mount Analyzer

Use the volume mount analyzer, available as a component of DFSMS software, to plan for and optimize the 3590 tape installation. It provides reports on datasets by size and frequency of use. These reports determine if tape is the best storage media for the analyzed datasets. It also determines if its frequency of access warrants it residing within a tape library.

## Other Considerations

### Status Bytes and Sense Bytes

The subsystem operates with expanded sense bytes to support error-recovery procedure programs. The tape control unit processes many of these procedures rather than those that the host processes. Programs that refer to sense bytes may require modification. *IBM 3590 High Performance Tape Subsystem Hardware Reference* describes the status and sense bytes that are returned to SCSI-attached hosts.

### Tape-Write-Immediate Mode

Immediate rereading and comparing verifies all data written to tape. Use tape-write-immediate mode for applications that require immediate validation for a host data block that was written to tape, and not buffered. On completion of the write-to-read tape, the operation sends the ending status.

Tape-write-immediate mode should be used only for applications that require synchronous write verify and can tolerate lower performance.

### Data Compression

The 3590 tape drive has data compression capability. If, however, software is used to compress or encrypt the data before sending it to the drive, the drive data compression is not recommended. Drive compression used on encrypted or compressed data may moderately increase the data size, thus reducing effective tape capacity.

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## Planning for Data Migration

Data migration is the movement of data to a new tape cartridge type during the normal processing of jobs.

The following topics describe techniques to categorize a tape subsystem, determine a data movement schedule, balance tape drive requirements, and explore alternatives to form a general migration strategy.

Most tape libraries comprise groups of tapes that are defined by their common usage. Determining these usage groups is the first step in developing a migration strategy.

Each group is unique because of special criteria that are 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. Table 17 on page 64 describes tape categories.

Format Conversions between 3590 models occur with any type of write command at the beginning of tape. The typical conversion occurs after a cartridge has been loaded. The drive indicates that it is ready at load point and any type of write command is received. No indication that a 128-track cartridge is present is given unless a Write, Write Filemarks, or Erase command is received from the host. It will format the tape to 256-tracks on a Write, Write Filemarks, or Erase command. The E model drive will read 128-track tapes. The E model drive will indicate a 128-track cartridge formatted to 256-track. Appending with the E model drives on a 128-track cartridge is not supported. An attempted append causes drive errors. For more details on the SCSI interface refer to *IBM 3590 High Performance Tape Subsystem Hardware Reference*.

B model drive code is available which will support format interchange with E model drives. The E drive writes cartridge information such that a B model drive can read it. There is no indication that a 256-track cartridge is present unless the host receives any type of read or write command. The B model drive, with the prerequisite drive code level, will indicate a 256-track cartridge formatted to 128-track once the host issues a write command. B model drives with older code levels indicate an error with an attempted write command. The B model drive will not read 256-track tapes. It reports an error with an attempted read command after loading a 256-track cartridge. For more details on the SCSI interface refer to *IBM 3590 High Performance Tape Subsystem Hardware Reference*.

Table 17. Tape Characteristics by Tape Usage Group

Tape Category	Tape Characteristics
Archive	<ul style="list-style-type: none"> <li>• Contain records held for historical, legal, regulatory, or disaster recovery purposes.</li> <li>• Have a retention period usually more than a year and are often stored off-site.</li> <li>• Processing of these tapes can be done in locations other than the site where they were created. This off-site processing can occur as a part of a comprehensive disaster plan or for various legal or regulatory requirements.</li> </ul>
Interchange	<ul style="list-style-type: none"> <li>• Prepared for use in other locations.</li> <li>• May be used in other computer systems or for special purposes like microfilm production.</li> <li>• May be tapes prepared at another location to be used on the local system, for example, tapes created on data collection equipment.</li> </ul>
Disk backup	<ul style="list-style-type: none"> <li>• Created in normal backup jobs.</li> <li>• Represents several generations stored in a subsystem at any given time.</li> <li>• Used to recover files in the event of a program or system error or other malfunction. The restore function is seldom used, but when it is, the integrity of the copied data is usually critical.</li> <li>• Files usually have a high turnover rate and may require interchange with other sites.</li> </ul>
Journal	<ul style="list-style-type: none"> <li>• Contain transactions recorded against another dataset.</li> <li>• Allow their companion datasets to be reconstructed by applying the journal data to a previous version of the companion datasets.</li> <li>• Used in data base and online systems applications.</li> </ul>
Scratch	<ul style="list-style-type: none"> <li>• Called the scratch pool, it contains no active data. Often a regular flow of new, unused tapes entering a subsystem to be used for growth and replacement of old tapes. This may be important in determining the number of tape cartridges to order.</li> <li>• Used for the creation of new files during normal processing when the data is to be kept at job step or job end.</li> </ul>

Table 17. Tape Characteristics by Tape Usage Group (continued)

Tape Category	Tape Characteristics
Process	<ul style="list-style-type: none"> <li>• Created during periodic execution of an installation's application programs.</li> <li>• Represent the highest volume of files in a subsystem. For example, multiple generations of a tape master file can be considered process tapes.</li> <li>• Range of criteria and time frames; most commonly is the daily, weekly, and monthly processing cycle.</li> </ul>

## Managing Multiple Tape Formats and Lengths

For your migration strategy, include a consideration of multiple tape formats and the choice of cartridge system tapes. Depending on the mix of IBM 3490, 3490E, and 3590 subsystems and features available, consider the tape formats on which the tape subsystem writes data. Consider also, whether or not mixed media (18-track, 36-track, 128-track, or 256-track datasets) are present in the existing tape libraries.

A complete migration or conversion from 3490/3490E created tape cartridges involves copying all 3490 and 3490E cartridges to either 3590 High Performance Cartridge Tape or Extended High Performance Cartridge Tape. A partial conversion involves managing separate storage locations and drive locations for 18-track, 36-track, 128-track, and 256-track recording formats. A unique VOLSER range is desirable for the new format. Label new cartridges for easy identification, and store them separately in the tape library.

Migrated 3590 Model B (128-track) volumes are readable on 3590 Model E (256-track) drives. New data sets are created in 256-track format. A 3590 Model E cannot append data to a 128-track format tape, but can reformat the tape to 256-track.

3590 B models can reformat 256-track format cartridges to 128-track format. This function can be useful in a scratch pool shared by B and E Model drives. For Ultra 3590 Models, EC F23079 (link D0IB-60B) and later ECs have the reformat function. For base 3590 B Models, EC D19328 (link D0IA-2FC) and later ECs have the reformat function.

For a cartridge mounted for writing or OUTPUT in S/390 or zSeries, the initial VCR must be rerecorded in the same track width as that for the user data to be written. Thus, rewriting a tape, in a format different from the currently written format, the VCR is rewritten when the first WRITE is issued. This occurs at the beginning of volume. With MVS, this would occur during OPEN processing in the rewriting of the user label. This activity results in the following increases in processing time prior to start of writing by the job:

- 42 seconds when rewriting from 128-track to 256-track.
- 40 seconds when rewriting from 256-track to 128-track.

Please note that VCR rewrite and its associated delay does not occur with a volume mounted for INPUT on a read-compatible device. Nor does it occur for MOD on a write-compatible device:

- Tapes written in 128-track format are read-compatible with both 128- and 256-track (Model B or Model E) drives.
- Tapes written in 256-track format are read-compatible only with 256-track (Model E) drives.
- Tapes are appendable (mounted for MOD) only on drives of the same format as currently written.
- A tape mounted for READ or MOD on a drive incompatible with the currently written format will encounter an I/O error.

Here are some sample scenarios in which VCR rewrite occurs:

- All B-model drives upgrade to E-models concurrently: VCR rewrite will occur on the first reuse on 256-track E model for scratch tapes previously written in 128-track format.
- A common scratch pool is defined within an IBM Automated Tape Library (ATL) with an intermix of Model B1A and Model E1A: VCR rewrite will occur for any reuse of a scratch tape in the format not used previously.
- Migration is accomplished over time from B1A models to E1A models in an IBM ATL (temporary intermix). VCR rewrite will occur on any reuse of a scratch tape in the format not previously used. Rewrite also occurs until the drive upgrade process is complete, and all tapes have been written once on a 256-track drive (E1A).
- Silo environment with intermix of Model B1A and Model E1A using separate tape pools: VCR rewrite will occur on the first reuse on 256-track E1A model for scratch tapes previously written in 128-track format. The first-use VCR rewrite could occur also if redefined pool ranges are such that cartridges are reassigned to the “other” drive technology.
- Using new media pre-initialized in the format unlike that of the drive in use: VCR rewrite will occur on first use of a tape. VCR rewrite continues to occur when format changes on scratch tape reuse. This occurs in an IBM ATL environment with an intermix of Model B1A and Model E1A (common scratch pool). **In this case, it is important to note that new media may be ordered preformatted for either E1A or B1A drives, thus avoiding the rewrite penalty. Separate part numbers apply.**

A very small percentage of 3590 cartridges, which can be reformatted to 128-track format, may not be able to be reformatted to 256-track format. This is due to the tighter tolerances required to support the 256-track format.

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## Planning for 3590 Model B-to-E Migration

**Note:** This section pertains largely to the OS/390 or z/OS operating platform. See “Software and Operating Systems Support” on page 19 for details on software requirements for other platforms.

Upgrading B drives to E drives requires planning even though that 3590 Models B and E are both device-type 3590 (same UCB type in MVS environment). The change from 128-track recording to 256-track recording, which doubles the physical cartridge capacity, requires both system and application planning and implementation. This section outlines considerations for this recording technology migration. It provides references for obtaining further details.

### Host Software

Although the 3590 Model E is not a new UCB device type, this new device model requires software updates. Precede the hardware upgrade with software PTFs. Note that software maintenance installation requires an IPL.

See “S/390 or zSeries Environment Support” on page 104, “OS/390 (MVS/ESA) z/OS ESCON” on page 106, and “FICON Attachment Planning” on page 108 respectively for general software requirements, and ensure the required minimum level installation of software for the 3590E models. Install the PTFs for OS/390 or zSeries platform Model E support and for non-IBM library drives as well (stand-alone and silo-attached).

Check the PSP bucket regularly for ongoing maintenance recommendations.

## HCD

There is no need to change the hardware configuration definitions (HCD). You may use the same device addresses with the 3590 Exx Models that were used with the Bxx Models. Some installed maintenance avoids the need to perform input/output definition file (IODF) activate tasks. To perform the migration, ensure you invoke the following procedure for each subsystem or set of subsystems upgraded in a particular maintenance window:

- Vary the 3590 Model B drives off line.
- Remove the 3590B device addresses from the IODF and activate it<sup>1</sup>.
- Perform the upgrade.
- Add the 3590E device addresses to the IODF and activate it<sup>1</sup>.
- Vary the 3590E devices online to MVS.

**Note:** Application of maintenance cancels the requirement for these steps. Check the PSP bucket.

## JES3 Considerations

For 3590E tape drives installed in a 3494 tape library, update the JES3 definitions. WWQA item RS4000022395 provides some guidance on the required updates.

## SMS Definitions

For 3590 Model E tape drives installed inside a 3494 tape library, the following considerations apply. For detailed information, refer to the current level of the DFSMS *Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*.

- Define a new data class to direct new tape allocations to 3590 Model E drives. This data class specifies RECORDING TECHNOLOGY 256 and changes the ACS routines for new tape allocations accordingly to assign the new data class.
- To enable reading of existing cartridges written in 128-track mode on 3590 Model E tape drives, you need to update the TCDB. You must set the SPECIALATTRIBUTE(READCOMPATIBLE) for PRIVATE tapes. This can be done either through IDCAMS ALTER or DFSMSrmm, if this is your tape management system.
- Ensure the SYS1.PARMLIB DEVSUPxx is set to VOLNSNS=YES to enable relabeling of scratch cartridges written using a different technology.

## Silo-Compatible Frame Considerations

For 3590E tape drives installed in a silo, refer to the latest version of *Magstar 3590 Silo Implementation Guide* on the URL listed at “Redbooks” on page xv. Refer also to the *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide*.

For 3590 E tape drives used in 3490E emulation mode for DFSMSHsm, there are some major differences as compared to setup requirements with the B drives.

HSM defaults to using 97% of the physical cartridge capacity when the underlying 3590 drive model is E1x (but not when it is B1x.) Therefore you do not need to specify the TAPEUTIL for the unit name of the 3590 E1x drives. It may be desirable, however, to specify a value of 98, 99 or 100 in order to get slightly more data on each cartridge. Beware of specifying a value greater than 100% when outputting to 3590 E1x emulating 3490. This could have the effect of specifying NOLIMIT and cause output to span.

HSM does not allow mixed device types in an esoteric group. HSM considered the 3590 Model B as a UCB-type 3490E. Thus, it is possible to have esoteric groups defined that manage mixed technology and media relationships. An example would be 3590s in 3490E emulation mode and STK 9490s with host software component (HSC). However, with support for 3590 Model E, HSM recognizes the actual underlying drive type as a 3590 model. It will not tolerate esoteric names that mix these 3590s (even in 3490E emulation mode) with devices that are actually type 3490E.

Refer to HSM considerations in the current level of the DFSMSHsm publications.

### **Other Migration Considerations**

It is not necessary to keep 3590B drives during a migration period, because the 3590E models can read the cartridges written by the 3590B drives.

The 3590E drives always write in 256-track mode. Thus, on a 3590EB drive you cannot use DISP=MOD processing to extend a data set on a previously written in 128-track mode cartridge. If you use DISP=MOD processing to extend existing tape data sets, you need to copy them to a new cartridge on a Model E drive.

The situation for appending 128-track written tapes applies also for HSM workload. During the last few days before the hardware upgrade, you should set the HSM parameter TAPEUTILIZATION(MARKFULL) in the ARCCMDxx parmlib member. This will ensure that HSM does not reuse the tapes written on 3590 Model B tape drives once upgraded to 3590 Model E drives. After the hardware upgrade, you can switch back to your normal HSM definitions.

For Tivoli Systems Management (TSM), formerly ADSM, similar considerations apply. Cartridges that were previously written in 128-track mode, need to be marked READ-ONLY before the hardware upgrade. Also, a storage pool that previously had 128-track drives would need to have Max or Estimated capacity adjusted for the doubled capacity with 256-track recording.

Migration can take place by directing new allocations to the 3590 E drives and letting old data sets expire on cartridges written in 128-track mode. There is no need to copy the data sets unless the additional cartridge storage provided by the 3590 Model E tape drives is required immediately.

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## Planning for SCSI to Fibre Channel Migration

Verify whether or not you have an intermix of Model B and Model E drives. Drive intermix creates two possible options you must consider.

Installation of Fibre Channel begins with the last drive on the SCSI bus and proceeds toward the first drive on the SCSI bus. The *first drive to be upgraded* to Fibre Channel must be the *last drive* on the SCSI bus and it must be a *Model E drive*. This requirement must be maintained for all succeeding Fibre Channel installations.

If the last drive on the SCSI bus is a Model B drive, you have two options listed below.

- The Model B drive must be exchanged with a Model E drive.
- The Model B drive must be migrated to a model E drive with Fibre Channel added. See “Planning for 3590 Model B-to-E Migration” on page 67.

**Correctly identify the drives to be upgraded to Fibre Channel.** Upgrades are ordered to a specific serial number for E drives, an exchange install, or an upgrade of B to E.

Not all devices are migratable due to host limitations. Check that your current operating system version supports Fibre Channel on 3590. See “3590 Operating Systems and Platforms” on page 19.

### Host Software

Most open systems software that supports SCSI should work with Fibre Channel. Some configurations, where drives are shared, will require software upgrades.

### Silo-Compatible Frame Considerations

See *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12, and C14 Introduction, Planning, and User Guide*.

### 3494 Frame Considerations

See *IBM Magstar 3494 Tape Library Introduction and Planning Guide*.

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## Planning Checklists for SCSI and Fibre Channel

Consult these checklists if you install a 3590 on a complex system with considerable planning and change control activity requirements.

Migration from a non-tape environment or from an existing non-compatible tape environment to the enhanced capability tape subsystem involves the following tasks:

1. Ensuring completion of pre-installation planning and migration tasks.
2. Selecting the appropriate model and features to satisfy the performance requirements for the applications used.
3. Planning the physical environment for installation.
4. Determining software that is required to support applications.
5. Planning for possible application and operational changes in a tape subsystem environment.
6. Planning for data migration from a non-tape or non-compatible tape environment to the 3590 tape subsystem.
7. Determining required supplies and equipment.
8. Scheduling a systems assurance review.

### Planning Personnel

To ensure an efficient installation, define tasks of planning personnel to do the following:

- Ensure that planning and ordering activities proceed on schedule.
- Determine the location of the subsystem, and ensure that environmental, electrical, and space requirements are met.
- Choose, install, and test the licensed programs for the system.
- Define a storage management policy and plan for data migration.

### Task Assignments

Things to do before ordering:

- Determine performance requirements and configuration requirements.
  - Determine volume throughput requirements.
  - Determine access time requirements.
- Determine the subsystem configuration to meet performance requirements.
  - Determine the number of tape drives that are required.
  - For conversion from SCSI to Fibre Channel, identify the device driver. Refer to the *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12, and C14 Introduction, Planning, and User Guide*. Also refer to *IBM Magstar 3494 Tape Library Introduction and Planning Guide* for your appropriate information.
  - Determine cartridge-input/output requirements.

- Determine channel attachments.
- Determine the number and length of required cables.
- If using a storage area network (SAN), determine its requirements.
- Determine data security requirements.
- Identify device addresses.
- Determine required licensed programs.
- Determine electrical and power requirements.
- Determine the required number of IBM 3590 tape cartridges.
- Determine requirements for extra cleaner cartridges.
- Determine cartridge label requirements.

On order date:

- Order the 3590 tape subsystem and features.
- Order additional data cartridges and cleaning cartridges, magazines, and other supplies as required.
- Order licensed programs.
- Upgrade the operating system.
- Prepare the physical layout.
- Confirm 3590 subsystem orders and supplies orders 3590 subsystem and supplies.

Before delivery:

- Begin the software installation.
- Complete site preparation and installation of electrical wiring and power outlets.
- Upgrade host software with needed PTFs installed.
- Prior to hardware installation, you must define the following:
  - ACF mode of operation, (B11 and E11 models only). (operator configured)
  - SCSI or Fibre Channel port addresses (non-control unit attached drives). (operator configured)
  - Language of operator screen. (operator configured)
  - Large display to be attached to drive or not (Texas Digital Systems (TDS) display). (customer engineer configured)
  - Host reporting. (customer engineer configured)
    - SIM severity filtering is on or off (default is off).
    - MIM severity filtering is on or off (default is off).
    - Hardware SARS reporting is on or off (default is on).
    - Media SARS reporting is on or off (default is on).

- Repeat SIM reporting (default is to not repeat).
- Enable or disable the Auto-Share function (default is disabled).
- Ensure the document for the Device Driver program (non-control unit attached drives) is ordered and reviewed.
- Ensure you test the drive and SCSI/Fibre Channel attachment, for drives not attached to a control unit, by using your environment device driver.

At delivery:

- Install and test the hardware.
- Define new tape I/O configuration to attached hosts.
- Specify channel paths to controllers, drive addresses, and tape volume serial number ranges.



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## Chapter 6. Device Characteristics

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### Site Planning

This chapter describes various characteristics and specifications necessary for your site planning in the following topics:

- “Environmental Specifications”
- “Acoustic Specifications” on page 76
- “Cabling Information” on page 76
- “3590 Power Characteristics” on page 77
- “Power Specifications” on page 77
- “Power Cords” on page 78
- “3590 Component Specifications” on page 80
- “SCSI Attachment Planning” on page 93
- “ESCON Attachment Planning” on page 101
- “FICON Attachment Planning” on page 108
- “Fibre Channel attachment Planning” on page 110

### Environmental Specifications

The temperature and humidity ranges for the 3590 vary according to environmental conditions. The environments shown in Table 18 apply to the components of the tape subsystem, and not to the 3590 cartridges.

Measurements should be taken at the drive.

*Table 18. 3590 Environmental Specifications*

Condition	Temperature	Relative Humidity	Maximum Wet Bulb
Drive Operating	16 to 32°C (60.8 to 89.6°F)	20 to 80%	26°C (78.8°F)
Drive Nonoperating	10 to 43°C (50 to 109.4°F)	8 to 80%	23°C (73.4°F)
Drive Storage	0.6 to 60°C (33 to 140°F)	5 to 80%	0.6 to 29.4°C (33 to 85°F)
Drive Shipping	-40 to 60°C (-40 to 140°F)	5 to 100% (excluding precipitation)	0.6 to 29.4°C (33 to 85°F)
Tape Operating	15.6 to 32.2°C (60 to 90°F)	20 to 80%	25.6°C (78°F)

## Cooling Requirements

The 3590 requires ambient room temperatures that are consistent with the environmental specifications. See “Environmental Specifications” on page 75 for additional information.

The three cooling fans cool the tape deck, power supply, and card enclosure. Do not obstruct the air inlets for these fans.

## Thermal Protection

Sensors in the 3590 tape drive provide thermal protection. When activated, these sensors cause an immediate power down of the 3590. Contact a service representative to reset activated sensors.

## Acoustic Specifications

The 3590 High Performance Tape Subsystem is classified as a Category 1 product as defined in C-S 1710-006. Table 19 shows the acoustic specifications for the 3590.

Table 19. Acoustic Specifications

Model	$L_{WA,d}$		$\langle L_{pA} \rangle_m$	
	Operating (bels)	Idling (bels)	Operating (dB)	Idling (dB)
E11 or B11	6.1	5.8	45	40
E1A or B1A	5.8	5.8	40	40
A00	5.7	5.3	45	40
A50	5.3	5.0	45	40
A60	6.8	6.8	45	40
3591 A01	6.0	6.0	43	43
C10	7.4	7.4	53	53
C12	7.4	7.4	53	53
C14	7.4	7.4	53	53

### Notes:

- For definitions of levels, refer to *IBM General Information Manual: Installation Manual-Physical Planning*
- $L_{WA,d}$  - is the declared upper limit sound power level.
- $\langle L_{pA} \rangle_m$  - is the mean value of the A-weighted sound pressure at the one-meter position.

## Cabling Information

Cable features include all cables for the following optional features:

- AS/400 or iSeries Remote Power Sequence feature
- AS/400 or iSeries Host Attachment features
- RS/6000 or pSeries Host Attachment feature

See “Chapter 2. Standard Features” on page 21 for additional information on the 3590 features. For additional host system cable attachment information, see “SCSI Attachment Planning” on page 93, “SCSI Cable Features” on page 41, “Fibre Channel attachment Planning” on page 110, and the host system’s physical planning publications. Also, refer to *IBM General Information Installation Manual—Physical Planning*.

### 3590 Power Characteristics

A rack or frame, with connections to an AC source, supplies AC power to the 3590. A power-on and off switch, located on the back of the device, provides device power control. A power-on indicator is located near the power-on and off switch. The 3590 has a single AC to DC supply.

The 3590 accepts a variety of supply voltages and frequencies. The voltage and frequency range from 200–240 volts AC (nominal) and 50–60 Hz (nominal) respectively. The device adjusts itself automatically for proper operation with any combination of these voltages and frequencies.

This equipment design is connectable to an Impedance-Terminated (IT) neutral power system.

### Power Specifications

Table 20 shows the power specifications for the 3590 subsystem.

Table 20. Input Voltages

Model	50 Hz $\pm$ 0.5 Hz	60 Hz $\pm$ 0.5 Hz	Operating Current Nominal at 200 V	Inrush Current	Typical Power Consumed
E11 E1A	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	1.2 A	20 A	225 W
B11 B1A	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	1.25 A	20 A	300 W
A00	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	1.2 A	120 A	140 W
A50	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	1.0 A	10 A	120 W
A60	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	2.5 A	30 A	500 W

Table 20. Input Voltages (continued)

Model	50 Hz $\pm 0.5$ Hz	60 Hz $\pm 0.5$ Hz	Operating Current Nominal at 200 V	Inrush Current	Typical Power Consumed
3591 A01	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	2.2 A	50 A	250 W
A14	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	8.0 A	100 A	1600 W
C10	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	5.0 A	100 A	1000 W
C12	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	6.0 A	150 A	1100 W
C14	200 180–220 220 193–238 230 202–249 240 210–259	200 180–220 208 180–220 220 193–238 240 208–254	6.0 A	150 A	1100 W
<b>Note:</b> Models A14 and C12 data is for fully-loaded frames.					

## Power Cords

The ship group provides the appropriate power cord for all electrical environments in which the device is expected to operate. An appliance coupler is at the device end of the cord. The only cord that needs specification is FC9986, the Chicago power cord.

The factory selects the appropriate power cord that is based on the destination country. Underwriter's Laboratories (UL) lists, and Canadian Standards Association (CSA) certifies the power cables that are used in the United States and Canada. These power cables consist of electrical cables, type SVT or SJT, ended by attachment plugs that comply with the National Electrical Manufacturers Association (NEMA).

U.S.A. and Canada models require one of the following plug and receptacle pairs:

- Plug type: NEMA 5–15P (100–127 V AC)
- Receptacle: NEMA 5–15R (100–127 V AC)
- Plug type: NEMA 6–15P (200–240 V AC)
- Receptacle: NEMA 6–15R (200–240 V AC)

Check local electrical codes. Ensure that adequate electrical service is available for the tape subsystem. A receptacle above the raised floor may be required for the subsystem power. Raised floor installations with the receptacle below the floor may require the following:

- Plug type: Russellstoll 3720DPU2
- Receptacle: Russellstoll 3743U-2 (Figure 4)
- Connector housing: Russellstoll 3913U-2 (Figure 4)
- Power cord style: A8

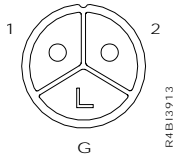


Figure 4. Receptacle Connector for Russellstoll 3913U-2 or 3743U-2

Service ratings for plug type 3720DPU2 are as follows:

- Maximum voltage: 208-240 V AC
- Current: 15 A
- Phases: 1
- Wires: 3

A Russellstoll inline connector used with flexible metal conduit or liquid-tight flexible metal conduit requires a Russellstoll FSA adapter.

Power cables used in other countries conform to the electrical codes that are established by that country. These power cables consist of electrical cables, type HD21, ended by attachment plugs that are approved by the testing organizations for each specific country.

A 250 V 30 A connector 3750DP is supplied for receptacle 9R33UOW or for the inline connector, 9C33UO. The connector supports 3590 Model A14, C10, C12, and C14 frames.

## 3590 Component Specifications

The figures listed below show representative 3590 configurations in rack, frame, and library installations.

- “3590 Model B11” on page 81
- “3590 Model B1A” on page 82
- “3590 Model E11” on page 83
- “3590 Model E1A” on page 84
- “3590 Model A00” on page 85
- “3590 Model A50” on page 86
- “3590 Model A60” on page 87
- “3590 Model A14 Frame Mount” on page 88
- “3590 Rack Mount” on page 90

## 3590 Model B11



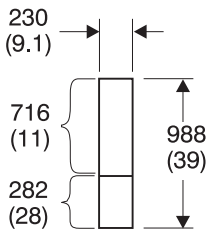
To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.



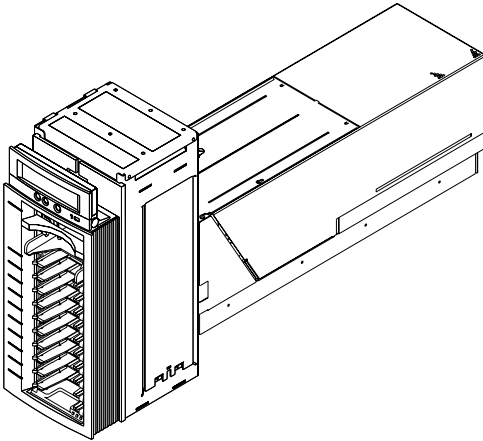
The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 21. 3590 Model B11



A1400064



A1400026

### SPECIFICATIONS

#### Dimensions:

	Front	Side	Height
mm	230	988	522
(in.)	(9.1)	(39.0)	(20.6)

#### Service Clearances:

Refer to the frame or rack installation for clearances.

#### Weight:<sup>1, 2, 3</sup>

kg	49.5
(lb)	(109)

#### Heat Output:

kw	0.3
(kBTU/hr)	(1.02)

#### Airflow Rate:

m <sup>3</sup> /min	3.4
---------------------	-----

#### Power Requirements:<sup>4, 5</sup>

kV-A	0.3(Maximum)
Phases	1

#### Notes:

1. This weight includes the drive, ACF, rack-mount slides, and rack shelf. The rack shelf extends across the full width of the rack and is included as part of FC9221 and FC9223. Each drive and its attaching slides use half the width of the rack shelf.
2. With a magazine and 10 cartridges, add 2.7 kg (6 lb).
3. Shelf and rack-mount slides weigh 38.6 kg (85 lbs).
4. See Table 20 on page 77.
5. An appropriate internal line cord is attached at the factory that plugs into the frame or rack and takes advantage of the external power cord of the frame or rack.

### 3590 Model B1A



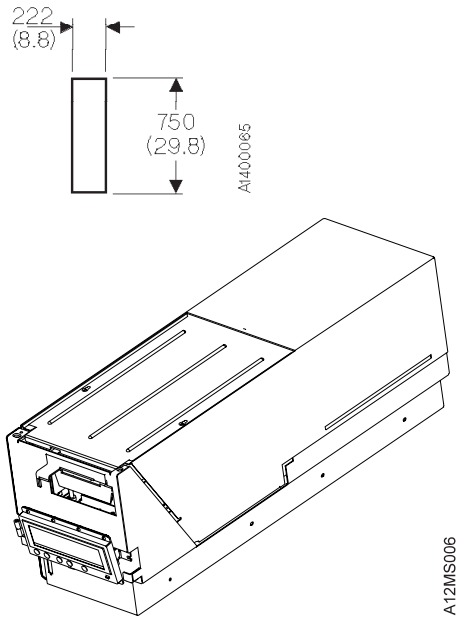
To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.



The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 22. 3590 Model B1A



#### SPECIFICATIONS

##### Dimensions:

	Front <sup>1</sup>	Side	Height
mm	222	750	262
(in.)	(8.8)	(29.8)	(10.5)

##### Service Clearances:

Refer to the Model C12 installation for clearances.

##### Weight:

kg	28.6
(lb)	(63)

##### Heat Output:

kw	0.3
(kBTU/hr)	(1.02)

##### Airflow Rate:

m <sup>3</sup> /min	3.4
---------------------	-----

##### Power Requirements:<sup>2</sup>

kV·A	0.3(Maximum)
Phases	1

##### Notes:

1. The display adds 8 mm (0.3 in) to the width.
2. An appropriate internal line cord is attached at the factory that plugs into the frame and takes advantage of the external power cord of the frame.

## 3590 Model E11



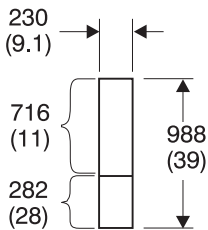
To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.



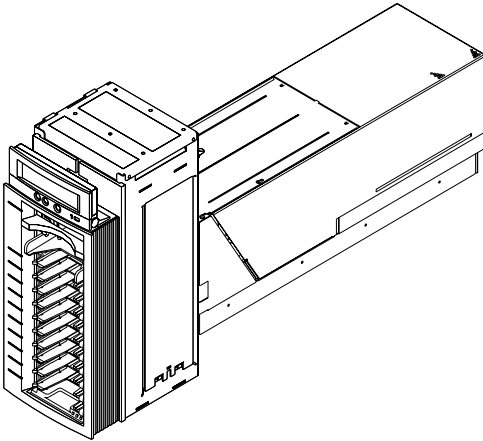
The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 23. 3590 Model E11



A1400064



A1400026

### SPECIFICATIONS

#### Dimensions:

	Front	Side	Height
mm	230	988	522
(in.)	(9.1)	(39.0)	(20.6)

#### Service Clearances:

Refer to the frame or rack installation for clearances.

**Weight:**<sup>1, 2</sup>  
 kg 46.7  
 (lb) (103)

**Heat Output:**  
 kw .225  
 (kBTU/hr) (.77)

**Airflow Rate:**  
 m<sup>3</sup>/min 3.4

**Power Requirements:**<sup>3</sup>  
 kV-A 0.225(Maximum)  
 Phases 1

#### Notes:

1. This weight includes the drive, ACF, rack-mount slides, and rack shelf. The rack shelf extends across the full width of the rack and is included as part of FC9221 and FC9223. Each drive and its attaching slides use half the width of the rack shelf.
2. With a magazine and 10 cartridges, add 2.7 kg (6 lb).
3. See Table 20 on page 77.
4. An appropriate internal line cord is attached at the factory that plugs into the frame or rack and takes advantage of the external power cord of the frame or rack.
5. Model E11 leakage current is 2.1 ma.
6. Model E11 requires 12 EIA units for installation in a rack.
7. Shelf and rack-mount slides weigh 38.6 kg (85 lb).

### 3590 Model E1A



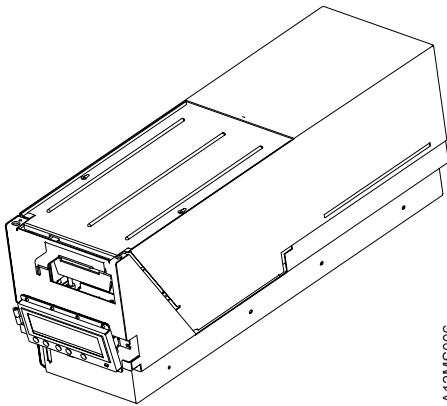
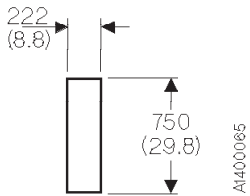
To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.



The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 24. 3590 Model E1A



#### SPECIFICATIONS

##### Dimensions:

	Front <sup>1</sup>	Side	Height
mm	222	750	262
(in.)	(8.8)	(29.8)	(10.5)

##### Service Clearances:

Refer to the Model C12 installation for clearances.

##### Weight:

kg	30.0
(lb)	(66)

##### Heat Output:

kw	.225
(kBTU/hr)	(.77)

##### Airflow Rate:

m <sup>3</sup> /min	3.4
---------------------	-----

##### Power Requirements: <sup>2</sup>

kV·A	.225(Maximum)
Phases	1

##### Notes:

1. The display adds 8 mm (0.3 in) to the width.
2. See Table 20 on page 77.
3. An appropriate internal line cord is attached at the factory that plugs into the frame and takes advantage of the external power cord of the frame.
4. Model E1A requires 6 EIA units for installation in a rack.

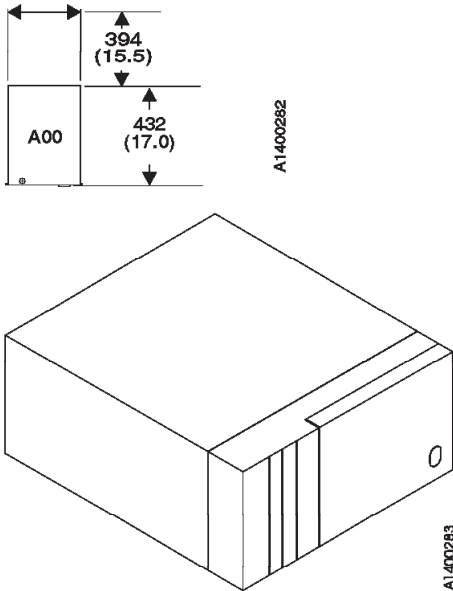
## 3590 Model A00



To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.

English measurements are shown in parentheses.

Table 25. 3590 Model A00



### SPECIFICATIONS

#### Dimensions:

	Front	Side	Height
mm	394	432	191
(in.)	(15.5)	(17.0)	(7.5)

#### Service Clearances:

Refer to the frame or rack installation for clearances.

#### Weight:

kg	16
(lb)	(35)

#### Heat Output:

kw	0.15
(kBTU/hr)	(0.51)

#### Airflow Rate:

m <sup>3</sup> /min	1.4
---------------------	-----

#### Power Requirements:

kV·A	0.25 (Maximum)
Phases	1

#### Notes:

FC5000 provides two power cords.

- For an A00 adjacent to a C12, install an appropriate internal line cord is provided. It plugs into the C12 frame and takes advantage of the external power cord of the frame.
- A line cord is provided for powering the A00 from a 220v wall outlet.
- For rack mount installation (without FC5000), an appropriate internal line cord for rack-to-ACS is supplied. For details refer to *IBM Magstar 3590 High Performance Tape Subsystem, Introduction, Planning, and User's Guide*.

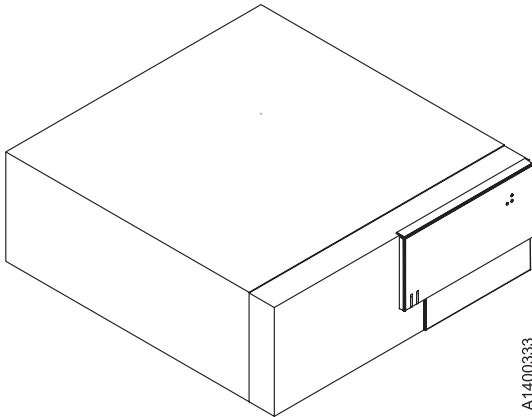
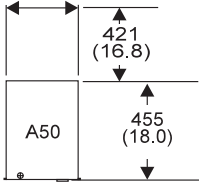
## 3590 Model A50



To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.

English measurements are shown in parentheses.

Table 26. 3590 Model A50



### SPECIFICATIONS

#### Dimensions:

	Front	Side	Height
mm	421	455	156
(in.)	(16.8)	(18.0)	(6.1)

#### Service Clearances:

Refer to the frame or rack installation for clearances.

#### Weight:

kg	18
(lb)	(39.6)

#### Heat Output:

kw	0.15
(kBTU/hr)	(0.51)

#### Airflow Rate:

m <sup>3</sup> /min	1.4
---------------------	-----

#### Power Requirements:

kV·A	0.45(Maximum)
Phases	1

**Note:** An appropriate internal line cord is attached at the factory that plugs into the rack, library, or frame and takes advantage of its external power cord.

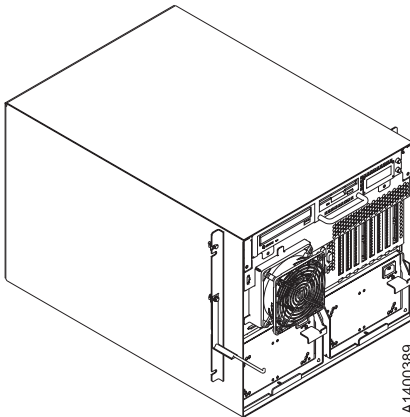
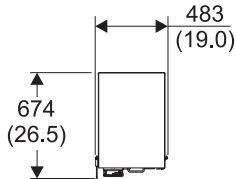
## 3590 Model A60



To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.

English measurements are shown in parentheses.

Table 27. 3590 Model A60



### SPECIFICATIONS

#### Dimensions:

	Front	Side	Height
mm	483	674	401
(in.)	(19.0)	(26.5)	(15.8)

#### Service Clearances:

Refer to the frame or rack installation for clearances.

#### Weight:

kg	75
(lb)	(165)

#### Heat Output:

kw	0.5
(kBTU/hr)	(1.7)

#### Airflow Rate:

m <sup>3</sup> /min	1.4
---------------------	-----

#### Power Requirements:

kV·A	0.75(Maximum)
Phases	1

Model A60 control unit requires 8 EIA units.

**Note:** An appropriate internal line cord is attached at the factory that plugs into the rack, library, or frame and takes advantage of its external power cord.

## 3591 Model A01 Controller

Refer to *IBM 3591 Tape Control Unit Model A01 Introduction, Planning, and User's Guide* for information.

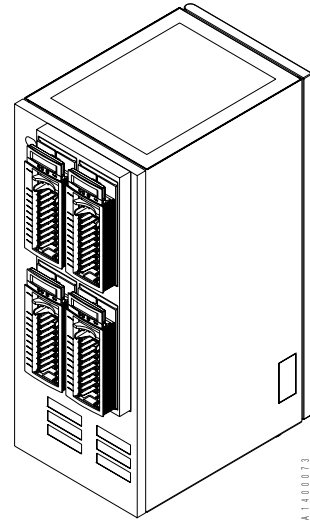
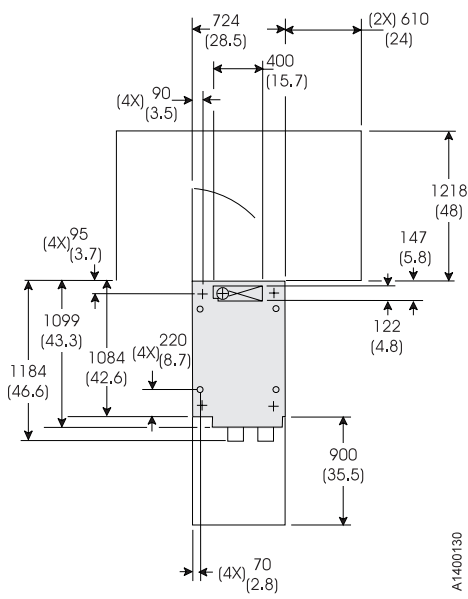
### 3590 Model A14 Frame Mount



To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.

English measurements are shown in parentheses.

Table 28. 3590 Model A14



3590 Model A00/A50/A60 control units and Model E11 or B11 drives are installable in an IBM Model A14 Frame.

Table 29. SPECIFICATIONS

The following specifications are for the frame only. To calculate total weights, power requirements, and heat output, add the equivalent values for each 3590 device that is mounted in the frame.

**Dimensions:**

	Front	Side <sup>1</sup>	Height
mm	724	1099	1800
(in.)	(28.5)	(43.3)	(70.9)

**Service Clearances:**

	Front	Side	Rear
mm	750x900	(see note <sup>2</sup> )	750x1218
(in.)	(29.5x35.5)		(29.5x48)

**Frame Weight:**

kg	227
(lb)	(500)

**Heat Output:**

kw	0.1
(kBTU/hr)	(0.34)

**Power Requirements:**

kV·A	0.1(Maximum)
Phases	1

**Frame Power Attachments:**

Plug type (US default)	R&S 3750DP
Receptacle type (US default)	9R33UOW
Inline Connector (US default)	9C33UO

**Notes:**

1. The side dimension value given does not include additional aisle or service clearance required by installed drives and cartridge loaders.  
  
The ACF extends forward of the A14 frame by 85 mm (3.3 in).
2. Left and right rear service clearances of 610mm x 1218mm (24in x 48in) each are required. Left and right service clearances can overlap when Model A14s are placed side by side.
3. The appropriate line cord is attached at the factory based on the order destination country code.

### 3590 Rack Mount

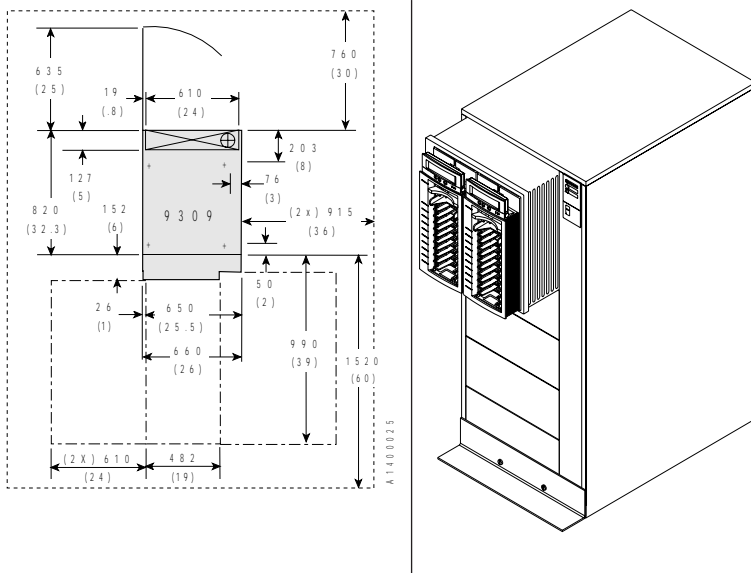
This example illustrates the layout of an IBM 3590 Model E11 or B11 installed in an IBM 9309-2 rack. Other racks may be used.



To prevent a possible electrical shock when adding or removing any devices to or from the system, ensure that the power cords for those devices are unplugged before the signal cables are connected or disconnected. If possible, disconnect all power cords from the existing system before you add or remove a device.

English measurements are shown in parentheses.

Table 30. 3590 Rack Mount



The following specifications are for the frame only. To calculate total weights, power requirements, and so on you must add the equivalent values for each 3590 device that is mounted in the frame.

Table 31. SPECIFICATIONS

**Dimensions:**

	Front	Side <sup>1</sup>	Height
mm	650	972	1578
(in.)	(25.6)	(38.3)	(62.1)

**Service Clearances:**

	Front <sup>1</sup>	Side	Rear
mm	1524	760	0
(in.)	(60)	(30)	(0)

**9309 Weight:**

kg	138
(lb)	(303)

**Heat Output:**

kw	0.1
(kBTU/hr)	(0.34)

**Power Requirements:**

kV·A	0.1(Maximum)
Phases	1

**Rack Power Attachments:** <sup>2, 3, 4</sup>

Plug type (US default) NEMA L6-30P  
 Receptacle type (US default) NEMA L6-30R

**Notes:**

1. Left and right front service clearances of 610x990 (24x39) each are required. Left and right service clearances can overlap when racks are placed side by side.
2. The appropriate line cord is attached at the factory based on the order destination country code.
3. Refer to *IBM 9309 Rack Enclosure General Information and Site Preparation Guide* for plug type, receptacle type, connector and power cord style. For AS/400 or iSeries physical planning information, Refer to *IBM Application System/400 Physical Planning Guide*.
4. The Models E11 and B11 require 12 EIA units in a rack.

**3590 Models C10, C12, and C12 Frame Mount**

Refer to *IBM Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C10, C12 and C14 Introduction, Planning, and User Guide* for planning details.



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## Chapter 7. Device Attachment Planning

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### SCSI Attachment Planning

This section describes necessary planning for the various SCSI attachments. Planning includes the following topics:

- SCSI Attachment
- “SCSI Host Software Considerations” on page 95
- “Sharing SCSI Buses with Disk Devices” on page 100
- “Removing, Installing, or Resetting a 3590 on an Active SCSI Bus” on page 100
- “Ultra SCSI and non-Ultra (fast/wide) SCSI Peripherals” on page 100

### Multiple SCSI Ports

The 3590 Model B11 and B1A have two independent SCSI-2 fast/wide or SCSI Ultra/wide differential interfaces (ports). The E11 and E1A models have two SCSI-3 SCSI Ultra/wide differential interfaces (ports). This enables concurrent attachment of two independent SCSI host strings to each drive. One or both ports may be attached to either of the following systems:

- One or more RS/6000 or pSeries, RS/6000 SP, HP, and Sun systems
- One or more AS/400 or iSeries system
- One or more Windows NT or xSeries system
- Only one port is usable with Windows 2000 or xSeries

On the same drive, one port could be attached to the RS/6000 or pSeries, RS/6000 SP2, or Sun system. The other 3590 port could be attached to an AS/400 or iSeries system. Taking any unused port offline requires selecting options on the operator panel.

Two terminating plugs ship with each 3590 drive, one for each port. Depending on the configuration of your system, you must order one or more of the following:

- SCSI cables for attaching a 3590 host to a 3590 device.
- Cables for attaching a 3590 device to another device
- Interposers

When sharing a drive between different systems, take caution to keep both hosts from attempting to use the drive at the same time. For more information, see “Drive Assignment” on page 47.

## SCSI Physical Interface Characteristics

The 3590 B-Models operate as a SCSI-2 device with SCSI-3 features. The instruction set is SCSI-2, but includes SCSI-3 commands and mode sense data.

3590 E-Models are SCSI-3 devices and will work with SCSI-2 hosts (initiators).

Each 3590 tape drive attaches to host processors through an SCSI Ultra/wide differential SCSI or fast/wide differential SCSI interface. Each uses shielded high-density SCSI-3 68-pin P connectors. Each device may attach directly to a differentially driven, 2-byte wide SCSI-3 P-cable.

Under the SCSI protocol, this type of attachment allows cable lengths of up to 25m (81 ft) with the appropriate cable and terminator selection. The stub length at each device must not exceed 0.2-m (0.66 ft).

The 3590 tape drive also logically supports the narrow (8-bit) protocol. Connecting a 3590 tape drive device to an 8-bit SCSI bus requires an interposer.

**Note:** Only 8 bus addresses (0 to 7) are valid for an 8-bit bus.

## SCSI-ID and LUN Assignments

Each 3590 device is assigned a default SCSI ID of 0 for port 0, and 1 for port 1. Operator panel options allow changing the SCSI address for either port.

The B-Model drive defaults to providing one LUN at LUN address 0. An option is available to support a separate Medium Changer device at LUN address 1. This selection depends on host software requirements. The 3590 E model drive provides a Medium Changer device at LUN address 1.

## Bus Termination

Proper termination, according to SCSI standards, are required for the SCSI bus and cable wires. This termination is especially important if a system mixes devices or initiators with 68-pin connectors with the 50-pin style.

A terminator must be installed on the last device on each end of a string of multiple devices. Two external differential terminators are included with each drive (one for each SCSI port).

## SCSI Host Software Considerations

For SCSI cable feature codes that are matched to specific software applications, see “SCSI Cable Features” on page 41.

### SCSI Interposers

Table 32 shows required interposers.

Table 32. SCSI Interposers

Feature Code	Host Connection	Host
9410	Magnetic Media Subsystem Controller (FC6501)	AS/400 or iSeries
9701	SCSI-2 Differential High-Performance Controller (FC2420)	RS/6000 or pSeries
9702	IBM SCSI-2 Fast/Wide Adapter/A (FC2416 and FC2412)	RS/6000 or pSeries

### RS/6000, pSeries, SP

In this environment, multiple initiators (hosts) and multiple targets (devices) can be serial connected and intermixed on a common SCSI bus. This is accomplished within the distance, attachment capabilities, and specifications of the host’s SCSI adapter. The RS/6000 or pSeries and SP2 attach to the 3590 only through the following host SCSI adapter features:

- RS/6000 or pSeries FC2412 - Enhanced SCSI-2 Differential Fast/Wide Adapter/A. See Table 32 for required interposers and “SCSI Cable Features” on page 41 for supported SCSI cables.
- RS/6000 or pSeries FC2416 - SCSI-2 Differential Fast/Wide Adapter/A. See Table 32 for required interposers and “SCSI Cable Features” on page 41 for supported SCSI cables. See Table 32 for required interposers and “SCSI Cable Features” on page 41 for supported SCSI cables.
- RS/6000 or pSeries FC2420 - SCSI-2 High-Performance External I/O Controller (Narrow Adapter). See Table 32 for required interposers and “SCSI Cable Features” on page 41 for supported SCSI cables.
- RS/6000 or pSeries FC2409 - PCI SCSI-2 Fast/Wide Differential Adapter.
- RS/6000 or pSeries FC6207 - PCI Differential Ultra SCSI Adapter. If used with the SCSI Ultra/wide 3590, then Ultra SCSI speeds are achievable. Otherwise the SCSI speed will be limited to fast/wide performance. Actual performance may be faster than non-SCSI Ultra fast/wide 3590 drives.
- RS/6000 or pSeries FC6209 - PCI SCSI-2 Differential Fast/Wide Adapter.

The host system must have AIX 4.3.3 or greater. The RS/6000 or pSeries and SP2 environments do not support all hardware platforms. Use of a fibre fabric switch allows the connection and intermix of multiple hosts and devices. The specified distance, the attachment capabilities, and the host’s Fibre Channel

adapter specifications accomplish this connection. The RS/6000 or pSeries and SP attach to the 3590 only through the following host Fibre adapter features:

- RS/6000 or pSeries FC6227

**RS/6000 or pSeries Environment for SCSI:** AIX 4.3.0 and subsequent releases support the IBM 3590 in RS/6000 or pSeries and RS/6000 SP operating environments. This includes support for the ACF in random mode. The Open Systems Device Driver, FC9200, on the 3590 E11 or B11 provides specific 3590 device support for AIX. It is available as FC9200 on the 3494 for the 3590 E1A and B1A.

Tivoli Storage Manager provides 3590 support with highly automated, centrally scheduled, policy-managed backup and archival facilities. These features protect data in distributed environments that use AIX systems as servers.

#### **AS/400 or iSeries System Environment**

AS/400 attachment to a 3590 does not support serial connecting multiple AS/400 or iSeries hosts (initiators). Nor does it support serial connecting multiple 3590 devices (targets).

AS/400 9404 or 9406 attachment to a 3590 uses AS/400 Feature 2729, 6501 or 6534 (Tape/Disk Device Controller).

Refer to *Application System/400 Automated Tape Library Planning* for additional information.

Program support for the Magstar Tape Subsystem is provided in the AS/400 or iSeries environment by OS/400 V3R2, OS/400 V3R7, or later versions.

#### **AS/400 or iSeries Note:**

Program temporary fixes (PTF) are required prior to attaching a Magstar Tape Subsystem to an AS/400 or iSeries system. The PTFs for all supported AS/400 or iSeries releases are listed in INFO APAR II11472. This information APAR contains the most current PTF information for all supported releases. It also includes important information concerning attachment of the Magstar Tape Subsystem to the AS/400 or iSeries.

To ensure that the new IOP code is available during a system recovery, perform a SAVSYS After installing the appropriate PTFs.

### **AS/400 or iSeries System Feature 2729, 6501, or 6534**

Set the drive address to 0 when attaching to AS/400 or iSeries with system feature 6501. The AS/400 or iSeries will recognize the device as address 7 due to system design.

A connection to the Magstar tape drives system feature 6501 requires an interposer, FC9410. Connecting the Magstar tape drives to system features 2729 or 6534 requires no interposers.

The following conditions apply to AS/400 FC9404 and FC9406 SCSI bus attachment of the Magstar Tape Drive:

1. FC2729 and FC6534 provide one port.
2. FC6501 provides two ports, but one 6501 port must remain unused when connecting the 3590 tape drive to achieve optimum performance.
3. No other devices can be supported on FC2729, FC6501, or FC6534 port with the Magstar tape drives attached.
4. An AS/400 or iSeries system cannot be interconnected with any other system on the same SCSI bus (including another AS/400 or iSeries).
5. When the subsystem is attached to AS/400 or iSeries with FC2729, FC6501 or FC6534, one of the SCSI addresses on the Magstar tape drives must be set to 0 if the Magstar is to be used as an alternate IPL device.

### **Hewlett-Packard**

In this environment, multiple initiators (hosts) and multiple targets (devices) can be serial connected and intermixed on a common SCSI bus. This must be accomplished within the distance, attachment capabilities, and specifications of the host's SCSI adapter.

Use any combination of initiators and targets, to a total of 16, if either of the following applies:

1. The SCSI bus terminates properly at each end.
2. The use of SCSI specification for cable restrictions. The maximum cable length is 25m (81 ft). See "SCSI Cable Features" on page 41 for a list of cables to attach the 3590 to an HP system.

HP 9000 N and V Class Servers support the Magstar 3590 Models B11, B1A, E11, and E1A Tape Drives. These servers must support the HP F/W Differential SCSI 2 adapter (A4800A) running HP-UX 11.0. V Class Servers require an Inline SCSI Terminator. Specify FC9798 on the 3590 B11, B1A, E11, E1A, or C12 systems.

Hewlett-Packard (HP) 9000 Series 800 Business Servers support the Magstar 3590 Models B11, B1A, E11, and E1A Tape Drives. They are further supported on other servers that support HP Precision Bus (HP-PB) slots and the HP-PB

Fast/Wide Differential 28696A Adapter. Supported systems include the HP9000 T, K, and D Class Servers that run HP-UX 10.20 and 11.0.

Specify FC9200 for HP-UX drivers.

### **Sun Solaris**

In this environment, multiple initiators (hosts) and multiple targets (devices) can be serial connected and intermixed on a common SCSI bus. This must be accomplished within the distance, attachment capabilities, and specifications of the host's SCSI adapter.

Sun SPARC and UltraSPARC Architecture workstations and servers support the 3590 Model B11, B1A, E11, and E1A Tape Drives. This includes the Ultra/Enterprise Server Family. Specify FC9200 for Solaris device drivers.

**SCSI Support:** These workstations and servers support one or more of the following host bus adapters:

- Sun Sbus Differential Fast/Wide Intelligent SCSI-2 Host Adapter (X1062A)
- Sun Sbus Ultra Differential Fast/Wide Intelligent SCSI-2 Host Adapter (X1065A)
- Sun Dual-Channel Differential Ultra SCSI Host Adapter (PCI) (X6541A)

The VHDCI to HD68 Cable/Interposer (FC9799) is required to connect an industry standard high-density 68-pin (HD68) cable connector. Typically, the HD68 is used on Fast/Wide devices to the Sun PCI Dual-Channel Differential Ultra SCSI Host Adapter (X6541A), which has a VHDCI connector.

Solaris 2.6, 7, or Solaris 8 release is required.

**Fibre Channel:** A 3590 Model E11 and E1A Fibre Channel attachment, with a Qlogic QLA2200F Fibre Channel attachment installed, requires Solaris 2.6, 7, or 8 release.

Use any combination of initiators and targets, to a total of 16, if either of the following applies:

1. The SCSI bus terminates properly at each end.
2. The use of SCSI specification for cable restrictions. The maximum cable length is 25m (81 ft). See "SCSI Cable Features" on page 41 for a list of cables to attach the 3590 to a Sun Solaris system.

For SUN attachment, an external terminator is **required** for use on the SCSI bus. In some multi-host systems, this may require the removal of internal terminators from one of the host adapters.

**Windows NT or xSeries**

Intel-compatible processors, operating for Microsoft Windows NT or xSeries, support the Magstar 3590 Models B11, B1A, E11, and E1A Tape Drives. Specify FC9200 for Windows or xSeries drivers.

**SCSI Support:** The Adaptec AHA-2944UW PCI Differential Ultra SCSI adapter is required as well as Windows NT or xSeries Service Pack 3, or later.

**Fibre Channel:** The Model E11 and E1A drives support direct attachment to a Qlogic QLA2200F Fibre Channel adapter. The Model E11 and E1A drives can also connect to a SAN.

The system must include a SCSI (F/W) differential adapter, Adaptec 2944UW F/W Differential.

The following applies:

- The SCSI bus terminates properly at each end.
- The use of SCSI specification for cable restrictions. The maximum cable length is 25m (81 ft). See “SCSI Cable Features” on page 41 for a list of cables to attach the 3590 to a Windows NT or xSeries system.
- Only one Windows NT or xSeries and one device are allowed for attachment at a time. To share or use both 3590 ports on either the same or different systems, is *not* supported.
- The unused SCSI port must be set offline.

**Microsoft Windows 2000 or xSeries Support**

Intel-compatible processors, operating for Microsoft Windows 2000 or xSeries, support the Magstar 3590 Models B11, B1A, E11, and E1A Tape Drives.

**SCSI Support**

The Adaptec AHA-2944UW PCI Differential Ultra SCSI adapter is required as well as Windows 2000 or xSeries Build 2195 or later.

**Fibre Channel**

The Model E11 and E1A drives support direct attachment to a Qlogic QLA2200F Fibre Channel adapter. The Model E11 and E1A drives can also connect to a SAN.

## Sharing SCSI Buses with Disk Devices

Because of SCSI bus contention, sharing a SCSI bus between tape devices and disk storage devices is not recommended. Tape devices usually use large block sizes and high effective data rates. The high SCSI bus usage by tape devices may degrade disk performance due to frequent rotational position-sensing (RPS) misses. SCSI bus contention can cause significant delays in interrupt signals, which an operating system may interpret as missing interrupts.

See “Ultra SCSI and non-Ultra (fast/wide) SCSI Peripherals”.

## Removing, Installing, or Resetting a 3590 on an Active SCSI Bus

Attaching a 3590 to an active SCSI bus is supported. However, the preferred and safest method of adding or removing devices from the system is to work on a system that is powered off.

An active SCSI bus supports resetting and power cycling a 3590. The preferred and safest method is to take all SCSI ports offline before resetting the drive.

When adding or removing a 3590 from an active SCSI bus, adhere to the following restrictions:

- The device to be added or removed must not be involved in any bus activity. It must be quiesced.
- Power off the device.
- Bus cables may then be removed from the 3590 interface connector, in either of the following conditions:
  - The SCSI bus remains intact from initiator to terminating plug throughout the connection or disconnection process.
  - All signal lines, and ground lines that make up the bus, maintain continuity. Changing or moving the terminating plugs disrupts the bus continuity and is not allowed in the context of a non-disruptive process.

## Ultra SCSI and non-Ultra (fast/wide) SCSI Peripherals

Due to the 3590 SCSI Ultra/wide device speed, SCSI time-outs may occur to other peripherals if it is placed on a shared SCSI bus with multiple peripherals. This is preventable. Adapter SCSI and 3590 Ultra SCSI addresses should be lower (0 or 1) than peripheral SCSI addresses of (E or F). This gives the other peripherals higher priority and allows successful SCSI bus sharing.

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## ESCON Attachment Planning

This section describes the planning necessary for ESCON attachment. The following topics describe the planning:

- Configurations with ESCON System Attachment
- Host I/O Configuration Control Requirements for ES/9000 Systems
- 3591 Model A01 Tape Control Unit Environment

### Notes:

1. Both SCSI ports, on the 3590 Models must be attached to an IBM 3590 Model A00/A50/A60. Only one SCSI port is attachable to an IBM 3591 Model A01 ESCON controller.
2. The following applies when connecting 3590 drives, through a 3591 controller, for attachment to an ESCON host:
  - Only one drive port may attach to a controller
  - The other port may attach to any other supported SCSI host except another controller.
  - Set any unused ports offline.

### Configurations with ESCON System Attachments

The 3590 Model A00/A50/A60 or 3591 Model A01 tape controllers attach to the ESCON channels of S/390 or zSeries systems. A 3590 Model A00/A50 is installable in a Model A14, C12, or C14 frame or in a 3494 Model L14 or D14 frame. A 3590 Model A60 can be installed in a 3590 Model A14, C10, in a 3494 Model D14 frame, or stand-alone rack.

**Note:** See Table 1 on page 3 for detailed information on specific models.

Refer to *IBM 3591 Tape Control Unit Model A01 Introduction, Planning, and User's Guide* for information on Model A01 configuration. Because all system attachments do not support all host processor types, check with your marketing representative for details.

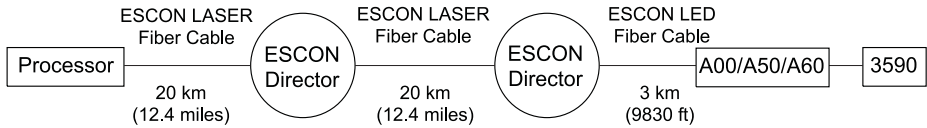
As part of your installation plan, analyze your performance and distance requirements carefully. See “ESCON System Attachments” and “ESCON Host Attachment” on page 103 for a starting point for a discussion with your IBM installation planning representative.

Refer to the Installation chapter of *IBM 3590 Tape Subsystem Maintenance Information A60 Controller* for installation information.

### ESCON System Attachments

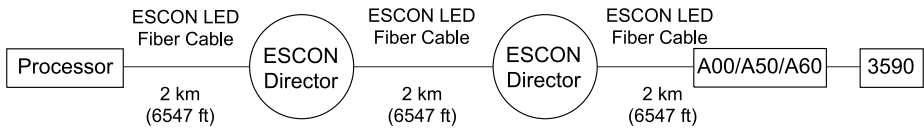
With ESCON, you have numerous options for the physical location of your 3590 subsystem. Several configuration options follow.

A 3590 can be located up to 43 km (27 miles) from a processor when using the ESCON laser fiber cable and two ESCON directors:



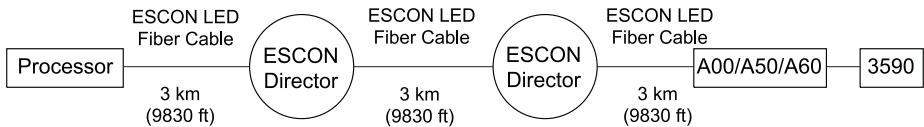
A1400101

A 3590 can be located up to 6 km (3.73 miles) from a processor when using the ESCON LED 50.0-micron cables and two ESCON directors:



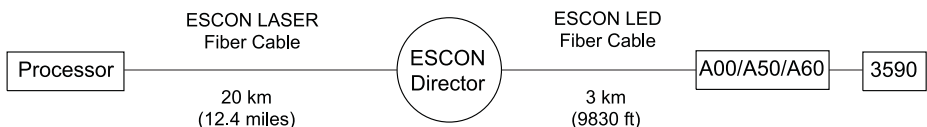
A1400102

A 3590 can be located approximately 9 km (5.6 miles) from a processor when using the ESCON LED 62.5-micron cables and two ESCON directors:



A1400099

A 3590 can be located 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:



A1400100

With ESCON directors, each subsystem ESCON adapter provides for up to 64 logical attachments.

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

**Note:** A50/A60 only support 3590 E Model.

## ESCON Host Attachment

Table 33 lists Model A60 ESCON host attachment features.

Table 33. 3590 Model A60 ESCON Host Attachment Features

Feature Code	Group Number <sup>1</sup>	Number of Cables	Connector ID
3412 <sup>2</sup>	3797/8486	1	55
3412 <sup>2</sup>	3797/8486	1	57
3412 <sup>2</sup>	3797/8486	1	59
3412 <sup>2</sup>	3797/8486	1	61
3412 <sup>2,3</sup>	3797/8486	1	63
3412 <sup>2,3</sup>	3797/8486	1	65
3412 <sup>2,3</sup>	3797/8486	1	67
3412 <sup>2,3</sup>	3797/8486	1	69

**Notes:**

1. Group number 3797 is for Riser rated cables. Group number 8486 is for Plenum rated cables. Plenum rated cables should be ordered only when required by local codes.
2. Two 31m (100 ft) cables are shipped with each FC3412. A special order must be placed if different lengths are required.
3. Model A60 supports up to four FC3412s, each with two ESCON interfaces. Connector ID numbers 59 and 61 belong to the cables in the first ESCON interface, and, accordingly, connector ID numbers 63 through 69 are associated with the second, third, and fourth ESCON interfaces, successively.

Use fiber-optic jumper cables to attach the 3590 Models A00, A50, and A60 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 34.

Table 34. Fixed Cable Lengths by Group

Cable Length	Group 3797 Available	Group 8486 Available
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:** Custom cable lengths are available up to 500 m (1640 ft).

## Host I/O Configuration Control Requirements for S/390 and zSeries Systems

With ESCON and FICON channel attachments, the host or control program I/O configuration controls must configure the 3590 subsystem for non-shared subchannels. The configuration controls must also define all assigned device addresses that are associated with the subsystem on each configured channel path. This is independent of the devices that are installed on the subsystem. The device addresses selected by the subsystem address configuration controls must match the device addresses that are defined in the host or control program configuration controls for each channel path.

Simultaneous accessibility for S/390 or zSeries, through ESCON and FICON, requires configuring the same device address for both path types.

### 3591 Model A01 Tape Control Unit Environment

The 3590 drive-to-3591 host configuration rules are as follows:

- The 3590 port SCSI bus which attaches to a 3591 does not support host serial connections. Only one 3591 can be attached to the same B11 or B1A.
- The unused SCSI port on the 3590 may attach to any supported host. However, this second 3590 SCSI port may not attach to another 3591.

As in the other SCSI-attached environments, SCSI cables must be ordered with the 3590 to provide attachment to the 3591. The maximum end-to-end cable length is 25 meters.

Refer to *IBM 3591 Tape Control Unit Model A01 Introduction, Planning, and User's Guide* for information.

### S/390 or zSeries Environment Support

The ES/3090 and ES/9000 processors, and S/390 or zSeries servers, using 3590 controllers, support the Magstar 3590 drives for attachment to ESCON. IBM 9672 Enterprise G5 and G6 Servers and zSeries Servers support Native FICON with the Magstar 3590 A60 control unit. Supported drive model and controller model combinations are shown in Table 35.

*Table 35. Drive and Controller Combinations*

3590 Drive Model	Controller Model
E1A, E11	A50*, A60
B1A, B11	Model 3591 A01*, A00*, A50*, A60
<b>Note:</b> * No longer offered by IBM.	

Model E and Model B drives are not intermixable on the same subsystem (controller). The subsystem will operate in either 3590 or 3490E drive

emulation mode. The 3590 drives attach to that subsystem’s controller and add to the host system’s I/O configuration as if they were device type 3590 or 3490E. See “Chapter 8. S/390 or zSeries Operational Considerations” on page 115 for information to use in planning for emulation-mode implementation and operation.

Even when the drives are operating in 3490E emulation mode, software maintenance may be required to exploit Magstar media capacity. Always check the 3590 PSP bucket for details on required or recommended maintenance. General guidelines for software support are shown in Table 36.

Table 36. Recommended or Required Maintenance

Emulation Mode	Maintenance Guideline	
	3590 B Models	3590 E Models
3590	<ul style="list-style-type: none"> <li>PTFs for 3590 Model B device support are required for recent operating system releases.</li> <li>Refer to operating environment descriptions below for minimum release-level requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Release levels of operating systems and application programs with 3590 Model B device support are required.</li> <li>PTFs for 3590 Model E device support may be required. Refer to operating environment description below for minimum release-level requirements.</li> </ul>
3490E	<ul style="list-style-type: none"> <li>Release levels of operating systems and application programs with 3490E device support are required.</li> <li>Certain applications such as HSM require PTFs.</li> </ul>	<ul style="list-style-type: none"> <li>Release levels of operating systems and application programs with 3490E device support are required.</li> <li>PTFs for new device support may be required for supported operating system releases. Refer to operating environment description below for minimum release-level requirements.</li> </ul>

When used in an ESCON environment, the 3590 drives provide support for the software levels specified for OS/390 and z/OS in Table 37 on page 106, for VM/ESA and z/VM in Table 38 on page 107, and for VSE/ESA in Table 39 on page 107. Earlier levels are not supported; however, later releases will include support. For operating system support levels when using the A60 with native FICON, see “Magstar 3590 A60 Tape Control Unit Native FICON Support” on page 109.

### Subsystems in 3494 Library

The support for 3590 Model E provides controls to allow intermixing of 3590 Model E and Model B subsystems in Storage Management Subsystem (SMS)-managed 3494 libraries. Allocations provide a desired drive type that is managed through an additional data class attribute for 256-track recording format. Libraries with both 128-track and 256-track subsystems exploit

downward read compatibility of 128-track recorded tapes on 256-track drives. This allows a shared common media pool by both drive model types. In a 3494 library, 3590 drives are always defined as device type 3590.

### Subsystems not in 3494 Library

For 3590 E Model or B Model Tape Drives not inside 3494 libraries, the software support cannot manage allocation among multiple drive models that use the same emulation type. Drives not inside 3494 libraries or located in silo-compatible frames are considered non-library drives. (For example, 3590 E Model and B Model Tape Drives that are both defined in the I/O configuration as device type 3590). Local procedures or software products must manage the allocation for different drive models which have the same device type. (For example, Basic Tape Library Support (BTLS) or StorageTek's Host Software Component (HSC).) Install the maintenance for 3590 E model drives to promote full media capacity exploitation by applications. Maintenance installation also ensures that DDR swaps occur between like device models, and it enables EREP reporting by true device type or model. See "Chapter 8. S/390 or zSeries Operational Considerations" on page 115 for further details on planning for emulation-mode support.

### OS/390 (MVS/ESA) z/OS ESCON

Table 37. OS/390

Support for 3590 Model B Drives	Support for 3590 Model E Drives
<i>Required for 3590 native attachment. With 3490E emulation, PTFs may be required by applications such as HSM to ensure exploitation of full media capacity.</i>	<i>Required with either 3590 or 3490E device type attachment.</i>
OS/390 version 2 Release 6 and higher or z/OS and their associated levels of DFSMS	OS/390 version 2 Release 6 and higher or z/OS and their associated levels of DFSMS
EREP 3.5 plus PTFs	Additional PTF Required
ADSM/MVS Release 2.1 plus PTFs	Same as Model B Drives
DFSORT Release 13 plus PTFs	DFSORT Release 13 and 14 plus PTFs
DITTO/ESA Release 2	Same as Model B Drives

## VM/ESA ESCON

Table 38. VM/ESA

<b>Support for 3590 Model B Drives</b>	<b>Support for 3590 Model E Drives</b>
<i>Required for 3590 native attachment. Release levels of operating system and application software with 3490E device support are required for 3490E emulation mode.</i>	<i>Requires no additional software maintenance. Support is handled transparently through device-type emulation. Release levels of operating system and application software with 3490E device support are required for 3490E emulation mode. Release levels of operating system and application software with 3590 Model B device support are required for 3590 emulation mode.</i>
VM/ESA 2.1 plus PTFs or VM/ESA 2.21. z/VM version 3, release 1.	Same as Model B Drives
EREP 3.5 plus PTFs	Additional PTF Required
ADSM/MVS Release 2.1 plus PTFs	Same as Model B Drives
DITTO/ESA Release 2	Same as Model B Drives

## VSE/ESA ESCON

Table 39. VSE/ESA

<b>Support for 3590 Model B Drives</b>	<b>Support for 3590 Model E Drives</b>
<i>Required for 3590 native attachment. Release levels of operating system and application software with 3490E device support are required for 3490E emulation mode.</i>	<i>Requires no additional software maintenance. Support is handled transparently through device-type emulation. Release levels of operating system and application software with 3490E device support are required for 3490E emulation mode. Release levels of operating system and application software with 3590 Model B device support are required for 3590 emulation mode.</i>
VSE/ESA 2.2	Same as Model B Drives
EREP 3.5.0 plus PTFs	Additional PTF Required
DITTO/ESA Release 2	Same as Model B Drives

## TPF ESCON

TPF Release 4.1, plus PTFs, provide support for 3590 Model B drives. The 3590 can be defined in the I/O configuration as either 3590 or 3490E device type.

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## FICON Attachment Planning

This section describes the planning necessary for FICON attachment. The following topics describe the planning:

- Configurations with FICON System Attachment
- Host I/O Configuration Control Requirements for S/390 or zSeries Parallel Enterprise Server systems

**Note:** Only the Model A60 supports FICON attachment

### Configurations with FICON System Attachments

The 3590 Model A60 tape control units attach to the FICON channels on a 9672 Enterprise G5 or G6 server or zSeries server. A 3590 Model A60 can be installed in a 3590 Model A14, C10, or in a 3494 Model D14 frame.

**Note:** See Table 1 on page 3 for detailed information on specific models.

Refer to the Installation chapter of *IBM 3590 Tape Subsystem Maintenance Information A60 Controller* for installation information.

For a thorough discussion of FICON system planning considerations, refer to *Planning for: Fiber Optic Links (ESCON, FICON, Coupling Links, and Open system Adapters)*. Also refer to *S/390® System Overview Parallel Enterprise Server — Generation 5* and *S/390® System Overview Parallel Enterprise Server — Generation 6*.

With FICON switches, each subsystem FICON adapter provides for up to 64 logical attachments. A given system may simultaneously attach a device through both ESCON and FICON.

Simultaneous accessibility for OS/390 or zSeries, through ESCON and FICON, requires configuring the same device address for both path types.

### FICON Host Attachment

Table 40 lists Model A60 FICON host attachment features.

*Table 40. 3590 Model A60 FICON Host Attachment Features*

Feature Code	Group Number	Number of Cables	Connector ID
3432	8311	1	71
3432	8311	1	73
3433	8311	1	75
3433	8311	1	77

## Magstar 3590 A60 Tape Control Unit Native FICON Support

Table 41 lists support for the A60 control unit with Model B or Model E drives unless otherwise noted. The supported servers are IBM 9672 Enterprise G5 or G6, and zSeries 900.

Table 41. FICON Support

Operating System	Minimum Levers	Comments
OS/390	Version 2 Release 6 and subsequent releases. PTFs are required.	
z/OS	Version 1 Release 1 and subsequent releases. APAR OW47844 is recommended	
z/VM - native	Version 3 Release 1 and subsequent releases. Requires APAR VM62710.	RSU tape shipped with z/VM includes APAR VM62710.
z/VM - guests	Version 3 Release 1 and subsequent releases.	z/VM with guest operating systems that support native FICON.
VM/ESA - native	Version 2.3 and subsequent releases. Requires APAR VM62710.	
VM/ESA- guests	Version 2 Release 2 and subsequent releases. APAR VM62090 required for Version 2 Release 2, and Version 2 Release 3.	VM/ESA with guest operating systems that support native FICON.
VSE/ESA	Version 2 Release 3 and subsequent releases.	
TPF	Version 4 Release 1 and subsequent releases.	3590 Model B drives only.

**Note:** PTFs may be required for the operating systems. Refer to 3590 and specific processor PSP buckets for details.

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## Fibre Channel attachment Planning

This section describes necessary planning for various Fibre Channel attachments to non-S/390 or zSeries systems. Planning includes the following topics:

- “RS/6000 or pSeries Environment for Fibre”
- “Multiple Fibre Channel Ports”
- “Fibre Channel Physical Interface Characteristics” on page 111
- “Supported Topologies” on page 111
- “Address Assignments” on page 112
- “World-Wide ID and LUN Assignments” on page 112
- “Removing, Installing, or Resetting a 3590 on an Active Fibre Channel” on page 112
- “Sharing on a Storage Area Network” on page 113

### RS/6000 or pSeries Environment for Fibre

The host system must use AIX 4.3.3 or greater, Sun, Windows NT, Windows 2000, and or xSeries. Use of a fibre fabric switch allows the connection and intermix of multiple hosts and devices. The specified distance, the attachment capabilities, and the host’s fibre adapter specifications accomplish this connection. The RS/6000 or pSeries and SP attach to the 3590 only through the following host Fibre Channel adapter features:

- RS/6000 or pSeries FC6227

AIX 4.3.3 and subsequent releases support the IBM 3590 in RS/6000 or pSeries and RS/6000 SP operating environments. This includes support for the ACF in random mode. The Open Systems Device Driver (FC9200), on the 3590 E11 provides specific 3590 device support for AIX. It is available as FC9200 on the 3494 for the 3590 E1A.

Tivoli Storage Manager provides 3590 support with highly automated, centrally scheduled, policy-managed backup and archival facilities. These features protect data in distributed environments that use AIX systems as servers.

### Multiple Fibre Channel Ports

The 3590 Model E11 and E1A drives have two independent Fibre Channel interfaces, or ports. Both ports run the SCSI protocol with Fibre Channel tape support. Two ports allow concurrent attachment of two independent Fibre Channel configurations to each drive. One or both ports may be attached to the following:

- RS/6000 or pSeries
- Fibre switches
- Fibre hub (Distance Solution) (two nodes only on hub).

Plug any unused ports.

## **Fibre Channel Physical Interface Characteristics**

The 3590E models support industry standard short-wave SC-Duplex fiber optics cables. This allows cable lengths of up to 500 meters with 50 micron core fibre.

For Fibre Channel cable feature codes, see “Fibre Channel Cable Features” on page 44.

## **Supported Topologies**

The 3590E Fibre Channel supports Switched Fabric and Point-to-Point Loop topologies.

### **Switched Fabric**

Two or more Fibre Channel end points interconnect through a switch. The Fibre Channel architecture supports up to 256 ports through each switch.

Switches include a function called *Zoning*. This function allows the user to partition the switch ports into port groups. It then assigns group access to other groups. This prevents group interferences. See “Sharing on a Storage Area Network” on page 113 for this function’s potential needs.

Switched fabrics allow all of its ports simultaneous use of the full Fibre Channel architecture bandwidth.

To connect a 3590 Fibre Channel drive to an Enterprise Fibre Channel Director 2032 Model 001-McData ED-5000 switch, use a SAN Data Gateway. Connect the 3590 drive to the SAN Data Gateway, and connect the SAN Data Gateway to the 2032 switch. The 3590 attaches directly to the 2109 switch.

For more information on the Enterprise Fibre Channel Director 2032 Model 001-McData ED-5000 switch, see the web site at “McDATA Switch” on page xv.

### **Point-to-Point Loop**

Point-to-point *loop* is similar to point-to-point topology. Both have two Fibre Channel end points connected together. The difference is in the protocol.

Therefore, when only two Fibre Channel end points connect together, either protocol is usable. Both end points must, however, use the same protocol. The 3590 supports Point-to-Point Loop. SAN Data Gateway will utilize either protocol. Most Fibre Channel adapters default to the loop protocol when not directly connected to a fabric.

## Address Assignments

The 3590E must have a fiber address to communicate over the Fibre Channel interface. The 3590 allows both hard and soft addressing. Most fiber hosts (initiators) support hard addressing, and do not support soft addressing. See your device driver documentation for more information.

Selecting the hard addressing option enables you to also select the driver's Arbitrated Loop Physical Address (AL\_PA). The higher the number, the lower the priority. Most hosts will attempt the lowest AL\_PA number (highest priority). The drives should have a higher AL\_PA (lower priority). Multiple drives connected in an arbitrated loop require the drive closest to the host to have a lower AL\_PA number (higher priority) than the next drive. Follow this protocol throughout the loop.

The soft address feature allows the drive to arbitrate the AL\_PA number with other fiber devices.

When sharing a drive between different systems, take caution to keep both hosts from attempting to use the drive at the same time. For more information, see "Sharing on a Storage Area Network" on page 113.

## World-Wide ID and LUN Assignments

Each port on the 3590E model drive has a World-Wide ID that is unique to the port. IBM manufacturing assigns this ID. It also identifies physical drive ports. The ID is viewable from the operator panel.

The 3590E Model Drive provides one LUN at LUN address 0. It also provides a Medium Changer device at LUN address 1 for ACF model E11.

## Removing, Installing, or Resetting a 3590 on an Active Fibre Channel

An active Fibre Channel bus supports a 3590 attachment. This is due to the nature of Storage Area Networks (SAN) and also applies when attaching directly to a system.

An active Fibre Channel bus supports 3590 resetting and power cycling. The preferred and safest method is to take all Fibre Channel ports offline before resetting the drive.

When adding or removing a 3590 to a live system or SAN, follow the guidelines below:

- The added or removed device must not be involved in bus activity. It must be quiesced.
- Power off the device.
- Fibre Channel cables may then be removed from the 3590 interface connector.

- After all the changes are complete, do a reconfiguration on all systems to update all configurations.

### **Sharing on a Storage Area Network**

With SAN components, the possibilities for connecting multiple systems and multiple drives have increased. Not all software and systems are designed to share drives. Check that the systems and software support this sharing before installing a drive in a fashion that would allow two systems to see that drive.

If your software does not support sharing, be aware that Fibre channel switches have a zoning capability to form a SAN partition. Use this zoning to keep systems that do not cooperate from seeing the same drives. You can remove partitioning via zoning as software and system levels become available.



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## Chapter 8. S/390 or zSeries Operational Considerations

The goal of this chapter is to help you understand the kinds of situations that require special attention or may potentially pose usage restrictions with emulation-mode operation.

This chapter provides an overview of software considerations and requirements that are related to device-type emulation with IBM 3590 tape drives. For a more detailed treatment of these considerations, refer to *IBM Magstar 3590 Tape Subsystems: Multiplatform Implementation* and *DFSMS/MVS Software Support for IBM Magstar 3590 Model E1x Tape Drive*. This chapter includes:

- “General Considerations for Emulation-Mode Operation”
- “Library Maintenance” on page 117
- “Drive Allocation/Selection” on page 117
- “Media Capacity Exploitation” on page 118
- “Catalog Considerations” on page 119
- “Media Interchangeability” on page 119
- “3490E-Emulation Compared to Actual 3490E” on page 120

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### General Considerations for Emulation-Mode Operation

The IBM 3590 Model Axx controllers permit the attached host to interact with the 3590 tape drives that use either 3590 or 3490E device-type interfaces. Either a 3590 native feature or a 3490E emulation feature is factory-installed in a 3590 Model A00 or A50 controller. Mode change in the field with 3590 Model A00 or A50 controller requires FC4301 for 3590 mode and FC4300 for 3490E mode. Service personnel can set the device type for an A60 control unit. All attached hosts in the I/O configuration require definition of control unit and drives. The host must be defined with the unit type that matches the device-type definition which is active on the control unit for that subsystem.

3590 Model Exx support is provided only as an emulation of 3590 Bxx support. This is because the actual recording technology of the 256-track Model E drives is different than the 128-track format of the 3590 device type. With 3590 Model B drives, 3590 native definition, and controller feature represent the true (actual) device type 3590. Thus, with the 3590 Model E drives, we refer to the 3590 definition as an “emulation mode.” Table 42 on page 116 shows device model definition options by device-type.

Table 42. Device-Type Definition Options

3590 Models	Device-Type Definition Options
E1A, E11	3590 emulation or 3490E emulation
B1A, B11	3590 native or 3490E emulation

Emulation-mode operation requires understanding of characteristic differences. The host perceives the drive as the emulated device type. However, the actual drive and associated media have some characteristics that may be different from that of the emulated device type. Generally, host programs use the 3590 tape drives in emulation mode with no problems and with full exploitation of device and media capabilities.

**Attention:** *The actual drive recording format writes data on the 3590 media. Model E drive media is written in 256-track format, regardless of device-type definition, and Model B drive media is written in 128-track format, regardless of device-type definition.*

In a 3494 library, the 3590 Model E drives are always in 3590-emulation mode, and the 3590 Model B drives are always in 3590 native mode. (That is, 3590 drives never emulate 3490E when installed in a 3494 library.) The DFSMS/MVS SMS Tape support manages the recording technology differences between the Model E and Model B drives. DFSMS/MVS SMS Tape support also tracks the recording density of the Storage Management Subsystem (SMS)-managed volumes. Thus, special attention to the emulation-mode considerations applies for 3590 tape drives in the following two environments: (1) In the MVS/ESA or OS/390 environment for drives that are not installed in IBM 3494 libraries. (2) In VM/ESA or VSE/ESA environments for drives either inside or outside 3494 libraries. Be sure to review the emulation mode considerations if any of the following implementation scenarios apply to your environment:

- *Outside* a 3494 library, both 3590 E *and* B drives connect to an MVS/ESA, OS/390, or zSeries host.
- *Inside or outside* a 3494 library, both 3590 E *and* B drives connect to a VM/ESA or VSE/ESA host or TPF, OS/390, or zSeries.
- 3590 Model E drives or 3590 Model B drives in 3490E emulation mode connect to any S/390 or zSeries host.
- 3590 Model E drives, in either 3490E or 3590 emulation mode, connect to a VM/ESA or VSE/ESA host.

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## Library Maintenance

The SD/2 library maintenance “dot method” is NOT valid in an environment where the 3590 native drives report to Sys1.logrec in 3490 emulation mode. The 3480/3490 SD2 library maintenance algorithm was designed to use hardware and the temporary error threshold that is only valid with real 3480/3490 drives. SARS algorithms that are in the 3590 microcode contain required thresholds for 3590 drives.

If 3590 drives are reporting to SD/2 in 3490 emulation mode, the service representative should change the SD/2 tape configuration entry for the affected drives. This is accomplished by unchecking (turning off) the library entry on all subsystems reporting in 3490 emulation mode.

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## Drive Allocation/Selection

With tape drives that emulate another device type, the unit type becomes ambiguous when there are actual drives of the same type that are host attached. For example, any 3590 drive that is in 3490E-emulation mode has the same unit type as an actual 3490E drive. A 3590 Model E that is in 3590-emulation mode has the same unit type as an actual 3590 Model B (in 3590 mode). Application software maintains the relationships between pieces of media and the subset of drives on which they can be mounted. In turn, the software must influence the selection of an appropriate tape drive.

### MVS/ESA (OS/390) Considerations

The following applications exemplify the kind of software that can manage allocation scenarios where emulated as well as actual 3590 drives, or 3490E drives.

- Basic Tape Library Support (BTLIS) may be used with non-library tape resources to create logical libraries that associate specific subsets of drives with designated cartridge ranges.
- StorageTek’s Host Software Component (HSC) manages mixed media and model types within a silo complex. Refer to *Magstar 3590 Tape Subsystem Silo-Compatible Frame Models C12 and C14 Introduction, Planning, and User Guide* for further information.
- With ADSM/MVS, different Device Classes can be created for each model type, despite the common unit type. Storage Pools containing appropriate media type can be associated with each Device Class.

### VM/ESA Considerations

The operating system does not manage device allocation.

### VSE/ESA Considerations

Use of the generic device type, in the ASSGN JCL statement, eliminates distinction between an emulated and actual 3490E, or 3590 cannot be made. If

both 3590 Model E and Model B are added in 3490E emulation mode, the ASSGN JCL statements that specifies “3490E” cannot work properly. The same applies if either Model E or Model B is added when there are also actual 3490E drives present. If both Model E and Model B are added in 3590 mode, then ASSGN JCL statements that specify “3590” cannot work properly.

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## Media Capacity Exploitation

A majority of applications that write data on tape are not sensitive to unit type in internal processing used to determine end-of-volume. However, some applications (for example, DFSMSHsm) use unit type as a factor in calculating the capacity for a particular piece of media. Check the 3590 PSP bucket for maintenance required for IBM applications. Contact independent software vendors to verify that other software products will exploit the full tape capacity when drives are in emulation mode. With 3490E-emulation mode, another factor with the potential to affect full capacity utilization is the 22-bit blockid that is used with 3490 interfaces. With small block sizes, the full capacity of the tape is not used before the subsystem encounters logical end-of-volume. (Small block sizes are considered to be under 8 KB with average 3:1 compaction ratio on 128-track drives.) This is based on the largest possible block count that can be represented with 22 bits. It is unlikely that an application suitable for high-capacity tapes would write such small block sizes.

## MVS/ESA (OS/390) Considerations

### DFHSM and DFSMSHsm

Using the 3590 Model B in 3490E emulation mode with DFHSM and DFSMSHsm requires a special setup. If 3590 is used for migration or backup when the tape utilization option is not NOLIMIT, it is critical to apply a PTF. Contact IBM service for information on a list of applicable maintenance APAR. Model E drives require the 3590 Model E device support SPE regardless of emulation mode.

### DFDSS and DFSMSdss

DFDSS and DFSMSdss can use the full capacity of the 3590 media. When exploiting the 3590 media capacity to stack multiple dump datasets on a single tape volume, it is recommended to install the Stand-alone Services SPE. This includes multiple full-volume DASD dumps. The APAR numbers for DFDSS V2.5 (FMID HAE2502, for DFP releases) are PN74583 and PN77830. For DFSMSdss 1.1.0, 1.2.0, 1.3.0 (FMID JDZ1120, HDZ11B0, HDZ11C0), the APAR numbers are OW14835 and OW16802. Using DFDSS and DFSMSdss Stand-alone sometimes requires the Stand-alone Services SPE. For example, to restore from a file that is not the first file on the tape, the Stand-alone Services SPE installation is **required**.

## **OAM**

An OAM enhancement will allow full 3590 cartridge capacity exploitation when 3590 drives are attached with the 3490E emulation feature.

## **VM/ESA Considerations**

VM/ESA commands and functions for writing tape data can make full use of 3590 media capacity. Specifying the largest possible block size when issuing CMS commands ensures optimum use of media capacity and promotes the best exploitation of 3590 performance.

## **VSE/ESA Considerations**

Typically, applications use the physical end-of-volume to determine that a tape is full. Applications fully use capacity of media, regardless of emulation-mode or track density.

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## **Catalog Considerations**

### **Emulated Device Types**

Inventories and catalogs that track the generic unit name of the device on which data sets are written reflect the emulated device type. In the event that the emulation mode of installed drives changes, the volumes themselves may need to be recatalogued. Application catalogs and inventories may require manual update to reflect the new generic unit type. Thus, effective management of 3590 cartridges includes dedicating a volume serial numbers range for 3590 cartridges only. The emulated generic unit type in catalogs should also be reviewed in the context of resource availability at disaster recovery facilities.

### **MVS/ESA (OS/390) Considerations**

With ADSM/MVS, data written on the medium, as well as in the product inventory, identifies the cartridge as the emulated type (3490E or 3590). A read-compatibility capability allows cartridges that are written in 3490E emulation mode and marked as “3490E” to be read on a 3590-mode drive.

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## **Media Interchangeability**

As mentioned above, data is always written on the 3590 media in the recording format of the actual drive. Model E drive media is written in 256-track format, regardless of device-type definition. Model B drive media is written in 128-track format, regardless of device-type definition. Keep in mind that an application may write metadata on the media to identify the cartridge with a specific unit type. With emulation mode, this will be the emulated unit type. Also remember that with a 3490E-emulation mode drive, reading a tape written on a 3590-mode device could be constrained. It could be limited by the 22-bit blockid limit if the block count written in 3590-mode is greater than the maximum count supported by 22 bits (4,194,303).

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## 3490E-Emulation Compared to Actual 3490E

A 3590 in 3490E-emulation mode has the following behavioral differences when compared to an actual 3490E:

- **The Block ID, returned from the 3490 Axx with the 3490E emulation host feature, does not provide wrap, segment, and format-mode indicators in bits 0-9.**

The wrap and segment notations in 3490E media format cannot be presented in a meaningful context for 3590 media. The 3590 drive as part of the 32-bit block ID interprets a non-zero value in any of these bits. Tapes written on drives that are attached in emulation mode must be readable in the future by 3590 drives that are attached in 3590 mode. To ensure readability, the Axx presents the wrap, segment, and format-mode bits in emulation mode to the host as 0. Thus, using wrap and segment fields to sense the approaching physical end-of-tape is not effective. Applications and products which utilize wrap, segment, or format-mode bit settings as returned from the tape subsystem may experience unpredictable results.

- **The Erase gap command is functionally a No-Op.**

There are technology differences between the 3490E and 3590 media formats. The 3490E Erase Gap channel command word is effectively a No-Op, but it causes synchronization of the drive buffers.

- **DDR swap to another drive may fail in certain cases that would be successful with actual 3490E drives.**

Differences between 3490E and 3590 handling of buffered data during certain error scenarios have the potential to result in unsuccessful completion of DDR swap during error recovery.

- **Error reports may be inconsistent with 3490E.**

Not all error scenarios that are possible with a 3590 Axx control unit with the 3490E emulation feature are parallel to an IBM 3490E control unit error and vice versa. Thus, the error reported may require contextual interpretation.

- ERA Code 3C

This error code reports data lost in connection with a Manual Unload.

- ERA Code 2E, Not Capable

This error code report an attempt to load a cartridge type other 3590.

- ERA Code 2F, Limited Shared Access Violation

This error code repeats when a second host attempts tape-motion commands in the middle of a first host's active use of a tape volume.

- ERA Code 48, Unsolicited Informational Data

An error encountered in the 3590 Axx Control Unit generates ERA Code 48. Also when a 3590 service information message (SIM) or 3590 media information message (MIM) has been logged.

- **A 3590 Axx subsystem is not installable in a 3494 library in 3490E emulation mode.**

The 3590 Axx control unit with the emulation feature provides a stand-alone 3590 tape subsystem configuration or integration of 3590 tape subsystem in StorageTek libraries.

- **Operator actions for stand-alone tape utilities may have some variations when compared to those for 3490E.**

There are differences between 3490E and 3590 tape unit controls. For example, there is no manual rewind function on a 3590. So, an operator must perform a manual unload and then reload the cartridge to restart a stand-alone operation.

- **Recovering data beyond the logical end-of-data (EOD) mark requires a different technique.**

Sometimes unusual circumstances create a need to recover data located beyond the logical end-of-data mark of a 3590 cartridge. For example, a volume has been scratched for reuse. Subsequently, a need arises to read old data from an area not yet rewritten on the tape.

In such situations, some differences in technique and error handling will be experienced as compared to performing a comparable operation on an actual 3490E. The essential distinction lies in the respective format characteristics of 3490E and 3590 media. With 3490E, it is possible to refer to a physical location on tape through wrap and segment designations. With 3590, only logical reference (to Block ID) is possible in specifying relative locations on the media.

Spacing or reading beyond the logical end-of-data (EOD) mark on a 3590 cartridge initially results in an end-of-data-encountered error. A subsequent record sequence error occurs when there is spacing or reading beyond the logical end-of-data mark upon encountering the first out-of-sequence block ID. This error may recur if there are additional EOD marks and subsequent old data fragments.

The native 3590 command interfaces provide options to ignore sequence errors. Thus, recovery of data can be accomplished without encountering record sequence errors with SCSI, ESCON, or FICON, attachment of drives as a 3590 device type.

Overwritten data, beyond the last-recorded logical EOD, cannot be recovered locally whether in 3490E-emulation or 3590 mode. Data written in 128-track format, and overwritten in 256-track format (or vice versa) beyond the last-recorded logical EOD, cannot be recovered locally.



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## Appendix. Host Reporting

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### Statistical Analysis and Reporting System

The Statistical Analysis and Reporting System (SARS) assists in determining read error causation and write error causation by drive media (tape) or hardware. The 3590 microcode contains a Volume SARS (VSARS) algorithm and a Hardware SARS (HSARS) algorithm to analyze errors. SARS algorithms report messages through SIMs and MIMs.

The 3590 executes algorithms prior to unloading a tape. The SARS *volume* algorithms require tape that is mounted on different drives to distinguish error patterns and trends. The SARS *hardware* algorithms requires one drive to mount different volumes. As degraded hardware passes through predefined error thresholds, cleaning and service repair messages or error codes display. Similarly, if tape volumes continue to perform poorly on different drives, re-write or discard-media messages display.

The SARS reporting of Service Information Message (SIM) and Media Information Message (MIM) functions can be disabled if host software does not support SIMs and MIMs.

---

### Service and Media Information Messages (SIMs and MIMs)

SIM and MIM functions are primary factors for improved product availability.

- A SIM alerts you when an abnormal operational condition in the 3590 requires service attention. Information in the SIM identifies the affected drive, the failing component and severity of its fault condition, and the expected operational impact of the pending service action. This information restores the operation to normalcy with maximum efficiency and minimal disruption. It assists the user to initiate and expedite appropriate recovery and service procedures.

A SIM contains the machine type, machine serial number, and Field Replaceable Unit (FRU). This allows the dispatch of the appropriate service personnel and the replacement parts required to correct the machine fault. This procedure helps improve service response time and helps reduce the time required for machine repair.

- A MIM identifies problems with the media (tape) and with the *bad* cartridge volume number. This allows the customer to do maintenance within the tape library and to prevent unnecessary service calls when the fault is media.

You can select, depending on your software, the severities you wish to see. For example, you may only want to see the *acute* SIM/MIM, or you may prefer to see all SIMs and MIMs sent to the host. Severity filtering can be done through configuration options for SIM/MIM. The four severity codes display:

- Severity 0 (FID4) code means the device requires service, but normal drive function is not affected.
- Severity 1 (FID3) code means the problem is moderate.
- Severity 2 (FID2) code means the problem is serious.
- Severity 3 (FID1) code means the problem is acute.

A MIM specifies what is wrong with the cartridge that is indicated. The three MIM severity codes display:

- Severity 1 indicates the detection of *high temporary read/write* errors (moderate severity).
- Severity 2 indicates *permanent read/write* errors were detected (serious severity).
- Severity 3 indicates *tape directory* errors were detected (acute severity).

A configuration option allows reporting the same SIM/MIM more than once. The time between repeat SIMs/MIMs is eight hours. For example, setting the configuration option to two, creates a SIM message when an error occurs. This setting causes the SIM message to repeat twice more every eight hours. The default is to not repeat SIMs/MIMs.

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## SIM/MIM Presentation

SIMs and MIMs reporting varies for different systems. Refer to the *Statistical Analysis and Reporting System User Guide* which can be accessed on the web site listed at “IBM Storage Products” on page xiv. This is not an orderable book.

There are specific SIM and MIM presentations for the following systems-

<b>System</b>	<b>Presentation</b>
<b>S/390 or zSeries</b>	IEA480E and IEA486E messages, as well as EREP reports
<b>VM/ESA</b>	HCP6359I and HCP6357I messages, as well as EREP reports
<b>VSE/ESA</b>	OP64I, OP65I, and OP20 messages, as well as EREP reports
<b>TPF</b>	CEFR0354I, CEFR0355W, CEFR0356W, CEFR0357E, CEFR0347W, CDFR0348W, and CDFR0349E messages, as well as EREP reports

**TSM (formally ADSM)**

ANR8972E, ANR8830E, and ANR8831W messages

**AIX**

Error reports are available; the messages are dependent on the application

**HP**

Messages are dependent on the application

**SUN**

Messages are dependent on the application

**Windows NT or xSeries**

Messages are dependent on the application



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## Glossary

This glossary defines the special terms, abbreviations, and acronyms that are used in this publication. If you do not find the term you are looking for, refer to the *Dictionary of Computing*, New York: McGraw-Hill, 1994.

### A

**access method.** A technique for moving data between processor storage and input/output devices.

**ACF.** See Automated Cartridge Facility.

**ACS.** Automated Cartridge System

**ADSM.** See TSM

**AEN.** Asynchronous event notification is the ability of a device to initiate communications with attached hosts.

**AFS.** adjacent frame support

**ALPA.** Arbitrated Loop Physical Address

**APAR.** authorized program analysis report

**archiving.** The storage of backup files and associated journals, usually for a given period.

**arbitrated loop.** see “Fibre Channel arbitrated loop (FC-AL)”

**archiving application.** The retention of records, in machine-readable form, for historical purposes.

**automatic cartridge facility (ACF).** An optional feature for the 3590 tape drive. It allows both the automatic loading and unloading of tape cartridges.

**automatic mode.** A mode of operation that can be selected on the ACF cartridge loader. This

mode allows the automatic feeding and loading of tape cartridges requiring no operator action.

### B

**backup and recovery application.** The short-term retention of records used for restoring essential business and system files when vital data has been lost because of program or system errors or malfunctions.

**BRMS.** Backup Recovery and Media Services

**bit.** A binary digit that may have the value of either 0 or 1.

**block.** A collection of contiguous records recorded as a unit. Blocks are separated by inter-block gaps, and each block may contain one or more records.

**BOV.** beginning of volume

**BTLS.** Basic Tape Library Support

**buffer.** A temporary storage location used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another.

**byte.** A binary number containing exactly eight bits.

### C

**capacity.** See *media capacity*.

**cartridge loader.** A standard function for the tape drive. It allows the automatic loading of tape cartridges.

**channel.** A device to device connection between the processing unit and the I/O control unit.

**channel command.** An instruction that directs a data channel, control unit, or device to perform an operation or set of operations.

**channel path.** The physical path between the channel and the control unit. Synonymous with channel.

**command.** A control signal that initiates an action or the beginning of a sequence of actions. See also *channel command*.

**control unit (CU).** A device that controls input and output operations of one or more devices.

**control unit function.** A device that contains the functional logic for controlling the input and output operations at one or more devices.

**conversion.** The process of changing from one method of data processing to another or from one data-processing system to another.

**CPU.** central processing unit

**CRC.** cyclic redundancy check

## D

**DARS.** daily activity reporting system

**data.** Any representations such as characters or analog quantities to which meaning is, or might be, assigned.

**data base.** A set of data, consisting of at least one file, that is sufficient for a given purpose or for a given data-processing system.

**data channel.** A device that connects a processor and main storage with the I/O control unit. Synonymous with input/output channel and I/O channel.

**data compression.** An algorithmic data-reduction technique that encodes data from the host and stores it in less space than un-encoded data. The original data is recovered by an inverse process called decompression.

**data-compression ratio.** The number of host data bytes divided by the number of encoded

bytes. It is variable depending on the characteristics of the data being processed. The more random the data stream, the lower the opportunity to achieve compression.

**dataset.** The major unit of data storage and retrieval, consisting of a collection of data in one of several prescribed arrangements and described by control information to which the system has access.

**DDR.** Dynamic device reconfiguration

**DFSMS.** Data Facility Storage Management Subsystem

**drive loaded.** A condition of a tape drive in which a tape cartridge has been inserted in the drive, and the tape has been threaded to the beginning-of-tape position. Also known as a mount.

**dump.** To write the contents of storage, or of a part of storage, usually from an internal storage to a external medium, for a specific purpose such as to allow other use of storage, as a safeguard against faults or errors, or with debugging.

## E

**ECC.** Error-correction code.

**effective data rate.** The average number of bits, bytes, characters, or blocks per unit time transferred from a data source to a data sink and accepted as valid. The rate is expressed in bits, bytes, characters, or blocks per second, minute, or hour.

**EIA.** A unit of measure established by the Electronics Industry Association, equal to 44.45 mm (1.75 in).

**EHPCT.** extended high performance cartridge tape

**emulation.** imitation of another device

**enable.** To provide the means or opportunity. The modification of system, control unit, or

device action through the change of a software module or a hardware switch (circuit jumper) position.

**Error Recovery Executive Program.** (EREP)

**EOV.** End of volume; the point on a tape volume beyond which writing of logical blocks or tape marks is not allowed.

**EREP.** See Error Recovery Executive Program

**error-recovery procedures (ERP).** (1) Procedures designed to help isolate and, where possible, to recover from errors in equipment. The procedures are often used with programs that record the statistics of machine malfunctions. (2) Error-recovery procedures performed by the subsystem.

**ESA.** expanded storage array

**ESCON.** Enterprise System Connection architecture.

## F

**Fabric, Fibre Channel.** An interconnection that receives addressed information which, in turn, routes the information to its appropriate destination.

**FC.** Feature code.

**Fibre Channel.** An optics cable utilizing filaments to transmit data.

**Fibre Channel arbitrated loop (FC-AL).** In this topology, two or more Fibre Channel end points are interconnected through a looped interface. Information is routed through the loop to its destination.

**Fibre Channel hub.** In this topology, the hub provides ports similar to switch ports and uses a Fibre Channel arbitrated loop structure.

**Fibre Channel switch (switched fabric).** In this topology, two or more end points are interconnected through one or more switches.

**Fibre Channel topologies.** Shared loop host and storage controllers.

**FID.** format identification field

**field replaceable unit (FRU).** An assembly that is replaced in its entirety when any one of its components fails. In some cases a field replaceable unit may contain other field replaceable units; for example, a brush and a brush block that can be replaced individually or as a single unit.

**file.** A set of related records, treated as a unit, for example, in stock control, a file could consist of a set of invoices.

**file protected.** Pertaining to a tape volume from which data can be read only. Data cannot be written on or erased from the tape.

**format.** The arrangement or layout of data on a data medium.

**formatted tape volume.** A tape volume that has been initialized with certain formatting information (servo tracks, etc.) which is required to exist for the recording technique used on the volume before any data can be recorded. Depending on the format and medium, formatting may or may not be required to utilize the medium for data recording purposes.

## G

**GB.** Gigabyte; 1 000 000 000 bytes.

**GBIC.** Gigabit Interface Convertor

**Gigabit Interface Convertor.** GBIC

## H

**HCD.** hardware configuration definition

**High Performance Tape Subsystem.** An IBM tape subsystem using 3590 Model B1A or B11 tape drives and, in some configurations, a 3590 Model A00 or A50 tape controller.

**host system.** A data-processing system that is used to prepare programs and the operating environments for use on another computer or controller.

**HPCT.** high performance cartridge tape

**HSC.** host software component

## I

**immediate mode.** In tape-write-immediate mode, channel end and device end are presented separately.

**index.** A function performed by the cartridge loader that moves cartridges down the input or output stack one cartridge position. A cartridge loader can perform multiple consecutive indexes.

**initiator.** A device that requests an I/O process to be performed by another device (a target). In many cases, an initiator can also be a target. processing unit, that handles the transfer of data between main storage

**install.** To set up for use or service. The act of adding a product, feature, or function to a system or device either by a singular change or by the addition of multiple components or devices.

**interchange.** The ability to process (read or write) a given tape volume on any one of a set of tape devices that support the form factor and recording format on the tape volume.

**interchange application.** The preparation of tapes for use on other systems or devices, either local or remote, or the use of tape data prepared by another system.

**interposer.** An interposer is used to connect two dissimilar cable or device connectors.

**invoke.** To petition for help or support. The request for a feature or function to be utilized in future processing activities by using software or hardware commands.

**I/O.** Input/output.

**IODF.** input/output definition file

## J

**job control language (JCL).** Problem-oriented language designed to express statements in a job that are used to identify the job or describe its requirements to an operating system.

## K

**KB.** Kilobyte; 1 000 bytes.

## L

**label.** A label is a control file that is associated with a data file which provides volume and file identification information. The label is a software construct that appears as any other file to the I/O subsystem.

**loader.** See *cartridge loader*.

**load point.** The beginning of the recording area on magnetic tape.

**logical-backward direction.** Tape movement is in the logical backward direction when the tape position is moving away from EOV and toward BOV. Logical backwards is defined independently of the physical forward or physical backward directions.

**logical block.** A logical block is an independently accessible unit of information created by the program within a file. A logical block may be either a data logical block or a mark logical block.

**logical end of tape.** A point on the tape where written data normally ends.

**logical-forward direction.** Tape movement is in the logical forward direction when the tape position is moving away from BOV and toward EOV. Logical forward is defined independently of the physical forward or physical backward directions.

**logical record.** A logical record is a string of concatenated data bytes that is passed between an application program and a control program or access method as the result of an I/O request.

**logical-write protection.** Logical-write protection is a facility provided by the device that allows a program to write-protect a tape volume through some device command. Logical-write protection persists for the duration of a tape mount or until deactivated by the program.

**long wave.** A Fibre Channel cable that has a 1400 nm wave length.

## M

**magnetic recording.** A technique of storing data by selectively magnetizing portions of a magnetizable material.

**magnetic tape.** A tape with a magnetizable surface layer on which data can be stored by magnetic recording.

**manual mode.** A mode of operation that can be selected on the cartridge loader. This mode allows a single tape cartridge feed, performed by the operator.

**missing interrupt handler (MIH).** An MVS and MVS/XA facility that keeps track of I/O interrupts, informing the operator and keeping a record whenever an unexpected interrupt fails to occur in a preset time interval.

**MB.** Megabyte; 1 000 000 bytes.

**media capacity.** The amount of data that can be contained on storage media and expressed in bytes of data.

**microcode.** Programming code, representing the instructions of an instruction set, that is implemented in a part of storage that is not program-addressable.

**microprocessor.** An integrated circuit that accepts coded instructions for execution; the instructions may be entered, integrated, or stored internally.

**microprogram.** (1) A sequence of elementary instructions that correspond to a specific computer operation, that is maintained in special storage, and whose execution is initiated by the introduction of a computer instruction into the instruction register of a computer. (2) A group of micro instructions that when executed perform a preplanned function.

**migration.** See *conversion*.

**MIM.** Media information message.

**mount.** The act of making a tape volume available for processing by a specific tape device.

**mounted.** The state of a tape volume while it is available for processing by a specific tape device.

**multiplexer channel.** A channel designed to operate with a number of I/O devices simultaneously.

## N

**nonremovable media.** Recording media that cannot be added to or removed from a recording device.

## O

**OEM.** Original equipment manufacturer.

**output stack.** The part of the cartridge loader that receives and holds processed cartridges.

## P

**partitions.** One or more non-overlapped mini-volumes, each with its own beginning and ending points, contained within a single physical tape volume.

**physical-backward direction.** Tape movement is in the physical backward direction when the physical tape is moving in the direction that is

defined as backward for the device processing tape. Physical backward is defined independently of the logical forward or logical backward directions.

**physical end of tape.** A point on the tape beyond which the tape is not permitted to move.

**physical-forward direction.** Tape movement is in the physical forward direction when the physical tape is moving in the direction that is defined as forward for the device processing tape. Physical forward is defined independently of the logical forward or logical backward directions.

**physical-write protection.** A facility provided by the mechanical housing of the tape volume that allows a human being or robotics device to write-protect a tape volume. Physical-write protection persists until the state of the facility on the tape volume is changed.

**processing application.** The execution of a systematic sequence of operations performed on data to accomplish a specific purpose.

**PSP.** product service planning

**PTF.** Program temporary fix

## Q

**queuing.** The ability of a device to accept multiple commands; implementation is either tagged or untagged. Tagged queuing allows a device to accept multiple commands from a host. Untagged queuing allows a device to accept only a single command that must be completed before accepting another command from the same host.

**quiesce.** To bring a device or system to a halt by a rejection of new requests for work.

## R

**random access.** Random access refers to the processing of information on a volume in a manner that requires the device to access nonconsecutive storage locations on the medium.

**read-type commands.** Any commands that cause data to be read from tape.

**record.** A collection of related data or words, treated as a unit; for example, in stock control, each invoice could constitute one record.

**recording density.** The number of bits in a single linear track measured per unit of length of the recording medium.

**removable media.** Recording media that can be added to or removed from a recording device.

## S

**SAN.** Storage Area Network

**SARS.** Statistical Analysis and Reporting System

**SCSI.** Small computer system interface.

**SCSI device.** A host adapter or a target controller that can be attached to the SCSI bus.

**sequential access.** Refers to the processing of information on a volume in a manner that requires the device to access consecutive storage locations (for example, logical blocks) on the medium.

**ship group.** The group of supplies, cables, or documentation that is shipped with the machine.

**short wave.** A Fibre Channel cable that has an 850 nm wave length.

**SIM.** Service Information Message

**SPE.** Small programming enhancement

**special feature.** A specific design addition to an IBM product that is quoted in the IBM Sales Manual and ordered separately.

**standard function.** The significant design elements of an IBM product that are included as part of the basic standard product.

**subsystem..** A secondary or subordinate system, usually capable of operating independently of, or asynchronously with, a controlling system.

**system mode.** A mode of operation that can be selected on the cartridge loader. This mode allows the automatic feeding and loading of premounted blank or scratch tape cartridges in response to nonspecific volume requests, while specific volume requests require operator insertion of the requested tape cartridge.

## T

**tape cartridge.** A container holding magnetic tape that can be processed without separating it from the container.

**tape device.** A computer peripheral device that supports reading or writing of a removable recording medium called a tape volume. A tape device has a model number.

**tape drive.** A device that is used for moving magnetic tape and includes the mechanisms for writing and reading data to and from the tape.

**tape format.** The tape format defines the way that information is physical recorded and arranged on a tape volume. It includes the physical representation for all constructs associated with the tape data model as well as other constructs that are format dependent.

**tape library.** A structure that provides for the storage of tape volumes and facilitates the movement of tape volumes between the storage structure and the tape device.

**tape mark.** A tape mark is a mark logical block that can be recorded on the medium under program direction. Tape marks are used by the program to delineate collections of data logical blocks on a given volume.

**tape mount.** The operation associated with mounting a tape volume on a tape device.

**tape synchronous mode.** The tape synchronous mode transfers records whose length is greater than the limits defined for buffered records. The

device operates in the tape synchronous mode, if the format being processed is supported.

**tape unit.** A device that contains tape drives and their associated power supplies and electronics.

**tape volume.** The recording medium and associated mechanical package that houses the media used by a tape device. See also *volume*.

**target.** A SCSI device that performs an operation requested by the initiator. In many cases, a target can also be an initiator.

**TB.** Terabyte; 1 000 000 000 000 bytes.

**terminator.** A part used to end a channel or connection on a computer system.

**TPF.** transaction processing facility

**TSM.** Tivoli Storage Manager.

## U

**Ultra.** The ANSI SCSI standard allowing up to 40MB/s transfers on a SCSI bus.

**unformatted tape volume.** A tape volume that has not been initialized with certain formatting information (for example, servo tracks), which is required to exist for the recording technique used on the volume before any data can be recorded. Depending on the format and medium, formatting may be required to utilize the medium for data recording purposes.

## V

**volume.** (1) A certain portion of data, together with its data carrier, that can be handled conveniently as a unit. (2) A data carrier that is mounted and demounted as a unit, for example, a reel of magnetic tape, a disk pack.

**volume identifier (volid).** An identifier that uniquely identifies a tape volume within an installation. The volume identifier may be shown on an external label on the tape volume and may also be recorded on an internal label on the

media itself. On some devices, the same volid may be associated with multiple units of media or the different volids may be associated with the same unit of medium.

## W

**World-Wide ID.** Unique port and node addresses.

**write protected.** A tape volume is write protected if some logical or physical mechanism causes the device processing the tape volume to prevent the program from writing on the volume.

**write-type commands.** Any commands that cause data to be written on tape or affect buffered write data.

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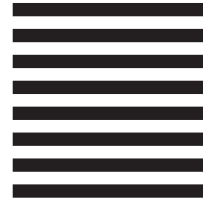
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