

IBM TotalStorage Enterprise Tape System 3590



Introduction and Planning Guide

IBM TotalStorage Enterprise Tape System 3590



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 129.

Nineteenth Edition (September 2004)

This edition of the *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, GA32-0329-18, makes obsolete and replaces GA32-0329-17. Changes or additions are indicated by a vertical line in the left margin.

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Read This First

This section covers changes made to the current edition of this publication and information on contacting IBM with comments.

Summary of Changes

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

Nineteenth Edition

This edition provides updates to the Notices section.

Eighteenth Edition

This edition introduces performance enhancements and updated Feature Codes for the A60 controller, updates to the drive environmental specifications, and introduces 'Data Path Failover,' a new capability in the AIX tape device driver.

Seventeenth Edition

This edition introduces the IBM TotalStorage Enterprise Tape Drive 3592 attachment to the 3590 Model A60 Controller and 3590 tape drives attachment to the IBM TotalStorage Enterprise Tape Controller 3592 Model J70.

Sixteenth Edition

This edition introduces 2-Gbps Fibre CONnection (FICON) attachment to the Model A60 and Fibre Channel 3590 Tape Drives through the IBM TotalStorage SAN Switch 2109 Model F16.

Fifteenth Edition

This edition introduces performance enhancements and capacity for the new H Model Tape Drives. Updated Feature Codes and specific product information for H Model drives is included. The H Model tape drive writes 384-track tapes and is backward read compatible with Model E and Model B versions.

Fourteenth Edition

This edition introduces performance enhancements and capacity and new FICON cable options for the IBM TotalStorage Enterprise Tape Controller Model A60. This edition also includes IBM TotalStorage rebranding changes and information about FC 0500 microcode update.

Thirteenth Edition

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

Twelfth Edition

This edition provides corrected cable information in “ESCON Host Attachment” on page 107, and a new table, “FICON Host Attachment” on page 112. It also corrects the minimum AIX® level listed in “RS/6000 or IBM @server pSeries™ Environment for SCSI” on page 87.

Eleventh Edition

This edition introduces multiframe support on the 3590 C12 and C14 Silo-Compatible Frame. Because this feature doubles the number of drives attachable to an IBM TotalStorage Enterprise Tape Controller Model A60, you can now support up to eight IBM TotalStorage Enterprise Tape Drives from a single Model C10 frame using multiframe attachment.

Also, this edition introduces two Enterprise Systems Connection (ESCON®) attachments supported on each Model A60 control unit in StorageTek Silo, standalone, and IBM TotalStorage Enterprise Automated Tape Library (3494) solutions.

The IBM TotalStorage Enterprise Tape System 3590 with Fibre Channel is now attachable in Sun, Windows NT, and Windows 2000 environments.

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 when 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 3590 E Model 256-track serpentine format capacity to 40GB and the IBM 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-H or E-to-H Migration” on page 73, has been added to provide information on required planning for this model change. Two tables have been added to “Preformatted Data Cartridges” on page 61; 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 IBM Enterprise Tape System 3590 in stand alone and automated configurations. Also, the physical specifications of the 3590 Model A60 control unit are changed from 10 Electronic Industries Association (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.

Seventh Edition

This release includes information on the new control unit, Model A60 and its supporting Silo 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.

Sixth Edition

This release includes information on two new IBM Enterprise 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. Model 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.

The 256-track serpentine results in a tape capacity of 20GB of uncompressed data on the IBM 3590 High Performance Cartridge Tape.

See Table 2 on page 3 for a summary of Model E11 and E1A attachments. "Tape Drives" on page 9 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 12 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 TotalStorage Enterprise Tape Library (3494) Considerations" on page 17 lists the various frames into which Models E11 and E1A are compatible.

The various supported operating environments are listed in "Operating Systems and Platform Support" on page 19.

Chapter 8, "Operational Considerations," on page 119 helps you understand the kinds of situations that require special attention or may potentially pose usage restrictions with emulation mode operation.

Do You Have Comments or Suggestions?

Your feedback is important in helping to provide accurate and high-quality information. If you have comments or suggestions for improving this publication, use the Readers' Comments form located in the back of this publication or send your comments electronically by using one of these addresses:

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Contents

Read This First.	iii
Summary of Changes.	iii
Nineteenth Edition	iii
Eighteenth Edition	iii
Seventeenth Edition	iii
Sixteenth Edition	iii
Fifteenth Edition	iii
Fourteenth Edition	iii
Thirteenth Edition	iii
Twelfth Edition	iv
Eleventh Edition	iv
Tenth Edition	iv
Ninth Edition	iv
Eighth Edition	iv
Seventh Edition	v
Sixth Edition	v
Do You Have Comments or Suggestions?	v
Figures.	xi
Tables.	xiii
Safety	xv
Material Handling Safety	xv
Laser Safety and Compliance	xv
Preface	xvii
Prerequisite and Related Information	xvii
IBM 3592 Publications	xvii
IBM 3590 Publications	xvii
IBM Fibre Channel Switch Publications.	xvii
IBM ESCON Publication	xvii
IBM FICON Publications	xvii
Software Publications	xvii
Other Publications	xviii
Online Access.	xviii
Chapter 1. Introduction.	1
Read and Write Capacity	2
Model Attachment	3
Host System Attachment.	8
SCSI Attach	8
ESCON Attach	8
FICON Attach.	8
Fibre Channel Attach	8
Tape System Description.	9
Tape Drives	9
Control Units.	12
Call Home	15
Frames.	15
Racks	16
Automated Tape Library 3494 Support	17
IBM TotalStorage Enterprise Tape Library (3494) Considerations	17

IBM 3495 Tape Library Considerations	19
Operating Systems and Platform Support	19
3590 Operating Systems and Platforms	19
Independent Software Vendors	20
Device Drivers	21
Chapter 2. Standard Features	23
Model B11, B1A, E11, E1A, H11, and H1A Drive Features	23
Feature Description	23
Feature Definitions	24
Models A00, A50, and A60 Control Features	28
Feature Descriptions	28
Feature Definitions	31
Model A60 Attachment Capabilities	37
Additional A60 Fibre Channel to Tape Drive Requirements	38
2109–F16 and 2109–S16 Switches (an A60 Fibre Channel to Tape Drive Requirement).	39
3591 Model A01 Control Unit.	39
Frame Features	39
Model A14 Feature Description	39
Model A14 Feature Definitions	40
Rack Mount Frames	46
Model C10, C12, and C14 Frames	46
SCSI Cable Features	47
Feature Description	47
Feature Definition	48
Fibre Channel Cable Features	49
Feature Description	49
Feature Definition	49
Language Feature Codes	50
Chapter 3. Standard Functions	51
Standard Functions	51
Read/Write Buffering	51
Drive Assignment	51
High-Speed Search	51
Message Display	52
Automatic Cartridge Facility	52
Operating and Power Controls, Indicators, and Procedures for the 3590 Tape Drives	54
Power On/Off Switch.	54
Operator Display Panel	54
Chapter 4. 3590 High Performance Cartridge Tape and Extended High Performance Cartridge Tape	55
Tape Cartridge Considerations	55
Tape Characteristics	56
Tape Handling and Storage Advantages.	58
Chapter 5. Planning Considerations	59
Planning for Supplies and Equipment	59
3590 Supplies	60
Preformatted Data Cartridges	61
Other Media Supplies	62
Cartridge Weights	62
Label Ordering	62

Media Supply Contact	62
Planning for Operator Training	63
Planning for Drive Cleaning	63
Planning for Applications Programming	64
Data Security Erase	64
Missing Interrupt Handler	64
Software Tools	65
Other Considerations	65
Planning for Data Migration	67
Cartridge Reuse in Mixed Drive Model Environments	67
Managing Multiple Tape Formats and Lengths	69
Planning for 3590 Model B-to-E Migration	71
Host Software	71
HCD	72
JES3 Considerations	72
SMS Definitions	72
Silo-Compatible Frame Considerations	72
Other Migration Considerations	73
Planning for 3590 Model B-to-H or E-to-H Migration	73
Host Software	74
Hardware Configuration Definitions (HCD)	74
SMS Definitions	74
Silo Compatible Frame Considerations	75
Other Migration Considerations	75
Planning for SCSI to Fibre Channel Migration	77
Host Software	77
Silo Compatible Frame Considerations	77
3494 Frame Considerations	77
Planning Checklists for SCSI and Fibre Channel	78
Planning Personnel	78
Task Assignments	78
Chapter 6. Device Characteristics	81
Site Planning	81
Environmental Specifications	81
Acoustic Specifications	82
Cabling Information	82
3590 Power Characteristics	83
Power Specifications	83
Power Cords	85
3590 Component Specifications	86
3590 Model B11	87
3590 Model B1A	88
3590 Model E11	89
3590 Model E1A	90
3590 Model H11	91
3590 Model H1A	92
3590 Model A00	93
3590 Model A50	94
3590 Model A60	95
3591 Model A01 Controller	95
3590 Model A14 Frame Mount	96
3590 Rack Mount	98
Models C10, C12, and C14 Frame Mount	99
Chapter 7. Device Attachment Planning	101

Attachment Planning	101
Multiple SCSI Ports	101
SCSI Physical Interface Characteristics	101
SCSI ID and LUN Assignments	102
Bus Termination	102
Host Hardware and Software Considerations	102
SAN Attachment	103
ESCON Attachment Planning	105
FICON Attachment Planning	112
Fibre Channel Attachment Planning	114
Chapter 8. Operational Considerations	119
General Considerations for Emulation Mode Operation	119
Library Maintenance	120
Drive Allocation/Selection	120
OS/390, z/OS Considerations (MVS/ESA)	120
VM/ESA and z/VM Considerations	121
VSE/ESA Considerations	121
Media Capacity Exploitation	122
MVS/ESA (OS/390) Considerations	122
VM/ESA and z/VM Considerations	122
VSE/ESA Considerations	122
Catalog Considerations	123
Emulated Device Types	123
OS/390, z/OS Considerations (MVS/ESA)	123
Media Interchangeability	123
3490E-Emulation Compared to Actual 3490E	124
Appendix. Appendix A: Host Reporting	127
Statistical Analysis and Reporting System	127
Service and Media Information Messages (SIMs and MIMs)	127
SIM/MIM Presentation	128
Notices	129
Trademarks	130
AIX License Information Additional Terms and Conditions	131
Laser Safety and Compliance	131
Electronic Emission Notices	132
Federal Communications Commission (FCC) Class A Statement	132
Industry Canada Class A Emission Compliance Statement	132
Avis de conformité à la réglementation d'Industrie Canada	132
European Union (EU) Electromagnetic Compatibility Directive	133
Germany Electromagnetic Compatibility Directive	133
Taiwan Class A Electronic Emission Statement	134
People's Republic of China Class A Electronic Emission Statement	134
Japan VCCI Class A ITE Electronic Emission Statement	134
Glossary	135
Index	141

Figures

1.	Class I Laser Safety Caution Label	xv
2.	IBM 3590 Subsystem Components.	7
3.	Automatic Cartridge Facility	53
4.	IBM 3590 High Performance Cartridge Tape.	56
5.	Receptacle Connector for Russellstoll 3913U-2 or 3743U-2	85

Tables

1.	Read and Write Capacity of H Model, E Model, and B Model 3590 Tape Drives	2
2.	IBM 3590 Models	3
3.	3590 Drive Characteristics with High Performance Cartridge Tape	10
4.	3590 Drive Characteristics with Extended High Performance Cartridge Tape	11
5.	Feature Codes for Model B11, B1A, E11, E1A, H11, and H1A Drives.	23
6.	Feature Codes for Models A00, A50, and A60 Control Units	28
7.	Model A60 Attachment Capabilities	38
8.	Model A14 Frame Feature Codes.	39
9.	3590 SCSI Cable Length Feature Codes	47
10.	3590 Fibre Channel Cable Length Feature Codes.	49
11.	3590 Language Feature Codes	50
12.	Media Types	57
13.	Cartridge Capacity	58
14.	3590 Supply Items	60
15.	Preformatted 3590 Data Cartridges	61
16.	3590 High Performance Cartridge Tape	61
17.	3590 Extended High Performance Cartridge Tape.	61
18.	Other Media Supplies	62
19.	Tape Characteristics by Tape Usage Group	69
20.	Increased Rewrite Times for Dissimilar Tape Formats	70
21.	3590 Environmental Specifications	81
22.	Acoustic Specifications	82
23.	Input Voltages	83
24.	Input Voltages	84
25.	3590 Model B11	87
26.	3590 Model B1A	88
27.	3590 Model E11	89
28.	3590 Model E1A	90
29.	3590 Model H11	91
30.	3590 Model H1A	92
31.	3590 Model A00	93
32.	3590 Model A50	94
33.	3590 Model A60	95
34.	3590 Model A14	96
35.	SPECIFICATIONS	97
36.	3590 Rack Mount	98
37.	SPECIFICATIONS	99
38.	SCSI Interposers	102
39.	3590 Model A60 ESCON Host Attachment Features	107
40.	Fixed Cable Lengths by Group	107
41.	Drive and Controller Combinations	108
42.	Minimum Operating System Support for the 3590 Tape Drive Models B, E, and H	110
43.	3590 Model A60 FICON Host Attachment Features	112
44.	Device-Type Definition Options	119

Safety

Listed below are safety requirements for operating this product. Some danger and caution notices contains a reference number (RSFTxxxx). Use the reference number to check the translation in IBM Externally Attached Devices Safety Information, SA26-2004.

Material Handling Safety



> 28 kg
(61 lb)

CAUTION:

- Products weighing between 18 kg (39.7 lb) and 32 kg (70.5 lb) require 2 or more persons for safe handling. (RSFTC204)
- Products weighing between 32 kg (70.5 lb) and 55 kg (121.2 lb) require 3 or more persons for safe handling. (RSFTC205)
- Products weighing above 55 kg (121.2 lb) are non-portable equipment. (RSFTC206)

Laser Safety and Compliance

The IBM TotalStorage Enterprise Tape Drive 3590 is a Class I laser product. It is important for the operator to be aware of the laser caution label. See Figure 1 for an example of the label.



Figure 1. Class I Laser Safety Caution Label

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

Preface

This book includes functional specifications, features, and software support details, as well as Fibre Channel, ESCON, and FICON™ attachment considerations for the 3590 Tape System. It also includes sections on installation planning, site physical planning, and operator training.

Prerequisite and Related Information

IBM 3592 Publications

- *IBM® TotalStorage™ Enterprise Tape System 3592 Introduction and Planning Guide*, GA32-0464
- *IBM TotalStorage Enterprise Tape System 3592 SCSI Reference*, GA32-0466
- *IBM TotalStorage Enterprise Tape System 3592 Operator Guide*, GA32-0465
- *IBM TotalStorage Enterprise Silo Compatible Tape Frame 3592 Introduction, Planning, and User's Guide*, GA32-0463

IBM 3590 Publications

- *IBM TotalStorage Enterprise Tape System 3590 Introduction and Planning Guide*, GA32-0329
- *IBM TotalStorage Enterprise Tape System 3590 Hardware Reference*, GA32-0331
- *IBM TotalStorage Enterprise Tape System 3590 Operator Guide*, GA32-0330
- *IBM TotalStorage Enterprise Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*, GA32-0366

IBM Fibre Channel Switch Publications

- *IBM TotalStorage SAN Switch 2109 Model F16 Installation and Service Guide*, SY27-7623
- *IBM Fiber-Optic Channel Link Planning and Installation*, GA32-0367

IBM ESCON Publication

- *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*
- *FICON (FCV Mode) Planning Guide*, SG24-5445 (available at www.redbooks.ibm.com)

Software Publications

For information regarding software, refer to:

- *IBM TotalStorage Tape Device Drivers Installation and User's Guide*, GC35-0154

- *StorageTek Host Software Component (MVS/XA-ESA Implementation) System Programmers Guide Release 1.2*, 4044266-2
- *StorageTek Host Software Component MVS™ System Programmers Guide Release 2.0.1*, 112156401
- *StorageTek ACSLS 5.1.1 System Administration Guide*, 112194201

Other Publications

IBM Externally Attached Devices Safety Information, SA26-2004

Online Access

The following web sites provide current information in their respective areas of interest.

IBM Storage Media support: This site provides access to current regional and country-specific IBM telephone numbers:

- <http://www.ibm.storage.com/media/distributors>

The following web sites provide up-to-date information related to 3592 Tape Subsystems.

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

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

Device Driver support: You can download the latest levels of device and library drivers and documentation from the web. You can access this material from your favorite browser or through the IBM ftp site:

- <ftp://ftp.software.ibm.com/storage/devdvr/Doc>

FICON support:

- <http://www.ibm.com/servers/eserver/zseries/connectivity>

Provides information about connectivity and the integration of cabling systems.

- <http://www.ibm.com/services/networking/integration>

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.pdf>

IBM Tape Storage Publications: Provides IBM Hardware product documents in a PDF format for viewing and printing.

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

Open Systems support: This site describes hardware and software for Midrange and Open Systems Connectivity for IBM TotalStorage 3590.

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

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/tape/conntrix>

Chapter 1. Introduction

The IBM TotalStorage Enterprise Tape System 3590 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) or Fibre Channel interface. Each drive can connect to an IBM 3590 or 3592 tape controller for Enterprise Systems CONNecTion (Enterprise Systems Connection (ESCON)) or Fibre CONNecTions (FICON) attachment. The FICON connection, which now supports 2-Gbps links, is only available through the A60 or J70 Controller. Large scale automation offerings, which include the IBM 3494 and StorageTek Silo, support the 3590.

The IBM TotalStorage Enterprise Tape System 3590 provides a high level of performance, reliability, data integrity, and cartridge capacity. The new 3590 Model H11 and H1A (H Model) Tape Drives offer increased cartridge capacity and are intended to meet the growing needs of new and existing customers across a broad range of computing environments. These include selected IBM zSeries™, S/390®, IBM @server iSeries™, Application System/400® (AS/400), IBM pSeries, RS/6000, IBM @server xSeries™, Sun, and Hewlett Packard (HP) servers, as well as Intel compatible servers running Microsoft Windows NT, Microsoft Windows 2000, Microsoft Windows Server 2003, and Linux. The appropriate attachment adapter and software are required. The new H Models can also attach to selected S/390 and zSeries servers with ESCON and FICON attachment through the IBM TotalStorage Enterprise Tape Controller 3590 Model A60 or 3592 Model J70. The H Model is supported by the IBM Total Storage Enterprise Tape Library 3494, IBM TotalStorage Silo Compatible Tape Drive Frame 3590 Model C12 or C14, IBM TotalStorage Enterprise Tape Drive Frame 3590 Model A14, and standalone racks.

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 offsite data storage needs for disaster recovery.
- The 3590 provides data interchange with other systems that use 3590 subsystems.
- The 3590 meets data acquisition needs.

The new IBM TotalStorage Enterprise Tape Drive 3590 Models H11 and H1A offer Enterprise Class tape customers the following dramatic improvements in cartridge capacity and high performance:

- A 50% increase in native cartridge capacity (versus the E Model) to 60GB when utilizing the 3590 Extended High Performance Tape Cartridge or to 30GB when utilizing the 3590 High Performance Tape Cartridge.
- Upgrades from current models and backward read compatibility of cartridges written with B and E Models.
- A wide array of hardware and software attachment flexibility, including SCSI, Fibre Channel, ESCON, and FICON adapters with link speeds up to 2-Gbps.
- Up to 42MB/sec sustained data (at 3:1 compression), or up to 70MB/sec sustained data rate (with 256KB blocksize and high compression) using the Fibre Channel attachment.

- Up to 34MB/sec sustained data rate (at 3:1 compression) using Ultra SCSI attachment.

The Enterprise Tape Drive 390 Model H is an industry standard 1/2-inch tape drive designed for the following environments:

- High performance open-attached SCSI or Fibre Channel-attached servers where performance, capacity, and reliability are demanded. Each H Model has two SCSI or Fibre Channel ports for attachment to multiple servers or a single server with redundancy. Supported environments include:
 - 3590 Model H11 10-cartridge rack mounted tape library
 - 3590 Model H1A drive installed in a 3494 library or attached to a StorageTek Automated Cartridge System (ACS)
- ESCON or FICON attached servers where customers depend on mainframe class reliability, performance, and capacity the 3590 provides. These environments include the same as outlined above.

The H Models employ a new narrow track magnetic recording head to increase the number of tracks on a tape cartridge from 128 and 256 to 384 tracks, utilizing the current 3590 media. This is a 50% cartridge capacity increase versus the E model, and three times the capacity of a B Model. These advancements can reduce the number of tape drives and cartridges required and the associated floor space. See the “Read and Write Capacity” table below for a comparison of capacity rates.

The H Models have a 14MB/sec native data rate, the same high performance of the current E Models, and over 50% higher than the 9MB/sec data rate provided by the B Models. Installed 3590 Model B11, B1A, E11, and E1A Tape Drives can be field upgraded to the new H Models. The new H Models will write on existing 3590 cartridges, and read cartridges written with the current B and E Models.

- High speed data save operations where backup windows are critical and large amounts of data are archived to tape
- Large scale automated tape installations, such as the 3494 Tape Library or StorageTek ACS environments
- Upgrades from E Models when a reduction in the amount of space that is allocated to tape cartridges (either online or offline) is required
- Upgrades from B Models when a larger amount of data needs to be backed up in less time, a reduction in the amount of space allocated to tape cartridges is required, and read compatibility of existing data cartridges is critical
- Upgrades from B Models to fully utilize the capabilities provided through the use of Fibre Channel technology

Read and Write Capacity

The H Model Tape Drive provides increased read and write capacity over the E Model and B Model Tape Drives. Table 1 shows the read and write rates for each type of drive:

Table 1. Read and Write Capacity of H Model, E Model, and B Model 3590 Tape Drives

Type of Cartridge	H Model 384-Track Format	E Model 256-Track Format	B Model 128-Track Format
High Performance Cartridge Tape (native capacity)	30GB	20GB	10GB
High Performance Cartridge Tape (at 3:1 compression)	90GB	60GB	30GB

Table 1. Read and Write Capacity of H Model, E Model, and B Model 3590 Tape Drives (continued)

Type of Cartridge	H Model 384-Track Format	E Model 256-Track Format	B Model 128-Track Format
Extended High Performance Cartridge Tape (native capacity)	60GB	30GB	20GB
Extended High Performance Cartridge Tape (at 3:1 compression)	180GB	90GB	60GB

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. The SCSI Ultra/Wide instantaneous data rate is up to 40MB per second. The ESCON channel-instantaneous data rate is up to 17MB per second. The FICON channel-instantaneous data rate is 100MB per second with 1-Gbps attachment features. With 2-Gbps attachment features, the FICON channel-instantaneous data rate is 200MB per second.

Model Attachment

Table 2 summarizes models and attachments in the 3590 series.

Table 2. IBM 3590 Models

Model	Attachment
B11 tape drive	<ul style="list-style-type: none"> 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 that are 1.6m or higher Two B11 units require 12 EIAs of vertical space in a 9309, 7202, 7014-S00, 7014-T00, or 7015-R00 rack Up to four drives and, one A00, one A50 with one A00, or one or two A50 control units in an A14 frame Up to four drives and an A60 control unit in an A14 frame for a stand-alone tape subsystem Up to four drives in an A14 frame without a control unit.
B1A tape drive	<ul style="list-style-type: none"> Four drives in an A14 frame for attachment to an IBM 3495 Tape Library¹ Up to six drives in IBM 3494 Model D12¹ Up to two drives in IBM 3494 Model L12¹ Up to four drives and one A00, A50, or A60 control unit in IBM 3494 Model D14¹ Up to two drives and one A00 or A50 control unit in IBM 3494 Model L14¹ Up to four drives in a Model C12 frame with an external IBM 3591 Model A01 control unit for attachment to a StorageTek library^{2, 3} Up to four drives in a Model C12 frame with an optional external Model A00 or A50 control unit for attachment to a StorageTek library² 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 library² 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.

Table 2. IBM 3590 Models (continued)

Model	Attachment
E11 tape drive	<ul style="list-style-type: none"> • 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 that are 1.6m or higher, or up to four drives for Fibre Channel attachment • Two E11 units require 12 Electronic Industries Associations (EIA) of vertical space in a 9309, 7202, 7014-S00, 7014-T00, or 7015-R00 rack • Up to four drives and one or two A50 control units in an A14 frame • Up to four drives with an A60 control unit in an A14 frame for a stand alone tape subsystem • 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 • 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) • Up to two Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in 1.6m racks such as the IBM 7014-S00 rack • Up to four drives in an A14 frame without a control unit.
E1A tape drive	<ul style="list-style-type: none"> • Up to six drives in IBM 3494 Model D12¹ • Up to two drives in IBM 3494 Model L12¹ • Up to four drives and one A50 or A60 control unit in IBM 3494 Model D14¹ • Up to two drives and one A50 control unit in IBM 3494 Model L14¹ • Up to four drives in an Model C12 frame with an optional external Model A50 control unit for attachment to a StorageTek library² • Up to four drives in a Model C14 frame with one or two internal Model A50 control units for attachment to a StorageTek library² • 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.
H11 tape drive	<ul style="list-style-type: none"> • 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 that are 1.6m or higher, or up to four drives for Fibre Channel attachment • Two H11 units require 12 Electronic Industries Associations (EIA) of vertical space in a 9309, 7202, 7014-S00, 7014-T00, or 7015-R00 rack • Up to four drives with an A60 control unit in an A14 frame for a stand alone tape subsystem • 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 • 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) • Up to two Fibre Channel attached drives with an A60 control unit with Fibre Channel attachment in 1.6m racks such as the IBM 7014-S00 rack • Up to four drives in an A14 frame without a control unit.
H1A tape drive	<ul style="list-style-type: none"> • Up to six drives in IBM 3494 Model D12¹ • Up to two drives in IBM 3494 Model L12 or L14¹ • Up to four drives and one A60 control unit in IBM 3494 Model D14¹ • Up to two drives and one A60 control unit in IBM 3494 Model L14¹ • 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 System².

Table 2. IBM 3590 Models (continued)

Model	Attachment
A00 ESCON control unit	<ul style="list-style-type: none"> • In a 3494 Model L14 with up to two B1A drives¹ • In a 3494 Model D14 with up to four B1A drives¹ • In a 3590 A14 frame with four B1A or B11 drives • Externally attached to a C12 model with four B1A drives² • In a 3590 C14 frame with:² <ul style="list-style-type: none"> – One control unit with up to four B11 drives – Two control units with each control unit having up to two B11 drives • E and H models are not supported
A50 ESCON control unit	<ul style="list-style-type: none"> • In a 3494 Model L14 with up to two B1A drives¹ or two E1A drives • In a 3494 Model D14 with up to four B1A drives¹ or four E1A drives • In a 3590 A14 frame <ul style="list-style-type: none"> – One control unit with up to four B11 or four E11 drives – Two control units with each control unit attaching to up to two B11 or two E11 drives • Externally attached to a C12 model² • In a 3590 C14 frame with:² <ul style="list-style-type: none"> – One control unit with up to four B1A or four E1A drives – Two control units with each control unit having up to two B1A or two E1A drives • H Models are not supported.
A60 ESCON/ FICON control unit	<ul style="list-style-type: none"> • In a 3494: <ul style="list-style-type: none"> – Model D14 with up to four B1A, E1A, or H1A drives¹ – Model D24 with up to eight 3592 Model J1A tape drives⁴ – Models D22 or L22 with up to four 3592 Model J1A tape drives with adjacent frame support⁴ • In an A14 frame: <ul style="list-style-type: none"> – One control unit with up to four B11, E11, or H11 drives • In a 3590 C10 frame: <ul style="list-style-type: none"> – One or two A60 control units for attachment to B1A, E1A, or H1A drives in a C12 or C14 frame² – One or two A60 control units for attachment to 3592 J1A drives in a 3592 Model C20 frame⁵ • In a stand-alone rack: <ul style="list-style-type: none"> – 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 – 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) – 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 – Up to twelve Fibre Channel attached 3592 J1A tape drives with an A60 control unit in an IBM 7014-T42 rack⁵ – Up to eight Fibre Channel attached 3592 J1A tape drives with an A60 control unit in an IBM 7014-T00 or 7014-S00 rack⁵
3591 A01 ESCON control unit ³	<ul style="list-style-type: none"> • Rack-mounted with up to four B11 drives for 3490E emulation • Associated with two or four B1A drives for C12 frame attachment • E and H models are not supported

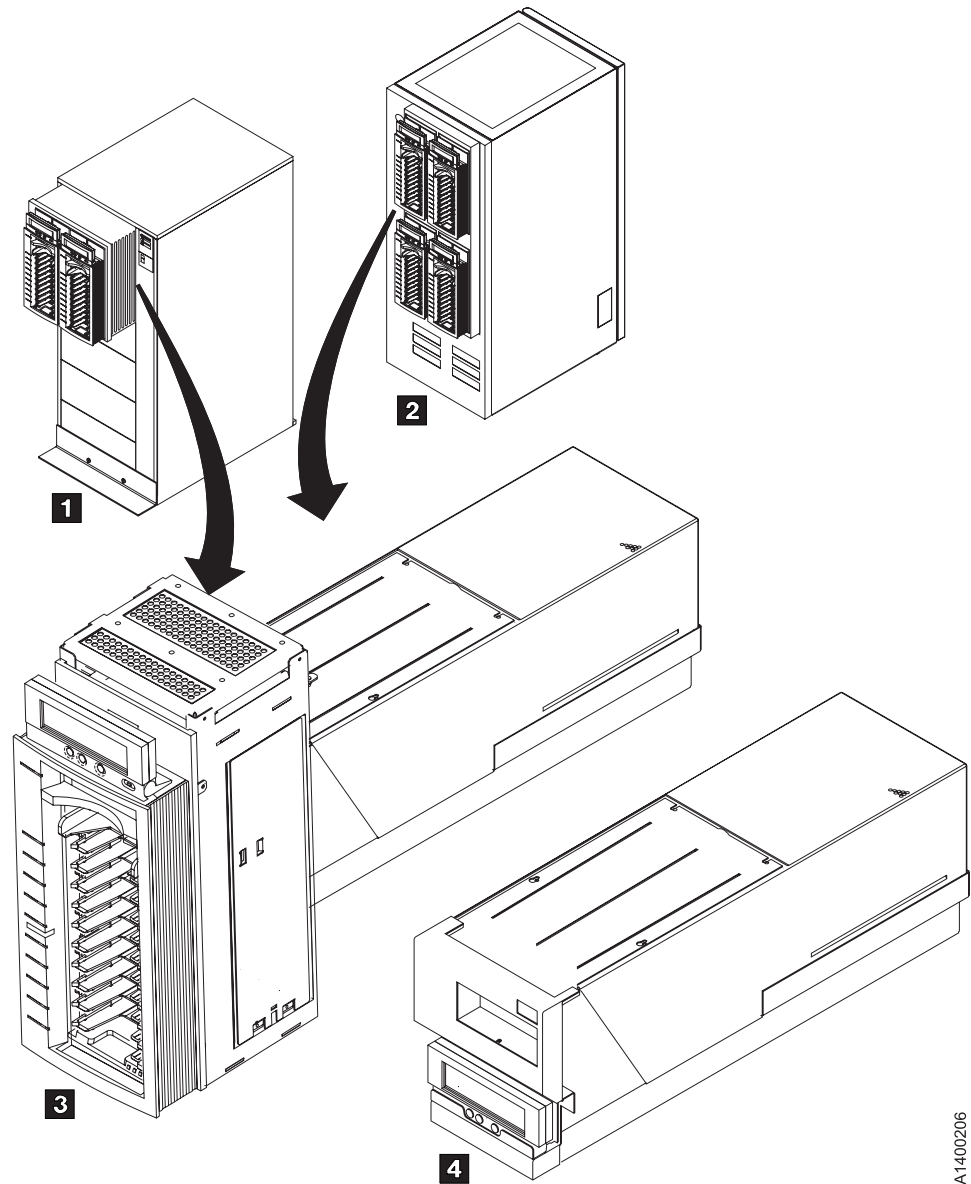
Table 2. IBM 3590 Models (continued)

Model	Attachment
A14 frame	<ul style="list-style-type: none"> • Four B1A drives and one A00 or one A50 control unit for attachment to IBM 3495 library • Up to four B11 drives and up to two A00 or A50 controllers. One A00 and one A50, or one A60 controller, for a stand-alone tape subsystem • Up to four E11 drives and one or two A50s or one A60 control unit for a stand alone tape subsystem • Up to four H11 drives and one A60 control unit for a stand-alone tape system.
C10 frame	<ul style="list-style-type: none"> • One or two internal 3590 Model A60 ESCON/FICON control units for attachment to 3590 B1A, E1A, or H1A drives in a C12 or C14 frame² • One or two 3590 Model A60 FICON/ESCON control units for attachment to 3592 J1A drives in a 3592 Model C20 frame⁶
C12 frame ²	<ul style="list-style-type: none"> • Up to four E1A or H1A drives for direct attach to SCSI or Fibre Channel server • Up to four B1A drives for direct attach to SCSI servers • Up to four B1A, E1A, or H1A SCSI drives, or up to four E1A or H1A Fibre drives attached through a 3590 A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System • Up to four B1A drives with one or two associated external 3591 Model A01 ESCON controllers for attachment to a StorageTek Automated Cartridge System • Up to four B1A drives with one or two associated external A00 or A50 controllers for attachment to a StorageTek Automated Cartridge System • Up to four E1A drives with one or two associated external 3590 Model A50 ESCON controllers for attachment to StorageTek Automated Cartridge System
C14 frame ²	<ul style="list-style-type: none"> • Up to four B1A, E1A, or H1A SCSI drives, attached through an A60 control unit in a C10 frame, for ESCON or FICON attachment to a StorageTek Automated Cartridge System • Up to four B1A drives with one or two internal A00 or A50 ESCON controllers for attachment to StorageTek Automated Cartridge System • Up to four E1A SCSI drives with one or two internal A50 ESCON controllers for attachment to StorageTek Automated Cartridge System

Notes:

1. Refer to “IBM TotalStorage Enterprise Tape Library (3494) Considerations” on page 17 for more information.
2. Refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User’s Guide* for more information.
3. Refer to *IBM 3591 Model A01 Tape Control Unit Introduction, Planning, and User’s Guide* for more information.
4. *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*
5. Refer to *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide* for more information.
6. Refer to *IBM TotalStorage Silo Compatible Tape Frame 3592 Introduction, Planning, and User’s Guide* for more information.

Figure 2 illustrates Models B11, B1A, E11, E1A, H11, and H1A.



A1400206

Figure 2. IBM 3590 Subsystem Components

- | | |
|-----------------------|-----------------------------------|
| 1 Rack Mounted | 3 B11/E11/H11 |
| 2 A14 Frame | 4 Typical library mounting |

Host System Attachment

SCSI Attach

The subsystem attaches to the following host systems:

- iSeries, AS/400
- pSeries, RS/6000 SP™
- pSeries, RS/6000
- HP
- iSeries
- pSeries
- Linux (Intel)
- Sun
- Microsoft Windows NT
- Microsoft Windows 2000
- Microsoft Windows Server 2003
- xSeries
- Linux (Intel)

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:

- Compaq AlphaServer
- iSeries
- pSeries, RS/6000
- pSeries, RS/6000 SP
- xSeries
- Hewlett Packard (HP)
- Linux (Intel)
- NUMA-Q® (B and E Model tape drives only)
- Sun
- Windows NT
- Windows 2000
- Microsoft Windows Server 2003

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

Tape System Description

This section describes models available in the IBM TotalStorage (formerly Magstar®) Enterprise Tape System 3590.

Tape Drives

Models B11, E11, and H11 are drives with a 10-cartridge Automated Cartridge Facility (ACF) and five modes of operation. Model B11 has two SCSI-2 differential Ultra/Wide ports (FC5790, FC9790). Models E11 and H11 have two SCSI-3 differential Ultra/wide SCSI ports or two Fibre Channel ports. The 3590 Tape Drive is a High Voltage Differential (HVD) drive and must be attached to an HVD adapter card at the host in a native SCSI environment.

In an ESCON- or FICON-attached environment, Models H11, E11, and B11 support the ACF in all modes except random. Models E11 and B11 are supported by ESCON with the A00, A50, A60, and J70 and by FICON with the A60 and J70. Model H11 is supported by ESCON and FICON with the A60 and J70. See the following description for each model:

- For Model H11:
 - Model A60 or J70 controller in an IBM 3590 A14 frame.
 - Model A60 or J70 controller in a rack.
- For Model E11:
 - Model A50, A60, or J70 controller in an IBM 3590 A14 frame.
 - Model A50, A60, or J70 controller in a rack.
- For Model B11:
 - Model A00, A50, A60, or J70 controller in an IBM 3590 A14 frame.
 - Model A00, A50, A60, or J70, and 3591 Model A01 controller in a rack.

Model B1A is a single-cartridge tape drive with two SCSI-2 differential Ultra/Wide ports. **Models H1A and E1A** are single-cartridge tape drives with two SCSI-3 differential Ultra/Wide ports or two Fibre Channel ports. Models E1A, and B1A are supported by ESCON with the A00, A50, A60, and J70 and by FICON with the A60 and J70. Model H1A is supported by ESCON and FICON with the A60 and J70. See the following description for each model:

- For Model H1A:
 - Model A60 or J70 control unit in an IBM 3590 C10 frame or in a 3494 D14 frame.
 - Model A60 or J70 controller in an IBM 3494 D14 or L14 frame.
- For Model E1A:
 - Model A50 control unit in an IBM 3590 C14 frame, or an A50 control unit external to a C12.
 - Model A60 or J70 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 or J70 control unit in an IBM 3590 C10 frame or in a 3494 D14 frame.

Table 3 shows the drive characteristics with High Performance Cartridge Tape. Table 4 on page 11 shows the 3590 drive characteristics with Extended High Performance Cartridge Tape.

Table 3. 3590 Drive Characteristics with High Performance Cartridge Tape

Characteristics	Specifications		
	3590 Model Hxx	3590 Model Exx	3590 Model Bxx
Display Panel	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display
Media	3590 High Performance Cartridge Tape	3590 High Performance Cartridge Tape	3590 High Performance Cartridge Tape
Cartridge Loader	10-cartridge capacity ACF	10-cartridge capacity ACF	10-cartridge capacity ACF
Host Attachment	ESCON via 3590 A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A60	ESCON via 3590 A50 or A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A50 or A60	ESCON via 3590 A00, A50, or A60, or 3591 A01 or SCSI direct attach; FICON via 3590 A60
Data Capacity	30GB per uncompressed cartridge	20GB per uncompressed cartridge	10GB per uncompressed cartridge
Device Data Rate (native)	14MB per second	14MB per second	9MB per second
Data Transfer Rate (maximum instantaneous)	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features
Data Search Rate	332MB per second	332MB per second	166MB per second
Tape Read/Write Access Speed	3.14m/sec (124 in./sec)	3.14m/sec (124 in./sec)	2m/sec (79 in./sec)
Tape Length	300m	300m	300m
Search/Rewind Speed	5m/sec (198 in./sec)	5m/sec (198 in./sec)	5m/sec (198 in./sec)
Full Cartridge Rewind Time (at end of volume)	2 sec	2 sec	2 sec
Maximum Cartridge Rewind Time	60 sec	60 sec	60 sec
Device Data Rate (3:1 compression sustained)	34/MB per second with Ultra/Wide SCSI and 42MB per second with Fibre Channel attachment	34/MB per second with Ultra/Wide SCSI and 42MB per second with Fibre Channel attachment	27MB per second with Ultra/Wide SCSI

Table 4. 3590 Drive Characteristics with Extended High Performance Cartridge Tape

Characteristics	Specifications		
	3590 Model Hxx	3590 Model Exx	3590 Model Bxx
Display Panel	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display	Alphanumeric liquid crystal display
Media	3590 Extended High Performance Cartridge Tape	3590 Extended High Performance Cartridge Tape	3590 Extended High Performance Cartridge Tape
Cartridge Loader	10-cartridge capacity ACF	10-cartridge capacity ACF	10-cartridge capacity ACF
Host Attachment	ESCON via 3590 A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A60	ESCON via 3590 A50 or A60; SCSI direct attach; Fibre Channel attach; FICON via 3590 A50 or A60	ESCON via 3590 A00, A50, or A60, or 3591 A01 or SCSI direct attach; FICON via 3590 A60
Data Capacity	60GB per uncompressed cartridge	40GB per uncompressed cartridge	20GB per uncompressed cartridge
Device Data Rate (Native)	14MB per second	14MB per second	9MB per second
Data Transfer Rate (maximum instantaneous)	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features	17MB per second with ESCON, 40MB per second with Ultra SCSI, 100MB per second with FICON with 1-Gbps features, or 200MB per second with FICON with 2-Gbps features
Data Search Rate	332MB per second	332MB per second	166MB per second
Tape Read/Write Access Speed	3.14m/sec (124 in./sec)	3.14m/sec (124 in./sec)	2m/sec (79 in./sec)
Tape Length	600m	600m	600m
Search/Rewind Speed	5m/sec (198 in./sec)	5m/sec (198 in./sec)	5m/sec (198 in./sec)
Full Cartridge Rewind Time (at end of volume)	2 sec	2 sec	2 sec
Maximum Cartridge Rewind Time	120 sec	120 sec	120 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	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

Ultra SCSI is standard on 3590 drive models, B11, B1A, E11, E1A, H11, and H1A, providing two SCSI Ultra/Wide ports. An optional feature code is available for Fibre Channel attachment on Models H11, H1A, E11, and E1A. For B11/B1A, the Ultra SCSI is FC9790. See “Ultra SCSI Attachment (FC9790)” on page 28 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 is installable in an STK Silo with C12 or C14 frames in supported racks. A mixture of A00 and A50 can be in an A14 or C14 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, “Operational Considerations,” on page 119 for considerations when operating in 3490E emulation mode.

Note: A00 does not support Exx or Hxx 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 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 or E11 drives in an A14 frame and supported racks. Model A50 is usable with B1A or E1A 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, “Operational Considerations,” on page 119 for considerations when operating in 3490E emulation mode.

Note: A50 does not support the Hxx Models.

Model A60 may contain any of the following combination features:

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

Model A60 is installable in a 3494 Model D14 Frame. 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 for the 1-Gbps adapter). 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 for the 1-Gbps adapter and up to 300m for the 2-Gbps adapter.

The A60 has the attachment capability listed below. More than four drives are attachable when using an adjacent-frame or multiframe support feature. For details of the A60 maximum attachments, see Table 7 on page 38.

- Up to 10 model B1A, E1A, or H1A drives in a 3494 configuration
- Up to eight SCSI-attached model B1A, E1A, or H1A drives in an STK Silo solution
- Up to 12 fiber-attached model H1A or E1A Models in an STK Silo solution
- Up to eight model B11, E11, or H11 SCSI attached drives in an A14 frame or rack solution
- Up to 12 fiber-attached E11 or H11 drives in an A14 frame or in either a 1.8m or 2.0m rack solution
- Up to 10 fiber-attached H11 or E11 drives in a 1.6m rack solution

The A60 controller is configurable to operate in either 3590 native mode or in 3590E emulation mode. See Chapter 8, "Operational Considerations," on page 119 for considerations when operating in 3490E emulation mode.

The A60 controller has the attachment capability with the 3592 Model J1A tape drive listed below:

- Up to 8 fibre-attached 3592 Model J1A drives in a 3494 configuration
- Up to 12 fibre-attached 3592 Model J1A drives in a 3494 configuration with adjacent frame support
- Up to 12 fibre-attached 3592 Model J1A drives in an STK Silo solution
- Up to 12 fibre-attached 3592 Model J1A drives in a 2.0m rack solution
- Up to 8 fibre-attached 3592 Model J1A drives in a 1.8m or 1.6m rack solution

Note: For additional information on attaching the 3592 Model J1A drive to the 3590 Model A60 controller, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

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 Hxx or Exx Models or Extended High Performance Cartridge Tape.

Call Home

The Call Home function opens a service alert if a problem occurs with a 3590 Model A50 or A60 control unit if activated with the appropriate level of code. 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 accomplishes this function for base remote support attached 3590 A60 units, and, if the optional enhanced remote support functions provided by FC2713, FC2714, and FC2715 is included, Call Home for both error alerts and wellness monitoring data is provided by these features through the IBM TotalStorage Master Console. 3590 Model A50 does not support these newer enhanced support features. The existing Remote Support FC2710, FC2711, or FC2712 accomplishes 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 drives with one or two A50 or A00 control units for ESCON host attachment
- Up to four E11 drives with one or two A50 control units for ESCON host attachment
- Up to four E11 or H11 drives with one A60 control unit for ESCON or FICON host attachment
- Up to four B11, E11, or H11 drives for A60 multiframe attachment to an ESCON or FICON host
- Up to four B1A drives for attachment to a 3495 tape library

Note: An A14 3495 environment does not support the A60 or the Hxx and Exx Models.

Model C10 contains:

- One or two A60 control units, each attached to B1A, E1A, or H1A drives in C12 or C14 frames
- One to two A60 control units, each attached to 3592 J1A drives in a 3592 Model C20 frame

Model C12 attaches B1A, E1A, or H1A drives to a StorageTek Automated Cartridge System as follows:

- Up to four B1A, E1A, or H1A drives for direct attachment to SCSI hosts
- Up to four E1A or H1A drives for direct attachment to Fibre Channel hosts
- Up to four B1A, E1A, or H1A drives attached to an A60 in a C10 frame for ESCON or FICON host attachment

Model C14 attaches B1A, E1A, or H1A 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, E1A, or H1A drives attached to an A60 in a C10 frame for ESCON or FICON host attachment

Refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's 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 H11, E11, and B11 unit requires twelve EIAs. Note that two drives can be placed side by side.

For example, two B11, E11, or H11 units require 12 EIAs of vertical space in a 9309, 7202, 7014-S00, or 7015-R00 rack.

B11, E11, and H11 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 7014-S00. 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 TotalStorage SAN Fibre Channel Switch 2109.

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.
6. In racks taller than 1.6 m, the drive and controller must be installed low enough to allow for service of the units.

Automated Tape Library 3494 Support

For fully automated tape operation, IBM 3590 Models H1A, E1A, or B1A can be integrated into an IBM Automated Tape Library 3494 (only Model B1A can be integrated into an Automated Tape Library 3495). 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 2 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 TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide* for additional information.

IBM TotalStorage Enterprise Tape Library (3494) Considerations

The 3494 has three components:

Tape drive unit frame

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

Tape library base frame

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

Storage frame

Contains storage cells

IBM 3590 drives are installable in the following 3494 models:

D12 Model D12 is a drive unit frame that contains up to six B1A, E1A, or H1A SCSI attached drives or six E1A or H1A Fibre Channel-attached drives. When attached to open systems servers any combination of B1A SCSI, E1A SCSI, H1A SCSI, or E1A or H1A Fibre Channel-attached drives are allowed.

The B1A, E1A, or H1A 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, all E1A, or all H1A) 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 frame that contains an A00, A50, or A60 control unit with up to four B1A drives. An A50 or A60 control unit supports up to four E1A drives. The H1A drive is only supported by an A60 controller. B1A, E1A, and H1A drives are not intermixable in this frame.

With SCSI adjacent frame support, SCSI attached B1A, E1A, or H1A 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 or H1A 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, all E1A, or all H1A) and have the same attachment capability (either SCSI or Fibre Channel). H1A does not attach to an A50 Controller.

L12 Model L12 is a control frame that contains up to two B1A, E1A, or H1A SCSI-attached drives or two E1A or H1A Fibre Channel-attached drives. When attached to open systems servers any combination of B1A SCSI-, E1A SCSI, H1A SCSI, or E1A or H1A Fibre Channel attached drives are allowed.

B1A, E1A, and H1A 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, all E1A, or all H1A) and have the same attachment capability (either SCSI or Fibre Channel).

All drives must be directly attached to an open systems server or to an A60 controller.

L14 Model L14 is a control 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, E1A, and H1A drives are not intermixable in this frame.

With SCSI adjacent frame support, SCSI-attached B1A, E1A, or H1A 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 controller in the L14 frame will no longer be operational. A 3590 drive with Fibre Channel attachment is not installable in an L14 frame.

A 3494 library can be configured with up to 16 IBM 3590 Model A00 or A50 control units and up to 62 Model B1A or E1A drives. A 3494 library can be configured with up to 15 IBM 3590 Model A60 control units and up to 62 Model B1A, E1A, or H1A drives. With adjacent frame support, up to 76 Model B1A, E1A, or H1A 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, or 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 can be installed adjacent to one another.

Note: A 3495 does not support Exx or Hxx 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.

Operating Systems and Platform Support

3590 Operating Systems and Platforms

The IBM TotalStorage Enterprise Tape System 3590 supports a variety of environments, some of which are listed below:

- S/390 and zSeries
- TPF
- AS/400 and iSeries
- OS/400®
- 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
- NUMA-Q (B and E Model Tape Drives only)
- DYNIX/ptx® (B and E Model Tape Drives only)
- Linux (Intel)
- Compaq AlphaServer
- Compaq Tru64

For more information on operating systems and platforms, see “Attachment Planning” on page 101, “ESCON Attachment Planning” on page 105, “FICON Attachment Planning” on page 112, and “Fibre Channel Attachment Planning” on page 114.

For current information on 3590 open systems support, see this Web site:

<http://www.storage.ibm.com/tape/3590/3590opn.pdf>

Independent Software Vendors

The Independent Software Vendors (ISV) listed below have announced support for the IBM TotalStorage Enterprise Tape System 3590. 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
- IBM: Tivoli Storage Manager
- Arkeia Software: Arkeia
- BakBone Software: NetVault
- CA-ARCserveIT and ARCserve 2000
- CA-BrightStor
- CommVault: Galaxy
- Dantz: Retrospect
- Help/Systems: Robot/Save
- HP: Omniback II
- Sterling Alexandria
- Legato(SCH): DiskXtender 2.3
- Legato(OTG): DiskExtender 2000
- Legato NetWorker
- LXI Corporation: Media Management
- LXI Corporation: TMS/IX
- STK(SCH) REELbackup
- STK(SCH) REELlibrarian
- STK(SCH): REEL Robot
- Sun Microsystems (LSC): SAM-FS
- SyncSort: Backup Express
- Veritas Backup Exec
- Veritas NetBackup

A supplemental list of vendor suppliers, including those supporting the B11, E11, and H11 Tape Drives, is listed at the following Web site:

<http://www.storage.ibm.com/tape/conntrix/index.html>

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 CD-ROM shipped with the unit provides specific device support for the following operating environments:

- IBM pSeries and RS/6000 servers running AIX
- IBM xSeries, pSeries, and zSeries servers running Linux
- Other Intel-compatible servers running Windows NT, Windows 2000, Windows Server 2003 and Linux
- Sun servers running Solaris
- HP servers running HP-UX

The most current firmware and support information for the device driver is available at xviii.

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, E1A, H11, and H1A Drive Features” in the section immediately following.
- “Models A00, A50, and A60 Control Features” on page 28
- “Frame Features” on page 39
- “SCSI Cable Features” on page 47
- “Fibre Channel Cable Features” on page 49
- “Language Feature Codes” on page 50

Model B11, B1A, E11, E1A, H11, and H1A Drive Features

The following table shows device attachment, installation, and media feature codes for Model B11, B1A, E11, E1A, H11, and H1A drives of the 3590 tape system.

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 5. Feature Codes for Model B11, B1A, E11, E1A, H11, and H1A Drives

Feature Code	Description	Hxx Models	Exx Models	Bxx Models
0500	Drive Microcode Update	H11/H1A	E11/ E1A	B11/B1A
1748	Custom Quickship Expedite	H11/H1A	E11/E1A	B11/B1A
2003	3590 Model C12 or C14 Attachment	H1A	E1A	B1A
2004	Field Install Silo Attachment	H1A	E1A	B1A
2005	Remove Silo Attachment for 3494	H1A	E1A	B1A
2006	Remove Silo Attachment for A14		E1A	B1A
2200	Deskside Enclosure	H11	E11	B11
3510 ⁷	Field Install Fibre Channel attachment	H11/H1A	E11/E1A	
5780	Extended High Performance Cartridge Tape MES			B11/B1A
5781	Extended High Performance Cartridge Tape MES		E11/E1A	
5790	Ultra SCSI Attachment Field Install (Withdrawn)			B11/B1A
9000	ES/9000, ES/3090 TM , S/390, or zSeries Attachment	H11/H1A	E11/E1A	B11/B1A
9066	Pearl White Cover (default color)	H11	E11	B11
9068	Raven Black Cover	H11	E11	B11
9200 ⁶	Open System Device Drivers	H11	E11	B11
9210 ¹	HP-UX Attachment	H11/H1A	E11/E1A	B11/B1A
9211	SUN Attachment	H11/H1A	E11/E1A	B11/B1A
9212	Windows or xSeries Attachment	H11/H1A	E11/E1A	B11/B1A
9213 ¹	Other non-IBM Attachment	H11	E11	B11
9221 ^{2,3}	First B11 or E11 plus rack shelf installed in a rack	H11	E11	B11

Table 5. Feature Codes for Model B11, B1A, E11, E1A, H11, and H1A Drives (continued)

Feature Code	Description	Hxx Models	Exx Models	Bxx Models
9222 ^{2,4}	Second or fourth B11, E11, or H11 installed in a rack	H11	E11	B11
9223 ^{2,5}	Third B11 or E11 plus rack shelf installed in a rack	H11	E11	B11
9400	AS/400 or iSeries Attachment	H11/H1A	E11/E1A	B11/B1A
9410	AS/400 or iSeries Interposer (6501 only)		E11/E1A	B11/B1A
9510 ⁷	Fibre Channel attachment - Plant Install	H11/H1A	E11/E1A	
9590	No Data Cartridges	H11		
9600	RS/6000, pSeries, or RS/6000 SP Attachment	H11/H1A	E11/E1A	B11/B1A
9631	Plant install drive			B11/B1A
9632	Attach B11 to 3591 Model A01 control unit			B11
9638	Plant install B1A in A14 Frame			B1A
9663	Plant Install E11 or E1A Drives		E11/E1A	
9701	Interposer, single-byte			B11/B1A
9702	Interposer, double-byte	H11/H1A	E11/E1A	B11/B1A
9790	Ultra SCSI Attachment (plant install)			B11/B1A
9798	Inline SCSI Terminator	H11/H1A	E11/E1A	B11/B1A
9799	VHDCI Cable/Interposer	H11/H1A	E11/E1A	B11/B1A

Notes:

- Several non-IBM systems vendors support attachment of the IBM TotalStorage Enterprise Tape Drive 3590. 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.
- Feature codes 9221, 9222, and 9223 are required for Model B11, Model E11, and Model H11 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.
- The first drive that is installed in the rack should specify FC9221 which includes the mounting hardware for the first two drives.
- The second or fourth rack-installed drives should specify FC9222.
- The third drive that is installed in the rack should specify FC9223, which includes the mounting hardware for the third and fourth drives.
- An update of the open system device drivers should be obtained to ensure support for the attachment of the 3590 Model H11 or H1A Tape Drives with Fibre Channel Attachment (FC9510 or FC3510) to Fibre Channel adapters on some servers. Customers with Feature Code 9200 installed can download new device driver firmware anonymously from this FTP site:
ftp.software.ibm.com/storage/devdrv
Additional information can be found in the *IBM TotalStorage Tape Device Drivers Installation and User's Guide* (GC35-0154), also available at this FTP site.
- Includes an SC-duplex connector for attachment of a 50-micron, multimode fiber cable.

Feature Definitions

Drive Microcode Update (FC0500)

This feature provides an update to the 3590 Tape Drive microcode on an installed tape drive. Newer microcode levels may be required when attaching the 3590 in selected Fibre Channel/SAN environments. Refer to the 3590 supported servers web site at <http://www.storage.ibm.com/tape/3590> for more details on minimum required levels. This feature should not be ordered in conjunction with 3590 model

conversions, when the drive is converted from SCSI to Fibre Channel, or Extended Length Media features are added to the drive, since these conversions/features include the latest microcode level.

Note: In order to support FC0500 on a 3590 B11/B1A drive, it must have been built with a "Common Card Pack." Machines shipped without a Common Card Pack will have microcode increment levels of either "IA_XXX" for NonUltra Machines and "IB_XXX" for Ultra level machines. (XXX indicates the actual increment level.)

Custom Quickship Indicator (FC1748)

For those countries (or regions) authorized under the Premier Response Program, specify this feature to request Custom Quickship service. This will provide improved product delivery of the tape drive. The tape drive will be delivered within five to seven business days (depending on geographic destination) from order entry to delivery. Custom Quickship is not available for installation features required on the frame or systems such as the Tape Library 3494 where the 3590 tape drive is installed.

3590 Model C12 or C14 Attachment (FC2003)

This feature is required for installing a 3590 Model H1A Tape Drive in the C12 or C14 Silo Compatible frame.

Field Install Silo Attachment (FC2004)

This feature must be ordered on an existing Model H1A Tape Drive to provide the drive changes necessary to convert it for installation in a C12 or C14 frame.

Remove Silo Attachment for 3494 (FC2005)

This feature must be ordered on an existing Model H1A Tape Drive to provide the drive changes necessary to remove it from a Model C12 or C14 Silo Compatible frame and convert it for reinstallation in an Enterprise Tape Library.

Remove Silo Attachment for A14 (FC2006)

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

Deskside Enclosure (FC2200)

This feature provides a deskside enclosure (sleeve and cover) and drive mounting hardware to allow use of the 3590 Model B11, E11, or H11 Tape Drive as a deskside unit. The appropriate 2.7 meter (9 ft.) power cord is included, based on the three digit country code. The Tape Drive will have to be manually powered on and off. The dimensions of the enclosure are:

- Height: 663mm (26.5 in.)
- Drive Width: 229 mm (9.0 in.)
- Width at Base (Stabilizer): 432 mm (17.0 in.)
- Length with ACF: 1029 mm (40.5 in.)

Field Install Fibre Channel Attachment (FC3510)

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 on a Model C12 frame or a Model L12 or D12 frame requires one FC3511 to supply the necessary attachment hardware. FC3510 includes an SC-duplex connector for attachment of a 50-micron, multimode fiber cable.

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

Ordering field install FC5780 upgrades B11 or B1A drives shipped prior to March 3, 2000 and B11 or B1A drives upgraded to E11 or E1A. This performance upgrade feature will enable the drive to support Extended High Performance Cartridge Tapes.

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

Ordering field install FC5781 upgrades E11 or 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 B 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 Ultra feature codes. Refer to Info APAR II11472.
- 3494 B10, B16, B18, and B20 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 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. FC9000 is attached to ES/3090, ES/9000, S/390, or zSeries systems.

Pearl White Cover (FC9066)

This feature is for Model E11 or H11 automated cartridge facility in a rack.

Raven Black Cover (FC9068)

This feature is for Model E11 or H11 automated cartridge facility in a rack.

Open System Device Drivers (FC9200)

This feature provides device drivers and documentation for attachment of the 3592 Model J1A on pSeries, RS/6000, HP-UX, Linux, Sun, or Windows systems when the tape drive is installed in a rack. Prerequisite: FC4674 (Install J1A in a Rack). Corequisite: One attachment (FC9210, FC9211, FC9212, FC9215, FC9216, or FC9600) must also be specified. Plant or field installation.

HP-UX Attachment (FC9210)

A device driver is available with FC9200, Open Systems Device Driver, for HP-UX attachment.

SUN Attachment (FC9211)

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

Windows or xSeries Attachment (FC9212)

A device driver is available with FC9200, Open Systems Device Driver, for xSeries or Intel Windows systems.

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, or H11 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, or H11 Installed in Rack (FC9222)

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

Third B11, E11, or H11 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 3590 Model E11, E1A, H11, or H1A tape drives or with a model conversion of a 3590 B Model to an E or H Model. The prerequisite is one FC3511 on any of these frames when a tape drive with this feature is installed. FC9510 includes an SC-duplex connector for attachment of a 50-micron, multimode fiber cable.

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

A device driver is available with FC9200, Open Systems Device Driver, for attachment to RS/6000 SP or pSeries systems.

Plant Install B11 or B1A Drives (FC9631)

This specify code allows the factory installation of a B11 into an A14 frame or a B1A into a 3494 Tape 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 or E1A Drives (FC9663)

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

Plant Install H1A Drive or Hxx SCSI Drive (FC9669)

This specify code allows the factory installation of a new Model H11 Tape Drive without the Fibre Channel Attachment feature into a new Model A14 coming from the plant. This code must appear on both the H11 and A14 orders.

Plant Install Hxx Fibre Drive (FC9670)

This specify code allows the factory installation of a new Model H11 Tape Drive with the Fibre Channel Attachment feature into a new Model A14 coming from the plant. This code must appear on both the H11 and A14 orders.

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 SCSI Ultra/wide SCSI ports.

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.

The 3590 Model A60 and the 3592 Model J70 controllers support the attachment of the 3592 Model J1A tape drive. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

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 6. 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

Table 6. Feature Codes for Models A00, A50, and A60 Control Units (continued)

Feature Code	Description	Models
0109	ESCON to 62.5um Multimode SC Duplex Cable	A60
0520	Functional Enhancement Field	A60
2710 ¹	Remote Support Facility	A00, A50, A60
2711 ²	Remote Support Switch	A00, A50, A60
2712 ³	Remote Support Attachment	A00, A50, A60
2713 ^{4 8}	Master Console for Service	A60
2714 ^{5 8}	Console Expansion	A60
2715 ^{6 8}	Console Attachment	A60
2717 ^{7 8}	Console A60 Enablement	A60
3059	J1A-to-Switch Cables	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
3434	2-Gbps FICON Long Wave	A60
3435	2-Gbps FICON Short Wave	A60
3463	Fibre Drive Attachment	A60
3465	Fibre Drive Attached Rack	A60
3473	LC Fibre Drive Attachment	A60
3475	LC Fibre Drive Attachment Rack	A60
4065	Multiframe 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	Multiframe SCSI A14	A60
9300	Withdrawn	A00, A50
9301	Withdrawn	A00, A50
9476	J1A Drive Attachment	A60
9511	Plant Installed Fibre Drive	A60
9520	Functional Enhancement Plant	A60
9651	Field merge A50 in C14	A50
9652	Withdrawn	A50
9655	Field merge A50 in 3494	A50
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

Table 6. Feature Codes for Models A00, A50, and A60 Control Units (continued)

Feature Code	Description	Models
9668	Field Merge A60 in A14	A60
9791	9–Micron LC/SC Fibre Cable (FICON longwave)	A60
9792	50–Micron LC/SC Fibre Cable (FICON shortwave)	A60
9793	9–Micron LC/SC Fibre Cable	A60
9794	50–Micron LC/SC Fibre Cable	A60

Note:

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.

Note: The first FC2710 requires an **analog** phone line in the installation. The same modem and switch may be shared between the following units:

- Models A00, A50, and A60
- 3494 Models B16, HA1, L10, L12, L14, or B18
- 3490E Model F1A or FC0 with FC3000

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.
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.
4. FC2713 supplies the IBM TotalStorage Master Console PC. Included with the PC are: keyboard, mouse, power cords (appropriate for destination country), and two modems. One modem supports remote call home, the other modem supports product dial-in functions. Two LAN RJ45 cables and a 16 port LAN hub are also included. The supplied RJ45 cable allows connection to the first 3590 Model A60 or 3494 Model B18, B10, B20 or AX0 at a customer's site. FC2713 also supplies the Master Console microcode, along with the Master Console MI. This feature requires two analog phone lines to connect, and it can be shared by the products mentioned above.
5. FC2714 supplies an expansion LAN Hub and additional RJ45 LAN cable to connect additional 3590 Model A60 or 3494 BXX and AXX products to the FC2713 described above. A maximum of three LAN Hubs, inclusive of the one supplied with FC2713, are allowed on one Master Console PC. Therefore, no more than two FC2714 can be ordered to attach to one FC2713. This must be ordered correctly as there is no way to place these order restrictions in the order system since site level planning is required to correctly order the Master Console features. With this configuration, a maximum of forty-three 3509/3494 units can be attached to one Master Console for Service, at which point another FC2713 must be ordered to attach additional units.
6. FC2715 supplies one additional RJ45 LAN cable to connect an additional Model A60 to the LAN Hub supplied with FC2713 or an expansion LAN Hub supplied by FC2714.
7. FC2717 supplies a NIC (Network Interface Card) that must be ordered in conjunction with one of the three features above to install in the 3590

Model A60. In addition, this feature supplies microcode to support the 3590 Model A60 for the Master Console attachment.

8. Master Console FC2713 and related feature codes cannot be supported if the 3590 Model A60 has two FC3412s and any combination which totals two FC3432s/FC3433s, since such a configuration uses all available Ethernet supported slots.

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 62.5 m 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 FC3433 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).

Functional Enhancement Field (FC0520)

This feature provides an upgrade to the Model A60 Controller to support application performance and capacity enhancements. It can be added to any Model A60 without feature FC9520 that was shipped prior to October 12, 2001 without this capability. See “Application-Related Features of the A60 Control Unit” on page 65 for more information.

Additionally, this feature provides a microcode upgrade to the Model A60 Controller to support WORM capability of 3592 drives. It is required to utilize WORM and Economy Cartridge capability in any 3592 drives attached to the A60 controller. This feature must be added to any A60 that was shipped prior to May 21, 2004. If the 3590 controller and 3592 drives are installed in a 3494 library, this feature must also be ordered against the LXX frame to utilize WORM and Economy Cartridges

capability. Refer to the *IBM TotalStorage Automated Tape Library (3494) Introduction and Planning Guide*, GA32-0448 for additional information on 3494 FC 0520.

Note: For more information regarding the 3592 drive, and 3592 WORM and Economy Cartridge capabilities, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*, GA32-0464.

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 can be ordered 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 can be ordered 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.

Master Console for Service (FC2713)

This feature provides the IBM TotalStorage Master Console, an Ethernet hub and a cable and connectors for connection of one of the above units to an IBM supplied modem to enable remote enhanced service. This feature should be specified on the first unit in an installation connected to a master console facility. The Ethernet hub provides 14 additional connections for cables supplied with feature FC2714 or FC2715. This is an optional feature on the Model A60.

Console Expansion (FC2714)

This feature provides an attachment cable for connection of one of the above units, and an Ethernet hub for expanding the number of units that can be attached to the Master Console For Service (FC2713). Up to 14 additional connections are provided by this feature for connection of FC2715 or another FC2714. This is an optional feature on the Model A60.

Console Attachment (FC2715)

This feature provides a cable to attach a unit to the Ethernet hub provided by the Master Console For Service (FC2713) or the Console Expansion (FC2714). A maximum of 40 of FC2715 may be included in a single master console facility. This is an optional feature on the Model A60.

Console A60 Enablement (FC2717)

This feature provides a network interface card installed within the Model A60 Controller to enable attachment to an IBM TotalStorage Master Console. This feature should only be ordered on a 3590 Model A60 whenever FC2713, FC2714, or FC2715 are ordered on the Model A60.

J1A-to-Switch Cables (FC3059)

This feature provides the necessary hardware and a single Fibre Channel cable between a 3592 Tape Drive and a 2109 Switch in a 3494 Model D24 Frame or

stand-alone rack for connection to a Model J70 Controller installed in that frame. One of these features should be specified for each 3592 Tape Drive in a 3494 Model D24 or stand-alone rack that is attached to the Model J70 in that frame or rack. Maximum: Eight. Prerequisite: FC3476 (LC Fibre Drive Adapters), and FC3483 (Fibre Drive Attached LC Switch) or FC3584 (Fibre Drive Attached SC Switch). Plant or Field Installation.

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, E1A, H11, or H1A 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 is four. Feature conversion are available to convert FC3412 to FC3432, FC3433, FC3434, or FC3435.

FICON Long Wave Attachment (FC3432)

This feature provides one long-wavelength 1-Gbps FICON adapter, with an SC Duplex connector, for the attachment of 3590 Tape Drives through the Model A60 to a FICON host system long wave channel utilizing a 9-micron single mode fibre cable. The total cable length cannot exceed 10km (up to 20km with RPQ). One 31-meter (100-foot) Single Mode 9-micron fibre cable with SC Duplex Connectors is included with each feature FC3432 unless feature FC9791 (9-Micron LC/SC Fibre Cable) is specified. The 1-Gbps speed FICON attachment (FC3432) supports up to 64 logical channels.

FICON Short Wave Attachment (FC3433)

This feature provides one short-wavelength 1-Gbps FICON adapter, with an SC Duplex connector, for the attachment of the 3590 Tape Drives through the Model A60 to a FICON host system short-wavelength channel utilizing a 50-micron multimode fibre cable. The total cable length cannot exceed 500 meters (up to 1,640 feet). One 31-meter (100-foot) multimode 50 micron fibre cable with SC Duplex Connectors is included with each FC3433 unless FC9792 (50 Micron LC/SC Fibre Cable) is specified. Feature conversions are available to convert FC3433 to FC3434 or FC3435. The 1-Gbps speed FICON attachment (FC3433) supports up to 64 logical channels.

2-Gbps FICON Long Wave Attachment (FC3434)

This feature provides one long-wavelength 2-Gbps FICON adapter, with LC Duplex Connectors for the attachment of 3590 Tape Drives through the Model A60 to a FICON host system long wave channel utilizing a 9-micron single mode fibre cable. The total cable length cannot exceed 10 km. One 31-meter (100-foot) Single Mode 9-micron fibre cable with LC Duplex Connectors is included with each feature

FC3434 unless feature FC9793 (9–Micron LC/SC Fibre Cable) is specified. Each 2–Gbps FICON attachment can support up to 128 logical channels.

2–Gbps FICON Short Wave Attachment (FC3435)

This feature provides one short–wavelength FICON adapter, with an LC Duplex connector, for the attachment of the 3590 Tape Drives through the Model A60 to a FICON host system short wavelength channel utilizing a 50–micron fibre cable. The total cable length cannot exceed 300 meters. The total cable multimode 50–micron fibre cable with LC Duplex Connectors is included with each feature FC3435 unless feature FC9794 (50–Micron LC/SC Fibre Cable) is specified. Each 2–Gbps FICON attachment can support up to 128 logical channels.

Fibre Drive Attachment (FC3463)

All configurations that attach Fibre Channel Drives to a 3590 Model A60 Controller require this feature. This feature replaces the Ultra SCSI tape drive attachment with two Fibre Channel adapters, for attachment of IBM TotalStorage 3590 E or H Model Tape Drives with Fibre Channel attachment capability. In addition, one IBM TotalStorage SAN Fibre Channel Switch 2109 Model S16 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 IBM TotalStorage 3590 Model A60 Controller in a rack. It includes the mounting hardware and instructions for installing the IBM TotalStorage SAN Fibre Channel Switch 2109 Model S16 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 SC/SC fibre cable features should be ordered with the drives.

LC Fibre Drive Attachment (FC3473)

This feature permits attachment of 3590 H Model or E Model Tape Drives with Fibre Channel Attachment (FC3510 or FC9510) to a 3590 Model A60 Controller and a 2109 SAN Fibre Channel Switch Model F16. It replaces the standard Ultra SCSI tape drive attachment, with two Fibre Channel adapters and includes the required microcode and installation instructions for the Model A60. In addition, one IBM TotalStorage SAN Fibre Channel Switch 2109 Model F16 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.

LC Fibre Drive Attached Rack (FC3475)

This feature supplies the required hardware to support attachment of 3590 Tape Drives with Fibre Channel Attachment (FC3510 or FC9510) to a 3590 Model A60 Controller in a rack. It includes the mounting hardware and instructions for installing the IBM 2109 SAN Fibre Channel Switch Model F16 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.

Multiframe 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 or E1A tape drive in a C12 or 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.

Multiframe SCSI A14 (FC9060)

This feature is required on the 3590 Model A60 controller to support SCSI multiframe 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.

Plant Install 3490E 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.

J1A Drive Attachment (FC9476)

This feature is required on all 3590 Model A60 controllers that will have a 3592 Model J1A tape drive attached to that Model A60. It provides an update to the Model A60 microcode to support the attachment of the 3592 tape drive, if required. Maximum: One. Plant or field installation.

Plant Install Fibre Drive (FC9511)

This feature tells the factory to install one 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 FC9510 (Fibre Channel Attachment - Plant Install), specified instead of feature FC9663 (Factory Install E1A) for the plant to install the proper tape drive. The quantity of feature FC9511 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 FC9630, FC9631, and FC9663.

Functional Enhancement Plant (FC9520)

This feature provides an upgrade to the Model A60 Controller to support application performance and capacity enhancements. This feature should be added to every Model A60 shipped on or after October 12, 2001, as this capability is included as standard after that date. See "Application-Related Features of the A60 Control Unit" on page 65 for more information.

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 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 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.

9–Micron LC/SC Fibre Cable (FC9791)

This feature ships a 31–meter (100–Foot) 9–micron single mode fibre cable with an LC Duplex connector on the one end, for connection to a host system, and an SC Duplex connector on the other end, for connection to 3590 Model A60 feature FC3432 (FICON Attachment - Long Wave). When specified, it replaces the fibre cable that ships standard with feature FC3432. This feature should be specified when attaching to a Model A60 with feature FC3432 to fibre components with LC Duplex connectors, such as the FICON channel feature for zSeries (FICON Express LW 1.75 feature FC2319) or supported Fibre Channel Directors with LC Duplex connectors.

50–Micron LC/SC Fibre Cable (FC9792)

This feature ships a 31–meter (100–Foot) 50–micron multimode fibre cable with an LC connector on one end, for connection to a host system, and an SC connector on the other end for connection to 3590 Model A60 feature FC3433 (FICON Attachment - Short Wave). When specified, it replaces the fibre cable that ships standard with feature FC3433. This feature should be specified when attaching a Model A60 with feature FC3433 to fibre components with LC Duplex connectors, such as the FICON channel feature for zSeries (FICON Express SW 1.75 feature FC2320) or supported Fibre Channel Directors with LC Duplex connectors.

9–Micron LC/SC Fibre Cable (FC9793)

This feature ships a 31– meter (100–foot) 9–micron single mode fibre cable with an LC Duplex connector on the one end, for connection to the 3590 Model A60 FC3434 (LC FICON Attachment — Long Wavelength) and an SC Duplex connector on the other end, for connection to a host system. When specified, it replaces the fibre cable that ships standard with feature FC3434. This feature should be specified when attaching to a Model A60 with feature FC3434 to fibre components with SC Duplex connectors, such as the FICON longwave channel features on G5 or G6 servers (FC2314) or zSeries servers (FC2315) or supported Fibre Channel Directors with SC Duplex connectors.

50–Micron LC/SC Fibre Cable (FC9794)

This feature ships a 31–meter (100–foot) 50–micron multimode fibre cable with an LC Duplex connector on the one end, for connection to the 3590 Model A60 FC3435 (LC FICON Attachment — Short Wavelength), and an SC Duplex connector on the other end, for connection to a host system. When specified, it replaces the fibre cable that ships standard with feature FC3435. This feature should be specified when attaching to a Model A60 with feature FC3435 to fibre components with SC Duplex connectors, such as the FICON shortwave channel features on G5 or G6 servers (FC2316) or zSeries servers (FC2318), or supported Fibre Channel Directors with SC Duplex connectors.

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 7 on page 38 for A60

maximum attachment capabilities.

Table 7. Model A60 Attachment Capabilities

Environment	SCSI Drives (maximum allowable)	Fibre Channel Drives (maximum allowable)	3592 Model J1A Drives (maximum allowable)
One A14 with one A60	4	4	N/A
Two A14 multiframe with one A60	8	8	N/A
Three A14 multiframe with one A60	N/A	12	N/A
One 1.6M rack with one A60	4	2	8
Two 1.6M rack multiframe with one A60	8	6	12
Three 1.6M rack multiframe with one A60	N/A	10	12
One 1.8M rack with one A60	4	4	8
Two 1.8M rack multiframe with one A60	8	8	12
Three 1.8M rack multiframe with one A60	N/A	12	12
Silo with one C12 (one A60 in a C10)	4	4	N/A
Silo multiframe with two C12s (one A60 in a C10)	8	8	N/A
Silo multiframe with three C12s (one A60 in a C10)	N/A	12	N/A
3494 D14	4	4	N/A
3494 D12 and D14 with adjacent frame	10	10	N/A
3494 D14 and L14	6	N/A	N/A
3494 D14 and L12	6	6	N/A
3494 D24	N/A	N/A	8
3494 D22 or L22 with adjacent frame	N/A	N/A	12

Additional A60 Fibre Channel to Tape Drive Requirements

Each A60 control unit that attaches Fibre Channel tape drives requires either one IBM TotalStorage SAN Switch Model F16 (2109–F16) or one IBM TotalStorage SAN Switch Model S16 (2109–S16). While the 2109–F16 supports link speeds up to 2–Gbps, the 2109–S16 supports link speeds up to 1–Gbps. Each must be ordered separately from the A60 control unit. Please note, IBM no longer markets the 2109–S16 as of September 13, 2002.

IBM TotalStorage SAN Switch Model F16

One 2109 Model F16 is required for each 3590 Model A60 Controller attaching Fibre Channel tape drives. Each 2109 Model F16 Switch comes standard with eight shortwave Gigabit Interface Convertors (GBICs), enough to connect to the two Model A60 Fibre Channel Attachments and up to six 3590 Fibre Channel Tape Drives. Fiber cables with LC Duplex connectors are required. See “LC Fibre Drive Attachment (FC3473)” on page 34 for more information.

Additional features that may be ordered include the following:

Additional Shortwave Transceiver(FC2210): FC2210 provides one additional GBIC. It must be ordered when more than six 3590 Tape Drives will be attached to the Model A60 Controller. The quantity of this feature should equal at least the number of tape drives attached to the Model A60 minus six (e.g. to attach ten 3590 Fibre Channel Tape Drives to a Model A60, a minimum of four FC2210 must be ordered).

Power Supply, Additional (FC6203): FC6203 provides an additional redundant power supply enabling dual-power source configurations to minimize power outages.

Non-Rack Install (FC9205): FC9205 should not be specified.

IBM TotalStorage SAN Switch Model S16

One 2109 Model S16 is required for each 3590 Model A60 Controller attaching Fibre Channel tape drives. Each 2109 Model S16 Switch comes standard with four shortwave Gigabit Interface Convertors (GBICs), enough to connect to the two Model A60 Fibre Channel Attachments and up to two 3590 Fibre Channel Tape Drives. Fiber cables with SC Duplex connectors are required. See “Fibre Drive Attachment (FC3463)” on page 34 for more information.

Additional features that may be ordered include the following:

Short Wavelength GBIC (FC2010): FC2010 provides one additional GBIC. It must be ordered when more than two 3590 Tape Drives will be attached to the Model A60 Controller. The quantity of this feature should equal at least the number of tape drives attached to the Model A60 minus two (e.g. to attach ten 3590 Fibre Channel Tape Drives to a Model A60, a minimum of eight FC2010 must be ordered).

Power Supply, Additional (FC6103): FC6103 provides an additional redundant power supply enabling dual-power source configurations to minimize power outages.

Non-Rack Install (FC9205): FC9205 should not be specified.

2109–F16 and 2109–S16 Switches (an A60 Fibre Channel to Tape Drive Requirement)

Addition of either the 2109–F16 switch or the 2109–S16 switch, along with the 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.

3591 Model A01 Control Unit

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

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 8. Model A14 Frame Feature Codes

Feature Code	Description
3464	Fibre Drive Attached A60

Table 8. Model A14 Frame Feature Codes (continued)

Feature Code	Description
3474	LC Fibre Drive Attached A60
4060	Multiframe SCSI A14
4062	Multiframe SCSI Drives
4064	Multiframe Fibre Drives
4074	LC Multiframe 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
4669	Replace B11 or E11 with H11
4672	Field Install H11 Drive
4730	Remove drive from A14
4860	Replace an A00, A50, or A60 with a J70 in an A14
4868	Field install J70 in an A14
9000	ES/9000, ES/3090, S/390, or zSeries Attachment
9012	Plant install in 3495 library
9059	3590 Tape Drive-to-J70 Attachment
9060	Multiframe SCSI A14
9062	Multiframe 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
9669	Plant install Hxx SCSI drive
9670	Plant install Hxx Fibre drive
9672	Field merge drive in an A14
9780	Extended High Performance Cartridge Tape MES
9867	Plant install J70 in A14
9868	Field merge J70 in A14

Model A14 Feature Definitions

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 TotalStorage SAN Fibre Channel Switch 2109 S16 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.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

LC Fibre Drive Attached A60 (FC3474)

This feature is required on the 3590 Model A14 Frame that contains a 3590 Model A60 Controller that 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 SAN Fibre Channel Switch Model F16 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.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

Multiframe SCSI A14 (FC4060)

To support 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.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

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 3590 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 nonfunctional.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

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 3590 A60 Controller in a different Model A14 Frame. In a multiframe fibre attachment, up to 12 IBM TotalStorage 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 Model S16 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.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

LC Multiframe Fibre Drive (FC4074)

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 3590 Model A60 Controller in a different Model A14 Frame. In a multiframe fibre attachment, up to twelve 3590 Tape Drives with Fibre Channel Attachment can be attached to the Model A60, four in each Model A14 Frame. This feature allows for a Fibre Channel cable from each tape drive to the 2109 Model F16 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 7 meters (23 feet). If another controller is installed in this Model A14 Frame, that controller will be non-functional.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

Field Install B11 or E11 (FC4630)

A currently installed A14 requires this feature to add a B11 or E11 tape drive. All tape drives attached to a control unit in an A14 must be the same model. Use either all H, 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 fibre 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.

Replace Model B11 or E11 with H11 (FC4669)

This feature is required to provide the mounting changes to replace a 3590 Model B11 or E11 Tape Drive with a Model H11 Tape Drive in a currently installed Model A14 frame. All tape drives attached to a controller in a Model A14 must be the same model (all H Model, all E Model, or all B Model).

Field Install H11 Drive (FC4672)

This feature is required on a Model A14 to add a 3590 Model H11 Tape Drive to a currently installed A14 frame. All tape drives attached to a control unit in an A14 must be the same model. Use either all H, all E, or all B Model tape drives. It provides the mounting hardware for the drive and proper cables to connect to the Model A60 Controller.

Remove Drive from A14 (FC4730)

You must use this feature to remove a B1A, B11, E11, or H11 drive from a currently installed A14 frame and install it elsewhere.

Replace and A00, A50, or A60 with J70 in A14 (FC4860)

This feature is required to provide the mounting changes to replace a 3590 Model A00, A50, or A60 Controller with a 3592 Model J70 Controller in a currently installed Model A14 frame. Maximum: One. The maximum of features FC9667 plus FC9668 plus FC9867 plus FC9868 plus FC4660 plus FC4860 plus FC4868 is one. This feature is mutually exclusive with features FC9062, FC9637, FC9657, FC9658, FC9667, FC9668, FC4650, FC4657, or FC4660. Field Installation Only.

Field install J70 in an A14 (FC4868)

This feature is required to provide the mounting hardware to add a 3592 Model J70 Controller to a currently installed Model A14 frame. This feature is not available if FC9012 is installed. Maximum: One. The maximum of features FC9667 plus FC9668 plus FC9867 plus FC9868 plus FC4660 plus FC4860 plus FC4868 is one. This feature is mutually exclusive with features FC9062, FC9637, FC9657, FC9658, FC9667, FC9668, FC4650, FC4657, or FC4660. Field Installation Only.

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.

3590 Tape Drive-to-J70 Attachment (FC9059)

This feature provides the necessary hardware and a single cable to connect a 3590 Tape Drive in a 3494 Model D14 frame, 3590 Model A14 Frame, or stand-alone rack to a Model J70 Controller installed in that frame. One of these features should be specified for each 3590 Tape Drive in a 3494 Model D14, 3590 Model A14 frame, or stand-alone rack that is attached to the Model J70 in that frame or rack. Maximum: Four. Plant or Field Installation.

3590 Tape Drive-to-J70 Attachment (FC9059)

This feature provides the necessary hardware and a single cable to connect a 3590 Tape Drive in a 3494 Model D14 frame, 3590 Model A14 Frame, or stand-alone

rack to a Model J70 Controller installed in that frame. One of these features should be specified for each 3590 Tape Drive in a 3494 Model D14, 3590 Model A14 frame, or stand-alone rack that is attached to the Model J70 in that frame or rack. Maximum: Four. Plant or Field Installation.

Dual LAN Control Path A60 (FC5245)

FC 5245 specifies Dual LAN installation for A60 control units in 3494 Models D14 and D24.

Multiframe 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 3590 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 within 7 meters of each other.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

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 or E11/H11 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 B Model, all E Model, or all H Model). This feature is uninstallable on an A14 with FC4638, FC9638, or FC9639.

Plant Install B11 or B1A Drives (FC9631)

This specify code allows the factory installation of a B11 or B1A into an A14. This feature is uninstallable 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 uninstallable 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 uninstallable 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 or E1A Drives (FC9663)

This specify code enables the factory installation of E11 or 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.

Plant install Hxx SCSI Drive (FC9669)

This specify code allows the plant install of an Hxx SCSI drive into an installed A14 frame.

Plant install Hxx Fibre Drive (FC9670)

This code allows the plant install of an Hxx fibre drive into an installed A14 frame.

Field Merge Drive H11 Tape Drive in A14 Frame (FC9672)

This specify code on the Model A14 allows the field merge of a 3590 Model H11 Tape Drive into a Model A14 coming from the plant. It notifies the factory to leave a mounting slot available for the field merge of the tape drive prior to completion of installation. All tape drives attached to a controller in a Model A14 must be the same model (all H Model, all E Model, or all B Model).

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.

Plant install J70 in A14 (FC9867)

This specify feature factory installs a new 3592 Model J70 Controller into a new Model A14 frame from the plant. This feature must appear on both the 3592 Model J70 and 3590 Model A14 orders. Maximum: One. The maximum of features FC9667 plus FC9668 plus FC9867 plus FC9868 plus FC4660 plus FC4860 plus FC4868 is one. This feature is mutually exclusive with features FC9062, FC9637, FC9657, FC9658, FC9667, FC9668, FC4650, FC4657, or FC4660.

Field merge J70 in A14 (FC 9868)

This specify feature notifies the plant that a 3592 Model J70 Controller will be field merged into a 3590 Model A14 Frame coming from the plant, as part of the final customer installation. Maximum: One. The maximum of features FC9667 plus FC9668 plus FC9867 plus FC9868 plus FC4660 plus FC4860 plus FC4868 is one.

This feature is mutually exclusive with features FC9062, FC9637, FC9657, FC9658, FC9667, FC9668, FC4650, FC4657, or FC4660.

Rack Mount Frames

Fibre Drive Attached Rack (FC3465)

This feature supplies the required hardware to support attachment of 3590 E Model and H Model 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 TotalStorage SAN Fibre Channel Switch 2109 Model S16 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 SC/SC fibre cable features with the drives.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

LC Fibre Drive Attached Rack (FC3475)

This feature supplies the required hardware to support attachment of 3590 Tape Drives with Fibre Channel Attachment (FC3510 or FC9510) to a 3590 Model A60 Controller in a rack. It includes the mounting hardware and instructions for installing the IBM 2109 SAN Fibre Channel Switch Model F16 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.

This feature also supports the 3592 Model J70 Controller. For more information, see the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

3590 Tape Drive-to-J70 Attachment (FC9059)

This feature provides the necessary hardware and a single cable to connect a 3590 Tape Drive in a 3494 Model D14 frame, 3590 Model A14 Frame, or stand-alone rack to a Model J70 Controller installed in that frame. One of these features should be specified for each 3590 Tape Drive in a 3494 Model D14, 3590 Model A14 frame, or stand-alone rack that is attached to the Model J70 in that frame or rack. Maximum: Four. Plant or Field Installation.

Model C10, C12, and C14 Frames

Refer to *IBM Enterprise 3590 Tape System 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 9 shows the SCSI cable length feature codes for the subsystem.

Table 9. 3590 SCSI Cable Length Feature Codes

Feature Code	Description ^{1,2}	Model
5106 ^{3, 4}	0.6 m (1.9 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5112	12 m (39.4 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5118	18 m (59 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5125 ⁵	25 m (82 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5128	2.8 m (9.2 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5129 ³	2.9 m (9.5 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5134 ³	3.4 m (11.1 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5138 ³	4.0 m (13.1 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A
5145	4.5 m (14.8 ft) SCSI cable	B11, B1A, E11, E1A, H11, H1A

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 or C14 models, refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*

Feature Definition

0.6 meter SCSI Cable (FC5106)

This feature supplies a 0.6 meter (1.9 ft.) differential SCSI cable with high density 68-pin connectors that is used to connect two Model H11s when they are side by side in a rack and connected to the same SCSI port.

12 meter SCSI Cable (FC5112)

This feature supplies one 12 meter (39.4 ft.) differential SCSI cable with high density 68-pin connectors on both ends. Use of the RS/6000 or pSeries FC2420 limits the total length of all device connections. The SCSI bus cannot exceed the 18 meter (59ft.) cable limitation of FC2420. The maximum number of features is two. This feature is optional and is for field or plant installation.

18 meter SCSI Cable (FC5118)

This feature supplies one 18 meter (59 ft.) differential SCSI cable with high density 68-pin connectors. This cable allows the tape drive to be located further away from the host system for greater flexibility.

25 meter SCSI Cable (FC5125)

This feature supplies one 25 meter (82 ft.) differential SCSI cable with high density 68-pin connectors on both ends.

2.8 meter SCSI Cable (FC5128)

This feature supplies a 2.8 meter (9.2-ft) differential SCSI cable with high density 68-pin connectors that is used to connect a Model H11 when it is in the same rack as the AS/400 9406 or RS/6000 processor. This cable is typically too short to be used if the processor is in a different rack.

2.9 meter SCSI Cable (FC5129)

This feature supplies a 2.9 meter (9.5-ft) differential SCSI cable with high density 68-pin connectors to connect to another drive on the same SCSI port of a host.

3.4 meter SCSI Cable (FC5134)

This feature supplies a 3.4 meter (11.1-ft) differential SCSI cable with high density 68-pin connectors. It is used to connect to another drive on the same SCSI port of a host.

4 meter SCSI Cable (FC5138)

This feature supplies a 4 meter (13.1-ft) differential SCSI cable with high density 68-pin connectors. It is used to connect to another drive on the same SCSI port of a host.

4.5 meter SCSI Cable (FC5145)

This feature supplies one 4.5 meter (14.8-ft) differential SCSI cable with high density 68-pin connectors. This is the minimum length SCSI cable required to connect one 3590 Model H11 or H1A to a SCSI port on a host system.

Fibre Channel Cable Features

Feature Description

The following cables attach 3590 E or H Model drives with the Fibre Channel attachment directly to open systems servers with shortwave multi-mode fiber. They are also used when attaching E or H 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 112 for details on cables used with the A60 and FICON.

For 3590 C12 models, refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User’s Guide*

The feature codes listed in Table 10 specify an appropriate cable length for a 3590 attachment.

Table 10. 3590 Fibre Channel Cable Length Feature Codes

Feature Code (IBM P/N)	Description	Model
5805	5-m Fibre Channel Cable	E11/E1A, H11/H1A
5813	13 meter Fibre Channel Cable	E11/E1A, H11/H1A
5825	25-m Fibre Channel Cable	E11/E1A, H11/H1A
5861	61 meter Fibre Channel Cable	E11/E1A, H11/H1A
5907	7 meter LC/SC Fibre Cable	E11/E1A, H11/H1A
5913	13 meter LC/SC Fibre Cable	E11/E1A, H11/H1A
5922	22 meter LC/SC Fibre Cable	E11/E1A, H11/H1A
5961	61 meter LC/SC Fibre Cable	E11/E1A, H11/H1A

Feature Definition

5 meter Fibre Channel Cable (FC5805)

This feature supplies one 5 meter (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.

13 meter Fibre Channel Cable (FC5813)

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

25 meter Fibre Channel Cable (FC5825)

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

61 meter Fibre Channel Cable (FC5861)

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

7 meter LC/SC Fibre Cable (FC5907)

This feature supplies one 7 meter (22.97 ft.) 50.0/125 micrometer fiber-optic cable with LC/SC cable connectors. This feature is for field or plant installation. It is not recommended when attaching Fibre Channel drives to an A60.

13 meter LC/SC Fibre Cable (FC5913)

This feature supplies one 13 meter (42.65 ft.) 50.0/125 micrometer fiber-optic cable with LC/SC cable connectors. This feature is for field or plant installation.

22 meter LC/SC Fibre Cable (FC5922)

This feature supplies one 22 meter (72.18 ft.) 50.0/125 micrometer fiber-optic cable with LC/SC cable connectors. This feature is for field or plant installation.

61 meter LC/SC Fibre Cable (FC5961)

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

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 Fibre Transport Services (FTS) offering. Preterminated fiber-optic trunk cables are available in standard lengths up to 138 meters (450 ft). 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 xviii.

Language Feature Codes

Table 11 shows the language feature codes for the subsystem. English is the default language.

Table 11. 3590 Language Feature Codes

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

Chapter 3. Standard Functions

This chapter describes standard functions of the IBM 3590.

Standard Functions

Standard functions of the IBM TotalStorage Enterprise Tape System 3590 follow.

Read/Write Buffering

The integrated drive controller contains a 4MB read/write data buffer for fast/wide and 16MB for Ultra/wide small computer system interface (SCSI). Note that all Hxx and 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 ports 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 117.

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 Model A01 Tape Control Unit Introduction, Planning, and User's Guide*.

High-Speed Search

For SCSI, FCP, ESCON, and FICON attached hosts, the drive supports a very high speed search for a requested logical block location. The precise search speed will be a function of the current location and the requested location, but on average the speed will be 166 MB/sec for B Model drives and 332 MB/sec for E and H Model drives.

SCSI and FCP attached hosts are also capable of initiating very high speed searches for a requested file number. With Model A60 controller performance enhancements, ESCON and FICON hosts may also initiate very high speed searches for any file on the media. In particular, the prior controller restriction to repeated use of single file space commands is now eliminated, with arbitrary single command searches for an arbitrary file now being fully supported by the controller and by specific levels of OS/390 and z/OS.

Message Display

Each 3590 drive has a message display as part of the operator 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 can be displayed 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 3 on page 53). 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.

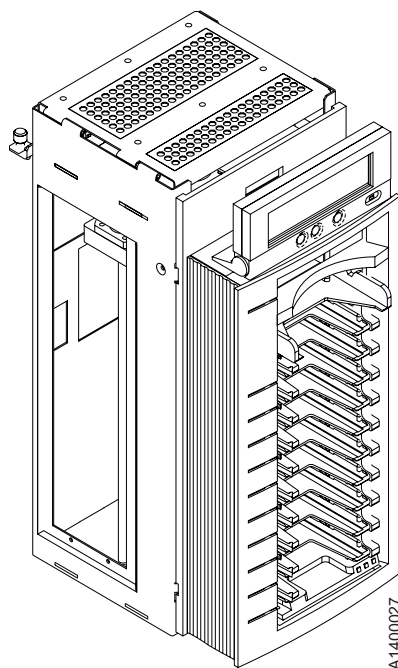


Figure 3. Automatic Cartridge Facility

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 and any cartridge can be selected.

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 Models H11, 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.

Operating and Power Controls, Indicators, and Procedures for the 3590 Tape Drives

The 3590 provides various operating and power controls and indicators to assist the operator in all phases of interaction with the device. These are described in more detail in the sections that follow.

Power On/Off Switch

There is a power on/off switch on the drive itself that controls the distribution of AC power to the device. This switch is located on the back of the drive.

Operator Display Panel

The Enterprise Tape Drive 3590 operator display panel is designed to facilitate interaction between the operator and the machine in all phases of operation. The panel is a menu driven liquid crystal display used to display menus, device status, activities, error conditions, and data. The operator panel is normally plugged into a socket located on the front of the tape drive or on the top of the ACF. For rear service environments, the operator panel can be removed from the front of the device and reinstalled at the rear of the device.

The device-generated messages may be displayed on the operator panel in other languages. This function is controlled by the language selection menu on the operator panel itself. Only device generated messages are automatically translated; messages issued by the host system are presented as received.

The operator display panel has an associated group of switches used to communicate choices and select functions as well as status indicators, attention indicators, and alert conditions.

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 384 tracks for Hxx Models, 256 tracks for Exx Models, and 128 tracks for Bxx models. All series of models concurrently process 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 Cartridge Considerations

The 3590 Tape Drives can utilize either the 3590 Extended High Performance Cartridge Tape (Extended Length Cartridge) or the 3590 High Performance Cartridge Tape (Standard Length Cartridge). The Extended Length Cartridge has a native capacity that is twice the capacity of the Standard Length Cartridge.

Many solutions require that all 3590 drives in the tape system have the Extended Media Support capability to optimize drive and media allocation. If Extended Length Cartridges are used, IBM recommends updating all tape drives to allow flexibility for mounting Extended Length Cartridges on any tape drive. However, if Extended Length Cartridges are to be used only on tape drives that are part of a defined subset, all drives in that subset must be updated. Some examples are:

- Enterprise Systems Connection (ESCON) or FICON attached tape drives in an Enterprise Tape Library 3494
- StorageTek Automated Cartridge Systems (ACS)

All 3590 B, E, and H Model Tape Drives support the Extended Length Cartridge. The Extended Media Support feature (FC 9780) must be added to the IBM TotalStorage Enterprise Tape Library Base Frame 3494 Model L10, L12, L14, or the IBM TotalStorage Enterprise Tape Drive Expansion Frame 3494 Model D12 or D14, to provide the Library Manager support for any 3494 Tape Library that will contain the new Extended Length Cartridges. If 3590 High Performance Cartridge Tape is used in the 3494, this feature must be on the Tape Drive Expansion Frame Model D12 or D14 containing those 3590 tape drives with Extended Media Support, and also on the Tape Library Base Frame Model L10, L12, or L14.

The Extended Media Support feature (FC 9780) must be added to the 3590 Model A14 or C12 to provide tape system support for Extended Length Cartridges. If 3590 Extended High Performance Cartridge Tape is used in any 3590 tape drive installed in the Model A14 or Model C12, this feature must be on that frame also.

Unlabeled and uninitialized Extended Length Cartridges can be included with the order of a new 3590 Model B11, E11, or H11 Tape Drive (FC 8140), Model C12 Silo Compatible Frame (FC 8240), or 3494 Tape Library frame (FC 8610). Labeled or initialized Extended Length Cartridges can be ordered using machine type 3599 or purchased through distributors. Refer to the **Supplies** section of this manual for specific information.

Tape Characteristics

High Performance Cartridge Tape and Extended High Performance Cartridge Tape are usable only on 3590 Enterprise Tape Systems because only a 3590 system can read tape cartridges written by a 3590 system. Neither the IBM 3590 High Performance Cartridge Tape nor the Extended High Performance Cartridge Tape is compatible with 3480, 3490, or 3490E drives. The 3590 system 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 system. 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 4 is for illustration purposes only. Note that items **4** and **5** differ. The specific icon is dependent on the supply source.

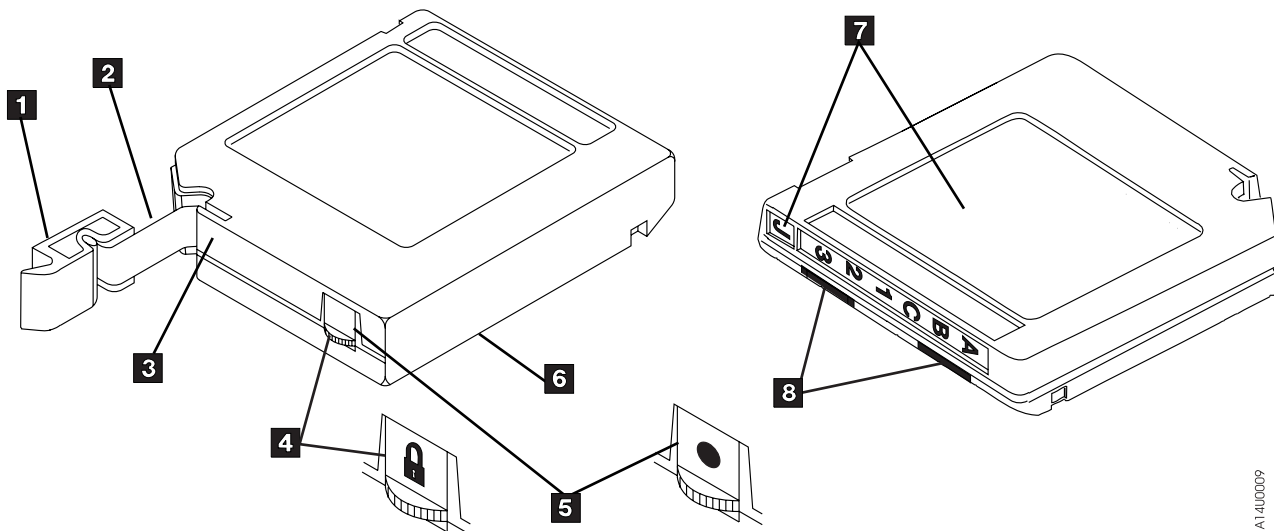


Figure 4. IBM 3590 High Performance Cartridge Tape

- **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 12 below.

Table 12. Media Types

Type	Seventh Character
3590 Extended High Performance Cartridge Tape	K
3590 High Performance Cartridge Tape	J
3490E Enhanced Capacity Cartridge System Tape	E
Standard 3480 Cartridge System Tape	1
Note: Use of a label <i>without</i> the seventh character J or K is recommended for Model C12 and C14 (refer to <i>IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's 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, Model E, or Model H drives. See “Managing Multiple Tape Formats and Lengths” on page 69 for a discussion of 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 H11, Model E11, or B11 drive that has an Automatic Cartridge Facility (ACF). Excluding priority slots, ten cartridges load into the ACF.

Table 13. Cartridge Capacity

System and Cartridge Selections	Capacity of a Single Cartridge	Capacity of 10 Cartridges in an ACF
3590 Bxx model system with IBM 3590 High Performance Cartridge Tape uncompressed	10GB	100GB
3590 Bxx model system with IBM 3590 Extended High Performance Cartridge Tape uncompressed	20GB	200GB
3590 Bxx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 2 to 1	20GB	200GB
3590 Bxx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 2 to 1	40GB	400GB
3590 Bxx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 3 to 1	30GB	300GB
3590 Bxx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 3 to 1	60GB	600GB
3590 Exx model system with IBM 3590 High Performance Cartridge Tape uncompressed	20GB	200GB
3590 Exx model system with IBM 3590 Extended High Performance Cartridge Tape uncompressed	40GB	400GB
3590 Exx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 2 to 1	40GB	400GB
3590 Exx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 2 to 1	80GB	800GB
3590 Exx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 3 to 1	60GB	600GB
3590 Exx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 3 to 1	120GB	1200GB
3590 Hxx model system with IBM 3590 High Performance Cartridge Tape uncompressed	30GB	300GB
3590 Hxx model system with IBM 3590 Extended High Performance Cartridge Tape uncompressed	60GB	600GB
3590 Hxx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 2 to 1	60GB	600GB
3590 Hxx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 2 to 1	120GB	1200GB
3590 Hxx model system with IBM 3590 High Performance Cartridge Tape and a compression ratio of 3 to 1	90GB	900GB
3590 Hxx model system with IBM 3590 Extended High Performance Cartridge Tape and a compression ratio of 3 to 1	180GB	1800GB

Chapter 5. Planning Considerations

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

- “Planning for Supplies and Equipment”
- “Planning for Operator Training” on page 63
- “Planning for Drive Cleaning” on page 63
- “Planning for Applications Programming” on page 64
- “Planning for Data Migration” on page 67
- “Planning for 3590 Model B-to-E Migration” on page 71
- “Planning for 3590 Model B-to-H or E-to-H Migration” on page 73
- “Planning for SCSI to Fibre Channel Migration” on page 77
- “Planning Checklists for SCSI and Fibre Channel” on page 78

Physical planning is a customer responsibility. Current levels of the open systems device drivers should be obtained to ensure the 3590 H Model is supported. The 3590 Model 60 Controller and 3494 Tape Library may require microcode updates by the IBM Service Representative for the proper installation and operation of attached 3590 Model H11 or H1A Tape Drives.

This chapter provides checklists to assist you in planning tasks.

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 empty cartridge magazine is supplied with each 3590 Model H11, E11, and B11.

Refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide* for supplies that are related to 3590 Model C12.

Note: A cartridge magazine must be in the Model H11, 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 system; Table 14 shows available supply items.

Table 14. 3590 Supply Items

Feature Code (IBM P/N)	Supply Item	3590 Model
8001	Cartridge magazine	B11, E11, H11
8002	Cleaner cartridge	B11, E11, H11, C12, C14
8130	30 High Performance Cartridge Tapes	B11, E11, H11
8140	30 Extended High Performance Cartridge Tapes	B11, E11, H11
9590	No data cartridges	B11/E11/H11

Note: See Table 15 on page 61 for alternative mechanism for ordering 3590 data cartridges.

Feature Definition

Cartridge Magazine (FC8001): This code supplies one cartridge magazine that can be used in a B11/E11/H11 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/E11/H11 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 (no data cartridges) 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 (no data cartridges) must be ordered with each box.

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

Preformatted Data Cartridges

The 3590 data cartridges can be ordered under machine type 3599 with 128-track, 256-track, or 384-track preformatting (see Table 15). For installations that have only Model E11 or E1A drives, data cartridges with 256-track preformatting should be ordered. For installations with only Model H11 or H1A drives, data cartridges with 384-track preformatting should be ordered. See “Managing Multiple Tape Formats and Lengths” on page 69 for additional information.

Table 15. Preformatted 3590 Data Cartridges

Feature Code	Supply Item	3590 Model
9070	128-track preformatted High Performance Cartridge Tape	H11, H1A, E11, E1A, B11, B1A
9071	256-track preformatted High Performance Cartridge Tape	H11, H1A, E11, E1A
9072	384-track preformatted High Performance Cartridge Tape	H11, H1A

Table 16. 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 17. 3590 Extended High Performance Cartridge Tape

Feature Code	Supply Item	Cartridge Quantity	3599 Model
4030	Labeled and Initialized	30	004
4210	Labeled and Initialized	210	004
1204	Labeled and Initialized	1200	004
5030	Label only	30	005
5210	Label only	210	005
1205	Label only	1200	005
6030	Standard	30	006
6210	Standard	210	006
1206	Standard	1200	006

Other Media Supplies

Table 18. Other Media Supplies

Feature Code	Supply Item	Quantity	3599 Model
7001	3590 Cleaning Cartridge	1	007
7010	3590 Cleaning Cartridge	10	007
8001	10-Cartridge Magazine	1	008

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 can be obtained 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 call the specific country (or region).

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 xviii.

Planning for Operator Training

Typical operator tasks are:

- Switching the tape system 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
- Analyzing problems

Refer to the *IBM TotalStorage Enterprise Tape System 3590 Operator Guide* for more information on the operator tasks.

Planning for Drive Cleaning

Attention: Take special care to ensure that the 3590 H11/H1A drives are receiving cleaning cartridges. More so than for B11, B1A, E11, or E1A drives, failure to use the cleaning cartridge at the appropriate times will result in permanent damage to the H11/H1A drive's read/write head. Investigate as a cleaning failure any persistent CLEAN message that displays on the drive's message display.

Any B11/B1A, E11/E1A, or H11/H1A drive with microcode at EC F24197 (IF_26E) or below had a drive cleaning time of approximately 1.5 minutes. Drives with MicroCode released after EC F24197 have an enhanced cleaning cycle time of approximately 4.5 minutes.

Refer to the following sources for more information about drive cleaning:

- To clean the 3590 Model B11, E11, or H11 drives, refer to the appropriate section in the *IBM TotalStorage Enterprise Tape System 3590 Operator Guide*.
- For information about automatic cleaning, refer to the appropriate section in the *IBM TotalStorage Enterprise Automated Tape Library (3494) Operator Guide*.
- To clean drives in C12 or C14 frames, refer to the appropriate section in the *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*.

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 Interrupt Handler

Most S/390 and zSeries operating environments include a mechanism for handling I/O events which do not complete in a device-specific nominal time. Generically, these mechanisms are known as missing interrupt handlers, and the time duration which when exceeded triggers their action is known as the *missing interrupt time* or *MIH*. The terminology *missing interrupt* pertains to the missing status response from the I/O system indicating completion or partial completion of an I/O operation. When installing a 3590 drive, it is important to review the time limits set for your operating system's missing interrupt handler. When an operating system misses an indication of the completion of an I/O operation, system processing may slow down or even cease in some contexts. Critical system resources may not be able to be released until the I/O operation has completed or is recognized as having failed by the operating system. When installing a 3590 drive, it is important to review the time limits set for your operating system's missing interrupt handler.

The 3590 Models A00, A50, and A60 set the MIH automatically when the devices are attached in 3590 mode. This occurs during device initialization time in the operating system and again when the device is varied online. There is no requirement for the system administrator to specify a time out value in this case. If the system administrator does specify a value via console command or via a parameter file (such as PARMLIB in the case of z/OS, for example), the specified value will override the correct values supplied by the I/O system.

For 3591 Model A01 as well as 3590 Models A00, A50, and A60, an MIH value must be supplied by the system administrator either via console command or via a parameter file (such as PARMLIB for z/OS). In this case the correct value to use may be determined as follows:

For 3590 Model B drives emulating 3490 drives:

- For standard length cartridges only: 43 minutes
- For extended length cartridges or a mix of standard and extended: 83 minutes

For 3590 Model E drives emulating 3490 drives:

- For standard length cartridges only: 39 minutes
- For extended length cartridges or a mix of standard and extended: 69 minutes

For 3590 Model H drives emulating 3490 drives:

- For standard length cartridges only: 52 minutes
- For extended length cartridges or a mix of standard and extended: 93 minutes

For installations that do not want to distinguish between Model B, Model E, and Model H 3590 Tape Drives, use the longest time above depending on your usage of standard or extended length cartridges.

The specific times above are accurate at the time of publication of this IBM TotalStorage Enterprise Tape System 3590 Installation and Planning Guide. Customers should check with their IBM Service Representative at the time of installation to assure their usage of correct and current values for MIH. Again, the customer is cautioned that the times above should only be set when the device is emulating a 3490. For 3590, the device will provide the values automatically to the operating system. In the 3590 case, the device provides two levels of timeout to distinguish between common (such as READ or WRITE) and long running commands (such as LOCATE or FORWARD SPACE FILE), and further distinction is made depending on what cartridge is mounted. 3490 support only permits a single timeout value. Console commands to display the timeout value only report the MIH in the case of 3490 mode attachment and only report the timeout value for common commands in the case of 3590 attachment.

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

Application-Related Features of the A60 Control Unit

Capacity Utilization: Customers operating the ESCON or FICON attached 3590 system in 3490 emulation mode have previously been limited to writing the maximal number of logical blocks allowed by the 3490 architecture, which, for large capacity tapes and small block sizes, can lead to an inability to fill an entire tape volume. With the capacity and performance features installed and with the appropriate levels of z/OS or OS/390, drives operating in 3490 emulation mode may now address as many logical blocks as drives operating in 3590 mode, permitting full cartridge capacity exploitation regardless of block size or data compressibility. The software interface that provides this capability is provided in the OPEN macro. DFSMS will take direct advantage of this capability in its key applications, such as DFSMSHsm™. Refer to the closing text for APAR OW49829 for more information on implementing this feature.

Read Performance: The Model A60 provides file-positioning interfaces that allow OS/390 and z/OS applications to access data based on file number at the same fast-locate speed achieved when data is accessed by block number. The A60 interface is exploited by OPEN, except in the case of ISO/ANSI Version 3 tapes, and it operates transparently to the application. Applications that write many files to a tape will experience significantly enhanced performance on subsequent mounts of the tape for file-oriented access. Block oriented access performance also remains very high speed.

Write Performance: The Model A60 controller provides new functions which can substantially improve the performance of applications which write many files on a single tape volume. The new controller functions coupled with new z/OS and OS/390 support in OPEN / CLOSE / EOVS macros remove most of the delays associated with the writing of tape labels for files (for Standard labeled tapes) and inter-file operations (for Standard labeled and for unlabeled tapes). This support is available with no application changes.

Additional benefits for applications which write multiple files can be gained by small application code changes which either take direct advantage of the new features of the A60 controller or which take indirect advantage of these features through the use of new capabilities of the z/OS and OS/390 DCBE macro. Where appropriate, the forced synchronization of buffered data to the tape medium during the writing of filemarks may be bypassed, resulting in very substantial application level performance improvements. Refer to the closing text for APAR OW49829 for more information on implementing this feature.

Status Bytes and Sense Bytes

The 3590 drive performs most error recovery internally, without surfacing any direct error condition to the attaching host. The error indications which are surfaced for SCSI and FCP attached hosts are documented in the IBM TotalStorage Enterprise Tape System 3590 Hardware Reference (GA32-0331). For ESCON and FICON attached hosts, much of the recovery which cannot be handled in the drive is performed by the controller, such as the Model A60. Error indications which must be surfaced by the controller are processed by the host software error recovery programs.

Tape-Write-Immediate Mode

When data is physically transferred to the tape medium it is always immediately reread and verified. The writing of data is normally buffered, however, which defers the physical transfer of the logical blocks to the tape until the buffer conditions require the offloading of the data or until a synchronizing command requires the transfer. If immediate validation of a successful transfer of data to the tape is required at the time that each logical block is written, then Tape Write Immediate mode may be programmatically invoked. This results in block-by-block synchronization and verification of successful transfer all the way to the medium, but at a very substantial cost in application 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 pre-compressed data may moderately increase the volume of data, thus reducing the effective tape cartridge capacity.

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 system, 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 19 on page 69 describes tape categories.

Cartridge Reuse in Mixed Drive Model Environments

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 or 256-track cartridge is present is given unless a *Write*, *Write Filemarks*, or *Erase* command is received from the host. The 3590 H Model will format the tape to 384-tracks on a *Write*, *Write Filemarks*, or *Erase* command. The H Model drive will read 128-track and 256-track tapes. The H Model drive will indicate a 128-track or 256-track cartridge formatted to 384-track. Appending with the H Model drives on a 128-track or 256-track cartridge is not supported. An attempted append causes drive errors. For more details on the SCSI interface refer to *IBM TotalStorage Enterprise Tape System 3590 Hardware Reference*.

B and E Model drive code is available which will support format interchange with H Model drives. The H drive writes cartridge information such that a B or E Model drive can read it. There is no indication that a 384-track cartridge is present unless the host receives any type of *read* or *write* command. The B or E model drive, with the prerequisite drive code level, will indicate a 384-track cartridge formatted to 128-track or 256-track once the host issues a *write* command. B or E Model drives with older code levels indicate an error with an attempted *write* command. The B or E Model drives will not read 384-track tapes. An error is reported with an attempted *read* command after loading a 384-track cartridge. For more details on the SCSI interface refer to *IBM TotalStorage Enterprise Tape System 3590 Hardware Reference*.

In customer environments where cartridges previously written on one 3590 drive model (such as a Model E) may be re-written on a lower density drive model (such as a Model B), care must be taken to assure that all drives and controllers have sufficiently current microcode to support this interchange. This is crucial in the case of automated library environments with cartridge scratch pools shared among different drive models. If all drives are controller attached (3590 Model A00, A50, or A60), then appropriate microcode controller levels will cause drive microcode levels to be consistently updated. Drives which are host attached via SCSI or FCP require independent microcode updates.

For environments which include Model H drives and either Model B or Model E drives, the following levels apply:

Native Controller (ESCON/FICON) Attached Environments

These levels supersede any need to separately update drive microcode:

- 3590 Model A60: 1.15.14.2 or higher
- 3590 Model A50: 1.10.10.2 or higher
- 3590 Model A00: 1.10.10.2 or higher

SCSI or FCP Attached Environments

These levels must be applied to each drive not under a controller, or to those drives attached to a Virtual Tape Dataserver:

- 3590 Model B1A or B11 Base: IA_572 or higher
- 3590 Model B1A or B11 Ultra: IB_91D or higher
- 3590 Model B1A or B11 Ultra (with the 'Common Card Pack'): IF_26E or higher
- 3590 Model E1A or E11: IF_26E or higher
- 3590 Model H1A or H11: any shipped level

3494 Automated Tape Library Environments

The Library Manager must be at one of the specified levels:

- LM523.28 or higher
- LM526.18 or higher

The interchange of data between Model B and Model E drives is supported at all current field levels.

Table 19. Tape Characteristics by Tape Usage Group

Tape Category	Tape Characteristics
Archive	<ul style="list-style-type: none"> • Contain records held for historical, legal, regulatory, or disaster recovery purposes. • Have a retention period usually more than a year and are often stored off-site. • 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.
Interchange	<ul style="list-style-type: none"> • Prepared for use in other locations. • May be used in other computer systems or for special purposes like microfilm production. • May be tapes prepared at another location to be used on the local system, for example, tapes created on data collection equipment.
Disk backup	<ul style="list-style-type: none"> • Created in normal backup jobs. • Represents several generations stored in a system at any given time. • 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. • Files usually have a high turnover rate and may require interchange with other sites.
Journal	<ul style="list-style-type: none"> • Contain transactions recorded against another dataset. • Allow their companion datasets to be reconstructed by applying the journal data to a previous version of the companion datasets. • Used in data base and online systems applications.
Scratch	<ul style="list-style-type: none"> • Called the scratch pool, it contains no active data. Often a regular flow of new, unused tapes entering a system to be used for growth and replacement of old tapes. This may be important in determining the number of tape cartridges to order. • Used for the creation of new files during normal processing when the data is to be kept at job step or job end.
Process	<ul style="list-style-type: none"> • Created during periodic execution of an installation's application programs. • Represent the highest volume of files in a system. For example, multiple generations of a tape master file can be considered process tapes. • Range of criteria and time frames; most commonly is the daily, weekly, and monthly processing cycle.

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 systems and features available, consider the tape formats on which the tape system writes data. Consider also whether or not mixed media (18-track, 36-track, 128-track, 256-track, or 384-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, 256-track, and 384-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 and 3590 Model E (256-track) volumes are readable on the 3590 Model H (384-track). New data sets are created in 384-track format. A 3590 Model H cannot append data to a 128-track or 256-track format tape, but can reformat the tape to 384-track.

3590 B models can reformat 384-track format cartridges to 128-track format and 3590 E Models can reformat back to 256-track format. This function can be useful in a scratch pool shared by B or E and H 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, when rewriting a tape in a format different from the currently written format, the VCR is rewritten when the first *write* command is issued. This occurs at the beginning of the volume. With MVS, this would occur during OPEN processing in the rewriting of the user label. Table 20 shows the resulting increases in processing time prior to start of writing by the job.

Table 20. Increased Rewrite Times for Dissimilar Tape Formats

Tape Formats	Increased Rewrite Time for High Performance Cartridge Tape (in seconds)	Increased Rewrite Time for Extended High Performance Cartridge Tape (in seconds)
256-track to 128-track	60	80
384-track to 128-track	60	80
128-track to 256-track	80	90
384-track to 256-track	80	90
128-track to 384-track	114	125
256-track to 384-track	114	125

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 128-track, 256-track, and 384-track (Model B, Model E, or Model H) drives.
- Tapes written in 256-track format are read-compatible with 256-track (Model E) and 384-track (Model H) drives.
- Tapes written in 384-track format are read-compatible only with 384-track (Model H) 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 or E Model drives upgraded to H Models concurrently: VCR rewrite will occur on the first reuse on 384-track H Model for scratch tapes previously written in 128-track or 256-track format.
- A common scratch pool is defined within an IBM Automated Tape Library (ATL) with an intermix of Model B1A, E1A, and Model H1A: VCR rewrite will occur for any reuse of a scratch tape in the format not used previously.
- Migration is accomplished over time from B1A or E1A Models to H1A 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 384-track drive (H1A).
- Silo environment with intermix of Model B1A, Model E1A, and H1A using separate tape pools: VCR rewrite will occur on the first reuse on 384 -track H1A model for scratch tapes previously written in 128-track or 256-track format. The first-use VCR rewrite could also occur if redefined pool ranges are such that cartridges are reassigned to the “other” drive technology.
- Using new media preinitialized 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, Model E1A, and Model H1A (common scratch pool). **In this case, it is important to note that new media may be ordered preformatted for either H1A, 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 or 256-track format, may not be able to be reformatted to 384-track format. This is due to the tighter tolerances required to support the 384-track format.

Planning for 3590 Model B-to-E Migration

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

Upgrading B drives to E drives requires planning even though 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 “ES/3090, ES/9000, S/390, and zSeries Systems” on page 108 and “FICON Attachment Planning” on page 112 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 it¹.
- Perform the upgrade.
- Add the 3590E device addresses to the IODF and activate it¹.
- Vary the 3590E devices online to MVS.

Note: ¹Application 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 more information on 3590 tape drives installed on a silo, refer also to the *IBM Enterprise 3590 Tape System 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 parmliib 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.

Planning for 3590 Model B-to-H or E-to-H Migration

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

Upgrading B or E drives to H drives requires planning, even though 3590 Models B, E, and H are all device-type 3590 (same UCB type in MVS environment). The change from 128-track or 256-track recording to 384-track recording, increasing 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 H 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 “ES/3090, ES/9000, S/390, and zSeries Systems” on page 108 and “FICON Attachment Planning” on page 112 for general software requirements, and ensure the required minimum level installation of software for the 3590 H 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.

Hardware Configuration Definitions (HCD)

There is no need to change the hardware configuration definitions (HCD). You may use the same device addresses with the 3590 Hxx Models that were used with the Bxx or Exx 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 system or set of systems upgraded in a particular maintenance window:

- Vary the 3590 Model B or E drives offline.
- Remove the 3590 B or E device addresses from the IODF and activate it¹.
- Add the 3590 H device addresses to the IODF and activate it¹.
- Perform the upgrade.
- Vary the 3590 H devices online to MVS.
- Final IODF ACTIVATE.

Note: ¹Application of maintenance cancels the requirement for these steps. Check the PSP bucket.

If the hardware upgrade plan entails conversion of B Model to E Model or H Model or E Model to H Model Tape Drives over time, it is important to keep in mind that the steps described above would need to be performed each time another subset of drives is upgraded. One approach to avoid this repeated activation scenario is to predefine a new set of addresses to be used when drives become 3590 H Models. The new addresses would be used when varying On the drives after upgrade.

SMS Definitions

For 3590 Model H tape drives installed inside a 3494 tape library, the following considerations apply:

- As applicable, define or alter an existing data class definition to direct new tape allocations to 3590 Model H Drives by specifying the RECORDING TECHNOLOGY as 384.
- To enable reading of existing cartridges written in 128-track or 256-track mode on 3590 Model H 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.

Note: Please make sure APAR OW41005 and APAR OW51940 are installed. These APARs address a problem related to the IDCAMS update of the volume record to READCOMPATIBLE.

For detailed information, refer to the current level of the DFSMS *Object Access Method Planning, Installation, and Storage Administration Guide for Tape Libraries*.

Silo Compatible Frame Considerations

For more information on 3590 tape drives installed on a Silo, refer also to the *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*, GA32-0366.

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

DFSMSShsm anticipates variances in the manufacture of tape cartridges and attempts to preserve the ability to TAPECOPY or duplex its migration and backup tapes by writing to 97% of the tape's capacity. DFSMSShsm is aware of the physical cartridge capacity for tapes mounted on 3590 drive models H1X and E1X, but uses a constant value based on the logical tape device for tapes mounted on a 3590 B1X. The DFSMSShsm SETSYS TAPEUTILIZATION command can be used to specify a percentage other than 97 to control the amount of data written to the tape. This command is typically used when a 3590 B1X emulates 3490 and the logical tape device is not reflective of the physical cartridge capacity. Although it is possible to specify a value of 98 or 99 for tapes to be mounted on 3590 H1X or E1X drives to get slightly more data on each cartridge, it is generally recommended that the default of 97% be used for those devices.

DFSMSShsm does not allow mixed device types in an esoteric group. DFSMSShsm 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 H and 3590 Model E, DFSMSShsm 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 DFSMSShsm considerations in the current level of the DFSMSShsm publications.

Other Migration Considerations

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

The 3590 H drives always write in 384-track mode. Thus, on a 3590 H Drive you cannot use DISP=MOD processing to extend a data set on a previously written 128-track mode or 256-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 H drive.

Just prior to the hardware upgrade, issue the DFSMSShsm LIST BVOL SELECT(NOTFULL) and LIST ML2 SELECT(NOTFULL) commands to display any

empty and partially filled backup and migration tapes. Issue a DELVOL MARKFULL command for each partially filled tape. No action needs to be taken for empty tapes.

For Tivoli Systems Management (TSM), formerly ADSM, similar considerations apply. Cartridges that were previously written in 128-track or 256-track mode need to be marked READ-ONLY before the hardware upgrade. Also, a storage pool that previously had 128-track or 256-track drives would need to have Max or Estimated capacity adjusted for the increased capacity with 384-track recording.

Migration can take place by directing new allocations to the 3590 H drives and letting old data sets expire on cartridges written in 128-track or 256-track mode. There is no need to copy the data sets unless the additional cartridge storage provided by the 3590 Model H tape drives is required immediately.

Planning for SCSI to Fibre Channel Migration

Verify whether or not you have an intermix of Model B, Model E and Model H 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 or Model H 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 or Model H drive.
- The Model B drive must be migrated to a Model E or Model H drive with Fibre Channel added. See “Planning for 3590 Model B-to-H or E-to-H Migration” on page 73.

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

Not all devices can be migrated, 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 TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*.

3494 Frame Considerations

See *IBM TotalStorage Enterprise Automated Tape Library (3494) Introduction and Planning Guide*.

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 system 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 system environment.
6. Planning for data migration from a non-tape or non-compatible tape environment to the 3590 tape system.
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 system, 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 system 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 TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide*. Also refer to *IBM TotalStorage Enterprise Automated Tape Library (3494) 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 system 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 system orders and supplies orders 3590 system 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, E11 and H11 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.

Chapter 6. Device Characteristics

Site Planning

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

- “Environmental Specifications” in the section immediately following.
- “Acoustic Specifications” on page 82
- “Cabling Information” on page 82
- “3590 Power Characteristics” on page 83
- “Power Specifications” on page 83
- “Power Cords” on page 85
- “3590 Component Specifications” on page 86
- “Attachment Planning” on page 101
- “ESCON Attachment Planning” on page 105
- “FICON Attachment Planning” on page 112
- “Fibre Channel Attachment Planning” on page 114

Environmental Specifications

The temperature and humidity ranges for the 3590 vary according to environmental conditions. Care should be taken when selecting a location for the subsystem.

Direct air from any heating/cooling ventilation source could be much different from the ambient air in the room. If the location of the subsystem covers a vent, air becomes trapped inside the frame. The environment inside the frame then becomes much different when compared with the room environment. Temperature and humidity can change dramatically inside the frame as the heating/cooling system is cycled on and off. Therefore, it is recommended to **NOT** locate a frame directly over a heating/cooling vent. Holes for cabling should be cut no larger than is necessary for the cables that will be used. Larger holes can become “vents” directing air into the subsystem. If larger holes are unavoidable P/N 2317361 pillows are recommended to aid in blocking air.

Occasionally a combination of low temperature and high humidity can create condensation on the HGA (Head Guide Assembly), which can degrade read/write function. Local environmental condition may direct air flow at the drive, which may cause temperature and humidity fluctuations. The temperature and humidity inside the HGA can change as ventilation system inside the building cycle on and off.

The environments shown in Table 21 apply to the components of the tape subsystem, and not to the 3590 cartridges. Measurements should be taken at the drive.

Table 21. 3590 Environmental Specifications

Condition	Temperature	Relative Humidity	Maximum Wet Bulb
Drive Operating	16 to 32°C (60 to 90°F)	20 to 80%	26°C (79°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)

Table 21. 3590 Environmental Specifications (continued)

Condition	Temperature	Relative Humidity	Maximum Wet Bulb
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	16 to 32°C (60 to 90°F)	20 to 80%	26°C (79°F)
Optimum Recommended	20°C to 26°C (68°F to 78°F)	45% to 65%	- -

Cooling Requirements

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 22 shows the acoustic specifications for the 3590.

Table 22. Acoustic Specifications

Model	L_{WA_d}		$\langle L_{pA} \rangle_m$	
	Operating (bels)	Idling (bels)	Operating (dB)	Idling (dB)
H11/H1A, 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

Refer to “Environmental Specifications” on page 81 for important 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 23 for additional information on the 3590 features. For additional host system cable attachment information, see “Attachment Planning” on page 101, “SCSI Cable Features” on page 47, “Fibre Channel Attachment Planning” on page 114, 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 is 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 23 shows the power specifications for the 3590 subsystem.

Table 23. 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
H11 H1A	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
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 23. Input Voltages (continued)

Model	50 Hz ±0.5 Hz	60 Hz ±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

Note: Model A14 and C12 data is for fully loaded frames.

Table 24 shows the power specifications for the 3590 subsystem's features.

Table 24. Input Voltages

Feature Code	Description	Customer supplied external outlet. Input Voltage	Hertz	Power Usage in watts	Dimensions (H x W x D)
2200	Deskside Enclosure	Min 100 vac Max 240 vac	Min 50 Max 60	Max 300	663 mm x 432 mm x 1029 mm (26.5 in. x 26.5 in. x 40.5 in.)
2710	Remote Support Facility	90 vac – 130 vac or 230 vac	50 or 60	16 w	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
2711	Remote Support Switch	115 vac or 230 vac	50 or 60	5 w	51 mm x 436 mm x 173 mm (2 in. x 17.15 in. x 6.8 in.)
2713	Master Console Service PC	Min 110 vac Max 265 vac	Min 47 Max 63	Min 80 Max 300	140 mm x 425 mm x 245 mm (5.5 in. x 16.7 in. x 16.7 in.)
	Monitor	Min 100 vac Max 240 vac	Min 50 Max 60	Min 50 Max 60	432 mm x 420 mm x 420 mm (17 in. x 16.5 in. x 16.5 in.)
	LAN hub	Min 100 vac Max 240 vac	Min 50 Max 60	Min 50 Max 120	43 mm x 330 mm x 127 mm (2 in. x 13 in. x 8 in.)
	Modem	120 vac	60	16	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
	Modem	120 vac	60	16	50 mm x 200 mm x 225 mm (2 in. x 8 in. x 9 in.)
2714	LAN hub	Min 100 vac Max 240 vac	Min 50 Max 60	Min 50 Max 120	43 mm x 330 mm x 127 mm (2 in. x 13 in. x 8 in.)

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 (or region), 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 5)
- Connector housing: Russellstoll 3913U-2 (Figure 5)
- Power cord style: A8

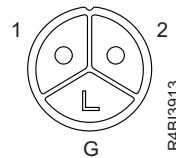


Figure 5. Receptacle Connector for Russellstoll 3913U-2 or 3743U-2

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 (or regions) conform to the electrical codes that are established by that country or region. These power cables consist of electrical cables, type HD21, ended by attachment plugs that are approved by the testing organizations for each specific country or region.

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 87
- “3590 Model B1A” on page 88
- “3590 Model E11” on page 89
- “3590 Model E1A” on page 90
- “3590 Model E11” on page 89
- “3590 Model H11” on page 91
- “3590 Model H1A” on page 92
- “3590 Model A00” on page 93
- “3590 Model A50” on page 94
- “3590 Model A60” on page 95
- “3590 Model A14 Frame Mount” on page 96
- “3590 Rack Mount” on page 98

3590 Model B11



DANGER

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.
(RSFTD203)

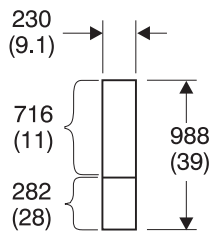


CAUTION:

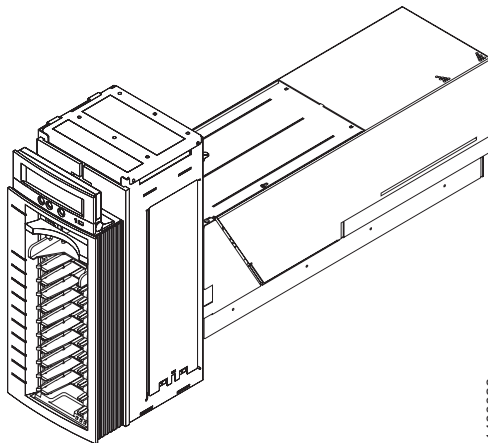
The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 25. 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:^{1, 2, 3}

kg	49.5
(lb)	(109)

Heat Output:

kw	0.3
(kBTU/hr)	(1.02)

Airflow Rate:

m ³ /min	3.4
---------------------	-----

Power Requirements:^{4, 5}

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 23 on page 83.
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



DANGER

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.
(RSFTD203)

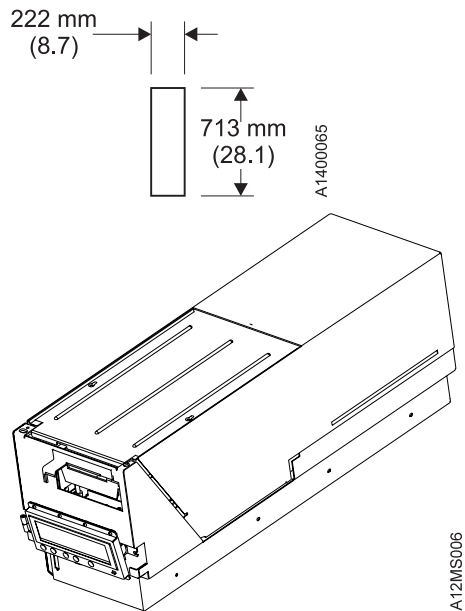


CAUTION:

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 26. 3590 Model B1A



SPECIFICATIONS

Dimensions:

	Front ¹	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 ³ /min	3.4
---------------------	-----

Power Requirements:²

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



DANGER

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.
(RSFTD203)

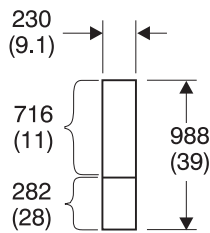


CAUTION:

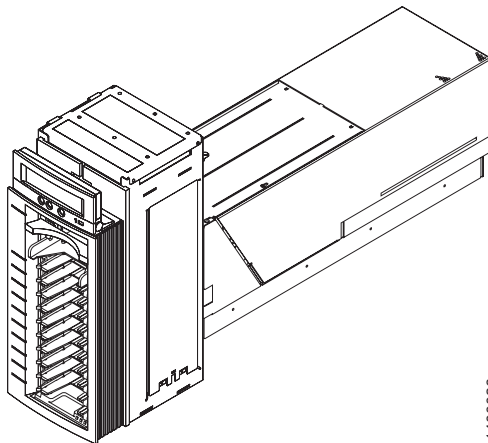
The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 27. 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:^{1, 2}

kg 46.7
(lb) (103)

Heat Output:

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

Airflow Rate:

m³/min 3.4

Power Requirements:³

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 23 on page 83.
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 lbs).

3590 Model E1A



DANGER

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.
(RSFTD203)

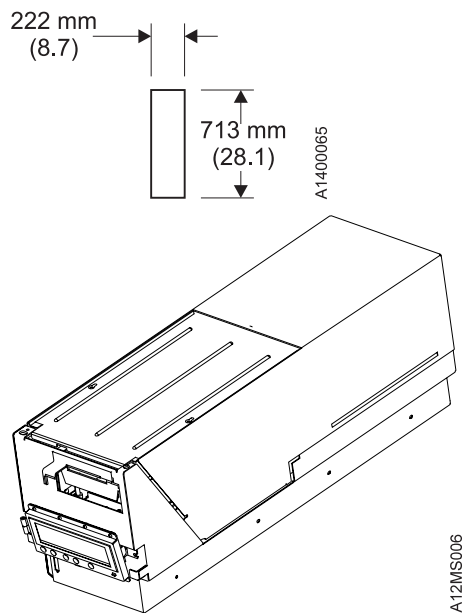


CAUTION:

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 28. 3590 Model E1A



SPECIFICATIONS

Dimensions:

	Front ¹	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:

m³/min 3.4

Power Requirements: ²

kV·A .225 (Maximum)
Phases 1

Notes:

1. The display adds 8 mm (0.3 in) to the width.
2. See Table 23 on page 83.
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 E1A units for installation in a rack.

3590 Model H11



DANGER

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.
(RSFTD203)

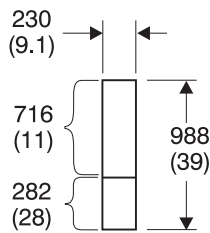


CAUTION:

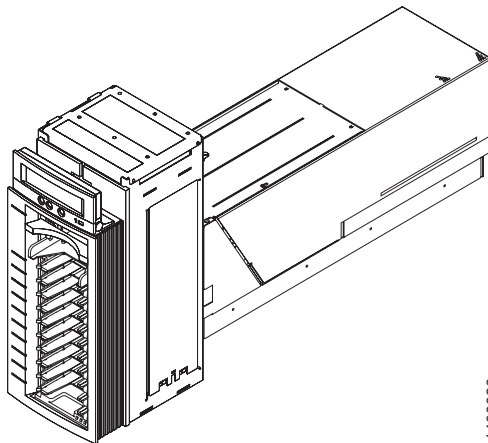
The weight of this assembly is such that it requires two or more persons to facilitate safe handling.

English measurements are shown in parentheses.

Table 29. 3590 Model H11



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:^{1, 2}

kg 46.7
(lb) (103)

Heat Output:

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

Airflow Rate:

m³/min 3.4

Power Requirements:³

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 23 on page 83.
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 H11 leakage current is 2.1 ma.
6. Model H11 requires 12 EIA units for installation in a rack.
7. Shelf and rack-mount slides weigh 38.6 kg (85 lbs).

3590 Model H1A



DANGER

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.
(RSFTD203)

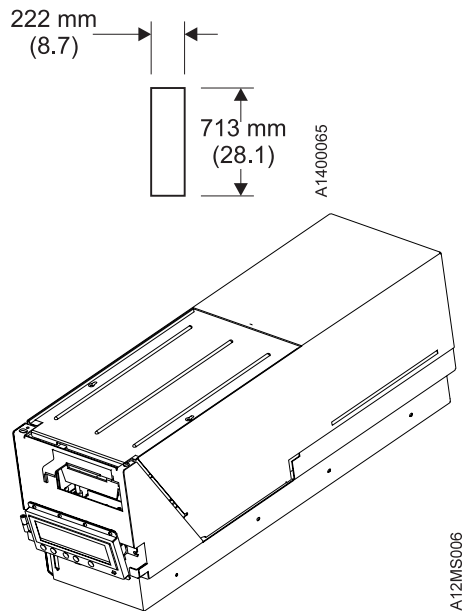


CAUTION:

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 30. 3590 Model H1A



SPECIFICATIONS

Dimensions:

	Front ¹	Side	Height
mm	221	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 ³ /min	3.4
---------------------	-----

Power Requirements: ²

kV·A	.225 (Maximum)
Phases	1

Notes:

1. The display adds 8 mm (0.3 in) to the width.
2. See Table 23 on page 83.
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 H1A requires 6 EIA units for installation in a rack.

3590 Model A00

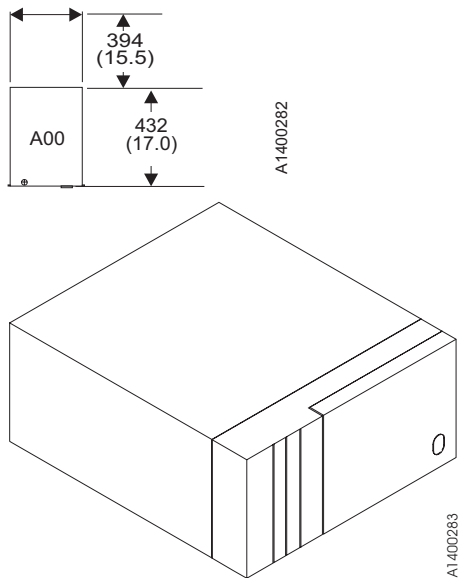


DANGER

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.
(RSFTD203)

English measurements are shown in parentheses.

Table 31. 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:

m³/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 TotalStorage 3590 High Performance Tape System, Introduction, Planning, and User's Guide*.

3590 Model A50

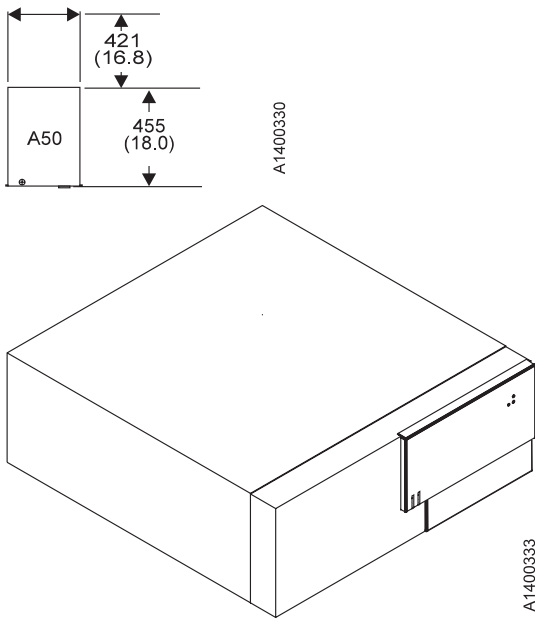


DANGER

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.
(RSFTD203)

English measurements are shown in parentheses.

Table 32. 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 ³ /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

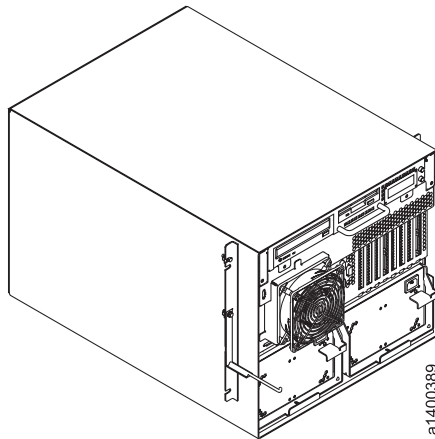
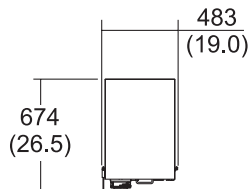


DANGER

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.
(RSFTD203)

English measurements are shown in parentheses.

Table 33. 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 ³ /min	1.4
---------------------	-----

Power Requirements:

kV·A	0.75 (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.

3591 Model A01 Controller

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

3590 Model A14 Frame Mount

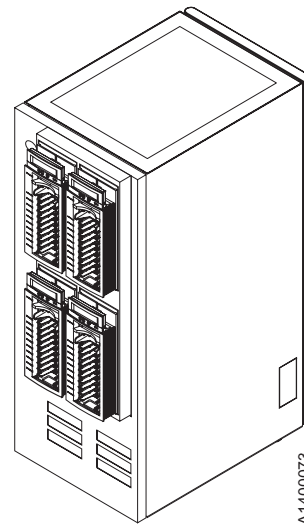
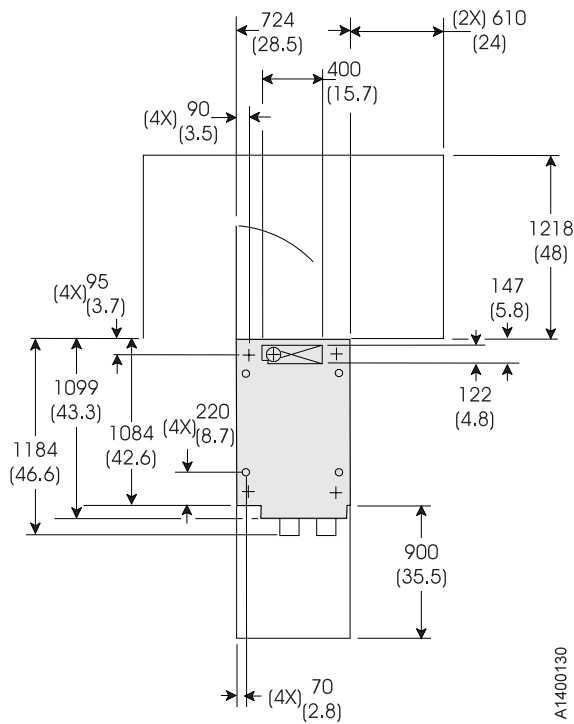


DANGER

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.
(RSFTD203)

English measurements are shown in parentheses.

Table 34. 3590 Model A14



3590 Model A00/A50/A60 controller and Model B11, E11, or H11 drives are installable in an IBM Model A14 Frame.

Table 35. 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 ¹	Height
mm	724	1099	1800
(in.)	(28.5)	(43.3)	(70.9)

Service Clearances:

	Front	Side	Rear
mm	750x900	(see note ²)	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 H11, E11, or B11 installed in an IBM 9309-2 rack. Other racks may be used.

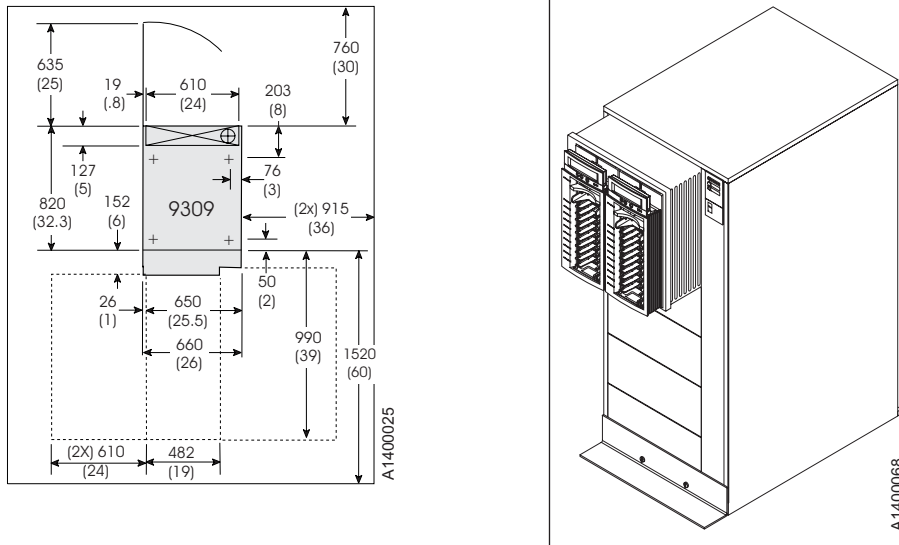


DANGER

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.
(RSFTD203)

English measurements are shown in parentheses.

Table 36. 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 37. SPECIFICATIONS

Dimensions:

	Front	Side ¹	Height
mm	650	972	1578
(in.)	(25.6)	(38.3)	(62.1)

Service Clearances:

	Front ¹	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: ^{2, 3, 4}

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 H11, E11, and B11 require 12 EIA units in a rack.

Models C10, C12, and C14 Frame Mount

Refer to *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's Guide* for planning details.

Chapter 7. Device Attachment Planning

Attachment Planning

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

- SCSI Attachment
- “Host Hardware and Software Considerations” on page 102
- “Sharing SCSI Buses with Disk Devices” on page 104
- “Removing, Installing, or Resetting a 3590 on an Active SCSI Bus” on page 104
- “Ultra SCSI and non-Ultra (fast/wide) SCSI Peripherals” on page 104

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, E1A, H11, and H1A 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 SP, 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 51.

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

Each 3590 tape drive attaches to host processors through a 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 and H Model drives provide a Medium Changer device at LUN address 1.

Bus Termination

Proper termination, according to SCSI standards, is 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).

Host Hardware and Software Considerations

For the latest information on supported servers, operating systems, and adapters, select "Interoperability Matrix" under "Learn more" at <http://www.storage.ibm.com/tape/drives/3590>.

For cable feature codes that are matched to specific software applications, see "SCSI Cable Features" on page 47 or "Fibre Channel Cable Features" on page 49.

SCSI Interposers

Table 38 shows required interposers.

Table 38. 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

SAN Attachment

Software requirements for attachment to various Fibre Channel fabric components depends on the server and adapter being used. Refer to the list of supported servers for software requirements for various configurations at the following Web site:

<http://www.storage.ibm.com/tape/3590/>

Attention: Tape and disk over the same adapter is not advised due to performance and stability concerns caused by the differing traffic profiles.

Native Fibre Attachment

The 3590 E Model and H Model Tape Drives with Fibre Channel Attachment (FC9510 or FC3510) can attach through a variety of Fibre Channel Switches and Fibre Channel Directors, such as:

- IBM TotalStorage SAN Switch 2109 Models S08 and S16
- IBM TotalStorage SAN Switch 2109 Model F16
- INRANGE FC/9000 Fibre Channel Director 64 (IBM 2042-001)
- INRANGE FC/9000 Fibre Channel Director (IBM 2042-128)
- McDATA ES-1000 Loop Switch (IBM 2031-001)

The McDATA ES-1000 Loop Switch is required to attach the 3590 E or H Model to the McDATA ES-3016 and ES-3032 Fabric Switches, McDATA ED-5000 Enterprise Fibre Channel Director (IBM 2032-001), and McDATA ED-6064 Enterprise Fibre Channel Director (IBM 2032-064). The support is dependent on server, operating system, and host bus adapter being used. For a current list of supported products or more information on the support and prerequisites, refer to the following Web site:

<http://www.storage.ibm.com/tape/3590/>

More information on supported Fibre Channel HBAs and supported directors is also available at:

http://ssddom02.storage.ibm.com/hba/hba_support.pdf

The 3590 H Model is not supported by the IBM 2108 SAN Data Gateway.

FICON Attachment

The 3590 B, E, and H Models are supported in native FICON environments when attached to the Enterprise Tape Controller Model A60 with a variety of Fibre Channel Directors. Supported products include:

- INRANGE FC/9000 Fibre Channel Director 64 (IBM 2042-001)
- INRANGE FC/9000 Fibre Channel Director (IBM 2042-128)
- McDATA ED-5000 Enterprise Fibre Channel Director (IBM 2032-001)
- McDATA ED-6064 Enterprise Fibre Channel Director (IBM 2032-064)

For more information on the FICON Director support and prerequisites, refer to the following Web site:

<http://www.ibm.com/storage/ibmsan/products/sanfabric.html>

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 nondisruptive process.

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

Due to the 3590 SCSI Ultra/wide device speed, SCSI timeouts 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.

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 2 on page 3 for detailed information on specific models.

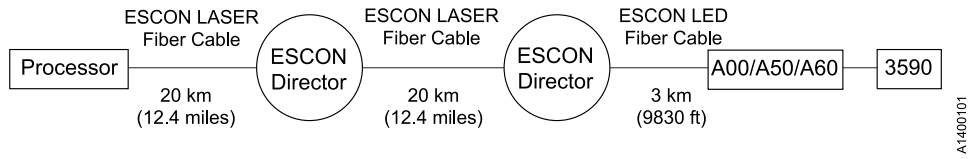
Refer to *IBM 3591 Model A01 Tape Control Unit Introduction, Planning, and User's Guide* for information on Model A01 configuration. Because all system attachments do not support all host processor types, check with your marketing representative for details.

As part of your installation plan, analyze your performance and distance requirements carefully. See "ESCON System Attachments" and "ESCON Host Attachment" on page 107 for a starting point for a discussion with your IBM installation planning representative.

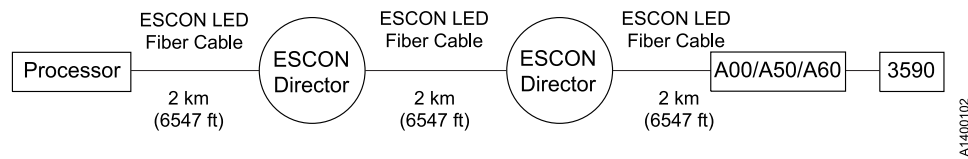
Refer to the Installation chapter of *IBM 3590 Tape Subsystem Maintenance Information A60 Controller* for installation information.

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

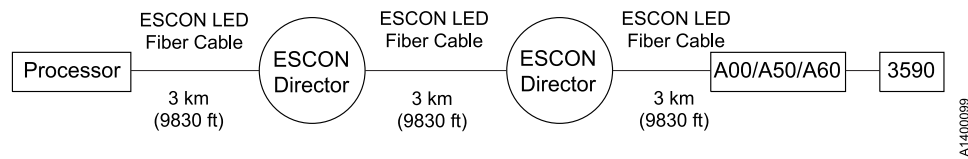
A 3590 can be located up to 43km (27 miles) from a processor when using the ESCON laser fiber cable and two ESCON directors:



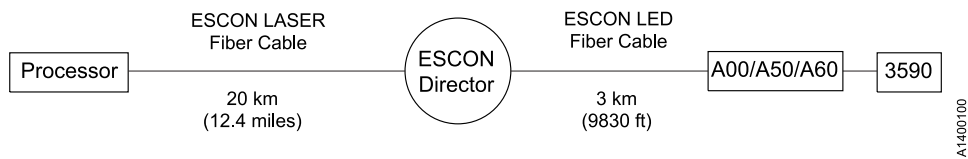
A 3590 can be located up to 6 km (3.73 miles) from a processor when using the ESCON LED 50.0 micron cables and two ESCON directors:



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:



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:



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

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

ESCON Host Attachment: Table 39 lists Model A60 ESCON host attachment features.

Table 39. 3590 Model A60 ESCON Host Attachment Features

Feature Code	Group Number ¹	Number of Cables	Connector ID
3412 ²	3797/8486	1	55
3412 ²	3797/8486	1	57
3412 ²	3797/8486	1	59
3412 ²	3797/8486	1	61
3412 ^{2,3}	3797/8486	1	63
3412 ^{2,3}	3797/8486	1	65
3412 ^{2,3}	3797/8486	1	67
3412 ^{2,3}	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-optics jumper cables are available from IBM in the fixed lengths shown in Table 40.

Table 40. 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 Model A01 Tape Control Unit Introduction, Planning, and User's Guide* for information.

3592 Model J70 Control Unit Environment

For information on the 3592 Model J70 control unit environment, refer to the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

ES/3090, ES/9000, S/390, and zSeries Systems

Models B11, E11, and H11 and B1A, E1A, and H1A Tape Drives are supported for attachment to ESCON and FICON channels on these systems through the Model A60 Controller. The tape system will operate in either 3590 or 3490E emulation mode. The tape drives are added to the host system's I/O configuration as if they were device type 3590 or 3490E. Table 41 gives the supported drive model and controller model combinations. Table 42 on page 110 gives the minimum operating system levels for Models B, E, and H.

Table 41. Drive and Controller Combinations

3590 Drive Model	Controller Model
H1A, H11	A60, J70 ¹
E1A, E11	A50 ² , A60, J70 ¹
B1A, B11	Model 3591 A01 ² , A00 ² , A50 ² , A60, J70 ¹

Note:

1. Refer to the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide* for more information.
2. No longer offered by IBM.

The 3590 Model H11 and H1A can be attached to ESCON and FICON channels of an ES/3090, ES/9000, S/390, or zSeries system via the 3590 Model A60 or 3592 Model J70 Controller. Up to four Model H11 drives and one Model A60 Controller can be placed in a Model A14 for non-library attachment to an ES/3090, ES/9000, S/390, or zSeries system. Up to four Model H11 drives and a 3590 Model A60 or 3592 Model J70 Controller can be placed in either a 9309-002, 7014-S00, 7014-T00, 7014-T42, 7015-R00, or space in an existing customer rack. Each H11 drive installed in a rack must have a rack placement code (FC9221, FC9222, or FC9223) and appropriate SCSI or Fibre Channel cables.

For use with an Enterprise Tape Library 3494, up to four Model H1A drives can be attached through one Model A60 or 3592 Model J70 Controller in a 3494 frame. Up to ten Model H1A drives can be attached to one Model A60 or 3592 Model J70 Controller in a 3494 frame when utilizing Adjacent Frame Support. Four Model H1A drives can be installed in a 3590 Model C12 or C14 Silo Compatible Frame attached to a StorageTek ACS and connected to ESCON or FICON channels through a 3590 Model A60 or 3592 Model J70 Controller.

Model H, 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, "Operational Considerations," on page 119 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 3590 media capacity. Always check the 3590 PSP bucket for details on required or recommended maintenance.

The A60 or J70 Control Unit hardware has application specific features that can improve capacity, utilization, and performance. Refer to the application related information on "Application-Related Features of the A60 Control Unit" on page 65. For information on the 3592 Model J70 Control Unit, refer to the *IBM TotalStorage Enterprise Tape System 3592 Introduction and Planning Guide*.

Table 42. Minimum Operating System Support for the 3590 Tape Drive Models B, E, and H

Operating System	Minimum Levels ¹	Comments
OS/390	Version 2 Release 9 with DFSMS/MVS [®] Version 1 Release 5 ² . Version 2 Release 10 with its associated level of DFSMS ² .	PTFs are required for 3590 H Model support. PTFs are required for FICON support.
z/OS	Version 1 Release 1 and subsequent releases with associated level of DFSMS ² .	PTFs are required for 3590 H Model support. APAR OW47844 is recommended for FICON support.
z/VM	Version 3 Release 1 and subsequent releases, and DFSMS/VM [®] FL221.	PTFs are required for 3590 H Model support ³ . APAR VM62710 is required for native z/VM support with FICON.
VM/ESA	Version 2 Release 4 and DFSMS/VM FL221.	PTFs are required for 3590 H Model support ³ . APAR VM62710 is required for native VM/ESA support with FICON.
VSE/ESA	Version 2 Release 5 and subsequent releases.	- -
TPF	Version 4 Release 1 and subsequent releases. Requires 3590-support PTFs.	3590 Model B drives only.
Notes: <ol style="list-style-type: none"> PTFs may be required. Refer to 3590 and specific processor PSP buckets for details. PTFs are required for DFSMS for the application-related features of the A60 Control Unit described in "Application-Related Features of the A60 Control Unit" on page 65. For more details, refer to the closing text of the APAR OW49829. PTFs for APAR VM63073 are required for the CMS component of VM levels 240, 310, 410, and 420. PTFs for APAR VM63074 are required for the CP component of VM levels 240, 310, 410, 420, and 430. PTFs for APAR VM63097 are required for DFSMS/VM FL221. 		

Note: For OS/390 or z/OS, support for the H Model Tape Drives provides controls to allow intermixing H Model, E Model, and B Model tape drives in an SMS-managed automated Enterprise Tape Library 3494 or an IBM manual tape library. Allocations provide a desired drive type that is managed through a data class attribute for the 256- or 384-track recording format. Downward read compatibility of the 128- and 256-track tapes on the 384-track H Model Tape Drives is exploited in libraries with those tape systems. Shared common media pools are used in H Model, E Model, and B Model tape systems. In an IBM tape library, the H Model drives are defined through HCD in the I/O configuration as device type 3590, not as device type 3490E. The H Model software enhancements are required even if you are not intermixing H Model, E Model, and B Model tape systems in the library.

For tape drives not inside IBM tape libraries, non-library drives or drives located in Silo Compatible frames), 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 H Model, E Model, and B Model Tape Drives that are both defined in the I/O configuration as device type 3590.) Allocation for different drive models having the same device type must be managed under SMS as a manual library (available on DFSMS/MVS Version 1 Release 5 or later, for stand alone drives); or through local procedures or software products, such as Basic Tape Library Support (BTLS) for StorageTek's Host Software Component (HSC). Although the H Model device support PTFs do not manage allocation issues for mixed models outside libraries, this maintenance should be applied to realize

capacity exploitation benefits with applications such as HSM, OAM Object support, and DFSORT™ and to enable EREP reporting by true device type or model. This maintenance is also required to enable the H Model devices to come online. For further details about planning for emulation mode support, see Chapter 8, “Operational Considerations,” on page 119.

Note: OS/390, z/OS, VM, z/VM, and VSE system software and service updates are distributed on 3480 and 3490 format tape cartridges. In situations where the 3590 Tape Drives are sold into new accounts, it will be necessary to ensure the installation has at least one system-attached 3490 Tape Drive to read the system installation tapes, except for the following:

- z/OS Version 1 Release 3 ServerPac and Custom-Built Product Delivery Option (CBPDO) support delivery on 3590 media, including support for CBPDO service orders on 3590 media
- z/VM Version 4 Release 3 and System Delivery Option (SDO) products are available for installation and service on 3590 tape cartridges, except in Japan.

Application Performance and Capacity Enhancements: The 3590 Model A60 capacity and performance enhancements are supported on the minimum OS/390 and z/OS operating systems and DFSMS levels shown in Table 42 on page 110. The capacity and performance enhancements are also supported when the OS/390 and z/OS versions in Table 42 on page 110 are run as guests under z/VM Version 4 Release 2 and subsequent releases for 3590 B Model and E Model Tape Drives, or Version 4 Release 3 and subsequent releases for 3590 H Model Tape Drives. PTFs are required for DFSMS. Refer to the closing text of APAR OW49829 for further details. Additional PTFs may be required for the 3590 H Model.

Application Performance and Capacity Enhancement Limitations: The following limitations apply to capacity enhancements with DFSMSHsm:

- Tapes written with DFSMSHsm using the new extended capacity can only be read on tape devices that support this capability. Such devices include:
 - 3590 Tape Drives in 3490 emulation mode attached to Model A60 Controllers that have the new hardware enhancement and are attached to a system running DFSMS/MVS Version 1 Release 5 (or above), with all applicable maintenance applied.
 - 3590 H Model, E Model, and B Model Tape Drives that are not in 3490 emulation mode if the tapes are first converted to native 3590 via the DFSMSHsm ADDVOL command by a system that supports the new extended capacity.
- The new extended capacity capability does not apply to a 3590 Model A60 subsystem in an Enterprise Tape Library 3494 or to an SMS-managed manual tape library because 3490E emulation is not supported in either type of library.
- DFSMS/MVS Version 1 Release 4, with appropriate PTFs, can coexist with higher levels of DFSMS that support the new extended capacity capability. However, tapes written with the new capacity cannot be read or extended on any version of DFSMS prior to DFSMS/MVS Version 1 Release 5 unless the tapes are first converted to 3590 native capacity via the DFSMSHsm ADDVOL command by a system that supports the new extended capacity.

File positioning enhancements do not apply to ISO or ANSI Version 3 tapes.

Write performance enhancements do not apply to ISO or ANSI tapes.

FICON Attachment Planning

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

- Configurations with FICON System Attachment
- FICON Host Attachment

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.

Note: See Table 2 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 1-Gbps FICON adapter (FC3432 and FC3433) provides up to 64 logical attachments and each 2-Gbps FICON adapter (FC3434 and FC3435) provides up to 128 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 43 lists Model A60 FICON host attachment features.

Table 43. 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	8310	1	75
3433	8310	1	77

Note: To plan and order unspecified cable lengths for FC 3434 and FC 3435 see “Fiber Transport Services” on page 114.

Cables:

2-Gbps FICON Long-Wavelength Channel Attachment: The 2-Gbps FICON long-wavelength adapter shipped with FC3434 (2-Gbps FICON Attachment – Long Wavelength) has an LC Duplex Connector. One 31-meter (100-foot) single-mode 9-micron cable with LC Duplex Connectors on both ends is included with each FC3434, unless FC9793 (9-Micron LC/SC Fibre Cable) is specified. This cable can be attached to fibre components with LC Duplex adapters, such as the FICON channel feature for zSeries servers (FICON Express LW 1.75, FC2319) or supported Fibre Channel Directors with LC Duplex Connectors. A Model A60 with

FC3434 can be directly attached to host systems up to 10 km away. A long-wavelength connection with FC3434 can run over 9-micron cables up to a distance of 100km (62 miles) through FICON/FC switches with appropriate repeaters.

If FC9793 (9-Micron LC/SC Fibre Cable) is specified, a 31-meter (100-foot) single-mode 9-micron Fibre cable with an SC Duplex Connector on the host attachment end will be included instead of the standard cable with LC Duplex Connectors on both ends. The cable shipped when FC9793 is specified can be attached to Fibre components with SC Duplex Connectors, such as FICON longwave channel features on G5 or G6 servers (FC2314) or zSeries servers (FC2315), or supported Fibre Channel Directors with SC Duplex Connectors.

2-Gbps FICON Short-Wavelength Channel Attachment: The 2-Gbps FICON short-wavelength adapter shipped with FC3435 (2-Gbps FICON Attachment – Short Wavelength) has an LC Duplex Connector. One 31-meter (100-foot) multimode 50-micron cable with LC Duplex Connectors on both ends is included with each FC3435, unless FC9794 (50-Micron LC/SC Fibre Cable) is specified. This cable can be attached to fibre components with LC Duplex adapters, such as the FICON channel feature for zSeries servers (FICON Express SW 1.75, FC2320) or supported Fibre Channel Directors with LC Duplex Connectors. A 2-Gbps short-wavelength connection with FC3435 can run over 50-micron cables up to a distance of 300 meters (984 feet), or over 62.5-micron cables up to a distance of 150 meters (492 feet).

If FC9794 (50-Micron LC/SC Fibre Cable) is specified, a 31-meter (100-foot) multimode 50-micron Fibre cable with an SC Duplex Connector on the host attachment end will be included instead of the standard cable with LC Duplex Connectors on both ends. The cable shipped when FC9792 is specified can be attached to fibre components with SC Duplex Connectors, such as FICON Shortwave channel features on G5 or G6 servers (FC2316) or zSeries servers (FC2318), or supported Fibre Channel Directors with SC Duplex Connectors.

1-Gbps FICON Long Wavelength Channel Attachment: The 1-Gbps FICON long wavelength adapter shipped with FC3432 (FICON Attachment - Long Wave) has an SC-Duplex Connector. By specifying FC9791 (9 Micron LC/SC Fibre Cable), a 31 meter (100 foot) Single Mode 9 micron fibre cable with an LC-Duplex Connector on the host attachment end will be included instead of the standard cable with SC-Duplex Connectors on both ends. The cable shipped by specifying FC9791 can be attached to fibre components with LC-Duplex Connectors, such as the new FICON channel feature for zSeries servers (FICON Express LW 1.75, FC2319) or supported Fibre Channel Directors with LC Duplex Connectors. A long wavelength connection can run over 9 micron cables up to a distance of 100 km (62 miles) through FICON/FC switches with appropriate repeaters.

1-Gbps FICON Short Wavelength Channel Attachment: The 1-Gbps FICON short wavelength adapter shipped with FC3433 (FICON Attachment - Short Wave) also has an SC-Duplex Connector. By specifying FC9792 (50 Micron LC/SC Fibre Cable), a 31m (100 ft) multimode 50 micron fibre cable with an LC Duplex Connector on the host attachment end will be included instead of the standard cable with SC Duplex Connectors on both ends. The cable shipped by specifying FC9792 can be attached to fibre components with LC Duplex Connectors, such as the new FICON channel feature for zSeries servers (FICON Express SW 1.75, FC2320) or supported Fibre Channel Directors with LC Duplex Connectors. A short wavelength connection can run over 50 micron cables up to a distance of 500 meters (1,650 feet).

Fiber Transport Services

Additional Cables, Fabric Components, and Cabling Solutions: Conversion cables from SC Duplex to LC Duplex are available as features on the zSeries servers for customers currently using cables with SC Duplex Connectors that now require attachment to fibre components with LC Duplex connections. Please refer to the IBM 2064 sales manual for more information on these conversion kits.

Additional Information: In many situations, the configuration and facility specifications may require different cable lengths or the installation of cables. Product Support Services offered by IBM Global Services can provide additional fiber-optic components and fiber-optic cabling solutions. IBM Site and Connectivity Services (IT Consulting and Implementation Services in the U.S.) provides structured, modular, fiber-optic data center connectivity solutions as part of its Fiber Transport Services (FTS) offering. Pre-terminated fiber-optic trunk cables in standard lengths up to 138 m (450 ft) and fiber-optic jumper cables in lengths up to 61 m (200 ft) are available as part of the planning, fiber-optic commodities, and installation activities performed by IBM personnel. Custom lengths and custom installation of fiber-optic cables, both multimode and singlemode, can also be provided as part of IBM Site and Connectivity Services' solutions. Contact your local IBM Services Sales Specialist for additional information on Fiber Transport Services or IBM Site and Connectivity Services. In the United States, call 1-800-IBM-4YOU (426-4968). Additional information can be found at:

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

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:

- "Data Path Failover"
- "Multiple Fibre Channel Ports"
- "Fibre Channel Physical Interface Characteristics" on page 116
- "Supported Topologies" on page 116
- "Address Assignments" on page 117
- "Worldwide ID and LUN Assignments" on page 117
- "Removing, Installing, or Resetting a 3590 on an Active Fibre Channel" on page 118
- "Sharing on a Storage Area Network" on page 118

Data Path Failover

Data Path Failover provides a new capability in the AIX tape device driver that allows you to configure multiple redundant paths in a SAN environment to 3590 E and 3590 H Model Tape Drives having Fibre Channel Attachment. In the event of a path or component failure, the failover mechanism is designed to automatically seek to retry the current operation using the alternate, preconfigured path without aborting the current job in progress. This can provide improved availability in your SAN configuration and management.

Multiple Fibre Channel Ports

The 3590 Model H11, H1A, 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)
- Hewlett Packard
- Intel compatible platform with Windows NT, 2000, or Linux
- xSeries (NUMA-Q [B and E Model Drives only])
- Sun PCI bus, Windows NT, and Windows 2000
- Sun S-bus
- Compaq Alpha

Plug any unused ports.

Fibre Channel Physical Interface Characteristics

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

For Fibre Channel cable feature codes, see “Fibre Channel Cable Features” on page 49.

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 118 for this function’s potential needs.

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

IBM 2032 Model 001 McData ED-5000 Switch: 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.

IBM 2042 INRANGE FC/9000 Fibre Channel Director: The 3590 Model H11, H1A (H Model), E11, or E1A (E Model) Tape Drives with Fibre Channel Attachment (FC9510 or FC3510) can attach through an IBM 2042 InRange FC/9000 Fibre Channel Director to the Qlogic QLA2200F Fibre Channel Adapter on Intel based servers running Microsoft Windows NT or Windows 2000, or to the QLA2200F or Emulex LP8000 or LP8000S Fibre Channel Adapters on Sun servers with Sun Solaris 2.6, 7, or 8. An update of the 3590 Tape Drive microcode is required, so installed 3590 H or E Model Tape Drives will need to have the Drive Microcode Update (FC0500).

IBM 2031 McDATA ES-1000 Loop Switch: The TotalStorage 3590 Model H11, H1A (H Model), E11, or E1A (E Model) Tape Drives with Fibre Channel Attachment (FC9510 or FC3510) can attach through the IBM 2031 McDATA ES-1000 Loop Switch and a McDATA ED-5000 to attach to pSeries and RS/6000 models running AIX 4.3.3, or later.

For more information on Fibre Channel fabric support, visit the web at:

<http://www.ibm.com/storage/ibmsan/products/sanfabric.html>

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 3590 H or E Models 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 118.

Worldwide ID and LUN Assignments

Each port on the 3590 H or E Model drive has a Worldwide 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 3590 H or E Model Drive provides one LUN at LUN address 0. It also provides a Medium Changer device at LUN address 1 for ACF models H11 and 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.

Chapter 8. Operational Considerations

This chapter provides an overview of considerations related to device-type emulation with IBM 3590 tape drives. It helps you understand the kinds of situations that require special attention or may potentially pose usage restrictions with emulation mode operation. For a more detailed treatment of these considerations, refer to *IBM TotalStorage Enterprise Tape System 3590: Multiplatform Implementation and Software Support for the IBM TotalStorage Tape System 3590 Models E1x/H1x*, SC35-0484.

- “General Considerations for Emulation Mode Operation”
- “Library Maintenance” on page 120
- “Drive Allocation/Selection” on page 120
- “Media Capacity Exploitation” on page 122
- “Catalog Considerations” on page 123
- “Media Interchangeability” on page 123
- “3490E-Emulation Compared to Actual 3490E” on page 124

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 the native 3590 or 3490E emulation 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 Hxx and Model Exx support is provided only as an emulation of 3590 Bxx support. This is because the actual recording technology of the 384-track Model H or 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 H or Model E drives, we refer to the 3590 definition as an “emulation mode.” Table 44 shows device model definition options by device-type.

Table 44. Device-Type Definition Options

3590 Models	Device-Type Definition Options
H11, H1A	3590 emulation or 3490E emulation
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 H drive media is written in 384-track format and 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 H or 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 H and 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 z/OS or OS/390 environment for drives that are not installed in IBM 3494 libraries, and (2) in VM/ESA or VSE/ESA environments for drives either inside or outside 3494 libraries.

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.

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 H or 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.

OS/390, z/OS Considerations (MVS/ESA™)

Support the 3590 H Model Tape Drives provides controls to allow intermixing H Model, E Model, and B Model Tape Drive systems in an SMS-managed automated Enterprise Tape Library 3494 or in an IBM manual tape library. Allocations provide a desired drive type that is managed through a data class attribute for the 384-track recording format. Downward read compatibility of 128-track and 256-track recorded tapes on H Model Tape Drives is exploited in libraries with 128-track, 256-track, and 384-track tape systems. Shared common media pools are used for 3590 H Model, E Model, and B Model tape systems. In an IBM tape library, the 3590 H Model drives are defined through HCD in the I/O configuration as device type 3590 (not as device type 3490E). The 3590 H Model software enhancements are required even if you are not intermixing H Model, E Model, and B Model tape systems in the library.

For 3590 H Model, E Model, and B Model Tape Drives not inside an IBM tape library (non-library drives or drives located in Silo compatible frames), the software support cannot manage allocation among multiple drive models that use the same emulation type. Allocation for different drive models having the same device type must be managed under SMS as a manual library, which is available on DFSMS/MVS Version 1 Release 5 or later for stand alone drives. It is also available through local procedures or software products, such as Basic Tape Library Support (BTLS) or StorageTek's Host Software Component (HSC). Although the 3590 H Model device support PTFs do not manage allocation issues for mixed drive models outside libraries, this maintenance should be applied to realize capacity exploitation benefits with such applications as HSM, OAM Object Support, and DFSORT, and to enable EREP reporting by true device type or model. This maintenance is also required to enable the 3590 H Model devices to come online.

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 (BTLS) 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 *IBM TotalStorage Silo Compatible Tape Frame 3590 Introduction, Planning, and User's 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 and z/VM 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 3590 Model H, Model E, and Model B are added in 3490E emulation mode, the ASSGN JCL statements that specifies "3490 H or E" cannot work properly. The same applies if either Model H, Model E, or Model B is added when there are also actual 3490E drives present. If Model H, Model E, and Model B are added in 3590 mode, then ASSGN JCL statements that specify "3590" cannot work properly.

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.

Tapes written with DFSMSHsm using the extended capacity capability can only be read on tape devices that support this capability. Devices supporting this extended capacity include:

- 3590 Tape Drives in 3490 emulation mode attached to Model A60 Controllers that have this new hardware enhancement and are attached to a system running DFSMS/MVS Version 1 Release 5 or above with all applicable maintenance applied
- 3590 B, E, and H Model Tape Drives that are not in 3490 emulation mode if the tapes are first redefined as native 3590 via the DFSMSHsm ADDVOL command by a system that supports this new extended capacity

MVS/ESA (OS/390) Considerations

OAM

An OAM enhancement will allow full 3590 cartridge capacity exploitation when 3590 drives are attached with the 3490E emulation feature.

VM/ESA and z/VM 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.

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 inventoried again. 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.

OS/390, z/OS Considerations (MVS/ESA)

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.

Media Interchangeability

As mentioned above, data is always written on the 3590 media in the recording format of the actual drive. Model H drive media is written in 384-track format, regardless of device-type definition. Model E drive media is written in 256-track format, and 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).

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 A60 Control Unit offers the option of using 3590 block id architecture when the subsystem is in 3490E emulation mode. See “Application-Related Features of the A60 Control Unit” on page 65 for more details.

- **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.

Appendix. Appendix A: Host Reporting

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 runs 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 require 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 allows 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 information facilitates 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 code 0 (FID4) means the device requires service, but normal drive function is not affected.
- Severity 1 code (FID3) means the problem is moderate.
- Severity 2 code (FID2) means the problem is serious.
- Severity 3 code (FID1) means the problem is acute.

A MIM specifies what is wrong with the indicated cartridge. The three MIM severity codes display:

- Severity 1 code indicates the detection of *high temporary read/write* errors (moderate severity).
- Severity 2 code indicates *permanent read/write* errors were detected (serious severity).
- Severity 3 code indicates *tape directory* errors were detected (acute severity).

A configuration option allows reporting of 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.

SIM/MIM Presentation

SIMs and MIMs reporting vary for different systems. Refer to the *Statistical Analysis and Reporting System User Guide* which can be accessed on the web site listed at xviii. This book cannot be ordered.

There are specific SIM and MIM presentations for the following systems-

System	Presentation
S/390 or zSeries	IEA480E and IEA486E messages, as well as EREP reports
VM/ESA	HCP6359I and HCP6357I messages, as well as EREP reports
VSE/ESA	OP64I, OP65I, and OP20 messages, as well as EREP reports
TPF	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
Linux	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, or go to the IBM terminology web site at <http://www-3.ibm.com/ibm/terminology/>.

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.

database. A set of data, consisting of at least one file, 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 an 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 (such as 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 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 function 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 operation; 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 (void). 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 void may be associated with multiple units of media or the different voids may be associated with the same unit of medium.

W

Worldwide 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.

Index

Numerics

- 2109 switch 39
- 3490E emulation comparison 124

A

- accumulate mode, ACF 53
- acoustic specifications 82
- active Fibre Channel 118
- active SCSI bus 104
- additional publications xvii
- AIX License Information
 - Additional Terms and Conditions 131
- applications programming 64
- assigning drives 51
- Automated Tape Library 3494 Support 17
- automatic mode, ACF 53

B

- buffering, read/write 51

C

- cabling information 82
- Call Home 15
- changes, summary of iii
- checklists 78
- component specifications 86
- compression, data 66
- Control Unit Features 28
 - 3591 Model A01 control unit 39
 - Additional A60 Fibre Channel to Tape Drive Requirements 38
 - 2109 switch 39
 - control unit feature definitions 31
 - control unit feature descriptions 28
 - Model A60 attachment capabilities 37
- cooling requirements 82
- cords, power 85

D

- data migration 67
- data security erase 64
- Device Attachment 101
 - ESCON attachment planning 105
 - ESCON attachment configurations 105
 - ESCON host attachment 107
 - ESCON system attachments 105
 - Host I/O configuration control requirements for S/390 and zSeries systems 108
 - Model A01 tape control unit environment 108
 - Fibre Channel attachment planning 114
 - Address assignments 117

- Device Attachment (*continued*)
 - Fibre Channel attachment planning (*continued*)
 - Fibre Channel Physical Interface Characteristics 116
 - Multiple Fibre Channel Ports 114
 - Removing, Installing, or Resetting an Active Fibre Channel 118
 - Sharing on a Storage Area Network (SAN) 118
 - Supported topologies 116
 - Worldwide ID and LUN assignments 117
 - FICON attachment planning 112
 - Cables 112
 - FICON host attachment 112
 - FICON system attach configurations 112
 - SCSI attachment planning 101
 - Bus termination 102
 - host hardware and software considerations 102
 - multiple SCSI ports 101
 - Removing, Installing, or Resetting an Active SCSI bus 104
 - SCSI ID and LUN assignments 102
 - SCSI physical interface characteristics 101
 - Sharing SCSI Buses with Disk Devices 104
 - Ultra SCSI and non-Ultra (Fast/Wide) SCSI Peripherals 104
- Device Characteristics 81
 - Site Planning 81
 - acoustic specifications 82
 - cabling information 82
 - component specifications 86
 - cooling requirements 82
 - Environmental considerations 81
 - power characteristics 83
 - power cords 85
 - power specifications 83
 - thermal protection 82
- device-type emulation 119
- Drive Features 23
 - drive feature definitions 24
 - drive feature description 23

E

- electronic emission notices 132
- emulated device types 123
- emulation mode operation 119
- emulation, device type 119
- end of data (EOD), logical 125
- Enterprise Tape Library 3494 Considerations 17
- environmental specifications 81
- ERA code 2C, permanent equipment check 124
- ERA code 2E, not capable 124
- ERA code 48, unsolicited informational data 124
- erase function 64

F

- Fibre Channel Cable Features 49
 - Feature Definitions 49
 - Feature Description 49
- FID 127
- file protect 57
- formats, managing multiple tape formats and lengths 69
- Frame Features 39
 - Model A14 Feature Definitions 40
 - Extended High Performance Cartridge Tape MES (FC9780) 45
 - Model A14 Feature Description 39
 - Model C10, C12, and C14 Frames 46
 - Rack Mount Frames 46
- frame mount, A14 96
- functions, standard 51

G

- GBIC 39
- glossary 135

H

- High Performance Cartridge Tape and Extended High Performance Cartridge Tape 55
 - tape characteristics 56
 - tape handling and storage advantages 58
- Host Reporting 127
 - Service and Media Information Messages (SIMs and MIMs) 127
 - SIM/MIM Presentation 128
 - Statistical analysis and reporting system (SARS) 127
- host system attachment 8
 - ESCON attach 8
 - Fibre Channel attach 8
 - FICON attach 8
 - SCSI attach 8

I

- IBM 3495 Tape Library Considerations 19
- IBM TotalStorage Enterprise Tape Library 3494 Considerations 17
- improved data recording capability 66
- input voltages 83
- Installing active Fibre Channel 118
- interrupts 64
- Introduction 1
 - Model Attachment 3
 - Read and Write Capacity 2

L

- Language 50
 - Features 50
- language feature codes 50
- Laser safety and compliance 131

- library maintenance 120
- library mount, A14 96

M

- managing multiple tape formats and lengths 69
- manual mode, ACF 53
- Material Handling Safety xv
- media interchangeability 123
- migration planning 67
- missing interrupts 64

N

- nonoperating temperature, 3590 82
- not capable, ERA code 2E 124
- Notices 129

O

- operating temperature, 3590 82
- Operational Considerations 119
 - 3490E-Emulation compared to actual 3490E 124
 - Application Software
 - ES/3090/ ES/9000, S/390, and zSeries systems 108
 - Catalog Considerations 123
 - Emulated device types 123
 - OS/390, z/OS considerations (MVS/ESA) 123
 - Drive Allocation/Selection 120
 - OS/390, z/OS considerations (MVS/ESA) 120
 - VM/ESA considerations 121
 - VSE/ESA considerations 121
 - General considerations for Emulation Mode operation 119
 - Library Maintenance 120
 - Media capacity exploitation 122
 - MVS/ESA (OS/390) considerations 122
 - VM/ESA considerations 122
 - VSE/ESA considerations 122
 - Media Interchangeability 123
 - Tape Cartridge Considerations 55
- operator training 63

P

- permanent equipment check, ERA code 2C 124
- personnel planning for migration 78
- planning considerations
 - planning for data migration
 - cartridge reuse 67
 - managing multiple tape formats and lengths 69
- Planning Considerations 59
 - Planning Checklists for SCSI and Fibre Channel 78
 - Planning personnel 78
 - task assignments 78
 - Planning for 3590 Model B to E Migration
 - HCD 72
 - host software 71
 - JES 72

- Planning Considerations *(continued)*
 - Planning for 3590 Model B to E Migration *(continued)*
 - Other migration considerations 73
 - Silo compatible frame considerations 72
 - SMS definitions 72
 - Planning for 3590 Model B to H or E to H Migration 73
 - HCD 74
 - host software 74
 - Other migration considerations 75
 - Silo compatible frame considerations 75
 - SMS definitions 74
 - Planning for applications programming 64
 - data compression 66
 - data security erase 64
 - missing interrupt handler 64
 - other considerations 65
 - software tools 65
 - status bytes and sense bytes 66
 - tape write immediate mode 66
 - volume mount analyzer 65
 - Planning for Data Migration 67
 - Planning for Model B to E Migration 71
 - Planning for Operator training 63
 - Planning for SCSI to Fibre Channel Migration 77
 - 3494 frame frame considerations 77
 - host software 77
 - Silo compatible frame considerations 77
 - Planning for supplies and equipment 59
 - 3590 feature definitions 60
 - 3590 supplies 60
 - 3590 supplies feature description 60
 - cartridge weights 62
 - label ordering 62
 - Media supply contact 62
 - Preformatted data cartridges 61
- point-to-point loop 117
- power characteristics 83
- power specifications 83
- priority cell, ACF 53
- Publications xvii
 - 3592 xvii
 - FICON xvii

R

- rack mount 98
- random 2lun mode, ACF 54
- random mode, ACF 53
- read/write buffering 51
- remote service alert 15
- Removing active Fibre Channel 118
- requirements, software 119
- Resetting active Fibre Channel 118

S

- Safety xv
- safety, laser 131
- SARS 127

- scratch pool cartridges 69
- SCSI Cable Features 47
 - Feature definitions 48
 - Feature description 47
- SCSI interposer 102
- sense bytes 66
- service alert 15
- ship group 59
- shipping temperature, 3590 82
- site planning 81
- Software and Operating Systems Support 19
 - 3590 Operating Systems and Platforms 19
 - Device Drivers 21
 - Independent Software Vendors 20
- software requirements 119
- software tools 65
- Standard Features 23
- standard functions 51
 - Automatic cartridge facility 52
 - ACF security provisions 54
 - drive assignment 51
 - high speed search 51
 - message display 52
 - Read/Write buffering 51
- status bytes 66
- summary of changes iii
- supplies and equipment, planning 59
- support, software 19
- switched Fabric 116
- system mode, ACF 53

T

- tape drives 9
- tape handling advantages 58
- Tape System Description 9
 - Call Home 15
 - Control Units 12
 - Frames 15
 - Operator Display Panel 54
 - Power On/Off Switch 54
 - Racks 16
 - tape drives 9
- task assignments 78
- temperature ranges 82
- terminology 135
- thermal protection, drives 82
- TotalStorage Enterprise Tape Library 3494
 - Considerations 17
- Trademarks 130
- training, operator 63
- trouble alert 15

V

- volume mount analyzer 65

W

- write-validity-check option 66

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