IBM Enterprise Storage Server Delivers Increased Performance and Enhanced Connectivity with Native FICON

Overview
The Enterprise Storage Server™ (ESS), a leading storage solution used in Storage Area Networks (SANs), has just become even better.

The ESS, designed to provide a high level of performance, reliability, and heterogeneous server connectivity, is expanding its performance and connectivity options with support for native Fibre CONnections (FICON™) attachment and new enhanced Fibre Channel and ESCON adapters. A new 24 GB Cache feature has been added, providing an additional level of configuration flexibility and granularity. FlashCopy and Peer-to-Peer Remote Copy (PPRC) support for IBM @server iSeries and AS/400® servers, and ESS Copy Services Command Line Interface (CLI) support for the ptx® operating system are also being announced.

The ESS supports an intermix of FICON, ESCON, SCSI, and Fibre Channel attachments, making the ESS a natural fit for storage and server consolidation requirements. The new Fibre Channel/FICON Host Adapters support either FICON or SCSI-FCP over short-wave or long-wave fibre links to provide FICON attachment to IBM @server zSeries or S/390® servers, and FCP attachment to open systems servers. The FICON maximum channel link speed of 100 MB/sec full duplex versus 20 MB/sec simplex for ESCON, can significantly enhance disk storage performance. FICON will be supported on the ESS 2105 Models F10 and F20. The ESS may be directly attached to zSeries or S/390 servers up to 10 km away (20 km via a request for price quotation (RPQ)) or up to 100 km with appropriate SAN fabric components.

Today’s announcement fulfills (Preview) Hardware Announcement 100-328, dated October 10, 2000.

Key Prerequisites
Refer to the Technical Information section.

Planned Availability Dates
Refer to the Description section.

At a Glance
ESS Enhancements:
- Native FICON attachment significantly increases channel bandwidth as compared to ESCON, supporting:
  - Up to 16 FICON attachments per ESS
  - Enhanced subsystem performance
  - Increased attachment distance
  - Greater parallelism and bandwidth for Parallel Access Volumes (PAVs) via multiple data transfers to the same volume, at the same time, over the same channel
  - Streaming of Channel Command Words (CCW) from the channel to the control unit without intermediate status or acknowledgments
  - Multiple channel programs — to the same or different control units on a FICON link at the same time
- Improved flexibility and granularity with a 24 GB cache option
- An enhanced ESCON adapter with new microprocessors for greater performance over the standard ESCON adapter
- New Fibre Channel long-wave adapter and an enhanced Fibre Channel short-wave adapter with new microprocessors for greater performance
- PPRC and FlashCopy support for iSeries and AS/400 servers
- Command Line Interface (CLI) support for the ptx operating system (IBM @server xSeries 430 and NUMA-Q® servers)

For ordering, contact:
Your IBM representative, an IBM Business Partner, or IBM Americas Call Centers at 800-IBM-CALL
Reference: YE001

This announcement is provided for your information only. For additional information, contact your IBM representative, call 800-IBM-4YOU, or visit the IBM home page at: http://www.ibm.com.
FICON Extends the Performance Benefits of the Enterprise Storage Server (ESS)

The ESS Models F10 and F20 now support native FICON connection over short-wave or long-wave fibre links to provide FICON attachment to IBM zSeries or S/390 servers. This support is provided via the new Fibre Channel/FICON Host Adapters (#3021 and #3023).

The most obvious benefits of FICON connectivity are increased per channel bandwidth and greater simplicity of channel fabric. This speed allows customers to collapse existing ESCON channels into FICON channels at the rate of approximately 4:1, or in some cases more if ESCON channel utilizations are relatively low. So a well-configured ESS will typically need no more than eight FICON channel interfaces in order to exploit the bandwidth.

Greater simplicity of configuration is achieved because the FICON architecture allows more devices per channel (up to 16,384) and more Logical Subsystems (LSS) per channel to match the increased channel bandwidth. Single stream sequential operations may experience a significant improvement in throughput (as much as 2X), so that elapsed times for key batch, data mining, or dump operations will substantially improve. This can help provide relief for customers whose batch or file maintenance windows are constrained today.

Response time improvements may accrue for some customers, particularly for data stored using larger block sizes. The data transfer portion of response time is greatly reduced because the data rate during transfer is more than five times faster than ESCON. This improvement can lead to significant connect time reduction. The larger the transfer, the greater the reduction as a percentage of the total I/O service time. Pend time caused by director port busy are reduced or eliminated because collisions in the director are reduced or eliminated with FICON architecture. For customers whose ESCON directors are experiencing as much as 45-50% busy conditions, this will provide significant response time reduction.

With the advent of the ESS, IBM introduced one of the most important advances in disk system architecture since cache, Parallel Access Volumes (PAV). Simply stated, PAV allows multiple concurrent I/Os to the same volume at the same time. Complementing this ability, FICON channels can process multiple concurrent data transfers, whereas ESCON channels process only one operation at a time. The maximum bandwidth of a RAID array within the ESS is approximately 45 MB/sec, but the maximum bandwidth of an ESCON channel is only 17 MB/sec; hence, a single ESCON channel cannot exploit the maximum ability of the ESS arrays. PAV and FICON work together to allow multiple data transfers to the same volume at the same time over the same channel, providing greater parallelism and greater bandwidth while simplifying configurations.

Another performance advantage offered by FICON is that the ESS accepts multiple channel command words (CCWs) concurrently without waiting for completion of the previous CCW. This allows setup and execution of multiple CCWs from a single channel to happen concurrently. Moreover, I/O priority queueing is now handled at a “higher” point in the ESS system. Contention among multiple I/Os accessing the same data is now handled in the FICON host adapter, and queued according to the I/O priority indicated by the Workload Manager.

Finally, significant performance advantages can be realized by those customers who access their disk subsystems remotely. FICON reduces or eliminates data rate “droop” for distances up to 100 km for both read and write operations by using enhanced data buffering and pacing schemes.

FICON thus extends the ESS’ ability to deliver high bandwidth potential to the logical volumes needing it, when they need it. Older technologies are limited by the bandwidth of a single disk drive or a single ESCON channel, but FICON, RAID-5, and PAVs working together provide a high-speed pipe with multiplexed operation all the way down to user’s data.

New Fibre Channel/FICON Host Adapters Provide Expanded Attachment Options

The new Fibre Channel/FICON Host Adapters provide new attachment options for the ESS by introducing support for native FICON attachment and long-wave support for the Fibre Channel (SCSI-FCP) environment. This support is provided through two new adapter features:

- Fibre Channel/FICON (long wave) Host Adapter (#3021)
- Fibre Channel/FICON (short wave) Host Adapter (#3023)

In addition to expanding the attachment options, these adapters also utilize a faster microprocessor (as compared to the Fibre Channel Host Adapter (#3022)), and offers up to a 30% improvement in SCSI-FCP single port throughput for small block random operation workloads.

Specific characteristics include:

- Each adapter provides one port with a SC Duplex connector and provides an interface that supports 100 MB/sec full duplex data transfer. A 31 meter cable is included with each feature (9 micron cable with feature number 3021; 50 micron cable with feature number 3023).
- The adapters support FICON and SCSI-FCP, but not simultaneously; the protocol to be used is configurable by customers on an adapter by adapter basis.
  - SCSI-FCP Upper Layer Protocol (ULP) is supported on point-to-point, fabric, and arbitrated loop (private loop) topologies
  - FICON ULP is supported on point-to-point and fabric topologies
- The adapters support SCSI-FCP attachment to the same open systems servers and Storage Area Network (SAN) fabric components as currently supported by the Fibre Channel (short wave) Host Adapter (#3022).
- The ESS supports up to 16 host adapters which allows for a maximum of 16 Fibre Channel/FICON ports per machine. Both long-wave and short-wave adapters can be used in a single ESS.
- These features are supported in new and existing ESS Models F10 and F20 and can coexist with the Fibre Channel (short wave) Host Adapter (#3022) as well as all other ESS host adapters.

Prior to the introduction of these new adapters, ESS Fibre Channel connectivity was only available for SCSI-FCP and over short-wave fibre links with a maximum distance of 500 meters (point-to-point). With these new features, support is enhanced to provide native FICON attachment and extended distance SCSI-FCP for long-wave fibre links.
The Fibre Channel/FICON (long wave) Host Adapter, when used with 9 micron single mode fibre cable, extends the point-to-point distance up to 10 km. Customers who require support for FICON point-to-point distances up to 20 km can seek that support through a request for price quotation (RPQ) and distances up to 100 km can be supported with appropriate SAN fabric components. In addition, customers may utilize existing 50 micron and 62.5 micron ESCON cables with Mode Conditioning Patch cables.

The Fibre Channel/FICON (short wave) Host Adapter, when used with 50 micron multimode fibre cable, supports point-to-point distances of up to 500 meters. Additional distance can be achieved with the use of appropriate SAN fabric components. This adapter can also be used with 50 micron and 62.5 micron ESCON cables to enable customers to use their existing ESCON cables.

The following table summarizes the fibre cables and distances supported by the ESS with the new Fibre Channel/FICON Host Adapters:

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Short Wave (ESS Feature Number 3023)</th>
<th>Long Wave (ESS Feature Number 3021)</th>
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</thead>
<tbody>
<tr>
<td>9 micron, singlemode</td>
<td>NA</td>
<td>10 km</td>
</tr>
<tr>
<td>50 micron, multimode (500 MHz/km)</td>
<td>500 m</td>
<td>550 m</td>
</tr>
<tr>
<td>62.5 micron, multimode (200 MHz/km)</td>
<td>300 m</td>
<td>550 m</td>
</tr>
<tr>
<td>62.5 micron, multimode (160 MHz/km)</td>
<td>250 m</td>
<td>550 m</td>
</tr>
</tbody>
</table>

Notes:
- A distance of up to 20 km (point-to-point) can be supported on feature number 3021 (long wave) with 9 micron singlemode cable. This support requires a RPQ.
- Distances up to 100 km can be supported on FICON with the appropriate SAN fabric components.

Enhanced ESCON Host Adapter Offers Improved Performance

The Enhanced ESCON Host Adapter (#3012) is used for ESS attachment to ESCON channels and Peer-to-Peer Remote Copy (PPRC). The adapter has been enhanced with a faster microprocessor and offers up to a 10% increase in ESCON channel throughput for random operation workloads compared to the Standard ESCON Host Adapter (#3011).

The adapter features an LED-type interface and supports two ESCON links with each link supporting up to 64 logical paths. The ESS supports up to 16 host adapters which allows for a maximum of 32 ESCON links per machine. This feature is supported in new and existing ESS Models F10 and F20 and can coexist with the Standard ESCON Host Adapter (#3011) as well as all other ESS host adapters.

24 GB Cache Option Offers Additional Flexibility and Granularity

New and existing ESS Models F10 and F20 can now be configured with 24 GB of cache (#4005). With this new feature, four cache size options are now available, ranging from 8 GB to 32 GB.

Cache can help to enable your applications to run faster and allow you to configure additional capacity in an ESS without sacrificing performance. Almost all applications can enjoy an improvement in the cache hit ratio, the percentage of disk I/Os that are satisfied in cache rather than accessing the disk which translates directly into improved disk I/O response times and thus, improved host application performance. Installing additional cache in conjunction with additional disk capacity may allow you to maintain the same performance characteristics for workloads serviced by that ESS. Alternatively, an increase in cache size, without an increase in disk capacity, can provide improved response times due to greater cache hit ratios.

New Disaster Recovery and Backup Solution Options for IBM @server iSeries and AS/400 Servers

Support for ESS PPRC and FlashCopy functions are now extended into the iSeries and AS/400 environments.

PPRC is a hardware-based disaster recovery solution that provides real-time mirroring of logical volumes within an ESS or to another ESS, which can be located up to 103 km from the primary machine. PPRC is a synchronous copy solution where write operations are ensured on both copies (primary and secondary) before they are considered to be done.

FlashCopy provides an instant copy of data to minimize the downtime needed for data backup. FlashCopy creates a physical point-in-time copy of data and makes it possible to access both the source and target copies immediately. By creating an “instant” copy, FlashCopy enables applications using either the source or the target to operate with only a minimal interruption to perform the FlashCopy.

Both PPRC and FlashCopy are managed via a Web user interface provided through the IBM StorWatch™ Enterprise Storage Server Specialist.

These copy services functions are available as optional features on ESS Models E10/E20 and F10/F20 and are supported on SCSi and SCSi-FCP attached iSeries and AS/400 servers.

Command Line Interface (CLI) Support for ptx

Support for the ESS CLI has been extended to the ptx operating system (IBM @server xSeries 430 and NUMA-Q servers). The CLI enables the invocation and management of FlashCopy and PPRC functions through batch processes and scripts. The ESS copy services can thus be easily exploited by production job streams and managed via automated processes.

The CLI is also supported on the AIX®, HP-UX, Solaris, Windows® NT, and Windows 2000 operating systems.

Planned Availability Dates

August 24, 2001
- 24 GB Cache (#4005)

September 28, 2001
- Native FICON attachment (#9909)
- Native FICON attachment to:
  - z/OS™ and OS/390®
  - z/VM™ and VM/ESA®
  - VSE/ESA™
- Enhanced ESCON Host Adapter (#3012)
- Fibre Channel/FICON (long wave) Host Adapter (#3021)
- Fibre Channel/FICON (short wave) Host Adapter (#3023)
Product Positioning

The ESS is the storage device of choice for users wanting high availability, high performance disk storage consolidation, and data sharing on multiple, heterogeneous servers, including customers with FICON-capable servers such as zSeries z900 or the IBM 9672 Enterprise Generation 5 or Generation 6.

The product is designed for users who require:
- High performance, high availability (RAID-5), or read and write cache
- Common storage for multiple servers with ESCON, FICON, SCSI, and Fibre Channel attachments
- Improved performance with increased channel bandwidth
- More flexibility when selecting a read and write cache option
- Fast data duplication capability (FlashCopy)
- Remote copy and disaster recovery capability (PPRC and Extended Remote Copy (XRC))
- Storage management from a single location
- The most appropriate IBM disk solution for customers with FICON-capable servers such as zSeries z900 or the IBM 9672 Enterprise Generation 5 or Generation 6

A FICON migration from ESCON is appropriate for FICON-capable 9672 Enterprise Generation 5 and Generation 6 servers and the new zSeries z900. The ESS with FICON attachment leverages industry-standard Fibre Channel technology with IBM innovation and parallelism between your server and storage.
Publications

The following publication has been updated to include the new attachment and features, and is now available:

<table>
<thead>
<tr>
<th>Title</th>
<th>Order Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>IBM TotalStorage™ Enterprise Storage Server Introduction and Planning Guide</td>
<td>GC26-7294</td>
</tr>
</tbody>
</table>

These updated publications are shipped with the product and will be available with the planned availability of the new attachment and features.

Title                                                        | Order Number |
--------------------------------------------------------------|--------------|
IBM TotalStorage Enterprise Storage Server Introduction and Planning Guide | GC26-7294    |
IBM TotalStorage Enterprise Storage Server User’s Guide           | SC26-7295    |
IBM TotalStorage Enterprise Storage Server Host Systems Attachment Guide | SC26-7296    |
IBM TotalStorage Enterprise Storage Server Quick Configuration Guide | SC26-7354    |
IBM TotalStorage Enterprise Storage Server Web Interface User’s Guide | SC26-7346    |
IBM TotalStorage Enterprise Storage Server Copy Services Command-Line Interface Reference | SC26-7434    |

The publications are also available on the Enterprise Storage Server™ Web site at:


The IBM TotalStorage Enterprise Storage Server Configuration Planner (SC26-7353) is available only at the Enterprise Storage Server Web site at:


The following publications are planned to be available September 2001. To order, contact your IBM representative.

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<td>IBM TotalStorage Enterprise Storage Server Quick Configuration Guide</td>
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</tr>
<tr>
<td>IBM TotalStorage Enterprise Storage Server Web Interface User’s Guide</td>
<td>SC26-7346</td>
</tr>
</tbody>
</table>

Technical Information

Key Prerequisites

Native Fibre CONnections (FICON™) Attachment
- An Enterprise Storage Server (ESS) 2105 Model F10 or F20 with Licensed Internal Code (LIC) level 1.4.0, or later, native FICON attachment (#9099), and Fibre Channel/FICON Host Adapter (#3021 or #3023)
• Appropriate levels of server and/or director hardware and software that support native FICON attachment, along with appropriate cabling to support various Storage Area Network (SAN) configurations

Host Adapters
• The Fibre Channel/FICON Host Adapter (#3021 and #3023) will be available on new or existing ESS 2105 Models F10 and F20 and requires ESS LIC level 1.4.0, or later.
• The Enhanced ESCON® Host Adapter (#3012) will be available on new or existing ESS 2105 Models F10 and F20 and requires ESS LIC level 1.4.0, or later.

Cache
• The 24 GB cache (#4005) will be available on new or existing ESS Models F10 and F20 and will require ESS LIC level 1.3.0, or later.

PPRC and FlashCopy support for IBM @server iSeries and AS/400® Servers
• PPRC and FlashCopy support will be available on ESS 2105 Models E10/E20 and F10/F20 with ESS LIC level 1.4.0, or later.
• Additionally, PPRC features (#1820 — #1825) and FlashCopy (#1830 — #1835) are required.

Command Line Interface (CLI) Support for ptx®
• CLI support for the ptx operating system will be available on the ESS 2105 Models E10/E20 and F10/F20 with ESS LIC level 1.4.0, or later.

FICON Directors
• IBM is working to qualify various FICON Directors with the ESS.

Complete and current information regarding supported servers, operating systems, and host adapters, along with specific details on status, availability, and configuration options for FICON directors with the ESS are available on the Web at:


Additionally, consult with your IBM Storage Specialist to obtain operating system PTF information from the Technical function of ViewBlue by accessing Preventive Service Planning (PSP) information for the 2105 and specific server.

Fibre Channel (SCSI-FCP) Attachment
The Fibre Channel/FICON Host Adapters (#3021 and #3023) support Fibre Channel (SCSI-FCP) attachment to open systems servers and SAN fabric components. These adapters are supported on the ESS Models F10 and F20, and require ESS LIC level 1.4.0, or later.

The new adapters support attachment to the same open systems servers and SAN fabric components as currently supported by the Fibre Channel (short wave) Host Adapter (#3022).

Complete and current information on supported server models, adapters, operating system levels, storage product attachments, and configuration options are available on the Web at:


ESCON Attachment and 24 GB Cache Option
The Enhanced ESCON Host Adapter (#3012) is supported on the ESS Models F10 and F20, and requires ESS LIC level 1.4.0, or later.

The 24 GB Cache option (#4005) is supported on the ESS Models F10 and F20, and requires ESS LIC level 1.3.0, or later.

PPRC and FlashCopy with iSeries and AS/400 Servers
PPRC and FlashCopy are supported on the ESS Models E10/E20 and F10/F20, and require ESS LIC level 1.4.0, or later. These functions are available as optional features to the ESS:
• PPRC: feature numbers 1820 — 1825
• FlashCopy: feature numbers 1830 — 1835

Implementation of PPRC between two ESSs requires the PPRC feature to be purchased and installed on both the primary and secondary ESS. Additionally, PPRC requires the installation of an ESCON Host Adapter (#3011 or #3012) on both the primary and secondary ESS. The adapter provides the communications link between the primary and secondary server.

PPRC and FlashCopy are supported on OS/400® Version 4 Release 5 (V4R5), or later. Additionally, OS/400 PTFs may be required.

Command Line Interface (CLI) Support for ptx
The CLI support for the ptx operating system is supported on the ESS Models E10/E20 and F10/F20 with ESS LIC level 1.4.0, or later.
The following levels of ptx will be supported:

- 4.4.7, 4.4.8
- 4.5.1, 4.5.2
- 4.6.1

**Planning Information**

**Customer Responsibilities**

**Physical Planning**

Physical planning is a customer responsibility. Detailed physical planning information for the ESS can be found in the *IBM TotalStorage Enterprise Storage Server Introduction and Planning Guide (SG26-7294)*.

**FICON Attachment**

There are multiple, important considerations that need to be understood in order to properly configure a system with FICON interfaces. In summary, IBM provides the following guidelines for planning FICON-connected ESS configurations:

- For ESCON channels with typical utilization (25% to 50% today), plan one FICON channel for four ESCON channels.
  - If channel utilization today is low (less than 25%), you may be able to collapse more ESCON channels into each FICON channel, as many as 8:1.
  - If your ESCON channels today are exceedingly busy (75% or greater), recommendation is to collapse 2:1 to reduce channel utilization in the ultimate FICON environment.
- Plan minimally four channels per ESS. Fewer channels will not allow exploitation of full ESS bandwidth. A more typical configuration would have eight FICON channels for a 3.4 TB ESS.
- Spread FICON host adapters across all adapter bays. This should result in minimally one host adapter per bay, or in a typically configured ESS, two host adapters per bay.
- Define a minimum of four FICON cards per path group, as reflected in the IOCP/IODEF.

Your IBM Storage Specialist can help you plan and anticipate required levels of performance by analyzing your current configuration, utilization and performance, and modelling proposed configurations.

Additional FICON planning information can be found in the following documents:

- *IBM Enterprise Storage Server FICON Performance White Paper*
- *ESS FICON Channel Attachment White Paper*

The following IBM redbooks also contain ESS and FICON planning information:

- *The IBM Enterprise Storage Server (SG24-5465)*
- *Introduction to IBM S/390® FICON (SG24-5176)*
- *FICON Native Implementation and Reference Guide (SG24-6266)*
- *IBM S/390 FICON Implementation Guide (SG24-5169)*

**Cache**

IBM recommends the following cache-to-backstore “rules-of-thumb” for planning how much cache to accompany your disk capacity:

- 0.01 — Ultra-high performance
- 0.005 — High performance
- 0.0025 — Moderate performance

Your IBM Storage Specialist can help you plan and anticipate required levels of performance by modelling proposed configurations using Disk Magic.

**PPRC and FlashCopy on iSeries and AS/400**

PPRC requires careful customer planning. The appropriate installation and planning guides or IBM Global Services should be consulted.

PPRC requires the installation of ESCON Host Adapters (#3011 or #3012) on the ESS. The adapter provides the link between the ESS primary and ESS secondary server. A minimum of two ESCON Host Adapters per ESS is recommended for high availability.

The following IBM redbook contains information for implementing the ESS on iSeries:

- *iSeries and External Disk: A Guide to Implementing ESS on iSeries (SG24-6220)*

**Cable Orders**

**ESCON Attachment Cables**

An ESCON cable is required to attach the ESS to ESCON channels on servers or directors. The Enhanced ESCON Host Adapter (#3012) provides two ESCON links (ports) per adapter and uses an LED-type interface.

Cables must be separately ordered by specifying cable group number 3797 or cable group number 8486 for Plenum using the OMCABLE transaction in AAS.

**Fibre Channel/FICON Attachment Cables**

A fiber optic cable is required to attach the ESS to Fibre Channel/FICON ports on servers or SAN components. The ESS Fibre Channel/FICON Host Adapters each provide one port with a SC Duplex connector and include a 31 meter convenience cable.

- Fibre Channel/FICON (long wave) Host Adapter (#3021) includes one 31 meter 9 micron fibre cable with SC Duplex connectors
- Fibre Channel/FICON (short wave) Host Adapter (#3023) includes one 31 meter 50 micron fibre cable with SC Duplex connectors

**Cabling Considerations:** There are several considerations for planning Fibre Channel/FICON cabling. Besides the number, the distance, and physical routing requirements unique for each installation configuration, the required fiber cable and connectors must also be considered. There are three types of fiber cables commonly used for interconnecting:

- 9 micron singlemode
- 50 micron multimode
- 62.5 micron multimode

When using the short-wave Fibre Channel/FICON Host Adapter, you will need to use multimode cables. With the long-wave Fibre Channel/FICON Host Adapter, you can use either singlemode or multimode cables. However, the use of multimode cables with long wave reduces the...
distance capability provided by long wave, requires mode conditioning patch cables, and is primarily intended to enable use of existing ESCON cables for FICON.

The following table lists the cables and distances supported by the ESS:

<table>
<thead>
<tr>
<th>Cable Type</th>
<th>Short Wave (ESS Feature Number 3023)</th>
<th>Long Wave (ESS Feature Number 3021)</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 micron, singlemode</td>
<td>NA</td>
<td>10 k</td>
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<td>50 micron, multimode (500 MHz/km)</td>
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<tr>
<td>62.5 micron, multimode (200 MHz/km)</td>
<td>300 m</td>
<td>550 m</td>
</tr>
<tr>
<td>62.5 micron, multimode (160 MHz/km)</td>
<td>250 m</td>
<td>550 m</td>
</tr>
</tbody>
</table>

Notes:

- A distance of up to 20 km (point-to-point) can be supported on feature number 3021 (long wave) with 9 micron singlemode cable. This support requires a RPQ.
- Distances up to 100 km can be supported on FICON with the appropriate fabric components.

The ESS Fibre Channel/FICON Host Adapters have a SC Duplex connector. Fibre cable couplers can be used to attach a cable with SC connectors to a server or fabric component port with a LC connector.

A Mode Conditioning Patch (MCP) cable is required to use the Fibre Channel/FICON (long wave) Host Adapter (#3021) with existing 50 micron or 62.5 micron multimode fiber optic cables terminated with ESCON Duplex connectors. The cable should be terminated at one end with a 9 micron singlemode SC connector type and at the opposite end with a 62.5 micron multimode ESCON Duplex receptacle.

A jumper cable is required to use the Fibre Channel/FICON (short wave) Host Adapter (#3023) with existing 50 micron or 62.5 micron multimode fiber optic cables terminated with ESCON Duplex connectors. The cable should have a male SC connector type on one end and an ESCON Duplex receptacle on the other end.

Additional Cables, Fabric Components, and Cabling Solutions

In many situations, the required lengths and installation of cables will be to each customer’s configuration and facility specifications. 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 800-IBM-4YOU (426-4968), or contact Matt Matthews at 770-863-2326 (tie line 753-2326). Additional information can be found at:

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

Security, Auditability, and Control

This product uses the security and auditability features of the host hardware, host software, and/or application software to which it is attached.

The customer is responsible for evaluation, selection, and implementation of security features, administrative procedures, and appropriate controls in application systems and communications facilities.

Terms and Conditions

Feature Section

This product is available for purchase under the terms of the IBM Customer Agreement (ICA).

IBM hardware products are manufactured from new parts and used parts. In some cases, the hardware product may have been previously installed. Regardless, IBM’s warranty terms apply.

MES Discount Applicable: No
Field Installable Feature: Yes
Warranty Period: Three years
Customer Setup: No
Licensed Internal Code: Same license terms and conditions as designated machine.
## Prices

<table>
<thead>
<tr>
<th>Description</th>
<th>Machine Type/Model: 2105-F10</th>
<th>Feature Number</th>
<th>Purchase Price</th>
<th>Minimum Maintenance Charge Monthly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enterprise Storage Server</td>
<td></td>
<td>3012</td>
<td>$ 5,200</td>
<td>NC</td>
</tr>
<tr>
<td>Enhanced ESCON Host Adapter</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fibre Channel/FICON (long wave) Host Adapter</td>
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**Machine Type/Model: 2105-F20**

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NC = No Charge

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### ServiceSuite™ and ServiceElect Maintenance Charges

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NA = Not Applicable
Order Now

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Internet: ibm_direct@vnet.ibm.com
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        P.O. Box 2690
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