IBM TotalStorage FAStT EXP700
Storage Expansion Unit

Installation and User's Guide

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Note: Before using this information and the product it supports, be sure to read the general information in Appendix C, “Warranty information” on page 57 and Appendix D, “Notices” on page 69.

First Edition (July 2002)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الآمنية

Antes de instalar este produto, leia as Informações de Segurança.

在安装本产品之前，请仔细阅读 Safety Information
(安全信息)。

安裝本產品之前，請先閱讀「安全資訊」。

Prije instalacije ovog produkta obavezno pročitajte Sigurnosne Upute.

Před instalací tohoto produktu si přečtěte příručku bezpečnostních instrukcí.

Læs sikkerhedsforskrifterne, før du installerer dette produkt.

Lees voordat u dit product installeert eerst de veiligheidsvoorschriften.

Ennen kuin asennat tämän tuotteen, lue turvaohjeet kohdasta Safety Information.

Avant d'installer ce produit, lisez les consignes de sécurité.

Vor der Installation dieses Produkts die Sicherheitshinweise lesen.

Πριν εγκαταστήσετε το προϊόν αυτό, διαβάστε τις πληροφορίες ασφάλειας
(safety information).

לפני שתתקינו מוצר זה, קראו את הוראות הבטיחות.

A termék telepítése előtt olvassa el a Biztonsági előírásokat!

Prima di installare questo prodotto, leggere le Informazioni sulla Sicurezza.

製品の設置の前に、安全情報をお読みください。

본 제품을 설치하기 전에 안전 정보를 읽으십시오.

Пред да се инсталира овој продукт, прочитајте информацијата за безбедност.

Les sikkerhetsinformasjonen (Safety Information) før du installerer dette produktet.

Przed zainstalowaniem tego produktu, należy zapoznać się
z książką "Informacje dotyczące bezpieczeństwa" (Safety Information).

Antes de instalar este produto, leia as Informações sobre Segurança.

Перед установкой продукта прочтите инструкции по
технике безопасности.

Pred inštaláciou tohto zariadenia si pečítaje Bezpečnostné predpisy.

Pred namestitvijo tega proizvoda preberite Varnostne informacije.

Antes de instalar este producto, lea la información de seguridad.

Läs säkerhetsinformationen innan du installerar den här produkten.

Statement 1:

DANGER

Electrical current from power, telephone, and communication cables is hazardous.

To avoid a shock hazard:

- **Do not connect or disconnect any cables or perform installation, maintenance, or reconfiguration of this product during an electrical storm.**
- **Connect all power cords to a properly wired and grounded electrical outlet.**
- **Connect to properly wired outlets any equipment that will be attached to this product.**
- **When possible, use one hand only to connect or disconnect signal cables.**
- **Never turn on any equipment when there is evidence of fire, water, or structural damage.**
- **Disconnect the attached power cords, telecommunications systems, networks, and modems before you open the device covers, unless instructed otherwise in the installation and configuration procedures.**
- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect:	To Disconnect:
1. Turn everything OFF.	1. Turn everything OFF.
2. First, attach all cables to devices.	2. First, remove power cords from outlet.
3. Attach signal cables to connectors.	3. Remove signal cables from connectors.
4. Attach power cords to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

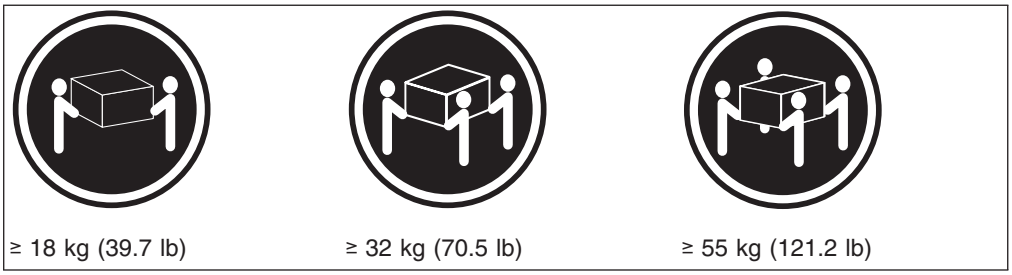
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Class 1 Laser statement

Class 1 Laser Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Apparell À Laser de Classe 1

IEC 825-11993 CENELEC EN 60 825

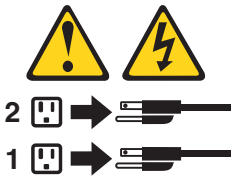
Statement 4:



CAUTION:
Use safe practices when lifting.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

About this book

This book provides instructions for installing and customizing the configuration of your IBM® TotalStorage™ FAStT EXP700 Storage Expansion Unit. It also provides troubleshooting information.

How this book is organized

Chapter 1, “Introduction” on page 1 describes the IBM TotalStorage FAStT EXP700 Storage Expansion Unit. This chapter includes an inventory checklist and an overview of the storage expansion unit features, operating specifications, and components.

Chapter 2, “Installing the FAStT EXP700” on page 11 contains the instructions to install the expansion unit in a standard rack cabinet, setting the interface options, cabling the expansion unit, and power cord routing. In addition, this chapter contains instructions for turning on and turning off the expansion unit during normal and emergency situations.

Chapter 3, “Installing and replacing devices” on page 39 contains step-by-step instructions for installing and removing customer replaceable units (CRUs), such as hard disk drives, power supplies, environmental services monitors (ESMs), and fan units.

Chapter 4, “Solving problems” on page 49 contains problems, symptoms, and error messages that are specific to your expansion unit.

Appendix A, “Records” on page 53 provides a table to record and update important information about your FAStT EXP700, including serial number and device records. Whenever you add options to your FAStT EXP700, be sure to update the information in this appendix.

Appendix B, “Getting help and technical assistance” on page 55 describes how to obtain help, service, and information about IBM products.

Appendix C, “Warranty information” on page 57 provides warranty statements for the IBM TotalStorage FAStT EXP700 Storage Expansion Unit.

Appendix D, “Notices” on page 69 provides product notices.

Notices and statements used in this book

The caution and danger statements used in this book also appear in the multilingual *Safety Information* book provided with your IBM TotalStorage FAStT EXP700 Storage Expansion Unit. Each caution and danger statement is numbered for easy reference to the corresponding statements in the safety book.

The following types of notices and statements are used in this book:

- **Note:** These notices provide important tips, guidance, or advice.
- **Important:** These notices provide information or advice that might help you avoid inconvenient or problem situations.
- **Attention:** These notices indicate possible damage to programs, devices, or data. An attention notice is placed just before the instruction or situation in which damage could occur.
- **Caution:** These statements indicate situations that can be potentially hazardous to you. A caution statement is placed just before the description of a potentially hazardous procedure step or situation.
- **Danger:** These statements indicate situations that can be potentially lethal or extremely hazardous to you. A danger statement is placed just before the description of a potentially lethal or extremely hazardous procedure step or situation.

Related publications

The following publications are available in Adobe Acrobat Portable Document Format (PDF) on the World Wide Web at http://www.ibm.com/pc/support/.

- *IBM LC-SC Fibre Channel Cable Adapter Option Installation Information*
- *IBM LC-LC Fibre Channel Cable Option Installation Information*
- *IBM FAStT700 Fibre Channel Cabling Instructions*
- IBM Netfinity® Fibre Channel Cabling Instructions
- IBM FAStT200 Fibre Channel Cabling Instructions
- *IBM Small Form-Factor Pluggable Module Option Installation Information*
- *IBM Fibre Channel Problem Determination Guide*
- *IBM FAStT Storage Manager Version 7.10 Installation and User's Guide for Microsoft® Windows NT® and Windows® 2000*
- *IBM FAStT Storage Manager Version 7.10 Installation and User's Guide for Novell NetWare and Red Hat Linux®*
- *IBM FAStT Storage Manager Version 8.2 Installation and User's Guide for Microsoft Windows NT and Windows 2000*
- *IBM FAStT Storage Manager Version 8.2 Installation and User's Guide for Novell NetWare*
- *IBM FAStT Storage Manager Version 8.2 Installation and User's Guide for Linux*

Chapter 1. Introduction

This chapter describes the IBM TotalStorage Fibre Array Storage Technology (FAStT) EXP700 Storage Expansion Unit operating specifications, features, and components. This chapter also includes a list of hardware that comes with the expansion unit.

Overview

The IBM TotalStorage FAStT EXP700 Storage Expansion Unit provides high-capacity, Fibre Channel disk storage. It delivers fast, high-volume data transfer, retrieval, and storage functions for multiple drives, to multiple hosts. The expansion unit provides continuous, reliable service, using hot-swap technology for easy replacement without shutting down the system.

The IBM TotalStorage FAStT EXP700 Storage Expansion Unit supports redundant, dual-loop configurations. External cables and Small Form-Factor Pluggable (SFP) modules connect the controller to the expansion unit.

You can connect IBM TotalStorage FAStT EXP700 Storage Expansion Units together to support a large number of disk drives on a Fibre Channel loop.

The IBM TotalStorage FAStT EXP700 Storage Expansion Unit is referred to throughout this book as the FAStT EXP700.

Fibre Channel defined

Fibre Channel technology is outlined in the *SCSI-3 Fibre Channel Protocol* (SCSI-FCP) standard. Fibre Channel is a high-speed data transport technology used for mass storage and networking.

Using a Fibre Channel Arbitrated loop (FC-AL), more than 100 Fibre Channel devices can be supported, compared to 15 small computer system interface (SCSI) devices.

The FAStT EXP700 is a 2 GB Fibre Channel device that supports data transfer rates up to 200 MB per second half-duplex and 400 MB per second full-duplex on optical interfaces.

Inventory checklist

The FAStT EXP700 comes with the following hardware:

- Two to four power cables
- One rack-mounting hardware kit
- Two rails (right and left assembly)
- Ten M6 black hex-head screws
- Ten M6 cage nuts
- Rack mounting template and instructions
- 14 blank trays (Your expansion unit might come with up to 14 hard disk drives.)

To connect your FAStT EXP700 to other devices, use the following options:

- IBM Small Form-Factor Pluggable (SFP) module
- IBM LC-LC Fibre Channel cable

Depending on your configuration, you might need the following options:

- IBM LC-SC Fibre Channel Cable Adapter
- Gigabit Interface Converter (GBIC)

Note: For some expansion unit models, you must order these options separately.

For a list of available publications, see “Related publications” on page xviii.

IBM FAStT EXP700 components

The FAStT EXP700 has the following removable components called customer replaceable units (CRUs). All CRUs are accessible from the front or back of the FAStT EXP700.

- FAStT 2 GB Fibre Channel hard disk drives
- Environmental services monitors (ESMs)(comes with two)
- Power supplies (comes with two)
- Fans (comes with two)

IBM FAStT EXP700 bays

This section shows the location of FAStT EXP700 hot-swap CRU bays and describes the functionality of each CRU. The hot-swap features of the FAStT EXP700 enable you to remove and replace FAStT 2 GB Fibre Channel hard disk drives, power supplies, ESMs, and fan units without turning off the expansion unit.

Hot-swap drive bays

The hot-swap drive bays that are accessible from the front of your expansion unit are shown in Figure 1.

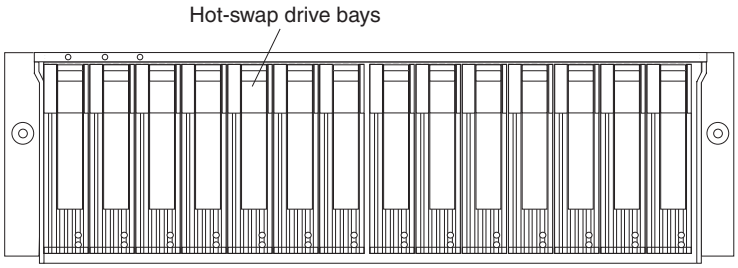


Figure 1. FAStT EXP700 hot-swap drive bays

The FAStT EXP700 supports up to 14 FAStT 2 GB Fibre Channel hard disk drives or later versions. These drives come preinstalled in drive trays. This drive-and-tray assembly is called a drive CRU. You install the drive CRUs in the 14 drive bays on the front of the expansion unit.

Note: FAStT 2 GB Fibre Channel hard disk drives must be used in the FAStT EXP700 even if the system is set to a 1 Gb per second rate. 1 GB hard disk drives are not supported.

Attention: Never hot-swap a drive CRU when its green Activity LED is flashing. Hot-swap a drive CRU when its amber Fault LED is lit and not flashing or when the drive is inactive and the green Activity LED is lit and not flashing.

The hot-swap feature of the FAStT EXP700 enables you to remove and replace hard disk drives, power supplies, ESMs, and fans without turning off the expansion unit. You can maintain the availability of your system while a hot-swap device is removed, installed, or replaced.

Fan, ESM, and power-supply bays

The location of the FAStT EXP700 hot-swap fan bays, hot-swap ESM bays, and hot-swap power supply bays are shown in Figure 2.

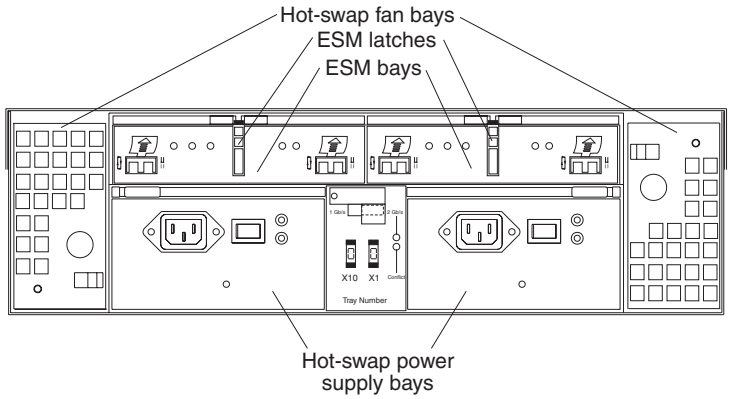


Figure 2. Hot-swap fan, ESM, and power supply bays

- **Hot-swap fan bays:** Your expansion unit comes with two interchangeable hot-swap and redundant fan units. These two fan units are located in the hot-swap fan bays. Each fan unit contains two fans. If one fan unit fails, the second fan unit continues to operate. Both fan units must be installed to maintain proper cooling within your expansion unit, even if one fan unit is not operational.
- **ESM bays:** Your expansion unit comes with two hot-swappable ESMs. The ESMs are located in the ESM bays. The ESMs provide a 1 GB or 2 GB Fibre Channel interface to the drives and monitor the overall status of the expansion unit. Each ESM has two SFP module connector ports for connecting your expansion unit to the controller or connecting two or more FAStT EXP700 units together. The ESMs provide redundancy when both of them are configured into redundant Fibre Channel loops. See your Fibre Channel controller documentation to determine if the controller supports this redundancy function.
- **ESM latches:** Your expansion unit ESMs come with locking latches to secure the ESMs to the expansion unit bays. The latch must be unlocked before the ESM can be removed from the expansion unit.
- **Hot-swap power-supply bays:** Your expansion unit comes with two hot-swap and redundant power supplies. The power supplies are located in the hot-swap power-supply bays. Both power supplies must be installed in your expansion unit, even if one power supply is not operational.

Front controls and indicators

This section describes the primary controls on the front of the expansion unit. The location of these primary controls are shown in Figure 3 on page 4.

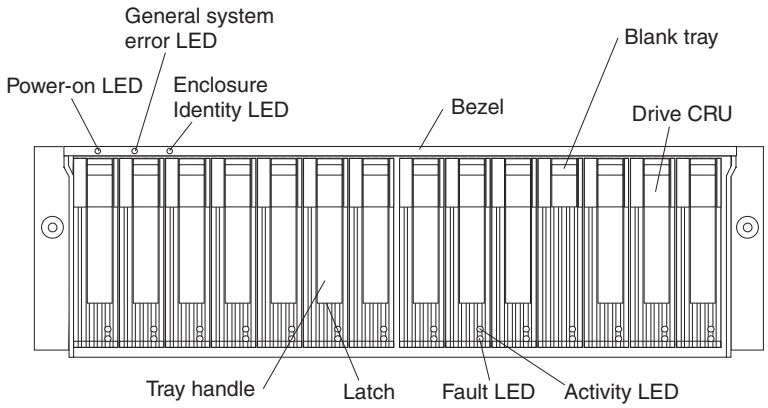


Figure 3. Front controls and indicators

- **Activity LED:** Each drive CRU has an Activity LED. When flashing, this green LED indicates drive activity. When lit, this green LED indicates the drive is properly installed and powered on.
- **Blank tray:** Expansion units come with blank trays in the unused drive bays. To begin installing new drives, you must first remove the blank trays and save them. Each of the 14 bays must always contain either a blank tray or a drive CRU.
- **Drive CRU:** You can install up to 14 hot-swap drive CRUs in the expansion unit.
- **Fault LED:** Each drive CRU has a Fault LED. When lit, this amber LED indicates a drive failure. When flashing, this amber LED indicates that a drive identify or rebuild process is in progress.
- **General system error LED:** When lit, this amber LED indicates that the unit has a power supply, fan unit, or hard disk drive error.
- **Latch:** This multipurpose blue latch releases or locks the drive CRU in place.
- **Power-on LED:** When lit, this green LED indicates that the expansion unit has dc power.
- **Enclosure identity LED:** When lit, this blue LED indicates that the unit is being identified by the controller. This LED is also lit when the devices that are part of a Fibre Channel loop are identified.

  Note: Enclosure identity LED activity is supported when an IBM TotalStorage FAStT700 Fibre Channel Storage Server is running FAStT Storage Manager software version 8.21 or later and storage-server firmware version 05.21.xxxx or later.
- **Tray handle:** Use this multipurpose handle to insert and remove a drive CRU in the bay.

Rear controls, indicators, and connectors

Two hot-swap power-supply CRUs, two hot-swap fan CRUs, and two ESMs are accessible from the back of the expansion unit. These components contain several controls, indicators, and connectors.

Power-supply controls, indicators, and connectors

The FAStT EXP700 comes with two 400-Watt hot-pluggable, redundant power supplies. Each power supply has a power and a fault LED located on the back of the FAStT EXP700. The green LED indicates that the power supply is detecting ac power. The amber fault LED is lit if the power supply is unable to deliver dc power.

The FAStT EXP700 requires that both power supplies be installed to meet Electromagnetic Compatibility (EMC) and cooling requirements. Figure 4 shows their locations.

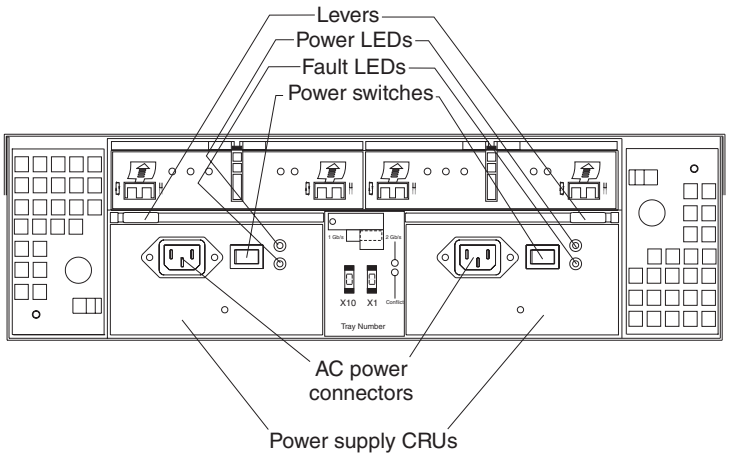


Figure 4. Power-supply controls, indicators, and connectors

- **Levers:** When you remove or install a power supply CRU, the levers located at the top of the power supply CRU must be unlocked.
- **Power LEDs:** These green power LEDs are lit when the expansion unit is turned on and receiving ac power.
- **Fault LED:** The amber power-supply fault LED is lit if a power-supply failure occurs.
- **Power switches:** The power switches are used to turn the power supplies on and off. You must turn on both switches to use the redundant power supplies.
- **AC power connectors:** To provide ac power to the expansion unit, power cables must be connected to the ac power connectors located on the back of the FAStT EXP700.
- **Hot-swap power-supply CRUs:** The two hot-swap power supplies are located on the back of the FAStT EXP700. Both power-supply CRUs must be installed, even if one power supply is not working.

Fan controls and indicators

The FAStT EXP700 comes with two fan units. Each expansion unit has two fans as shown in Figure 5 on page 6. The fan units in your FAStT EXP700 are hot-swappable and redundant. One fan will continue to operate if the other fan fails. You can remove and replace the fan unit while the FAStT EXP700 is powered on and accessing drives.

Each fan has a temperature sensor built into the air inlet. This sensor maintains fan speed to provide the necessary air flow. If the speed of one of the fans drops to a level that is too low or stops, the Fault LED located on the back of the fan unit is lit, and the General system error LED on the front of the FAStT EXP700 is lit. For the locations of the LEDs on the front of the expansion unit, see Figure 3 on page 4. For the LEDs on the back of the expansion unit, see Figure 5 on page 6.

Attention: The fans in your expansion unit draw in fresh air and force out hot air. These fans are hot-swappable and redundant; however, when one fan fails, the fan unit must be replaced within 48 hours to maintain redundancy and optimum cooling. When you remove the failed unit, be sure to install the replacement fan unit within 10 minutes to prevent overheating.

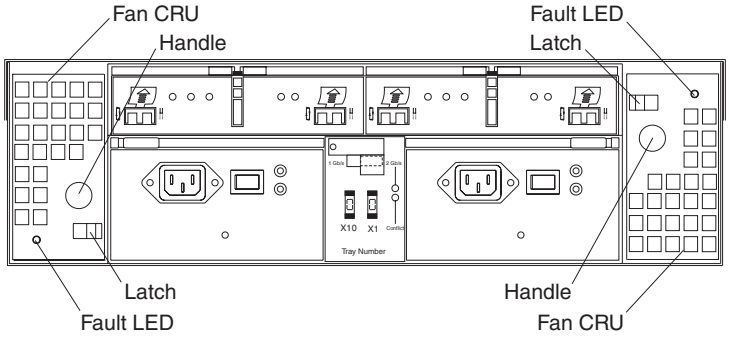


Figure 5. Fan controls and indicators

- **Fan CRUs:** The expansion unit comes with two fan CRUs. These fan units are hot-swappable and redundant.
- **Latches and handles:** Use the latches and handles to remove or install the fan CRUs.
- **Fault LED:** The amber fan fault LED is lit if a fan failure occurs.

ESMs and user controls

The FAStT EXP700 ESMs and user controls are shown in Figure 6.

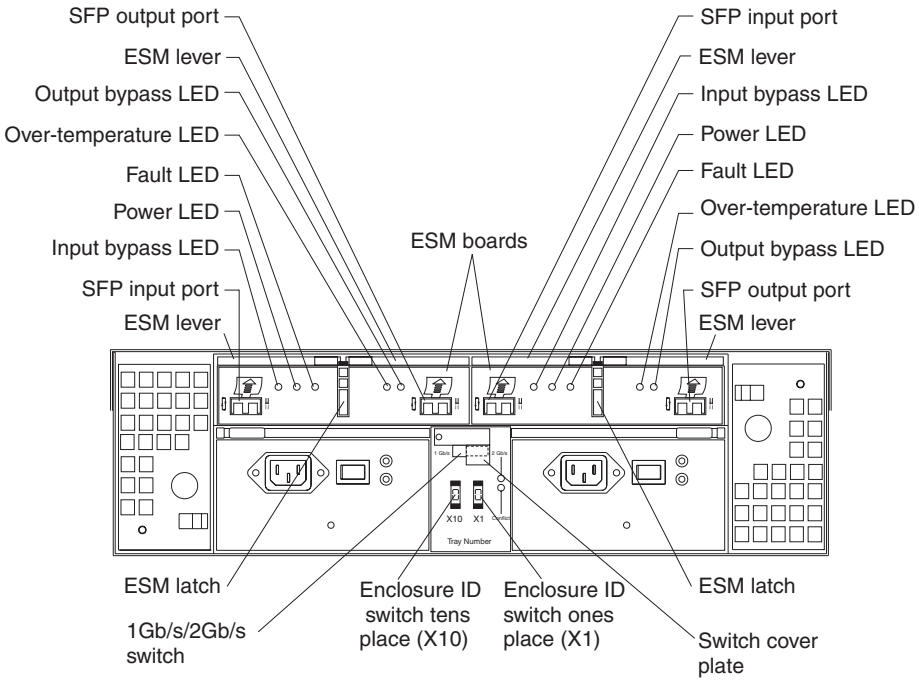


Figure 6. ESMs and user controls

- **SFP module input/output ports:** Each ESM has two SFP module connector ports for connecting your expansion unit to the controller or connecting two or

more FAStT EXP700 expansion units together. Install an SFP module into the input and output ports. Fibre Channel cables are used to connect the expansion unit to the controller or to additional expansion units.

- **ESM latch:** The ESM latch secures the ESM to the expansion unit.
- **ESM levers:** The ESM latch must be unlocked before you can use the ESM levers to remove the ESM from the expansion unit. When you are installing the ESM into the bay, use the ESM levers to guide the unit into the ESM bay.
- **ESMs:** The ESMs contain the expansion unit controls, switches, and LEDs. Each ESM has two SFP module ports for connecting the expansion unit to the controller.
- **Fault LED:** The amber ESM fault LED is lit when an ESM failure occurs.
- **Input/output bypass LEDs:** These amber LEDs are lit when a faulty SFP module or fiber-optic cable is installed. Both ports on the ESM are bypassed and the LEDs are lit in the event of an ESM fault. In this case, the ESM fault error LED is also lit. This LED is also lit if an SFP module is installed and not connected to another device.
- **Power LED:** The green power LED is lit when there is power to the ESM.
- **Over-temperature LED:** The ESM amber LED is lit if the expansion unit overheats.
- **Enclosure ID switches:** Two enclosure ID switches are located between the power supplies at the rear of the FAStT EXP700. These switches are used to identify the FAStT EXP700 on a Fibre Channel loop and to assign physical addresses to the drives. You can use the push buttons to set the values between 0 and 7. The X1 value assigns the physical addresses of the drives and the ESM. The X10 value identifies the loop where the FAStT EXP700 is located.
- **1 Gb/s 2 Gb/s switch:** Use the 1 Gb/s 2 Gb/s switch located on the back of the FAStT EXP700 to enable drive operation. The default setting is 2 Gb per second. Your switch setting will depend on your system configuration.

  Note: To determine which speed the expansion unit must be set to, see Table 1.

Storage-management software and hardware compatibility

Table 1 lists the FAStT EXP700 hardware and software compatibility and the maximum speed that the FAStT EXP700 can be set to when configured with other IBM FAStT hardware and software products.

Note: For the latest information about supported servers and operating systems for the FAStT EXP700, go to the ServerProven® Web site at http://www.ibm.com/pc/us/compat/.

Table 1. FAStT EXP700 hardware and software compatibility

Storage server / expansion unit	Storage-management software	Firmware	FAStT EXP700 disk drive operation speed setting
FAStT500 RAID Controller Enclosure Unit	IBM FAStT Storage Manager Version 7.10 or later	04.01.02.30 or later	1 Gb/s
	IBM FAStT Storage Manager Version 8.21 or later	05.21.xx.xx or later	1 Gb/s
FAStT EXP500 Storage Expansion Unit	n/a	n/a	1 Gb/s

Table 1. FAStT EXP700 hardware and software compatibility (continued)

Storage server / expansion unit	Storage-management software	Firmware	FAStT EXP700 disk drive operation speed setting
FAStT200 Storage Server	IBM FAStT Storage Manager Version 7.10 or later	04.01.02.30 or later	1 Gb/s
	IBM FAStT Storage Manager Version 8.21 or later	05.20.07.xx or later	1 Gb/s
TotalStorage FAStT700 Fibre Channel Storage Server	IBM FAStT Storage Manager Version 8.21 or later	05.21.xx.xx or later	1 Gb/s
	IBM FAStT Storage Manager Version 8.21 or later	05.21.xx.xx or later	2 Gb/s

IBM FAStT EXP700 operating specifications

This section provides general information about the FAStT EXP700. All components plug directly into the backplane.

Table 2. IBM TotalStorage FAStT EXP700 Storage Expansion Unit specifications

Size

- **Width**: 44.5 cm (17.52 in.)
- **Height**: 12.8 cm (5.03 in.)
- **Depth**: 56.3 cm (22.17 in.)

Weight: 30.12 kg (66.4 lb)

Electrical input

- Sine-wave input (50 to 60 Hz) is required
- Input voltage low range:
  - Minimum: 90 V ac
  - Maximum: 127 V ac
- Input voltage high range:
  - Minimum: 198 V ac
  - Maximum: 257 V ac
- Input kilovolt-amperes (kVA), approximately:
  - Minimum configuration: 0.06 kVA
  - Maximum configuration: 0.39 kVA

Environment

- Air temperature
  - Expansion unit on:
    - 10° to 35°C (50° to 95°F)
    - Altitude: 0 to 914 m (3000 ft)
  - Expansion unit off:
    - 10° to 32°C (50° to 90°F)
    - Altitude: 914 m (3000 ft) to 2133 m (7000 ft)
- Humidity
  - 8% to 80%

Heat dissipation

- Fully configured expansion unit (14 FAStT 2 GB hard disk drives)
  - 1,221 BTU per hour

Acoustical noise emission values

For open-bay (0 drives installed) and typical system configurations (Eight hard disk drives installed):

- Sound power (idling):
  - 5.9 bel (open bay)
  - 6.1 bel (typical)
- Sound power (operating):
  - 5.9 bel (open bay)
  - 6.2 bel (typical)
- Sound pressure (idling):
  - 44 dBA (open bay)
  - 46 dBA (typical)
- Sound pressure (operating):
  - 44 dBA (open bay)
  - 47 dBA (typical)

These levels are measured in controlled acoustical environments according to ISO 7779 and are reported in accordance with ISO 9296. The declared sound power levels indicate an upper limit, below which a large portion of machines operate. Sound pressure levels in your location might exceed the average 1-meter values stated because of room reflections and other nearby noise.

IBM FAStT EXP700 features

The following features are available with this product.

Table 3. IBM TotalStorage FAStT EXP700 Storage Expansion Unit features

Power supply • Two 400 W hot-pluggable power supplies • Power supplies are accessible from the rear using camming levers or latches. • Two ac line cords • Two 9-ft jumper cords • On/off switch on the back of each power supply • 14 disk drives run continuously from a single power supply. **Two fan units** • Hot pluggable fan units accessible from the rear of the expansion unit, one on each side • Two fan units, with two fans per unit, for a total of four fans. The fans are redundant, meaning that if one fan is disabled the remaining three fans continue to cool the FAStT EXP700.	**Environmental services monitors** • Two ESMs are accessible from the back of the expansion unit. • ESMs are hot pluggable. • ESMs are redundant.

Chapter 2. Installing the FAStT EXP700

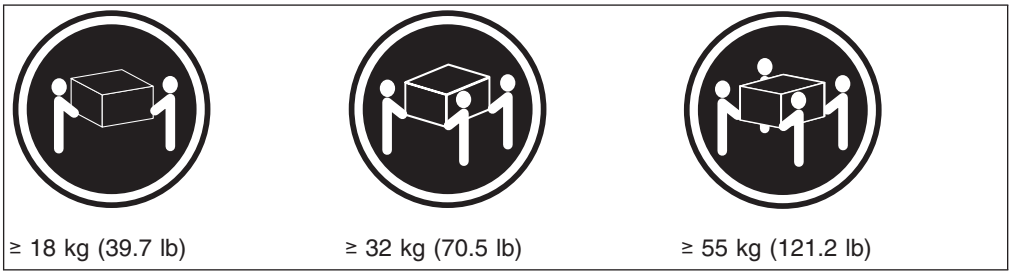
This chapter provides the information needed for preparing the FAStT EXP700 for installation into a rack cabinet. This chapter also contains information about cabling, setting interface options, and installing optional cables.

Preparing for installation

Complete the following steps to prepare the FAStT EXP700 for installation into a rack cabinet.

1. Prepare the site to meet all area, environmental, power, and site requirements. For more information, see “IBM FAStT EXP700 operating specifications” on page 8.
2. Move the FAStT EXP700 and its rack cabinet to the site.

   Statement 4:



   CAUTION:
   Use safe practices when lifting.
3. Remove the FAStT EXP700 from its shipping container and check the contents (see “Inventory checklist” on page 1). If any items are missing, contact your IBM reseller before proceeding.
4. Assemble the tools and equipment you will need for installation. These might include:
   - Power cords (comes with the FAStT EXP700)
   - Number 2 Phillips and medium flat-blade screwdrivers
   - Antistatic protection (such as a grounding wrist strap)
   - Fibre Channel (FC) and Ethernet interface cables and cable straps
   - Rack-mounting hardware (comes with the FAStT EXP700)
   - IBM FAStT Storage Manager software to configure the storage subsystems (comes with the IBM FAStT700 Fibre Channel Storage Server)
5. Continue with “Handling static-sensitive devices”.

Handling static-sensitive devices

Attention: Static electricity can damage electronic devices and your system. To avoid damage, keep static-sensitive devices in their static-protective packages until you are ready to install them.

To reduce the possibility of electrostatic discharge, observe the following precautions:

- Limit your movement. Movement can cause static electricity to build up around you.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed printed circuitry.
- Do not leave the device where others can handle and possibly damage the device.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the system unit for at least two seconds. (This drains static electricity from the package and from your body.)
- Remove the device from its package and install it directly into your system unit without setting it down. If it is necessary to set the device down, place it in its static-protective package. Do not place the device on your system unit cover or on a metal table.
- Take additional care when handling devices during cold weather because heating reduces indoor humidity and increases static electricity.

Continue with “Preparing the site”.

Preparing the site

This section lists the space requirements and weight information for the FAStT EXP700. For information on interface cables and connections, see “Cabling the expansion unit” on page 20.

Floor space: The floor area at the installation site must provide the following:

- Enough stability to support the weight of the fully configured FAStT EXP700 and associated systems.
- Sufficient space to install the FAStT EXP700.

Weight: The FAStT EXP700 total weight depends on the number of FAStT 2 GB Fibre Channel hard disk drives that are installed. A fully configured FAStT EXP700 with two fans, two power supplies, two ESMs, and up to 14 Fibre Channel hard disk drives installed weighs 43.99 kg (97 lbs).

Continue with “Preparing the rack”.

Preparing the rack

To prepare the rack for installation, review the following list and complete all applicable preparatory procedures:

1. Moving, unpacking, and leveling the rack at the installation site.
2. Removing external rack panels.
3. Stopping all I/O activity to the devices in the rack.
4. Turning off all drive enclosure and rack power, and disconnecting existing power, network, and other external cables.
5. Installing additional interface cables and power cables.
6. Installing support rails for mounting the FAStT EXP700. See the Rack mounting template and instructions that come with the FAStT EXP700.
7. Removing, adding, or reconfiguring expansion units or devices in the rack cabinet.

Important: Before installing the FAStT EXP700 in a rack, it is important that you do the following:

- Review the documentation that comes with your rack enclosure for safety and cabling considerations.
- Install the FAStT EXP700 in a maximum 35°C environment.
- To ensure proper airflow, do not block the air vents; 15 cm (6 in.) of air space is sufficient.
- To ensure rack stability, load the rack starting at the bottom.
- If you install multiple components in the rack, do not overload the power outlets.
- Always connect the expansion unit to a properly grounded outlet.

Continue with “Preparing the FAStT EXP700”.

Preparing the FAStT EXP700

You will need an antistatic wrist strap and a cart or level surface (to hold the CRUs). You will use the following procedure to prepare the FAStT EXP700 for installation. These instructions can be used after you have completed all applicable site, rack cabinet, and FAStT EXP700 preparations discussed in “Preparing for installation” on page 11.

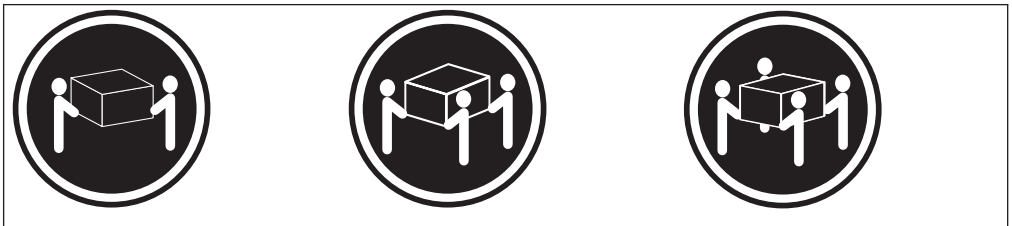
The FAStT EXP700 comes with a rack-mounting hardware kit for installation into a rack cabinet. It is easier to lift the FAStT EXP700 and install it in a rack cabinet if you remove all CRUs first.Remove the following CRUs from the expansion unit before installing it in the rack cabinet:

- ESMs
- Power supplies
- Fans
- Hot-swap hard disk drives

Note: You do not need to remove blank trays.

Use the following procedures to remove FAStT EXP700 CRUs. Removing the CRUs will reduce the overall weight of the FAStT EXP700.

Statement 4:



CAUTION:
Use safe practices when lifting.

Attention: The expansion unit comes with the bezel attached to the front of the unit with two white plastic screws and nuts. This bezel protects the light pipes located above the drive trays. Leave the protective bezel in place until you are instructed to remove it.

Complete the following steps to remove an ESM:

1. Push down on the ESM latch. The ESM levers will pop out of the locked position.
2. Grasp the pull rings and pull out on the levers; then, remove the ESM from the bay as shown in Figure 7.

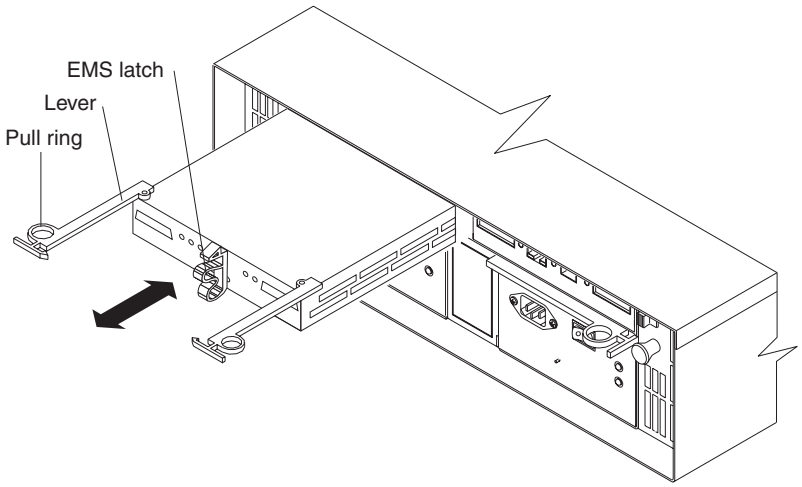


Figure 7. Removing an ESM

3. Place the ESM on a level surface.

Complete the following steps to remove a power supply CRU:

1. Grasp the pull-ring on the power-supply lever and squeeze the latch to release it.
2. Pull the lever open and remove the power supply as shown in Figure 8 on page 15.

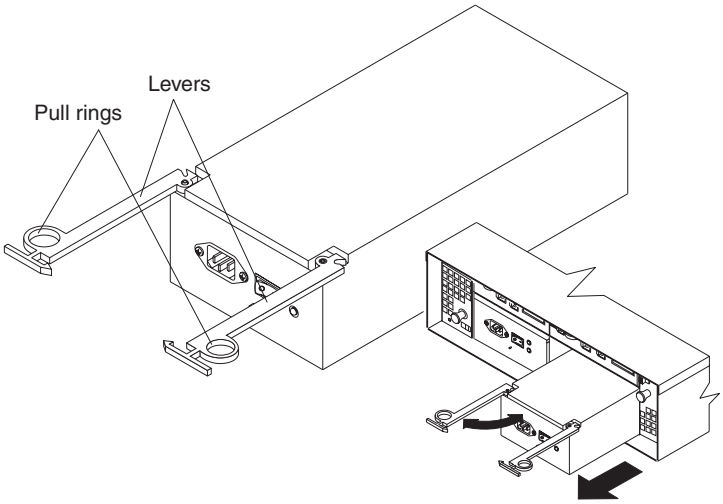


Figure 8. Removing a power supply CRU

3. Place the power supply on a level surface.

Complete the following steps to remove a fan CRU:

1. Unlock the latch by moving the latch in the same direction as the arrow.
2. Grasp the handle and pull the fan unit out of the bay as shown in Figure 9.

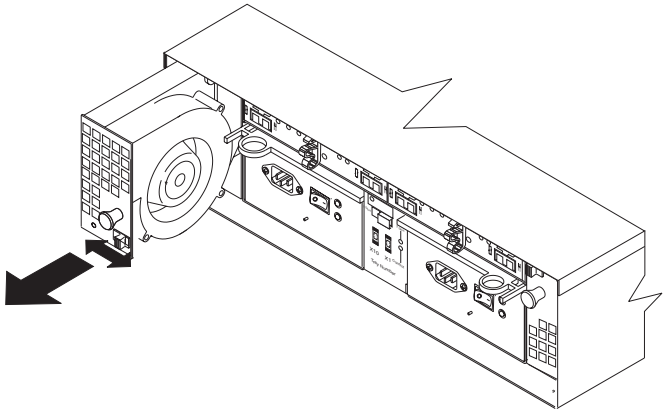


Figure 9. Removing a fan CRU

3. Place the fan unit on a level surface.

Complete the following steps to remove a hot-swap hard disk drive:

Note: The hard disk drive comes installed in a drive tray. Do not attempt to detach the drive from the tray.

1. Use Table 8 on page 53 to record the location and identify your FAStT 2 GB Fibre Channel hard disk drives. This record is required for replacing the hard disk drives in the original order before they were removed.
2. Release the blue latch on the drive CRU by pressing on the inside of the bottom of the tray handle.
3. Pull the handle on the tray out so that it is in the open position and pull the drive out of the bay as shown in Figure 10 on page 16.

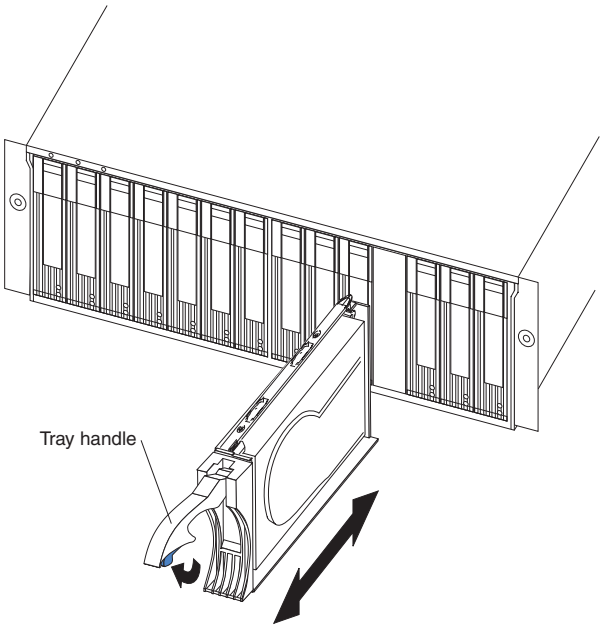


Figure 10. Removing drive CRUs

4. Place the drive on a level surface.

Continue with “Installing the support rails and the FAStT EXP700 into a rack cabinet”.

Installing the support rails and the FAStT EXP700 into a rack cabinet

To install the FAStT EXP700 in a rack cabinet, use the rails and rack-mounting hardware that come with your expansion unit. The FAStT EXP700 requires an EIA 310-D Type A 19-inch rack cabinet. This required rack cabinet has a minimum and maximum rack depth of 24 inches and 32 inches respectively, which is the distance between EIA rails, from the front of the rack cabinet to the rear of the rack cabinet. This rack cabinet conforms to the Electronic Industries Association (EIA) standard. Where you place the support rails in the cabinet depends on where you intend to position the expansion unit.

Use the rack mounting installation assembly package that comes with the expansion unit to locate the rack mounting holes and install the unit into a rack cabinet. Instructions for removing and replacing the bezel are included in the *Rack Mounting Template* that comes with the expansion unit.

After you install the FAStT EXP700 in a rack cabinet, continue with “Replacing the FAStT EXP700 CRUs”.

Replacing the FAStT EXP700 CRUs

Complete the following steps to replace the ESM CRUs that you removed:

1. Slide one ESM into the empty slot in the expansion unit. Be sure the levers are pulled straight out as you slide it in, as shown in Figure 11 on page 17.

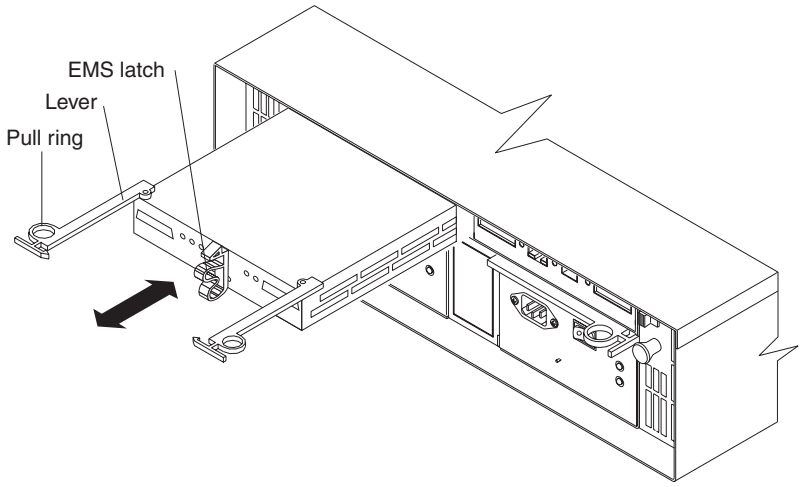


Figure 11. Replacing an ESM

2. After you install the ESM into the bay, the ESM latch will lock into place. Close the levers until the pull-ring latch locks in place. Make sure the levers lock into place in the expansion-unit chassis.
3. Repeat steps 1 and 2 to replace the second ESM.

Complete the following steps to replace the power-supply CRUs that you removed:

1. Slide one power supply into the expansion unit. Be sure the levers are pulled straight out as you slide the power supply into the expansion unit, as shown in Figure 12.

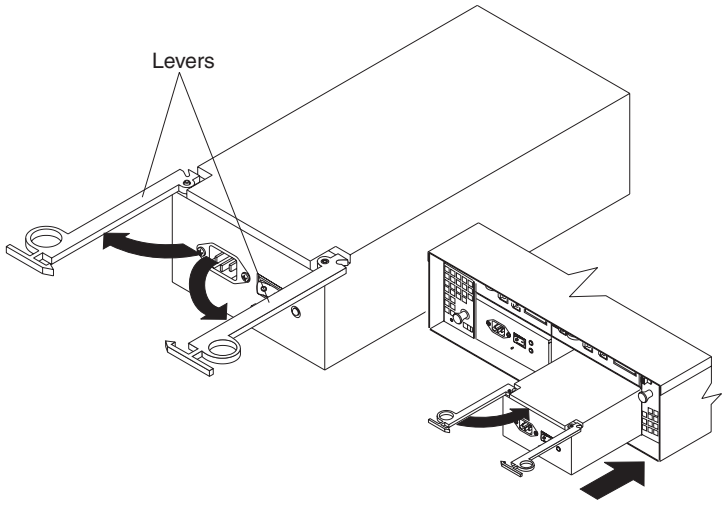


Figure 12. Replacing a power-supply CRU

2. Close the lever until the pull-ring latch locks in place. Make sure the lever locks into place in the expansion-unit chassis.
3. Repeat steps 1 and 2 to replace the second power supply.

Complete the following steps to replace the fan unit CRUs that you removed:

1. Place the fan CRU in front of the fan bay.

2. Ensure that you move the fan latch in the same direction as the arrow before you slide the fan all the way into the bay. If the fan does not go into the bay, rotate it 180°. (See Figure 13.)

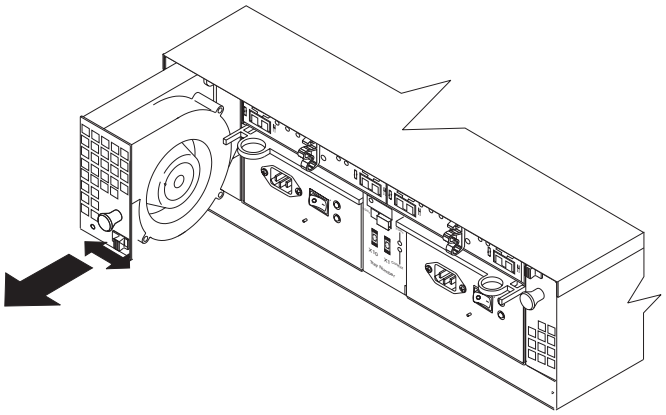


Figure 13. Replacing a fan CRU

3. If the latch does not automatically lock when you have successfully inserted the fan unit into the bay, pull back on the fan slightly and then push it in again until the latch snaps into place.
4. Repeat steps 1 through 3 to replace the second fan.

Complete the following steps to replace the hot-swap hard disk drives that you removed:

1. Lift up on the handle and gently push the drive CRU into the empty bay until the tray handle touches the expansion-unit bezel.
2. Push the tray handle down into the closed (latched) position as shown in Figure 14.

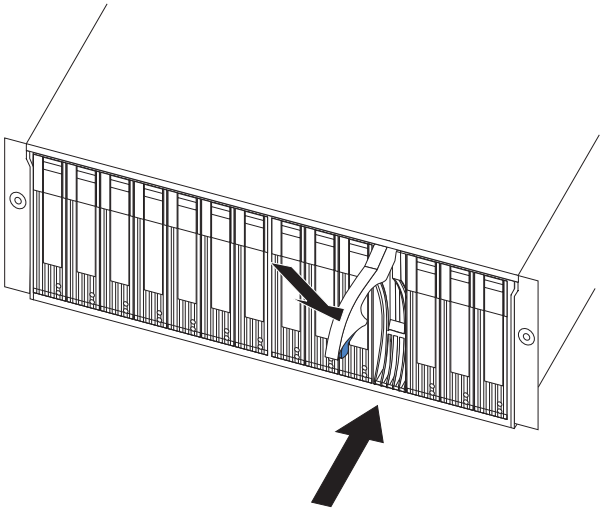


Figure 14. Replacing hot-swap hard disk drives

3. Repeat steps 1 and 2 to replace additional drives.

Continue with “Setting the interface options” on page 19.

Setting the interface options

The FAStT EXP700 comes with two enclosure ID switches that are used to identify the FAStT EXP700 on a Fibre Channel loop, and to assign physical addresses to the drives. The enclosure ID switches are located on the back of the expansion unit, as shown in Figure 15.

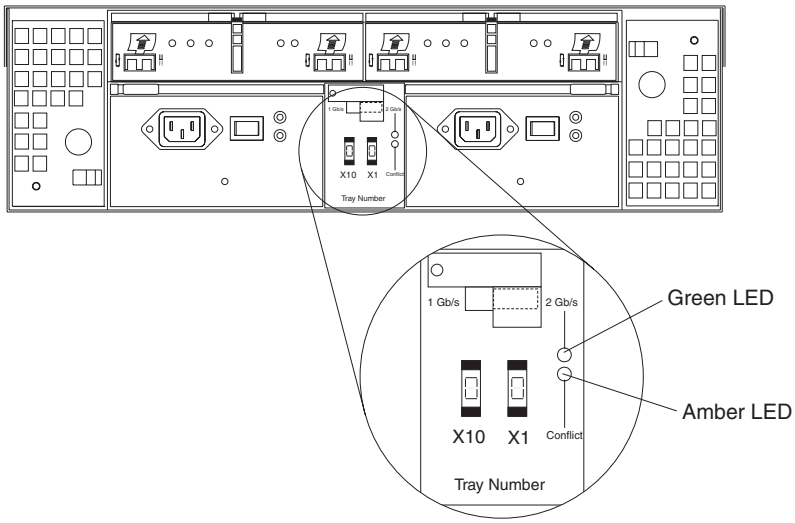


Figure 15. Setting the interface options

Fibre Channel loop and ID settings

When you install a hard disk drive in the expansion unit, the drive tray plugs into a printed circuit board called the *midplane*. The midplane sets the Fibre Channel loop ID automatically, based on the enclosure ID switch setting and the physical location (bay) of the hard disk drive.

Enclosure ID settings

Enclosure ID switch settings (values 0 through 7) set various addresses and IDs. Enclosure ID switch X1 is for setting the ones position, and Enclosure ID switch X10 is for setting the tens position. The settings of the two enclosure ID switches, when used together, provide a two-digit ID of the expansion unit. The storage-management software uses the enclosure ID to provide a correlation between the storage-management graphics and the physical expansion unit. The ID indicates which physical unit corresponds to the storage-management software status.

Use Enclosure ID switches X10 and X1 to set the expansion-unit ID to any value from 0 through 7. Each expansion unit that is connected to a Fibre Channel controller should have a unique ID. The ID must be different from all other expansion units connected to the storage server. Refer to your storage server documentation for more information.

Enclosure ID switch X1 also sets the physical IDs of the drives within the expansion unit. Use the X10 switch setting to identify the loop where the FAStT EXP700 is located.

Expansion unit speed settings

The default switch setting is 2 Gb per second. Be sure that you have read "Storage-management software and hardware compatibility" on page 7 to determine the correct operating speed *before* you complete the following steps to access and enable drive operation to 1 Gb per second:

1. Using a Phillips screwdriver, loosen the screw that secures the switch cover plate to the expansion unit; then, remove the switch cover plate.
2. To enable 1 Gb per second drive operation, press on the left side of the switch to 1 Gb/s (when set to 1 Gb/s, the green LED to the right of the switch is off).
3. Replace the switch cover plate.
4. Continue with "Cabling the expansion unit".

Cabling the expansion unit

The FAStT EXP700 provides two redundant loops. A redundant FAStT EXP700 loop consists of one or more expansion units connected to a storage server using two sets of Fibre Channel cables. If one Fibre Channel loop fails, the storage server uses the other FAStT EXP700 loop to maintain input/ouput to the FAStT EXP700 array group. Usually, there are two RAID controllers in a storage server. Use the *Fibre Channel Cabling Instructions* that comes with your storage server for the specific information about cabling the FAStT EXP700. Before cabling the expansion unit, read the following information:

- **Fibre Channel loop:** A Fibre Channel loop consists of Fibre Channel disk drives connected to each other and to one or more RAID controllers. A loop can support multiple RAID controllers, a large number of disk drives, and other addressable entities such as system-management logic chips. Refer to your storage server documentation for information about controller-dependent hardware configuration details. Some controllers might have restrictions on the maximum number of disk drives supported on a loop, cabling restrictions, and other requirements.
- **SFP module ports:** Your FAStT EXP700 supports large, complex, and redundant disk drive loop configurations. Each ESM has two SFP module ports. Each SFP module has an input and output port. A loop is created by connecting one or more FAStT EXP700 expansion units to one or more RAID controllers. You then use dual fiber-optic cables to connect one FAStT EXP700 to another.
- **Fibre Channel cable restrictions:** RAID controllers use specific IBM Fibre Channel options. Refer to the *Fibre Channel Cabling Instructions* that come with your storage server for the cable option that is required for your configuration.
- **Power cabling:** The expansion unit uses two standard power cables. You can connect the power cables to a primary power unit inside the rack cabinet, such as a properly grounded ac distribution unit or uninterruptible power supply (UPS). You can also connect the power cable to an external source, such as a properly grounded electrical outlet.

Installing SFP modules

The FAStT EXP700 requires SFP modules. SFP modules are used to convert electrical signals to optical signals that are required for Fibre Channel transmission to and from RAID controllers. After you install the SFP modules, you will use fiber-optic cables to connect the FAStT EXP700 to a FAStT200, FAStT500, or FAStT700.

Before installing SFP modules and fiber-optic cables, read the following information:

- The SFP module housing has an integral guide key designed to prevent you from inserting the SFP module improperly.
- Use minimal pressure when inserting an SFP module into an SFP port. Forcing the SFP module into a port could cause damage to the SFP module or the port.
- You can insert or remove the SFP module while the port is powered on.
- The operational or redundant loop performance is not affected when you install or remove an SFP module.
- You must insert the SFP module into a port before you connect the fiber-optic cable.
- You must remove the fiber-optic cable from the SFP module before you remove the SFP module from the port. Refer to “Removing SFP modules” on page 22 for more information.

Complete the following steps to install an SFP module:

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

Attention: When you handle static-sensitive devices, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see “Handling static-sensitive devices” on page 11.

1. Remove the SFP module from its static-protective package.
2. Remove the protective cap from the SFP module, as shown in Figure 16 on page 22. Save the protective cap for future use.

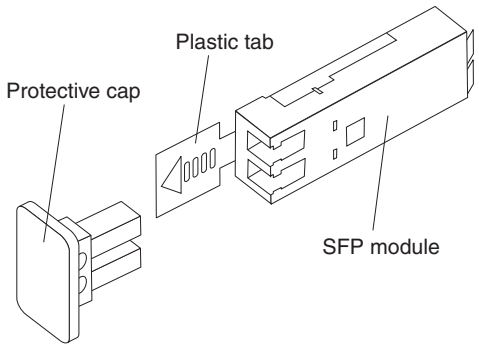


Figure 16. Small Form-Factor Pluggable (SFP) module

3. Remove the protective cap from the SFP port. Save the protective cap for future use.
4. Insert the SFP module into the SFP port until it clicks into place. See Figure 29 on page 30 for the correct orientation of the SFP in the FAStT EXP700.
5. Connect an LC-LC Fibre Channel cable. For information about the LC-LC cable, see “Using LC-LC Fibre Channel cables” on page 23.

Removing SFP modules

Complete the following steps to remove the SFP module from the SFP port:

Attention: To avoid damage to the cable or SFP module, make sure you unplug the LC-LC Fibre Channel cable *before* you remove the SFP module.

1. Remove the LC-LC Fibre Channel cable from the SFP module. For more information, see “Handling static-sensitive devices” on page 11 and “Using LC-LC Fibre Channel cables” on page 23.
2. Unlock the SFP module latch by pulling the plastic tab outward 10°, as shown in Figure 17.

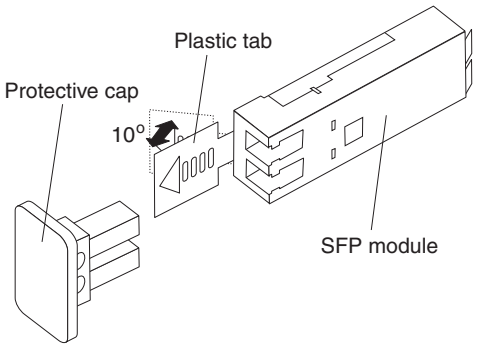


Figure 17. Unlocking the SFP module latch

3. With the SFP latch in the unlocked position, slide the SFP module out of the port.
4. Replace the protective cap on the SFP module.
5. Place the SFP module into a static-protective package.

Handling fiber-optic cables

Before using fiber-optic cables, read the following precautions.

Attention: To avoid damage to your fiber-optic cables, follow these guidelines:

- Do not route the cable along a folding cable-management arm.
- When connecting cables to a device on slide rails, leave enough slack in the cable so that it does not bend to a radius of less than 38 mm (1.5 in.) when extended or become pinched when retracted.
- Route the cable away from places where it can be snagged by other devices in the rack.
- Do not overtighten the cable straps or bend the cables to a radius of less than 38 mm (1.5 in.).
- Do not put excess weight on the cable at the connection point. Be sure that the cable is well supported.

Using LC-LC Fibre Channel cables

The LC-LC Fibre Channel cable shown in Figure 18, is a fiber-optic cable that is used to connect into one of the following devices:

- SFP module installed in an IBM FAStT EXP700 Storage Expansion Unit
- SFP module installed in an IBM FAStT700 Fibre Channel Storage Server

For more information about cabling these devices, see the documentation that comes with the LC-LC Fibre Channel cable.

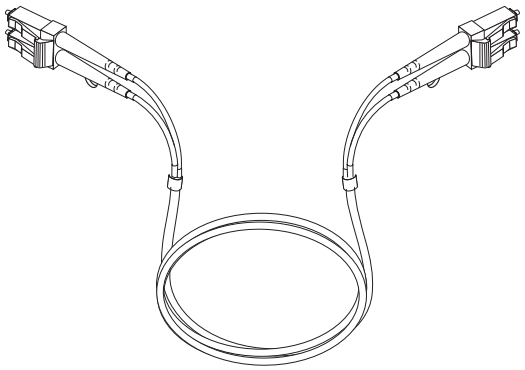


Figure 18. LC-LC Fibre Channel cable

Note: If you are connecting the FAStT EXP700 to an IBM FAStT500 or to an IBM FAStT200, you must also use an LC-SC Fibre Channel cable adapter. You also need the LC-SC cable adapter when connecting a FAStT EXP700 to a FAStT EXP500. For more information about using the Fibre Channel cable adapter, see “Using LC-SC Fibre Channel cable adapters” on page 26.

Connecting an LC-LC cable to an SFP module

Complete the following steps to connect an LC-LC Fibre Channel cable to an SFP module:

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

1. Read the information in “Handling fiber-optic cables” on page 23.
2. If necessary, remove the protective cap from the SFP module, as shown in Figure 16 on page 22. Save the protective cap for future use.
3. Remove the two protective caps from one end of the LC-LC cable, as shown in Figure 19. Save the protective caps for future use.

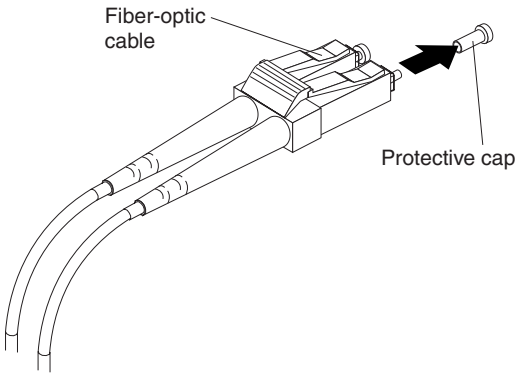


Figure 19. Removing fiber-optic cable protective caps

4. Carefully insert that same end of the LC-LC cable into an SFP module that is installed in the FAStT EXP700. The cable connector is keyed to ensure it is inserted into the SFP module correctly. Holding the connector, push in the cable

until it clicks into place, as shown in Figure 20.

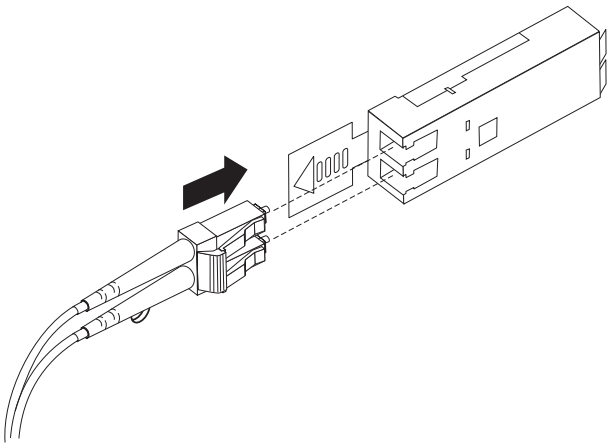


Figure 20. Inserting an LC-LC Fibre Channel cable into an SFP module

5. Remove the two protective caps from the other end of the LC-LC cable. Save the protective caps for future use.
6. Connect the LC-LC cable to one of the following devices:
   - SFP module that is installed in a separate FAStT EXP700
   - SFP module that is installed in a FAStT700
   - LC-SC Fibre Channel cable adapter. (For information about using an LC-SC cable adapter, see “Using LC-SC Fibre Channel cable adapters” on page 26.)

Removing an LC-LC Fibre Channel cable

Complete the following steps to remove an LC-LC Fibre Channel cable:

Attention: To avoid damaging the LC-LC cable or SFP module, make sure you press and hold the lever to release the latches before you remove the cable from the SFP module. Ensure that the levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure you do not grasp the SFP module plastic tab.

1. On the end of the LC-LC cable that connects into the SFP module or host bus adapter, press down and hold the lever to release the latches, as shown in Figure 21.

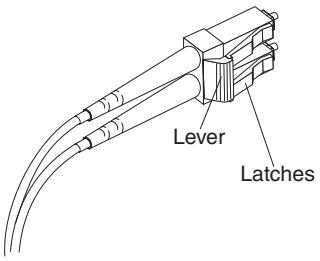


Figure 21. LC-LC Fibre Channel Cable lever and latches

2. Carefully pull on the connector to remove the cable from the SFP module as shown in Figure 22 on page 26.

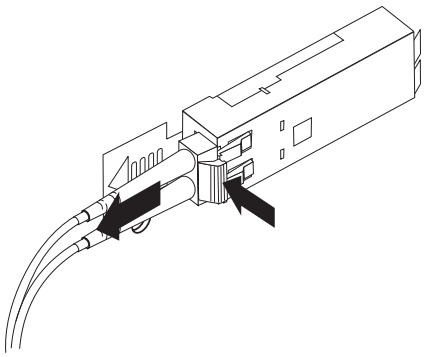


Figure 22. Removing the LC-LC Fibre Channel cable

3. Replace the protective caps on the cable ends.
4. Replace the protective cap on the SFP module.

Using LC-SC Fibre Channel cable adapters

The LC-SC Fibre Channel cable adapter is a fiber-optic cable that is used to connect an LC connector into one of the following devices that require SC connectors:

- IBM FAStT200 Storage Server
- IBM FAStT EXP500 Expansion Unit
- IBM FAStT500 RAID Controller Enclosure Unit

For more information about connecting to these devices, see the documentation that comes with the LC-SC Fibre Channel cable adapter.

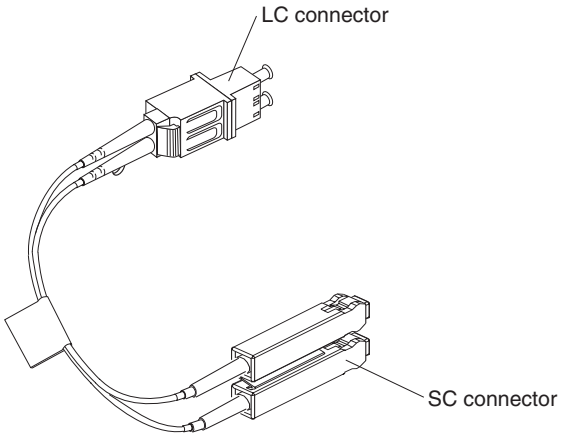


Figure 23. LC-SC Fibre Channel cable adapter

The following sections provide the procedures for properly connecting and removing an LC-SC Fibre Channel cable.

Connecting an LC-SC cable adapter to a device

Complete the following steps to connect an LC-SC Fibre Channel cable adapter to a device:

Statement 3:

CAUTION:
When laser products (such as CD-ROMs, DVD drives, fiber optic devices, or transmitters) are installed, note the following:

- **Do not remove the covers. Removing the covers of the laser product could result in exposure to hazardous laser radiation. There are no serviceable parts inside the device.**
- **Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.**

DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

1. Read the information in “Handling fiber-optic cables” on page 23.
2. Connect one end of an LC-LC cable to an SFP module in the FAStT EXP700. For instructions, see “Installing SFP modules” on page 20.
3. Remove the two protective caps from the LC connector end of the LC-SC cable adapter as shown in Figure 24. Save the protective caps for future use.

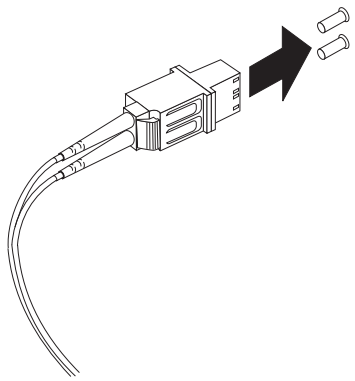


Figure 24. Removing the LC-SC cable adapter protective caps

4. Carefully insert the other end of the LC-LC cable into the LC connector end of the LC-SC cable adapter as shown in Figure 25 on page 28. Push in the connector until it clicks into place.

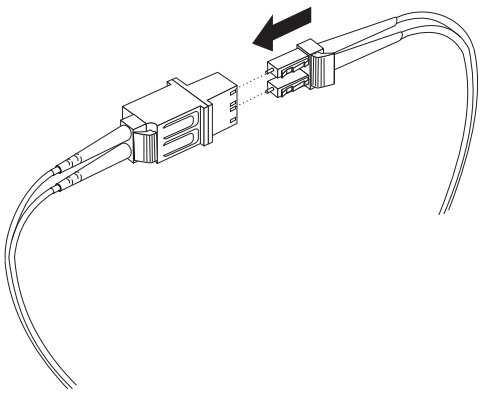


Figure 25. Connecting an LC-LC cable into the LC-SC cable adapter

5. If you are connecting the FAStT EXP700 to a FAStT200 or FAStT EXP500, connect the SC connector end of the LC-SC cable adapter to a Gigabit Interface Converter (GBIC) that is installed in a FAStT200 or FAStT EXP500. For more information about connecting to these devices, see the documentation that comes with the device.

Removing an LC-LC cable from an LC-SC cable adapter

Complete the following steps to remove an LC-LC cable from an LC-SC cable adapter:

Attention: To avoid damaging the LC-LC cable, make sure you press and hold the lever to release the latches before you remove the cable from an LC-SC cable adapter. Ensure that both levers are in the released position when removing the cable. When removing the cable from the SFP module, make sure you do not grasp the SFP module plastic tab.

1. On the end of the cable that connects into the LC connector end of the LC-SC cable adapter, press down and hold the lever to release the latches. Figure 26 shows the location of the lever and latches.

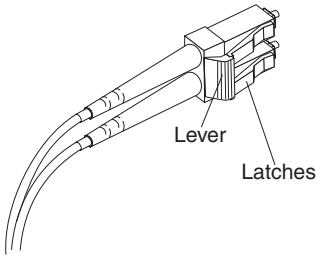


Figure 26. LC-LC Fibre Channel cable lever and latches

2. Carefully pull on the connector to remove it. Make sure you grasp the connector and not the cable when removing the LC-LC cable from the LC-SC cable adapter as shown in Figure 27.

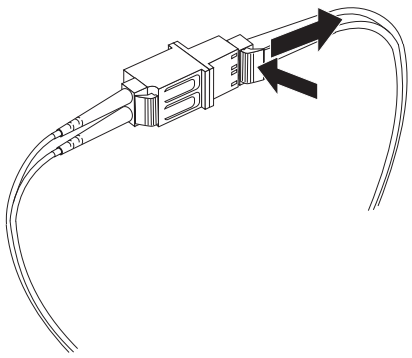


Figure 27. Removing the LC-LC Fibre Channel cable from an LC-SC Fibre Channel cable adapter

3. Replace the protective caps on the cable ends.

Cabling the FAStT EXP700 to a FAStT200, FAStT500, and FAStT700

You can cable the FAStT EXP700 to a FAStT200 Storage Server, FAStT500 RAID Controller Enclosure Unit, or FAStT700 Fibre Channel Storage Server. To cable the expansion unit to a FAStT200, FAStT500, or FAStT700, you need optional LC-LC and LC-SC cable adapters.

Cabling the FAStT EXP700 to a FAStT200 Storage Server

Complete the following steps to cable the FAStT EXP700 to a FAStT200:

1. Insert a GBIC into the expansion port located on the back of a FAStT200 and remove the protective cap, as shown in Figure 28.

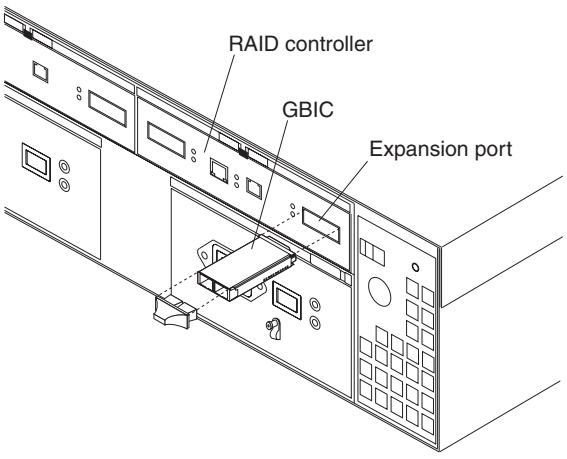


Figure 28. Installing a GBIC in a FAStT200

2. Using Figure 29 on page 30 as a guide, complete the following steps to connect the FAStT200 to the FAStT EXP700:
   a. Connect the SC end of an LC-SC cable adapter to the GBIC.

b. Connect one end of an LC-LC cable to the LC end of the LC-SC cable adapter.
c. Insert an SFP module into the SFP port located on the back of the FAStT EXP700; then, connect the other end of the LC-LC cable to the SFP module.

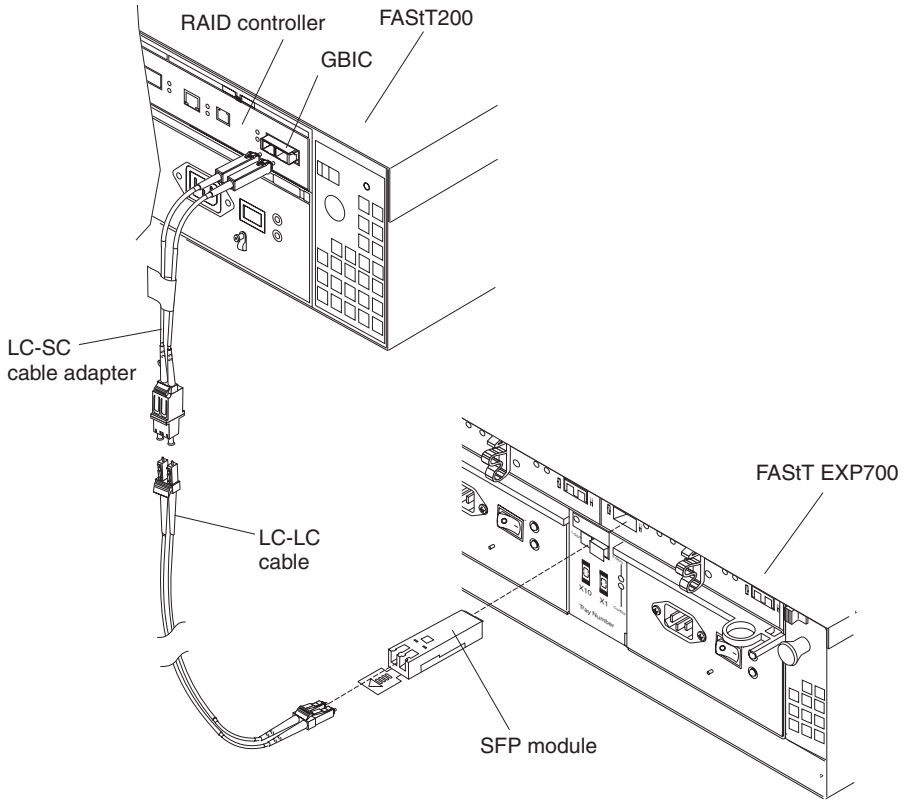


Figure 29. Connecting the FAStT200 to the FAStT EXP700

Cabling the FAStT EXP700 to a FAStT500 RAID Controller Enclosure Unit

Complete the following steps to cable the FAStT EXP700 to a FAStT500:

1. Insert a GBIC into a drive mini-hub port located on the back of a FAStT500, as shown in Figure 30 on page 31.

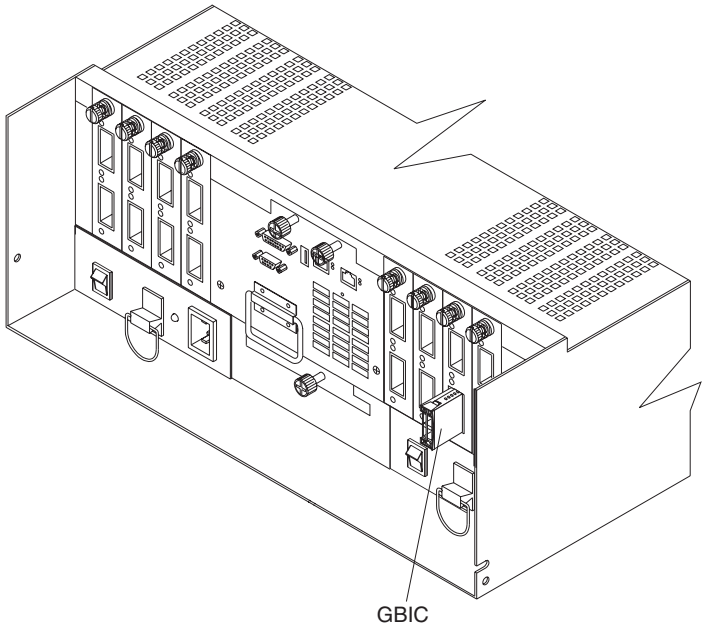


Figure 30. Installing a GBIC in a FAStT500

2. Using Figure 31 on page 32 as a guide, complete the following steps to connect the FAStT EXP700 to a FAStT500 RAID controller:
   a. Connect the SC end of an LC-SC cable adapter to the GBIC.
   b. Connect one end of an LC-LC cable to the LC end of the LC-SC cable adapter.
   c. Insert an SFP module into the SFP port located on the back of the FAStT EXP700; then, connect the other end of the LC-LC cable to the SFP module.

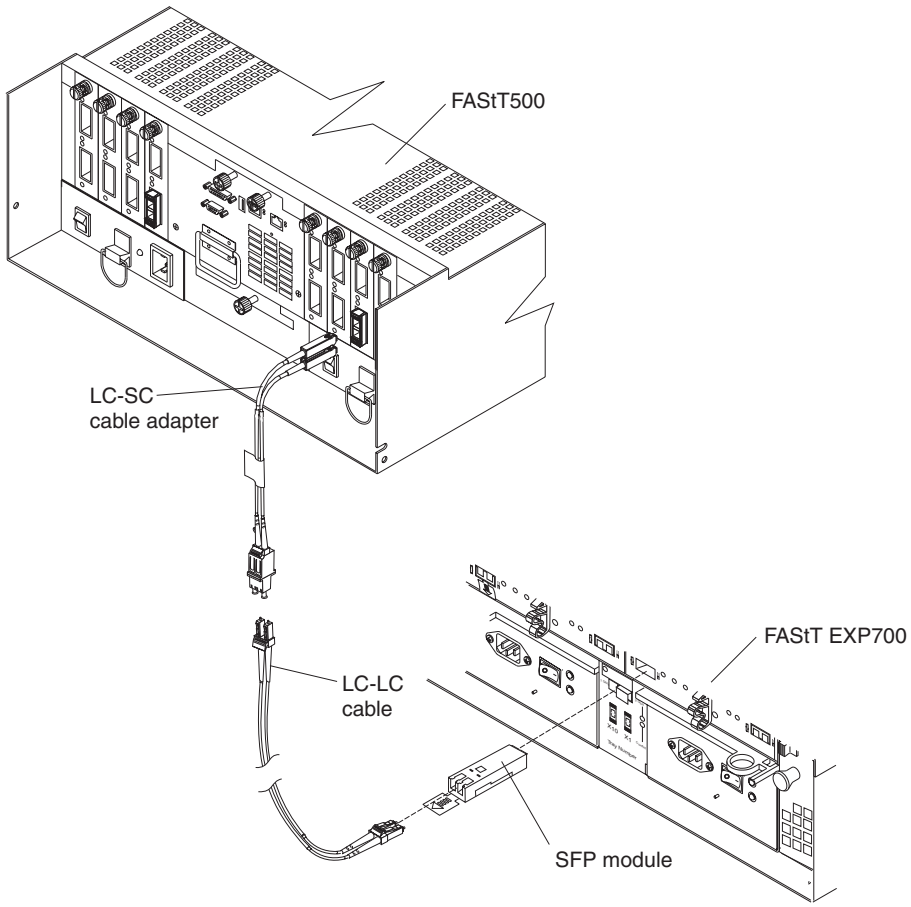


Figure 31. Connecting the FAStT500 to the FAStT EXP700

Cabling the FAStT EXP700 to a FAStT700 Fibre Channel Storage Server

Complete the following steps to cable the FAStT EXP700 to a FAStT700 Fibre Channel Storage Server:

1. Install an SFP module in the drive mini-hub port on the back of a FAStT700 Fibre Channel Storage Server.
2. Connect an LC-LC fiber-optic cable into the SFP module, as shown in Figure 32 on page 33.

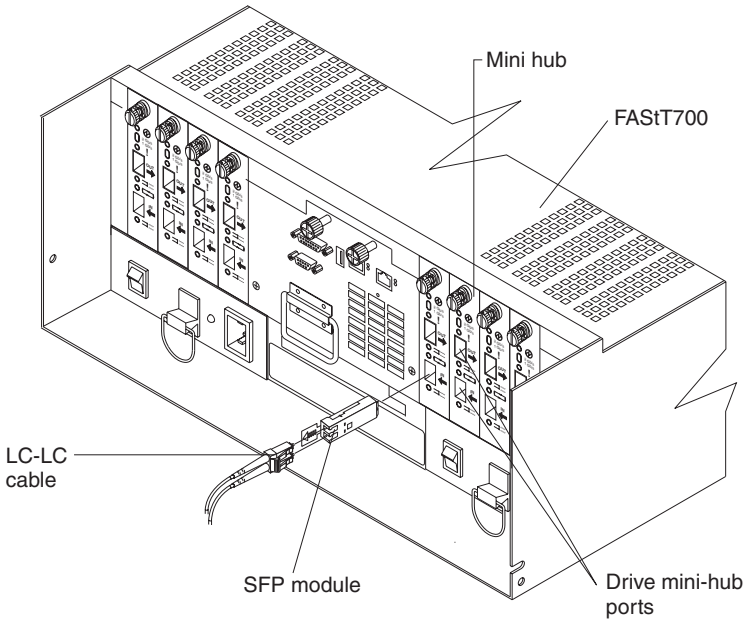


Figure 32. Installing an SFP module and LC-LC cable in a FAStT700

3. Install an SFP module in the SFP port on the back of the FAStT EXP700; then, connect the other end of the LC-LC cable into the SFP module, as shown Figure 33.

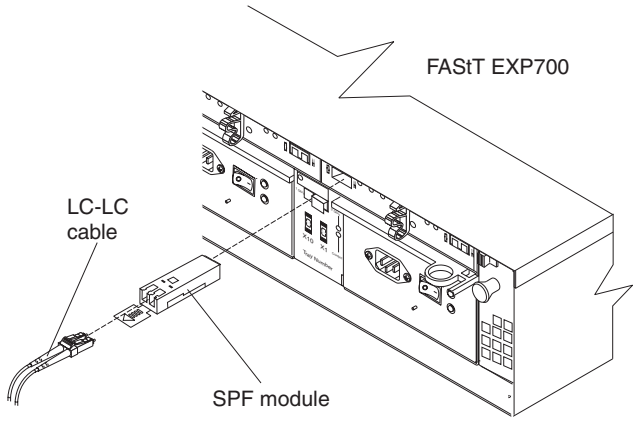


Figure 33. Installing an SFP module and connecting an LC-LC cable to the FAStT EXP700

Adding the FAStT EXP700 to a loop

You can add the FAStT EXP700 to a Fibre Channel loop. Figure 34 on page 34 shows an example of a fully configured storage server with the maximum number of drive loops that are supported. Before you cable your FAStT EXP700 to a loop, refer to the *Fibre Channel Cabling Instructions* that come with your storage server for specific instructions.

To add the FAStT EXP700 to a Fibre Channel loop, cable the SFP module input port on an existing ESM (shown as last drive enclosure in Figure 34) to an SFP module output port (shown as new FAStT EXP700 in Figure 34). You can cable additional FAStT EXP700 expansion units until the loop reaches the maximum defined by the storage server. The storage server might also have cabling configuration information or restrictions that you must follow.

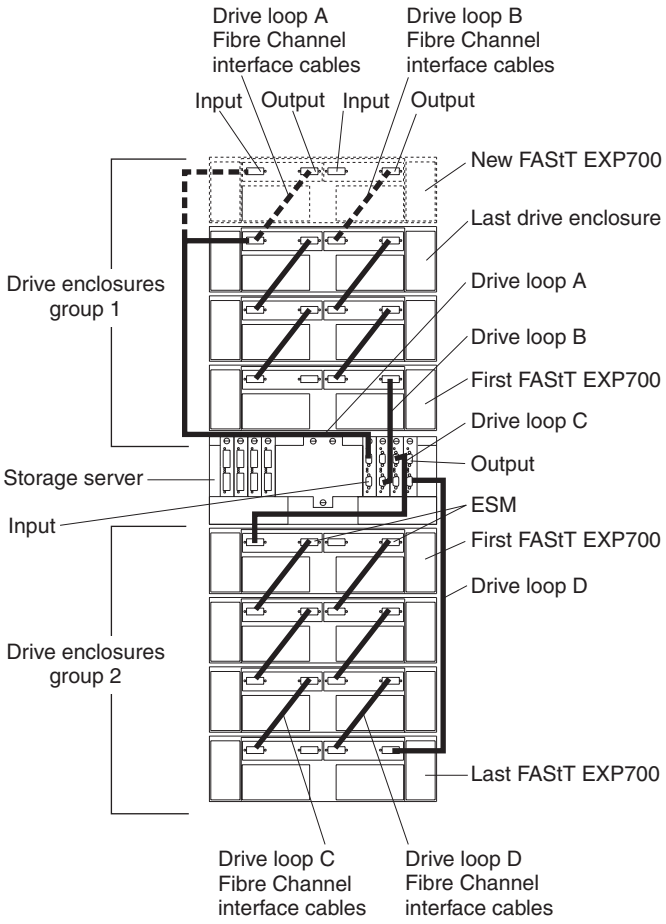


Figure 34. Cabling the FAStT EXP700 to a loop

You can connect FAStT200, FAStT500, and FAStT700 storage servers to FAStT EXP500 and FAStT EXP700 expansion units. Use Table 4 on page 35 and Table 5 on page 35 to determine the number of expansion units that you can connect to a FAStT storage server redundant loop (drive loop pair).

Table 4 on page 35 gives examples of FAStT EXP700 and FAStT EXP500 expansion unit configurations with one FAStT500 or one FAStT700 storage server. For each configuration, the maximum number of expansion units that you can connect to one storage server are listed. In addition, it shows the maximum number of hard disk drives that are supported in each configuration.

Table 4. Expansion unit configurations with the FAStT500 and FAStT700

Storage server[1]	Number of FAStT EXP700 expansion units	Number of FAStT EXP500 expansion units	Maximum number of hard disk drives
1-FAStT500 or 1-FAStT700	1	up to 9	104
	2	up to 8	108
	3	up to 7	112
	4	up to 5	106
	5	up to 4	110
	6	up to 3	114
	7	1	108
	8	0	112

[1] Running FAStT Storage Manager version 8.21 and firmware version 05.21.xxxx. For more information, see Table 1 on page 7.

Table 5 gives examples of FAStT EXP700 and FAStT EXP500 expansion unit configurations with one FAStT200 storage server. For each configuration, the maximum number of expansion units that you can connect to one FAStT200 HA (dual RAID controllers) are listed. In addition, it shows the maximum number of hard disk drives that are supported in each configuration.

Table 5. Expansion unit configurations with the FAStT200

Storage server[1]	Number of FAStT EXP700 expansion units	Number of FAStT EXP500 expansion units	Maximum number of hard disk drives
1-FAStT200 HA	1	up to 4	64
	2	up to 2	58
	3	1	62
	4	0	66

[1] Running FAStT Storage Manager version 7.10 and firmware version 04.01.02.30 or FAStT Storage Manager version 8.21 and firmware version 05.20.07.xx. For more information, see Table 1 on page 7.

FAStT EXP700 loop redundancy

The FAStT EXP700 provides redundant loop support when the second ESM is configured, and both loops are connected to a storage server that supports redundant loops. Figure 35 on page 36 shows a redundant loop. If an ESM, cable, or SFP module fails on drive loop A, drive loop B provides redundancy, which is an alternate path to your disk drives.

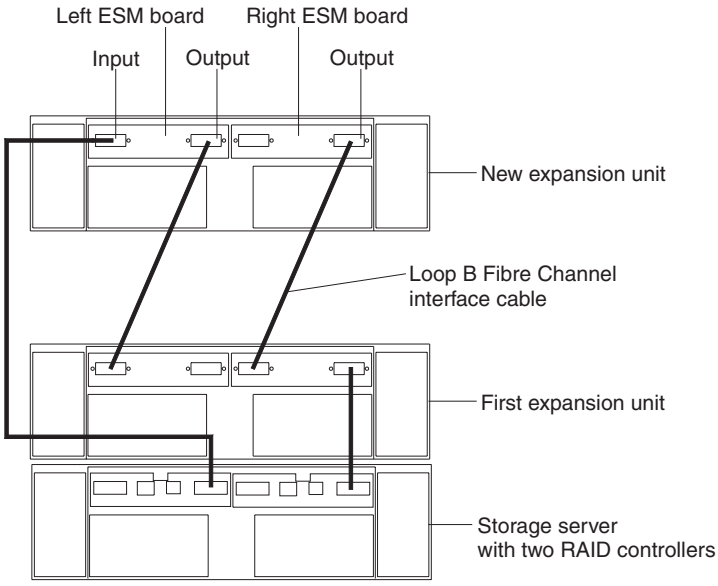


Figure 35. FAStT EXP700 redundant loop configuration

IBM Fibre Channel disk drives are dual-ported, providing individual access from two Fibre Channel loops to the same disk drive. When configuring the ESMs, configure the second ESM the same way you configured the first ESM. Refer to the *Fibre Channel Cabling Instruction*s that come with your storage server for more information about dual-loop support and implementation.

Each ESM has an SFP module input port and an SFP module output port. As you cable FAStT EXP700s together, connecting input ports to output ports can improve diagnostic capability. Refer to your storage server documentation and the *Fibre Channel Cabling Instruction*s for cabling connections between input and output ports.

Cabling the power supply

Complete the following steps to connect the power-supply cable:

1. Wrap the strain-relief clamp around the power cable approximately 20 cm (8 in.) from the power supply connection end.
2. Attach the power-supply nut and tighten it securely.
3. Connect the power cable to the power supply.
4. Plug the supply power cable into a properly grounded electrical outlet.
5. Continue with “Turning the expansion unit on and off” for the initial startup of the expansion unit.

Turning the expansion unit on and off

When you turn on and turn off the expansion unit, be sure to use the startup sequence in this section.

Turning on the expansion unit

Use the following startup sequence to turn on the power for the initial startup of the expansion unit:

1. Verify that:

- All communication and power cables are plugged into the back of the expansion unit and all power cables are connected to an ac power outlet.
- All hard disk drives are locked securely in place.
- The enclosure IDs on the expansion unit are set correctly. (See “Setting the interface options” on page 19 for more information.)

2. Check the system documentation for all the hardware devices you intend to turn on and determine the proper startup sequence.

   Note: Be sure to turn on the FAStT EXP700 before or at the same time as you turn on the storage server.

3. Turn on the power to each device, based on the startup sequence.

   Attention: If you are restarting the system after a normal shutdown, wait at least 10 seconds before you turn on the power-supply switches.

4. Turn on both power-supply switches on the back of the unit. The expansion unit might take a few seconds to turn on. During this time, you might see the amber and green LEDs on the expansion unit flash intermittently. When the startup sequence is complete, only the green LEDs on the front and back are lit. If other amber LEDs remain lit, see Chapter 4, “Solving problems” on page 49.

Turning off the expansion unit

Use this procedure to turn off the power for the expansion unit.

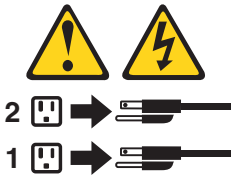
Attention: Except in an emergency, never turn off the power if any Fault LEDs are lit on the expansion unit. Correct the fault before you turn off the power, using the proper troubleshooting or servicing procedure. This will ensure that the expansion unit will start correctly later.

The expansion unit is designed to run continuously. After you turn on the expansion unit, do not turn it off. Turn off the power only in the following situations:

- Instructions in a hardware or software procedure require that you turn off the power.
- An IBM technical-support representative instructs you to turn off the power.
- A power outage or emergency situation occurs, see “Restoring power after an emergency” on page 38.

Statement 5:

CAUTION:
The power control button on the device and the power switch on the power supply do not turn off the electrical current supplied to the device. The device also might have more than one power cord. To remove all electrical current from the device, ensure that all power cords are disconnected from the power source.



Complete the following steps to turn off the power:

1. Check the system documentation for all hardware devices you want to turn off and determine the proper shutdown sequence.
2. Make sure that all input/output activity has stopped.
3. Make sure that all amber Fault LEDs are off. If any Fault LEDs are lit (drives, power supplies, or fans), correct the problem before you turn off the power.

   Note: Be sure to turn off the FAStT EXP700 after or at the same time as you turn off the storage server.
4. Turn off both power-supply switches on the back of the expansion unit.

Performing an emergency shutdown

Attention: Emergency situations might include fire, flood, extreme weather conditions, or other hazardous circumstances. If a power outage or emergency situation occurs, always turn off all power switches on all computing equipment. This will help safeguard your equipment from potential damage due to electrical surges when power is restored. If the expansion unit loses power unexpectedly, it might be due to a hardware failure in the power system or in the midplane of the expansion unit.

Complete the following steps to shut down the system during an emergency:

1. Stop all activity and check all of the LEDs. Make a note of any Fault LEDs that are lit so that you can correct the problem when you turn on the power.
2. Turn off all power-supply switches; then, unplug the power cables from the expansion unit.

Restoring power after an emergency

Complete the following steps to restart the expansion unit if you turned off the power-supply switches during an emergency shutdown, or if a power failure or power outage occurred:

1. After the emergency situation is over or power is restored, check the expansion unit for damage. If there is no visible damage, continue with step 2; otherwise, have your system serviced.
2. After you check the expansion unit for damage, ensure that the power switches are in the off position; then plug in the expansion-unit power cables.
3. Check the system documentation of the hardware devices that you want to turn on and determine the proper startup sequence.

   Note: Turn on the FAStT EXP700 before or at the same time as the controller.
4. Turn on the power to each device, based on the startup sequence.
5. Turn on both of the power supply switches on the FAStT EXP700. The green LEDs on the front and the back of the expansion unit should remain lit. If other amber Fault LEDs are lit, see Chapter 4, “Solving problems” on page 49.

Chapter 3. Installing and replacing devices

This chapter contains information about installing and replacing devices.

Working with hot-swap hard disk drives

This section explains how you can increase the expansion unit capacity by adding more hard disk drives or replacing existing drives with ones containing a larger capacity. Before you begin:

- Read the safety and handling guidelines provided in “Safety” on page xi and in “Handling static-sensitive devices” on page 11.
- Ensure that your current system configuration is working properly.
- Back up all important data before you make changes to data storage devices.

Before you install or remove drive CRUs, review the following information:

- **Blank trays:** An expansion unit without a full set of drives (14) contains blank trays in the unused drive bays. Before installing new drives, you must remove these empty trays. Save the empty trays for future use. Each of the 14 bays must always contain either a blank tray or a hot-swap hard disk drive.
- **Drive CRUs:** Your expansion unit supports IBM 2 GB Fibre Channel hard disk drives.
- **Drive CRU labels:** A label is provided on the front of each hard disk drive. Use this label to record the location information for each drive before you remove it. Ensure that you keep track of the drives and their corresponding bays. Also, record the location information in Table 8 on page 53. (If you install a drive in the wrong bay, you might lose data.)
- **Drive LEDs:** Each drive tray has two LEDs, which indicate the status for that drive. See Table 6 for the drive LED states and descriptions.

Table 6. Drive LED activity

LED	LED state	Descriptions
Activity LED	Green flashing	The green LED flashes to indicate Fibre Channel activity to the drive.
Activity LED	Green lit	The green LED is lit to indicate the drive is properly installed.
Fault LED	Amber flashing	The amber LED flashes to indicate a drive rebuild is underway, or that a drive has been identified by the software.
Fault LED	Amber lit	The amber LED is lit to indicate a drive failure.

- **Fibre Channel loop IDs:** When you install a hard disk drive in the expansion unit, the drive tray connects into a printed circuit board called the *midplane*. The midplane sets the Fibre Channel loop ID automatically, based on the setting of the enclosure ID switch and the physical location (bay) of the drive CRU.
- **Hot-swap hardware:** Your expansion unit contains hardware that enables you to replace a failed hard disk drive without turning off the expansion unit. You can continue to operate your system while a hard disk drive is removed or installed. These drives are known as hot-swap hard disk drives.

Installing hot-swap hard disk drives

You can install hard disk drives while the expansion unit is turned on and running. Complete the following steps to install hot-swap hard disk drives in the expansion unit.

1. Read the documentation that comes with the hard disk drive.
2. Check for Fault LEDs shown in Figure 36. If any amber LEDs are lit, see Chapter 4, “Solving problems” on page 49.

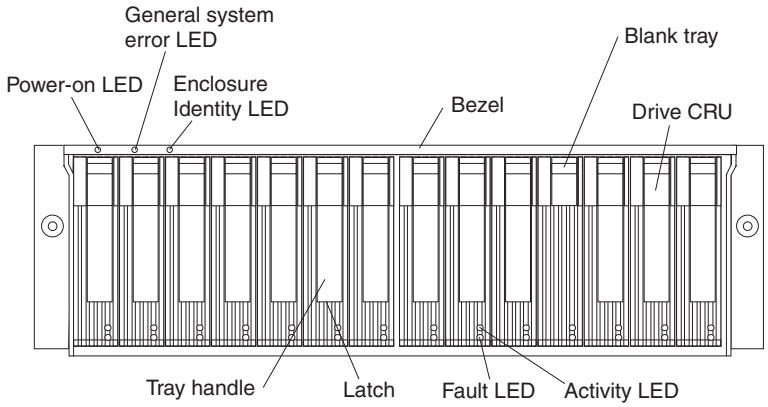


Figure 36. Hot-swap hard disk drive LEDs

3. Determine the bay into which you want to install the drive.
4. Remove the blank tray:
   a. Insert a finger into the square hole at the top of the blank tray to grip and pull the tray out of the drive bay.
   b. Save the blank tray for later use.
5. Install the hard disk drive:

   Note: The hard disk drive comes installed in a drive tray. Do not attempt to detach the drive from the tray.

   a. Release the blue latch on the drive CRU by pressing on the inside of the bottom of the tray handle.

b. Pull the handle on the tray out so that it is in the open position, as shown in Figure 37.

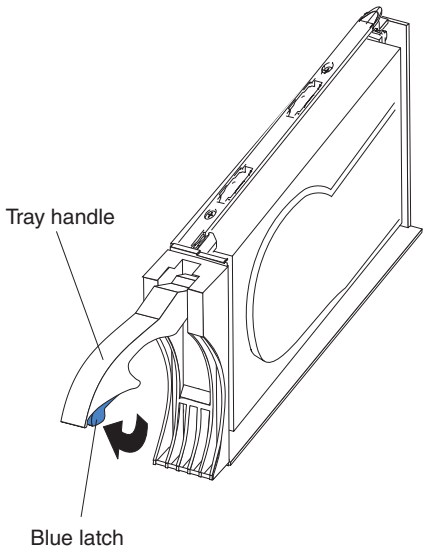


Figure 37. Drive CRU latch

c. Slide the drive CRU into the empty bay until the tray handle touches the expansion-unit bezel.
d. Push the tray handle down into the closed (latched) position, as shown in Figure 38.

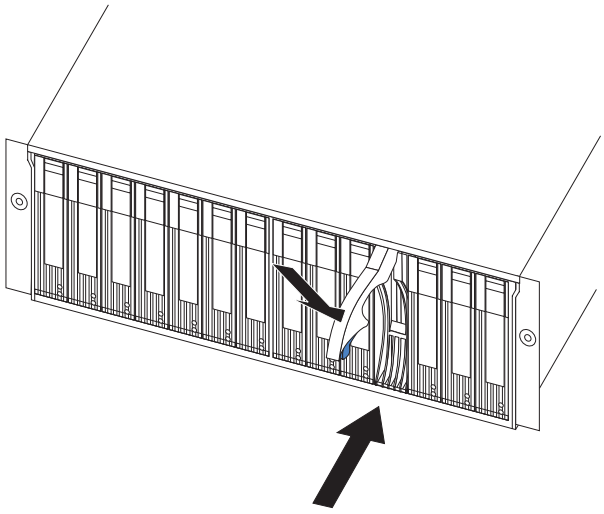


Figure 38. Closing the hot-swap hard disk drive tray handle

Replacing hot-swap hard disk drives

Drive problems include any malfunctions that delay, interrupt, or prevent successful input/ouput activity between the hosts and the hard disk drives in the expansion unit. This includes transmission problems between the host controllers, the ESMs, and the drives. This section explains how to replace a failed hard disk drive.

Attention: Failure to replace the hard disk drives in their correct bays might result in loss of data. If you are replacing a hard disk drive that is part of a RAID level 1 or RAID level 5 logical drive, ensure that you install the replacement hard disk drive in the correct bay. Check the hardware and software documentation provided with your system to see if there are restrictions regarding hard disk drive configurations. Some system Fibre Channel configurations might not allow mixing different drive capacities or types within an array.

Complete the following steps to replace a hot-swap hard disk drive:

1. Determine the location of the drive that you want to remove.

   Attention: Never hot-swap a drive CRU when its green Activity LED is flashing. Hot-swap a drive CRU only when its amber Fault LED is lit and not flashing or when the green Activity LED is lit and flashing at one-second intervals.
2. Remove the drive CRU:
   a. Press on the inside of the bottom of the tray handle to release the blue latch as shown in Figure 37 on page 41.
   b. Pull the tray handle out into the open position.
   c. Lift the drive CRU partially out of the bay.
   d. To avoid possible damage to the drive, wait at least 20 seconds before fully removing the drive CRU from the expansion unit to allow the drive to stop (spin down).
   e. Verify that there is proper identification (such as a label) on the drive CRU, and then slide it completely out of the expansion unit.
3. Install the new drive CRU:
   a. Gently push the drive CRU into the empty bay until the tray handle touches the expansion-unit bezel.
   b. Push the tray handle down into the closed (latched) position, as shown in Figure 39.

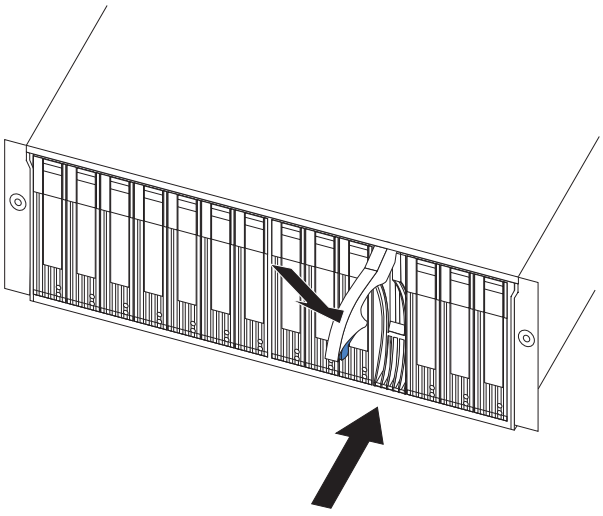


Figure 39. Closing the hot-swap hard disk drive tray handle

4. Check the drive LEDs:
   - When a drive is ready for use, the green Activity LED is lit and the amber Fault LED is off.

- If the amber Fault LED is lit and not flashing, remove the drive from the unit and wait 10 seconds; then, install the drive again.

Working with hot-swap power supplies

The power supplies are customer replaceable units (CRUs) and do not require preventive maintenance.

- Use only the supported power supplies for your specific expansion unit.
- Both power supplies must always be installed to maintain proper cooling.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

Removing the failed hot-swap power supply

Complete the following steps to remove the failed hot-swap power supply:

1. Turn the power-supply switch to the off position.
2. Unplug the power-supply cable from the electrical outlet.
3. Disconnect the power cable from the power supply ac connector.
4. Remove the nut and clamp from the rear of the power-supply.
5. Remove the power supply from the expansion unit:
   a. Grasp the pull-ring on the power supply lever and squeeze the latch to release it.
   b. Pull the lever open and remove the power supply.

Replacing the failed hot-swap power supply

This section describes the procedure for replacing the failed hot-swap power supply.

Note: When you replace the failed power supply, ensure that the new power-supply lever is attached to the side of the power supply that faces the middle of the expansion unit. If it is not, remove the lever screw, flip the lever over, and tighten the screw on the opposite side as shown in Figure 40 on page 44.

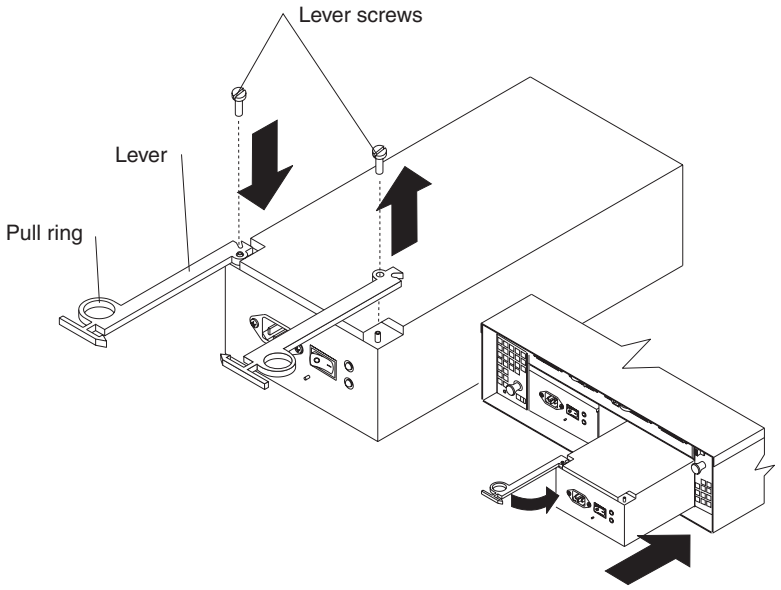


Figure 40. Moving the power-supply lever and replacing the failed hot-swap power supply

Complete the following steps to replace the failed hot-swap power supply.

Statement 8:

CAUTION:
Never remove the cover on a power supply or any part that has the following label attached.

Hazardous voltage, current, and energy levels are present inside any component that has this label attached. There are no serviceable parts inside these components. If you suspect a problem with one of these parts, contact a service technician.

1. Ensure that the ac power switch on the power supply you are installing is in the off position.
2. Install the power supply in the expansion unit:
   a. Slide the power supply into the expansion unit. Be sure the lever is pulled straight out as you slide the power supply into the expansion unit (see Figure 40).
   b. Close the lever until the pull-ring latch locks in place. Make sure the lever locks into place in the expansion-unit chassis.
3. Wrap the strain relief clamp around the power cable approximately 20 cm (8 in.) from the power-supply connection end.

4. Attach the power-supply nut and tighten it securely.
5. Connect the power cable to the power supply ac connector.

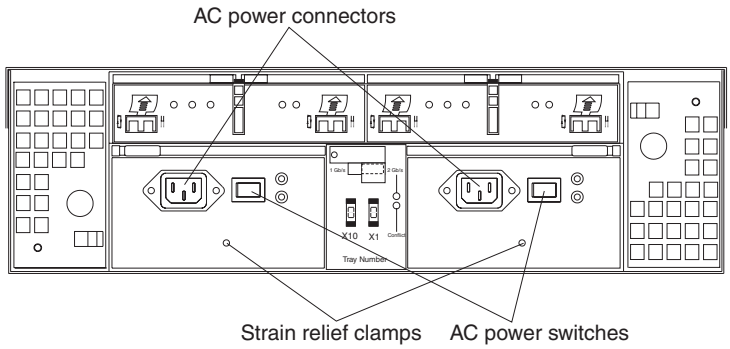


Figure 41. Connecting the power supply

6. Plug the supply power cable into a properly grounded electrical outlet.
7. Turn the power supply switch to the on position.

Replacing a failed hot-swap ESM

This section describes the removal and replacement procedure for a failed hot-swap ESM. Complete the following steps to remove a failed ESM:

1. Check the storage-management software online help for instructions on ESM failure-recovery procedures. Follow the steps provided before continuing to step 2.
2. Label each cable to ensure that all cables are properly connected to the new ESM.
3. Label the SFP modules when you remove them. You must install the SFP modules in the same positions on the new ESM.
4. Remove the SFP modules and Fibre Channel cables from the failed ESM.

   Attention: Be careful not to bend the Fibre Channel cables at a sharp angle or pinch them with objects. This can decrease the performance or cause data loss.
5. Be sure the Fault indicator LED is lit; then, push down on the ESM latch. The ESM levers will pop out of the locked position as shown in Figure 42.

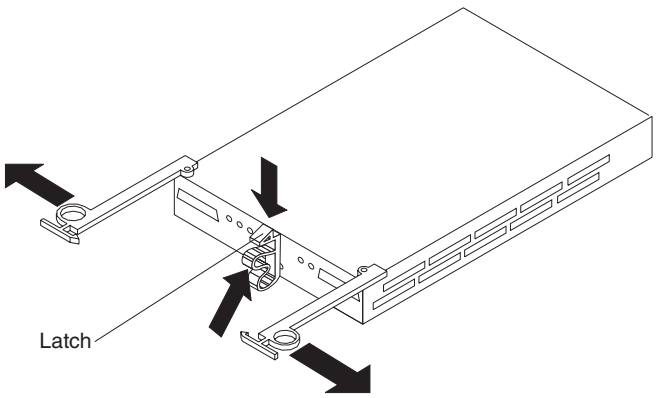


Figure 42. Removing the failed ESM

6. Grasp the pull-rings and pull out on the levers; then, remove the ESM.

7. Install the new ESM by sliding it into the empty slot. Be sure the levers are pulled straight out as you slide the ESM into the expansion unit. When you install the ESM into the bays, the ESM latch will lock into place.
8. Close the levers until the pull-ring latch locks in place. Make sure the levers lock into place in the expansion-unit chassis.
9. Reconnect the SFP modules and Fibre Channel cables to their original locations.
10. Check the input and output bypass LEDs at both ends of the reconnected cables. If the input and ouput bypass LEDs are lit, reconnect the cables and SFP modules.
11. Check the Power and Fault indicator LEDs on the new ESM:
    - If the Power indicator LED is off, the ESM might not be inserted correctly.
    - If the Fault indicator LED is lit, the Power indicator LED is off, or if any other Fault indicator LEDs are lit, see Chapter 4, “Solving problems” on page 49.
12. See your storage-management software online help for instructions for enabling the ESM.

Replacing a failed hot-swap cooling fan

Attention: Do not run the expansion unit without adequate ventilation and cooling. Improper ventilation might cause damage to the internal components and circuitry.

The fans are interchangeable and replaceable and do not require preventive maintenance. The fans help maintain proper air circulation across the components inside the expansion unit. Air flows through the expansion unit from the front to the back.

You can hot-swap the fans (replace them while the expansion unit is turned on and running), provided that you complete the exchange within 10 minutes. This time limit applies only to the total time that a fan is out of the expansion unit, beginning when you remove the failed unit and ending when you reseat the new one. This does not include the time it takes you to perform this entire procedure (checking LEDs, unpacking the new fan, and so on).

For any period of time exceeding ten minutes, both fan units must always be in place, even if one is not functioning properly. This is necessary to maintain proper cooling.

Complete the following steps to replace a hot-swap fan:

1. Check the LEDs on the back of the expansion unit.
2. If the fan amber Fault LED is lit, remove the failed fan:
    a. Slide the latch in the same direction as the arrow to unlock the fan CRU.
    b. Use the handle (black knob) to pull the fan from the fan bay as shown in Figure 43 on page 47.

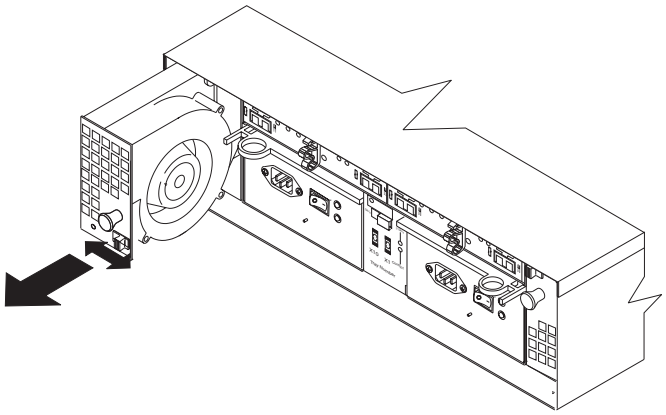


Figure 43. Replacing a hot-swap cooling fan

3. Install the new fan unit:
   a. Place the fan CRU in front of the fan bay.
   b. Ensure that you move the latch in the same direction as the arrow before you slide the fan all the way into the bay. If the fan does not go into the bay, rotate it 180°.
   c. If the latch does not automatically lock when you have successfully inserted the fan unit into the bay, pull back on the fan slightly, and then push it in again until the latch snaps into place.
4. Check the LEDs.
5. The Fault LEDs are no longer lit after a few seconds; if they remain on, see Chapter 4, “Solving problems” on page 49.

Chapter 4. Solving problems

This chapter contains information to help you solve some of the problems you might have with your expansion unit. It contains the problem symptoms and error messages along with suggested actions to take to resolve problems.

Table 7. Solving problems

Problem indicator	Component	Possible cause	Possible solutions
Amber LED is lit	Drive CRU	Drive failure	Replace failed drive.
	Fan CRU	Fan failure	Replace failed fan.
	ESM over-temperature LED	Subsystem is overheated	Check fans for faults. Replace failed fan if necessary.
		Environment is too hot	Check the ambient temperature around the expansion unit. Cool as necessary.
		Defective LED or hardware failure	If you cannot detect a fan failure or overheating problem, replace the ESM.
	ESM Fault LED	ESM failure	Replace the ESM. See your controller documentation for more information.
	ESM Bypass LED	No incoming signal detected	Reconnect the SFP modules and Fibre Channel (Fibre Channel) cables. Replace input and output SFP modules or cables as necessary.
		ESM failure	If the ESM Fault LED is lit, replace the ESM.
	Front panel	General machine fault	A Fault LED is lit somewhere on the expansion unit (check for Amber LEDs on CRUs).
		SFP transmit fault	Check that the CRUs are properly installed. If none of the amber LEDs are lit on any of the CRUs, this indicates an SFP module transmission fault in the expansion unit. Replace the failed SFP module. See your storage-manager software documentation for more information.
Amber LED is lit and green LED is off	Power-supply CRU	The power switch is turned off or there is an ac power failure	Turn on all power-supply switches.
Amber and green LEDs are lit	Power-supply CRU	Power-supply failure	Replace the failed power-supply CRU.

Table 7. Solving problems (continued)

Problem indicator	Component	Possible cause	Possible solutions
All green LEDs are off	All CRUs	Subsystem power is off	Check that all expansion-unit power cables are plugged in and the power switches are on. If applicable, check that the main circuit breakers for the rack are powered on.
		AC power failure	Check the main circuit breaker and ac outlet.
		Power-supply failure	Replace the power supply.
		Midplane failure	Contact an IBM technical-support representative to service the expansion unit.
Amber LED is flashing	Drive CRUs	Drive rebuild or identity is in process	No corrective action needed.
One or more green LEDs are off	Power supply CRUs	Power cable is unplugged or switches are turned off	Make sure the power cable is plugged in and the switches are turned on.
	All drive CRUs	Midplane failure	Replace the midplane (contact an IBM technical-support representative).
	Several CRUs	Hardware failure	Replace the affected CRUs. If this does not correct the problem, have the ESMs replaced, followed by the midplane. Contact an IBM technical-support representative.
	Front panel	Power-supply problem	Make sure that the power cables are plugged in and that the power supplies are turned on.
		Hardware failure	If any other LEDs are lit, replace the midplane. Contact an IBM technical-support representative.
Intermittent or sporadic power loss to the expansion unit	Some or all CRUs	Defective ac power source or improperly connected power cable	Check the ac power source. Reseat all installed power cables and power supplies. If applicable, check the power components (power units or UPS). Replace defective power cables.
		Power-supply failure	Check the power supply Fault LED on the power supply. If the LED is lit, replace the failed CRU.
		Midplane failure	Have the midplane replaced.

Table 7. Solving problems (continued)

Problem indicator	Component	Possible cause	Possible solutions
Unable to access drives	Drives and Fibre Channel loop	Incorrect expansion unit ID settings	Ensure that the Fibre Channel optical cables are undamaged and properly connected. Check the expansion unit ID settings. **Note:** Change switch position only when your expansion unit is powered off.
		ESM failure	Have one or both ESMs replaced.
Random errors	Subsystem	Midplane feature	Have the midplane replaced.

Appendix A. Records

Whenever you add options to your FAStT EXP700, be sure to update the information in this appendix. Accurate, up-to-date records make it easier to add other options and provide needed data whenever you contact technical support.

Identification numbers

Record and retain the following information.

Product name:	IBM TotalStorage FAStT EXP700 Storage Expansion Unit
Machine type:	1740
Model number:	1RU, 1RX
Serial number:	

The expansion unit serial number is located on the bottom inside surface on the rear and on the bottom right on the front.

Installed device records

Use the following table to record the number of the hard disk drives that you replaced and the corresponding bay number.

Attention: If you replace a hard disk drive in the wrong drive bay it might cause a loss of data.

Table 8. Hard disk drive record

Bay Number	Hard disk drive serial number	Replaced hard disk drive serial number

Appendix B. Getting help and technical assistance

If you need help, service, or technical assistance or just want more information about IBM® products, you will find a wide variety of sources available from IBM to assist you. This appendix contains information about where to go for additional information about IBM and IBM products, what to do if you experience a problem with your xSeries™ or IntelliStation® system, and whom to call for service, if it is necessary.

Before you call

Before you call, make sure that you have taken these steps to try to solve the problem yourself:

- Check all cables to make sure that they are connected.
- Check the power switches to make sure that the system is turned on.
- Use the troubleshooting information in your system documentation, and use the diagnostic tools that come with your system.
- Go to the IBM Support Web site at http://www.ibm.com/pc/support/ to check for technical information, hints, tips, and new device drivers.
- Use an IBM discussion forum on the IBM Web site to ask questions.

You can solve many problems without outside assistance by following the troubleshooting procedures that IBM provides in the online help or in the publications that are provided with your system and software. The information that comes with your system also describes the diagnostic tests that you can perform. Most xSeries and IntelliStation systems, operating systems, and programs come with information that contains troubleshooting procedures and explanations of error messages and error codes. If you suspect a software problem, see the information for the operating system or program.

Using the documentation

Information about your IBM xSeries or IntelliStation system and preinstalled software, if any, is available in the documentation that comes with your system. That documentation includes printed books, online books, README files, and help files. See the troubleshooting information in your system documentation for instructions for using the diagnostic programs. The troubleshooting information or the diagnostic programs might tell you that you need additional or updated device drivers or other software. IBM maintains pages on the World Wide Web where you can get the latest technical information and download device drivers and updates. To access these pages, go to http://www.ibm.com/pc/support/ and follow the instructions. Also, you can order publications through the IBM Publications Ordering System at http://www.elink.ibmlink.ibm.com/public/applications/publications/cgibin/pbi.cgi.

Getting help and information from the World Wide Web

On the World Wide Web, the IBM Web site has up-to-date information about IBM xSeries and IntelliStation products, services, and support. The address for IBM xSeries information is http://www.ibm.com/eserver/xseries/. The address for IBM IntelliStation information is http://www.ibm.com/pc/intellistation/.

You can find service information for your IBM products, including supported options, at http://www.ibm.com/pc/support/. If you click **Profile** from the support page, you can create a customized support page. The support page has many sources of information and ways for you to solve problems, including:

- Diagnosing problems, using the IBM Online Assistant
- Downloading the latest device drivers and updates for your products
- Viewing Frequently Asked Questions (FAQ)
- Viewing hints and tips to help you solve problems
- Participating in IBM discussion forums
- Setting up e-mail notification of technical updates about your products

Software service and support

Through IBM Support Line, you can get telephone assistance, for a fee, with usage, configuration, and software problems with xSeries servers, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, go to http://www.ibm.com/services/sl/products/.

For more information about Support Line and other IBM services, go to http://www.ibm.com/services/, or go to http://www.ibm.com/planetwide/ for support telephone numbers.

Hardware service and support

You can receive hardware service through IBM Integrated Technology Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. Go to http://www.ibm.com/planetwide/ for support telephone numbers.

In the U.S. and Canada, hardware service and support is available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9 a.m. to 6 p.m.

Appendix C. Warranty information

This section contains information about your warranty period and the service and support that are provided by your warranty.

Warranty period

The warranty period varies by machine type and country or region.

Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician.

This paragraph applies only to products with a warranty period of 3 years on parts and 1 year on labor. A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:

1. parts and labor during the first year of the warranty period
2. parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor it provides in performance of the repair or replacement.

The IBM Machine Warranties Web site at http://www.ibm.com/servers/support/machine_warranties/ contains a worldwide overview of the IBM Statement of Limited Warranty for IBM Machines, a glossary of terms used in the Statement of Limited Warranty, Frequently Asked Questions (FAQ), and links to Product Support Web pages. The IBM Statement of Limited Warranty is available from this Web site in 29 languages in Portable Document Format (PDF).

Machine - IBM TotalStorage FAStT EXP700 Storage Expansion Unit

Country or region	Warranty period	Service delivery method
Worldwide	Parts - 3 years, labor - 3 years	On-site

Problem determination

Prior to on-site warranty service, you are required to go through problem determination with an IBM service specialist call center technician. The service specialist will run diagnostic tests on the hardware and check the software.

Running diagnostics

The IBM service specialist will help you determine whether your equipment is functioning as specified. It might be necessary to isolate the failing xSeries, Netfinity®, or IntelliStation system; IBM component; or both from any active production environment to run diagnostics and perform defect-isolation programs. You are responsible for making the system, IBM component, or both available for running diagnostics and defect-isolation programs.

Checking software

The IBM service specialist will help you ensure that the correct BIOS code, firmware, device drivers, and other supporting IBM software are installed and

correctly configured. It might be necessary to manually gather information about the relevant software levels or run IBM-approved utility programs to gather this information. It might be necessary to isolate the failing system from any active production environment to gather this information. You are responsible, with assistance from the service specialist, for gathering this information. The IBM Statement of Limited Warranty does not include on-site assistance with this activity.

Warranty service and support

With the original purchase of an IBM xSeries or IntelliStation system, you have access to extensive service and support. During the IBM Machine warranty period, you may call IBM or your reseller for problem-determination assistance under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- **Problem determination** - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- **IBM hardware repair** - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service, either on-site or at an IBM service center as determined by IBM.
- **Engineering Change management** - Occasionally, there might be changes that are required after a product has been shipped from IBM. In those instances, IBM will make Engineering Changes (ECs) available that apply to your hardware.
- **Customer replaceable units (CRUs)** - Some parts of IBM xSeries and IntelliStation systems are designated as customer replaceable units. IBM ships CRUs to you for replacement by you. CRUs include keyboards, monitors, memory, diskette drives, hard disk drives, and mice (this list is not inclusive of all CRUs).

The following items are not covered under warranty service:

- Replacement or use of non-IBM parts. All IBM parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources.
- Installation of customer replaceable units (CRUs).
- Installation and configuration of BIOS code, firmware, or device drivers that are designated as customer installable.

See the IBM Statement of Limited Warranty for a full explanation of IBM warranty terms. Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- The machine type and model of your IBM hardware product (if available)
- Serial numbers of your IBM hardware products
- A description of the problem
- The exact wording of any error messages
- Hardware and software configuration information

International Warranty Service

If you travel with your xSeries or IntelliStation system or relocate it to a country or region where your system is sold and serviced by IBM or IBM resellers authorized

to perform warranty service, International Warranty Service (IWS) is available during the warranty period. Eligible IBM systems are identified by their four-digit machine types.

You can obtain IWS through the service delivery method (such as depot, carry-in, or on-site) provided in the servicing country or region. Service methods and procedures vary by country or region, and some service or parts might not be available in all countries and regions. Service centers in certain countries or regions might not be able to service all models of a particular machine type. In addition, some countries or regions might have fees and restrictions that apply at the time of service.

To determine whether your system is eligible for IWS, go to http://www.ibm.com/pc/support/ and click **Warranty lookup**.

Purchasing additional services

During and after the warranty period, you can purchase additional services, such as support for IBM and non-IBM hardware, operating systems, and application programs; network setup and configuration; upgraded or extended hardware repair services; and custom installations. Service availability and service name might vary by country or region.

For more information about these services, contact your IBM marketing representative.

IBM Statement of Limited Warranty Z125-4753-06 8/2000

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms and Part 2 - Country-unique Terms. The terms of Part 2 replace or modify those of Part 1. The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you purchase for your use, and not for resale, from IBM or your reseller. The term “Machine” means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. The term “Machine” does not include any software programs, whether pre-loaded with the Machine, installed subsequently or otherwise. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract. If you have any questions, contact IBM or your reseller.

The IBM Warranty for Machines: IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM’s Official Published Specifications (“Specifications”). The warranty period for a Machine is a specified, fixed period commencing on its Date of Installation. The date on your sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise.

If a Machine does not function as warranted during the warranty period, and IBM or your reseller are unable to either 1) make it do so or 2) replace it with one that is at least functionally equivalent, you may return it to your place of purchase and your money will be refunded.

Extent of Warranty: The warranty does not cover the repair or exchange of a Machine resulting from misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, or failure caused by a product for which IBM is not responsible. The warranty is voided by removal or alteration of Machine or parts identification labels.

THESE WARRANTIES ARE YOUR EXCLUSIVE WARRANTIES AND REPLACE ALL OTHER WARRANTIES OR CONDITIONS, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OR CONDITIONS OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM JURISDICTION TO JURISDICTION. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION OR LIMITATION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD.

Items Not Covered by Warranty: IBM does not warrant uninterrupted or error-free operation of a Machine. Any technical or other support provided for a Machine under warranty, such as assistance via telephone with “how-to” questions and those regarding Machine set-up and installation, will be provided **WITHOUT WARRANTIES OF ANY KIND.**

Warranty Service: To obtain warranty service for a Machine, contact IBM or your reseller. If you do not register your Machine with IBM, you may be required to present proof of purchase.

During the warranty period, IBM or your reseller, if approved by IBM to provide warranty service, provides without charge certain types of repair and exchange service to keep Machines in, or restore them to, conformance with their Specifications. IBM or your reseller will inform you of the available types of service for a Machine based on its country of installation. At its discretion, IBM or your reseller will 1) either repair or exchange the failing Machine and 2) provide the service either at your location or a service center. IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Some parts of IBM Machines are designated as Customer Replaceable Units (called "CRUs"), e.g., keyboards, memory, or hard disk drives. IBM ships CRUs to you for replacement by you. You must return all defective CRUs to IBM within 30 days of your receipt of the replacement CRU. You are responsible for downloading designated Machine Code and Licensed Internal Code updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

When warranty service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Many features, conversions, or upgrades involve the removal of parts and their return to IBM. A part that replaces a removed part will assume the warranty service status of the removed part.

Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service.

You also agree to
1. ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange;
2. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
3. where applicable, before service is provided:
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provides;
   b. secure all programs, data, and funds contained in a Machine;
   c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit them to fulfill their obligations; and
   d. inform IBM or your reseller of changes in a Machine's location.

IBM is responsible for loss of, or damage to, your Machine while it is 1) in IBM's possession or 2) in transit in those cases where IBM is responsible for the transportation charges.

Neither IBM nor your reseller is responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM or your reseller for any reason. You should remove all such information from the Machine prior to its return.

Limitation of Liability: Circumstances may arise where, because of a default on IBM's part or other liability, you are entitled to recover damages from IBM. In each such instance, regardless of the basis on which you are entitled to claim damages from IBM (including fundamental breach, negligence, misrepresentation, or other

contract or tort claim), except for any liability that cannot be waived or limited by applicable laws, IBM is liable for no more than

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages, up to the charges (if recurring, 12 months' charges apply) for the Machine that is subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

   This limit also applies to IBM's suppliers and your reseller. It is the maximum for which IBM, its suppliers, and your reseller are collectively responsible.

UNDER NO CIRCUMSTANCES IS IBM LIABLE FOR ANY OF THE FOLLOWING: 1) THIRD-PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, YOUR RECORDS OR DATA; OR 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES, LOST PROFITS OR LOST SAVINGS, EVEN IF IBM, ITS SUPPLIERS OR YOUR RESELLER IS INFORMED OF THEIR POSSIBILITY. SOME JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU.

Governing Law: Both you and IBM consent to the application of the laws of the country in which you acquired the Machine to govern, interpret, and enforce all of your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Part 2 - Country-unique Terms

AMERICAS

BRAZIL

Governing Law: *The following is added after the first sentence:*Any litigation arising from this Agreement will be settled exclusively by the court of Rio de Janeiro.

NORTH AMERICA

Warranty Service: *The following is added to this Section:* To obtain warranty service from IBM in Canada or the United States, call 1-800-IBM-SERV (426-7378).

CANADA

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws in the Province of Ontario.

UNITED STATES

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of the State of New York.

ASIA PACIFIC

AUSTRALIA

The IBM Warranty for Machines: *The following paragraph is added to this Section:* The warranties specified in this Section are in addition to any rights you may have under the Trade Practices Act 1974 or other similar legislation and are only limited to the extent permitted by the applicable legislation.

Limitation of Liability: *The following is added to this Section:* Where IBM is in breach of a condition or warranty implied by the Trade Practices Act 1974 or other similar legislation, IBM's liability is limited to the repair or replacement of the goods or the supply of equivalent goods. Where that condition or warranty relates to right to sell, quiet possession or clear title, or the goods are of a kind ordinarily acquired for personal, domestic or household use or consumption, then none of the limitations in this paragraph apply.

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of the State or Territory.

CAMBODIA, LAOS, AND VIETNAM

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:*laws of the State of New York.

The following is added to this Section: Disputes and differences arising out of or in connection with this Agreement shall be finally settled by arbitration which shall be held in Singapore in accordance with the rules of the International Chamber of Commerce (ICC). The arbitrator or arbitrators designated in conformity with those rules shall have the power to rule on their own competence and on the validity of the Agreement to submit to arbitration. The arbitration award shall be final and binding for the parties without appeal and the arbitral award shall be in writing and set forth the findings of fact and the conclusions of law.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The number of arbitrators shall be three, with each side to the dispute being entitled to appoint one arbitrator.

The two arbitrators appointed by the parties shall appoint a third arbitrator before proceeding upon the reference. The third arbitrator shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the ICC. Other vacancies shall be filled by the respective nominating party. Proceedings shall continue from the stage they were at when the vacancy occurred.

If one of the parties refuses or otherwise fails to appoint an arbitrator within 30 days of the date the other party appoints its, the first appointed arbitrator shall be the sole arbitrator, provided that the arbitrator was validly and properly appointed.

The English language version of this Agreement prevails over any other language version.

HONG KONG AND MACAU

Governing Law: *The following replaces "laws of the country in which you acquired the Machine" in the first sentence:* laws of Hong Kong Special Administrative Region.

INDIA

Limitation of Liability: *The following replaces items 1 and 2 of this Section:*

1. liability for bodily injury (including death) or damage to real property and tangible personal property will be limited to that caused by IBM's negligence;
2. as to any other actual damage arising in any situation involving nonperformance by IBM pursuant to, or in any way related to the subject of this Statement of Limited Warranty, IBM's liability will be limited to the charge paid by you for the individual Machine that is the subject of the claim.

JAPAN

Governing Law: *The following sentence is added to this Section:*Any doubts concerning this Agreement will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

NEW ZEALAND

The IBM Warranty for Machines: *The following paragraph is added to this Section:* The warranties specified in this Section are in addition to any rights you may have under the Consumer Guarantees Act 1993 or other legislation which cannot be excluded or limited. The Consumer Guarantees Act 1993 will not apply in respect of any goods which IBM provides, if you require the goods for the purposes of a business as defined in that Act.

Limitation of Liability: *The following is added to this Section:* Where Machines are not acquired for the purposes of a business as defined in the Consumer Guarantees Act 1993, the limitations in this Section are subject to the limitations in that Act.

PEOPLE'S REPUBLIC OF CHINA (PRC)

Governing Law: *The following replaces this Section:* Both you and IBM consent to the application of the laws of the State of New York (except when local law requires otherwise) to govern, interpret, and enforce all your and IBM's rights, duties, and obligations arising from, or relating in any manner to, the subject matter of this Agreement, without regard to conflict of law principles.

Any disputes arising from or in connection with this Agreement will first be resolved by friendly negotiations, failing which either of us has the right to submit the dispute to the China International Economic and Trade Arbitration Commission in Beijing, the PRC, for arbitration in accordance with its arbitration rules in force at the time. The arbitration tribunal will consist of three arbitrators. The language to be used therein will be English and Chinese. An arbitral award will be final and binding on all the parties, and will be enforceable under the Convention on the Recognition and Enforcement of Foreign Arbitral Awards (1958).

The arbitration fee will be borne by the losing party unless otherwise determined by the arbitral award.

During the course of arbitration, this Agreement will continue to be performed except for the part which the parties are disputing and which is undergoing arbitration.

EUROPE, MIDDLE EAST, AFRICA (EMEA)

THE FOLLOWING TERMS APPLY TO ALL EMEA COUNTRIES: The terms of this Statement of Limited Warranty apply to Machines purchased from IBM or an IBM reseller.

Warranty Service: If you purchase an IBM Machine in Austria, Belgium, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland or United Kingdom, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM. If you purchase an IBM Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kirghizia, Federal Republic of Yugoslavia, Former Yugoslav Republic of Macedonia (FYROM), Moldova, Poland, Romania, Russia, Slovak Republic, Slovenia, or Ukraine, you may obtain warranty service for that Machine in any of those countries from either (1) an IBM reseller approved to perform warranty service or (2) from IBM.

If you purchase an IBM Machine in a Middle Eastern or African country, you may obtain warranty service for that Machine from the IBM entity within the country of purchase, if that IBM entity provides warranty service in that country, or from an IBM reseller, approved by IBM to perform warranty service on that Machine in that country. Warranty service in Africa is available within 50 kilometers of an IBM authorized service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM authorized service provider.

Governing Law: The applicable laws that govern, interpret and enforce rights, duties, and obligations of each of us arising from, or relating in any manner to, the subject matter of this Statement, without regard to conflict of laws principles, as well as Country-unique terms and competent court for this Statement are those of the country in which the warranty service is being provided, except that in 1) Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Hungary, Former Yugoslav Republic of Macedonia, Romania, Slovakia, Slovenia, Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan, the laws of Austria apply; 2) Estonia, Latvia, and Lithuania, the laws of Finland apply; 3) Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Djibouti, Democratic Republic of Congo, Equatorial Guinea, France, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Mali, Mauritania, Morocco, Niger, Senegal, Togo, and Tunisia, this Agreement will be construed and the legal relations between the parties will be determined in accordance with the French laws and all disputes arising out of this Agreement or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 4) Angola, Bahrain, Botswana, Burundi, Egypt, Eritrea, Ethiopia, Ghana, Jordan, Kenya, Kuwait, Liberia, Malawi, Malta, Mozambique, Nigeria, Oman, Pakistan, Qatar, Rwanda, Sao Tome, Saudi Arabia, Sierra Leone, Somalia, Tanzania, Uganda, United Arab Emirates, United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe, this Agreement will be governed by English Law and disputes relating to it will be submitted to the exclusive jurisdiction of the English courts; and 5) in Greece, Israel, Italy, Portugal, and Spain any legal claim arising out of this Statement will be brought before, and finally settled by, the competent court of Athens, Tel Aviv, Milan, Lisbon, and Madrid, respectively.

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA AND GERMANY

The IBM Warranty for Machines: *The following replaces the first sentence of the first paragraph of this Section:* The warranty for an IBM Machine covers the functionality of the Machine for its normal use and the Machine's conformity to its Specifications.

The following paragraphs are added to this Section:

The minimum warranty period for Machines is six months. In case IBM or your reseller is unable to repair an IBM Machine, you can alternatively ask for a partial refund as far as justified by the reduced value of the unrepaired Machine or ask for a cancellation of the respective agreement for such Machine and get your money refunded.

Extent of Warranty: *The second paragraph does not apply.*

Warranty Service: *The following is added to this Section:* During the warranty period, transportation for delivery of the failing Machine to IBM will be at IBM's expense.

Limitation of Liability: *The following paragraph is added to this Section:* The limitations and exclusions specified in the Statement of Limited Warranty will not apply to damages caused by IBM with fraud or gross negligence and for express warranty.

The following sentence is added to the end of item 2: IBM's liability under this item is limited to the violation of essential contractual terms in cases of ordinary negligence.

EGYPT

Limitation of Liability: *The following replaces item 2 in this Section:* as to any other actual direct damages, IBM's liability will be limited to the total amount you paid for the Machine that is the subject of the claim. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code.

Applicability of suppliers and resellers (unchanged).

FRANCE

Limitation of Liability: *The following replaces the second sentence of the first paragraph of this Section:*In such instances, regardless of the basis on which you are entitled to claim damages from IBM, IBM is liable for no more than: *(items 1 and 2 unchanged)*.

IRELAND

Extent of Warranty: *The following is added to this Section:* Except as expressly provided in these terms and conditions, all statutory conditions, including all warranties implied, but without prejudice to the generality of the foregoing all warranties implied by the Sale of Goods Act 1893 or the Sale of Goods and Supply of Services Act 1980 are hereby excluded.

Limitation of Liability: *The following replaces items one and two of the first paragraph of this Section:*1. death or personal injury or physical damage to your real property solely caused by IBM's negligence; and 2. the amount of any other actual direct damages, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim.

Applicability of suppliers and resellers (unchanged).

The following paragraph is added at the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

ITALY

Limitation of Liability: *The following replaces the second sentence in the first paragraph:*In each such instance unless otherwise provided by mandatory law, IBM is liable for no more than: 1. *(unchanged)* 2. as to any other actual damage arising in all situations involving nonperformance by IBM pursuant to, or in any way related to the subject matter of this Statement of Warranty, IBM's liability, will be limited to the total amount you paid for the Machine that is the subject of the claim. *Applicability of suppliers and resellers (unchanged).*

The following replaces the third paragraph of this Section: Unless otherwise provided by mandatory law, IBM and your reseller are not liable for any of the following: *(items 1 and 2 unchanged)* 3) indirect damages, even if IBM or your reseller is informed of their possibility.

SOUTH AFRICA, NAMIBIA, BOTSWANA, LESOTHO AND SWAZILAND

Limitation of Liability: *The following is added to this Section:* IBM's entire liability to you for actual damages arising in all situations involving nonperformance by IBM in respect of the subject matter of this Statement of Warranty will be limited to the charge paid by you for the individual Machine that is the subject of your claim from IBM.

UNITED KINGDOM

Limitation of Liability: *The following replaces items 1 and 2 of the first paragraph of this Section:*

1. death or personal injury or physical damage to your real property solely caused by IBM's negligence;
2. the amount of any other actual direct damages or loss, up to 125 percent of the charges (if recurring, the 12 months' charges apply) for the Machine that is the subject of the claim or which otherwise gives rise to the claim;

The following item is added to this paragraph: 3. breach of IBM's obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982.

Applicability of suppliers and resellers (unchanged).

The following is added to the end of this Section: IBM's entire liability and your sole remedy, whether in contract or in tort, in respect of any default shall be limited to damages.

Appendix D. Notices

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Important notes

Processor speeds indicate the internal clock speed of the microprocessor; other factors also affect application performance.

CD-ROM drive speeds list the variable read rate. Actual speeds vary and are often less than the maximum possible.

When referring to processor storage, real and virtual storage, or channel volume, KB stands for approximately 1000 bytes, MB stands for approximately 1 000 000 bytes, and GB stands for approximately 1 000 000 000 bytes.

When referring to hard disk drive capacity or communications volume, MB stands for 1 000 000 bytes, and GB stands for 1 000 000 000 bytes. Total user-accessible capacity may vary depending on operating environments.

Maximum internal hard disk drive capacities assume the replacement of any standard hard disk drives and population of all hard disk drive bays with the largest currently supported drives available from IBM.

Maximum memory may require replacement of the standard memory with an optional memory module.

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Some software may differ from its retail version (if available), and may not include user manuals or all program functionality.

Electronic emission notices

Federal Communications Commission (FCC) statement

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits.IBM is not responsible for any radio or television interference causedby using other than recommended cables and connectors or by using other than recommended cables and connectors or by unauthorized changes or modifications to this equipment. Unauthorized changes or modifications could void the user's authority to operate the equipment.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Industry Canada Class A emission compliance statement

This Class A digital apparatus complies with Canadian ICES-003.

Avis de conformité à la réglementation d'Industrie Canada

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

Australia and New Zealand Class A statement

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

United Kingdom telecommunications safety requirement

Notice to Customers

This apparatus is approved under approval number NS/G/1234/J/100003 for indirect connection to public telecommunication systems in the United Kingdom.

European Union EMC Directive conformance statement

This product is in conformity with the protection requirements of EU Council Directive 89/336/EEC on the approximation of the laws of the Member States relating to electromagnetic compatibility. IBM cannot accept responsibility for any

failure to satisfy the protection requirements resulting from a nonrecommended modification of the product, including the fitting of non-IBM option cards.

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to CISPR 22/European Standard EN 55022. The limits for Class A equipment were derived for commercial and industrial environments to provide reasonable protection against interference with licensed communication equipment.

Attention: This is a Class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures.

Taiwanese Class A warning statement

警告使用者:
這是甲類的資訊產品，在
居住的環境中使用時，可
能會造成射頻干擾，在這
種情況下，使用者會被要
求採取某些適當的對策。

Japanese Voluntary Control Council for Interference (VCCI) statement

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Power cords

For your safety, IBM provides a power cord with a grounded attachment plug to use with this IBM product. To avoid electrical shock, always use the power cord and plug with a properly grounded outlet.

IBM power cords used in the United States and Canada are listed by Underwriter's Laboratories (UL) and certified by the Canadian Standards Association (CSA).

For units intended to be operated at 115 volts: Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT, three-conductor cord, a maximum of 15 feet in length and a parallel blade, grounding-type attachment plug rated 15 amperes, 125 volts.

For units intended to be operated at 230 volts (U.S. use): Use a UL-listed and CSA-certified cord set consisting of a minimum 18 AWG, Type SVT or SJT,

three-conductor cord, a maximum of 15 feet in length and a tandem blade, grounding-type attachment plug rated 15 amperes, 250 volts.

For units intended to be operated at 230 volts (outside the U.S.): Use a cord set with a grounding-type attachment plug. The cord set should have the appropriate safety approvals for the country in which the equipment will be installed.

IBM power cords for a specific country or region are usually available only in that country or region.

IBM power cord part number	Used in these countries and regions
13F9940	Argentina, Australia, China (PRC), New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa
13F9979	Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, China (Macau S.A.R.), Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe
13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dubai, Fiji, Ghana, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
6952301	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

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