

IBM TotalStorage DS300 and DS400



Dual Controller Hardware Installation and User's Guide

IBM TotalStorage DS300 and DS400



Dual Controller Hardware Installation and User's Guide

Note: Before using this information and the product it supports, read the general information in Appendix C, "IBM Statement of Limited Warranty Z125-4753-08 04/2004," on page 85 and Appendix D, "Notices," on page 103.

Third Edition (December 2004)

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Safety

Before installing this product, read the Safety Information.

قبل تركيب هذا المنتج، يجب قراءة الملاحظات الأمنية

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 pečítajte 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.

Important:

All caution and danger statements in this documentation begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in the *IBM Safety Information* book.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in the *IBM Safety Information* book under statement 1.

Be sure to read all caution and danger statements in this documentation before performing the instructions. Read any additional safety information that comes with your server or optional device before you install the device.

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:

1. Turn everything OFF.
2. First, attach all cables to devices.
3. Attach signal cables to connectors.
4. Attach power cords to outlet.
5. Turn device ON.

To Disconnect:

1. Turn everything OFF.
2. First, remove power cords from outlet.
3. Remove signal cables from connectors.
4. Remove all cables from devices.

Statement 2:



CAUTION:

When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- Throw or immerse into water
- Heat to more than 100°C (212°F)
- Repair or disassemble

Dispose of the battery as required by local ordinances or regulations.

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

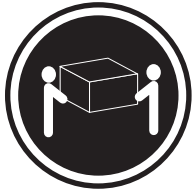
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.

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 Product
Laser Klasse 1
Laser Klass 1
Luokan 1 Laserlaite
Appareil À Laser de Classe 1

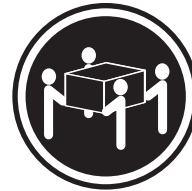
Statement 4:



≥ 18 kg (39.7 lb)



≥ 32 kg (70.5 lb)



≥ 55 kg (121.2 lb)

CAUTION:

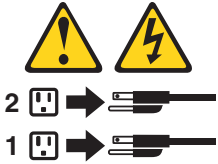
Use safe practices when lifting.

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.

Statement 10:



CAUTION:

Do not place any object weighing more than 82 kg (180 lb) on top of rack-mounted devices.



>82 kg (180 lb)

WARNING: Handling the cord on this product or cords associated with accessories sold with this product, will expose you to lead, a chemical known to the State of California to cause cancer, and birth defects or other reproductive harm. *Wash hands after handling.*

ADVERTENCIA: El contacto con el cable de este producto o con cables de accesorios que se venden junto con este producto, pueden exponerle al plomo, un elemento químico que en el estado de California de los Estados Unidos está considerado como un causante de cancer y de defectos congénitos, además de otros riesgos reproductivos. *Lávese las manos después de usar el producto.*

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Chapter 1. Introduction

This *Dual Controller Hardware Installation and User's Guide* contains instructions for setting up your IBM® TotalStorage® DS300 or IBM TotalStorage DS400 storage subsystem.

This document contains information about:

- Setting up and cabling the storage subsystem
- Starting and configuring the storage subsystem
- Installing options and removing and replacing components

The storage subsystem documentation might be updated occasionally to include information about new features, a translated version of the documentation might be available in your language, or technical updates might be available to provide additional information that is not included in the storage subsystem documentation. These updates are available from the IBM Web site. Complete the following steps to check for updated documentation and technical updates:

1. Go to <http://www.ibm.com/pc/support/>.
2. In the **Browse by topic** section, click **Publications**.
3. On the Publications page, in the **Brand** field, select **Servers**.
4. In the **Family** field, select **TotalStorage DS300** or **TotalStorage DS400**.
5. Click **Continue**.

Record information about the storage subsystem in Table 9 on page 81. You will need this information if you need to call for service.

Use Table 10 on page 81 to keep a record of the options that are installed in or attached to the storage subsystem. This information can be helpful when you install additional options or if you need to report a hardware problem.

For a list of supported options for the storage subsystem, see the ServerProven® Web site at <http://www.ibm.com/pc/compat/>.

See the *Rack Installation Instructions* that comes with the storage subsystem for complete rack installation and removal instructions.

The IBM Documentation CD

The IBM *Documentation CD* contains documentation for your storage subsystem in Portable Document Format (PDF) and includes the IBM Documentation Browser to help you find information quickly.

Hardware and software requirements

The IBM *Documentation CD* requires the following minimum hardware and software:

- Microsoft® Windows® 2000, or Red Hat® Linux®.
- 100 MHz microprocessor.
- 32 MB of RAM.

- Adobe Acrobat Reader 3.0 (or later) or xpdf, which comes with Linux operating systems. Acrobat Reader software is included on the CD, and you can install it when you run the Documentation Browser.

Using the Documentation Browser

Use the Documentation Browser to browse the contents of the CD, read brief descriptions of the documents, and view documents using Adobe Acrobat Reader or xpdf. The Documentation Browser automatically detects the regional settings in use in your system and displays the documents in the language for that region (if available). If a document is not available in the language for that region, the English version is displayed.

Use one of the following procedures to start the Documentation Browser:

- If Autostart is enabled, insert the CD into the CD drive. The Documentation Browser starts automatically.
- If Autostart is disabled or is not enabled for all users, use one of the following procedures:
 - If you are using a Windows operating system, insert the CD into the CD drive and click **Start --> Run**. In the **Open** field, type
`e:\win32.bat`

 where *e* is the drive letter of the CD drive, and click **OK**.
 - If you are using Red Hat Linux, insert the CD into the CD drive; then, run the following command from the `/mnt/cdrom` directory:
`sh runlinux.sh`

Select your storage subsystem from the **Product** menu. The **Available Topics** list displays all the documents for the storage subsystem. Some documents might be in folders. A plus sign (+) indicates each folder or document that has additional documents under it. Click the plus sign to display the additional documents.

When you select a document, a description of the document appears under **Topic Description**. To select more than one document, press and hold the Ctrl key while you select the documents. Click **View Book** to view the selected document or documents in Acrobat Reader or xpdf. If you selected more than one document, all the selected documents are opened in Acrobat Reader or xpdf.

To search all the documents, type a word or word string in the **Search** field and click **Search**. The documents in which the word or word string appears are listed in order of the most occurrences. Click a document to view it, and press Ctrl+F to use the Acrobat search function or Alt+F to use the xpdf search function within the document.

Click **Help** for detailed information about using the Documentation Browser.

Related documentation

This *Dual Controller Hardware Installation and User's Guide* provides general information about the storage subsystem, including information about features, how to configure the storage subsystem, and how to get help. In addition to this *Dual Controller Hardware Installation and User's Guide*, the following documentation comes with the storage subsystem or is available on the IBM Support Web site:

- *IBM TotalStorage DS300 and DS400 Quick Installation Guide*

This printed document contains the basic information you need to get the storage subsystem installed and running.

- *IBM TotalStorage DS300 and DS400 Software Installation Guide*

This document is available on the IBM Support Web site. It contains information about installing the IBM ServeRAID™ Manager program and using the FlashCopy® Management Command Line Tool.

- *Safety Information*

This document is in PDF on the IBM *Documentation CD*. It contains translated caution and danger statements. Each caution and danger statement that appears in the documentation has a number that you can use to locate the corresponding statement in your language in the *Safety Information* document.

- *Rack Installation Instructions*

This printed document contains instructions for installing the storage subsystem in a rack.

- *IBM TotalStorage DS300 Problem Determination Guide* and *IBM TotalStorage DS400 Problem Determination Guide*

The Problem Determination Guide is an interactive document that is available on the IBM Support Web site. The guide addresses problems that you might encounter with the DS300 or DS400 storage subsystem during and after installation. It uses flowcharting techniques to guide you in the isolation and correction of problems.

- *IBM TotalStorage DS300 and DS400 Hardware Maintenance Manual*

This document is in PDF on the IBM Support Web site. It contains information to help you solve problems yourself, and it contains information for service technicians.

Notices and statements used in this document

The caution and danger statements that appear in this document are also in the multilingual *Safety Information* document, which is on the IBM *Documentation CD*. Each statement is numbered for reference to the corresponding statement in the *Safety Information* document.

The following notices and statements are used in this document:

- **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 potential 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.

Specifications

The following information is a summary of the specifications of the storage subsystem. Depending on the storage subsystem model, some specifications might not apply.

Table 1. DS300 and DS400 storage subsystems operating specifications

<p>Size (measured from front of hard disk drive to rear of unit)</p> <ul style="list-style-type: none"> • Depth: 584 mm (23.0 in.) • Height: 128 mm (5.0 in) • Width: 442 mm (17.4 in) <p>Heat output</p> <ul style="list-style-type: none"> • 558 watts (1903.96 Btu/hr) <p>Weight</p> <ul style="list-style-type: none"> • Standard storage server as shipped (without hard disk drives): 48.2 kg (106 lb) • Standard storage server as shipped (with 14 hard disk drives): 62.2 kg (137 lb) • Unit weight (without hard disk drives): 25.9 kg (57 lb) • Unit weight (with hard disk drives): 39 kg (86 lb) <p>Electrical input</p> <ul style="list-style-type: none"> • Sine-wave input (50 to 60 Hz) is required • Input voltage: <ul style="list-style-type: none"> – Low range: <ul style="list-style-type: none"> - Minimum: 90 V ac - Maximum: 136 V ac – High range: <ul style="list-style-type: none"> - Minimum: 198 V ac - Maximum: 264 V ac – Approximate input kilovolt-amperes (kVA): <ul style="list-style-type: none"> - Minimum configuration: 0.06 kVA - Maximum configuration: 0.56 kVA 	<p>Environment</p> <ul style="list-style-type: none"> • Air temperature: <ul style="list-style-type: none"> – Storage server on: <ul style="list-style-type: none"> 10° to 35°C (50° to 95°F) Altitude: 0 to 914 m (3000 ft) – Storage server on: <ul style="list-style-type: none"> 10° to 32°C (50° to 90°F) Altitude: 914 m (3000 ft) to 2133 m (7000 ft) • Humidity: <ul style="list-style-type: none"> – 8% to 80% 	<p>Acoustical noise emissions:</p> <p>For maximum system configurations (14 hard disk drives installed).</p> <ul style="list-style-type: none"> • Sound power (operating): 5.7 bels (typical) • Sound pressure (operating): 42 dBA (typical) <p>Note: These levels were measured in controlled acoustical environments according to the procedures specified by the American National Standards Institute (ANSI) S12.10 and ISO 7779 and are reported in accordance with ISO 9296. Actual sound-pressure levels in a given location might exceed the average values stated because of room reflections and other nearby noise sources. The declared sound-power levels indicate an upper limit, below which a large number of computers will operate</p>
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Chapter 2. Planning the DS300 storage subsystem configuration

This chapter contains information about planning the DS300 storage subsystem configuration.

Before installing the storage subsystem in a rack, use the information in the following sections to determine the storage subsystem configuration that best meets your storage requirements.

Storage subsystem management

You can manage the storage subsystem by using the direct-management method, which uses Ethernet connections from a management station to each controller. You must install at least one management station. A management station can be the host or a workstation on the Ethernet network. Client software is installed on the management station. (For more information, see the *DS300 and DS400 Software Installation Guide*.) Attach Ethernet cables to each management station (one pair per storage subsystem). You will connect the cables to each controller later when you install the storage subsystem. The following illustration shows the direct-management method.

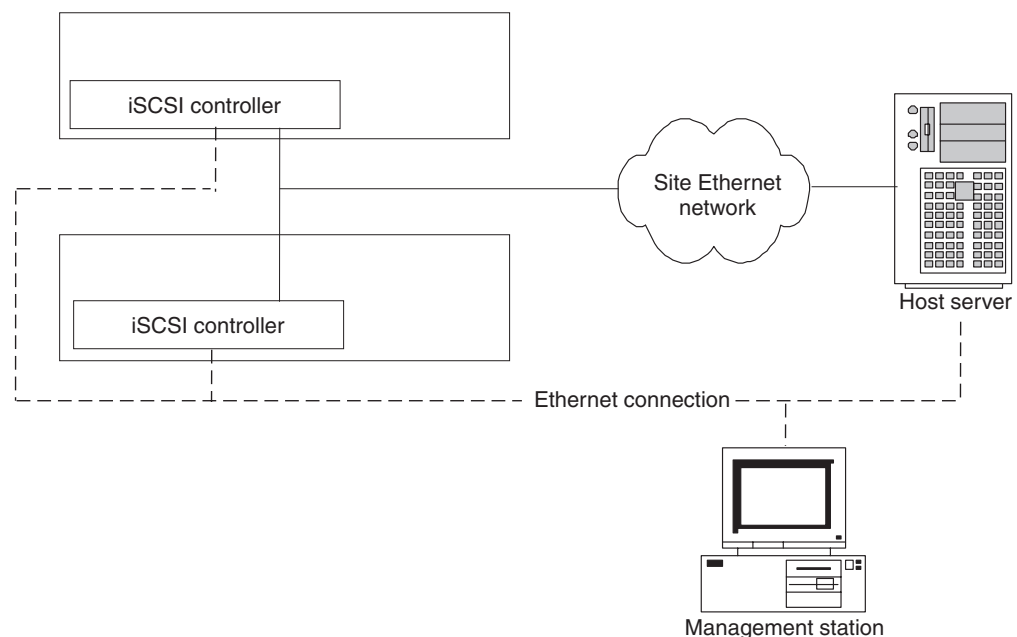


Figure 1. Direct management of iSCSI storage subsystems

DS300 storage subsystem configuration examples

This section shows basic and complex example configurations that you can use for your DS300 iSCSI storage subsystem and storage network.

Important:

- Do not configure any two interfaces on the same system to be on the same subnet unless you are a network administrator.
- Be careful if you are using DHCP on more than one interface. Both interfaces can end up on the same subnet, depending on the configuration of the DHCP server.
- If DHCP is used for the iSCSI Ethernet connectors, failover is disabled.

Single port, single server configuration

The following illustration is an example of a single port, single server configuration.

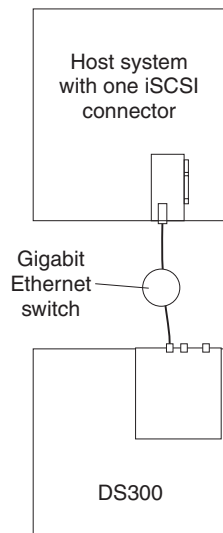


Figure 2. Single port, single server configuration (DS300)

Multiple port, single server configuration

A system with dual iSCSI ports provides enhanced performance compared to a system with a single iSCSI port.

The following illustration is an example of a multiple port, single server configuration.

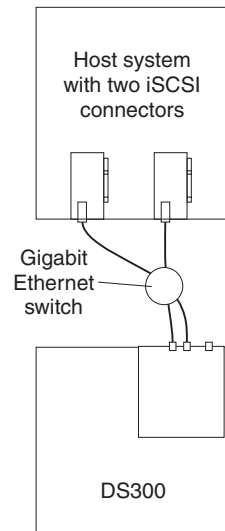


Figure 3. Multiple port, single server configuration (DS300)

Single port, two-server configuration

The following illustration is an example of a single port, two server configuration.

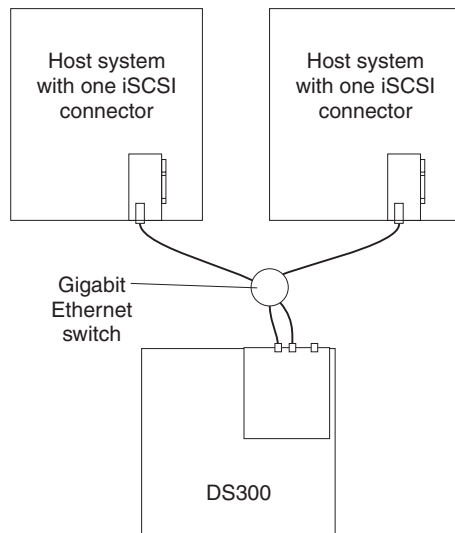


Figure 4. Single port, two-server configuration (DS300)

Multiple port, multiple server configuration

This configuration can also be used for cluster operation. You can replace the two Gb Ethernet switches shown in Figure 5 with one large Gb Ethernet switch that has the required number of ports. Virtual Local Area Network (VLAN) can also be used to isolate the two iSCSI networks, instead of a single switch.

The following illustration is an example of a multiple port, multiple server configuration.

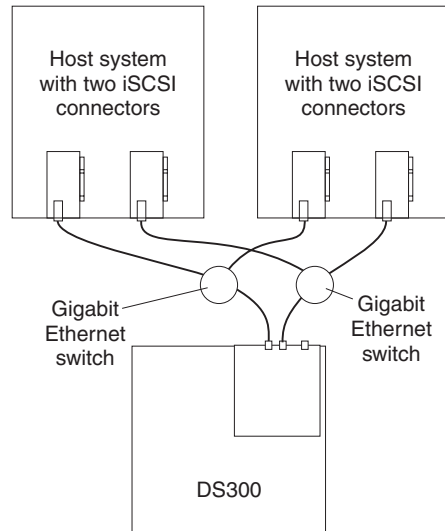


Figure 5. Multiple port, multiple server configuration (DS300)

Multiple port, multiple server, multiple storage subsystem configuration

You can replace the two Gb Ethernet switches shown in Figure 6 with one large Gb Ethernet switch that has the required number of ports. VLAN can also be used to isolate the two iSCSI networks, instead of a single switch.

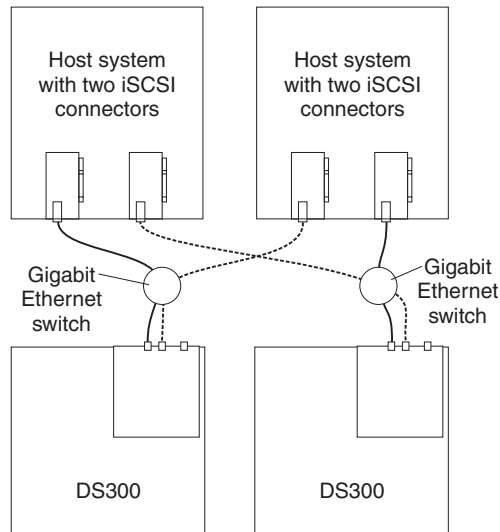


Figure 6. Multiple port, multiple server, multiple storage subsystem configuration (DS300)

Multiple port, single server, dual controller storage subsystem configuration

The following is an example of a multiple port, single server configuration. A system using dual iSCSI ports provides enhanced performance compared to a single iSCSI port.

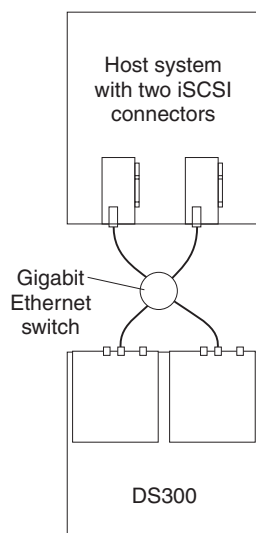


Figure 7. Multiple port, single server, dual controller storage subsystem configuration

Multiple port, multiple server, dual controller storage subsystem configuration

This configuration can also be used for cluster operation. You can replace the two Gb Ethernet switches shown in Figure 8 with one large Gb Ethernet switch that has the required number of ports. Virtual Local Area Network (VLAN) can also be used to isolate the two iSCSI networks, instead of a single switch.

The following illustration is an example of a multiple port, multiple server, dual controller storage subsystem configuration.

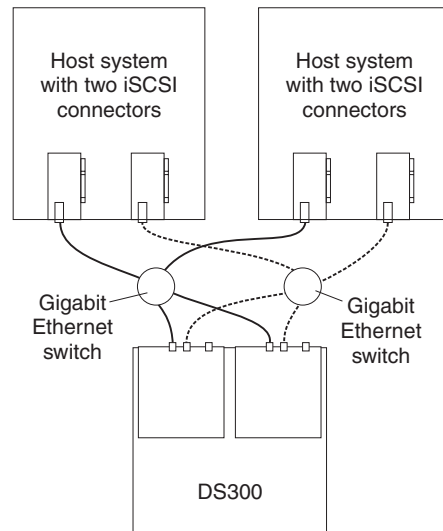


Figure 8. Multiple port, multiple server, dual controller storage subsystem configuration

Chapter 3. Installing and cabling the DS300 storage subsystem

This chapter describes the DS300 storage subsystem components and how to connect it to other devices.

Inventory checklist

After you unpack the storage subsystem, make sure that you have the items that are described in this section.

Hardware

The IBM TotalStorage DS300 storage subsystem (1701-1RL) comes with the following components:

- One iSCSI RAID controller
- One power supply
- Seven hard disk drive filler panels

The IBM TotalStorage DS300 storage subsystem (1701-1RS) comes with the following components:

- One iSCSI RAID controller
- 14 hard disk drive filler panels
- Two power supplies

The IBM TotalStorage DS300 storage subsystem (1701-2RD) comes with the following components:

- Two iSCSI RAID controllers
- 14 hard disk drive filler panels
- Two power supplies

The following hardware comes with all storage subsystem models:

- One rack-mounting hardware kit
 - Two rack support rails (right and left assembly)
 - Ten M6 hex screws
 - Ten M6 cage nuts
 - Ten M6 clip nuts
- Ethernet wrap plug (for diagnostic purposes only)
- Rack jumper power cords (one or two depending on storage subsystem model)
- Chassis bezel assembly

Software and documentation (all models)

- *IBM ServeRAID 7.20 (or later) Application CD*
- *IBM TotalStorage DS300 and DS400 Support CD*
- *IBM TotalStorage DS300 and DS400 Quick Installation Guide*
- *IBM Documentation CD*, including:
 - *IBM Safety Information* document

- *IBM TotalStorage DS300 and DS400 Warranty and Support*
- Rack Mounting Assembly kit, including:
 - *Rack Installation Instructions*
 - Rack mounting template (for aligning the rails properly)

If an item is missing or damaged, contact your IBM marketing representative or authorized reseller.

The following documents are available on the IBM Support Web site:

- *IBM TotalStorage DS300 and DS400 Dual Controller Hardware Installation and User's Guide*
- *IBM TotalStorage DS300 and DS400 Software Installation Guide*
- *IBM TotalStorage DS300 Problem Determination Guide and IBM TotalStorage DS400 Problem Determination Guide*
- *IBM TotalStorage DS300 and DS400 Hardware Maintenance Manual*

If you have not already done so, record the controller serial number in Table 9 on page 81.

Components of the DS300 storage subsystem

The following sections describe the components of the DS300 storage subsystem.

The hot-swap features of the storage subsystem enable you to remove and replace hard disk drives and power supplies without turning off the storage subsystem. Therefore, you can maintain the availability of the system while a hot-swap device is removed, installed, or replaced.

DS300 storage subsystem front view

The following illustrations show the components and controls on the front of DS300 storage subsystem models 1701-1RL, 1701-1RS, and 1701-2RD.

Note: The illustrations in this document might differ slightly from your hardware.

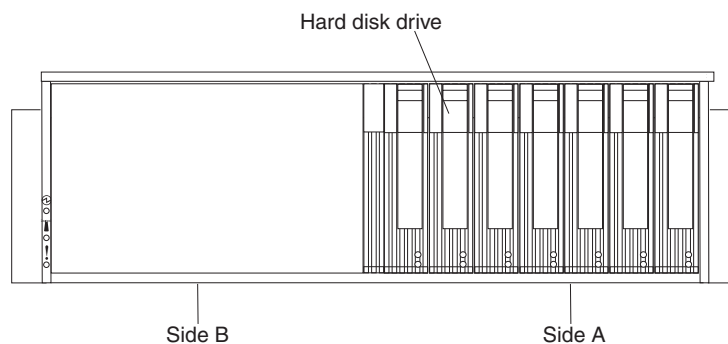


Figure 9. DS300 storage subsystem model 1701-1RL front components

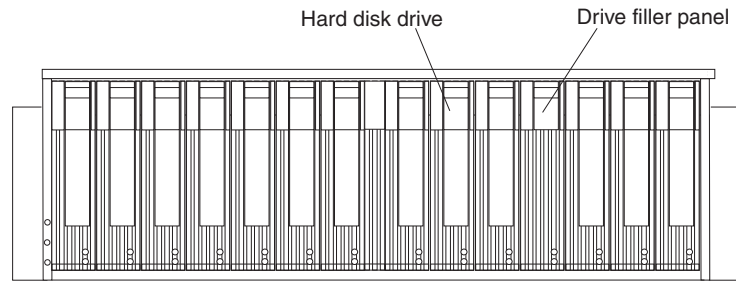


Figure 10. DS300 storage subsystem models 1701-1RS and 1701-2RD front components

Hard disk drive

You can install up to 14 Ultra320 hot-swap hard disk drive *customer replaceable units* (CRUs) in the storage subsystem. Each hard disk drive CRU contains a hard disk drive and tray.

Note: The DS300 storage subsystem model 1701-1RL supports seven hard disk drives. You can add up to seven more hard disk drives if you install a second power supply. (This power-supply option must be purchased separately.)

Drive filler panel

The storage subsystem comes without installed hard disk drives and contains filler panels in the unused drive bays. Before installing new drives, you must remove the filler panels and save them. Each of the 14 drive bays must always contain either a filler panel or a hard disk drive to maintain proper cooling and airflow.

Tray handle and latch

Use the blue latch on the tray handle to release or lock the hard disk drive in place.

For information about installing and replacing a hard disk drive, see “Installing a hot-swap hard disk drive” on page 60 and “Replacing a hot-swap hard disk drive” on page 61.

DS300 storage subsystem rear view

The following illustrations show the components on the rear of DS300 storage subsystem models 1701-1RL, 1701-1RS, and 1701-2RD.

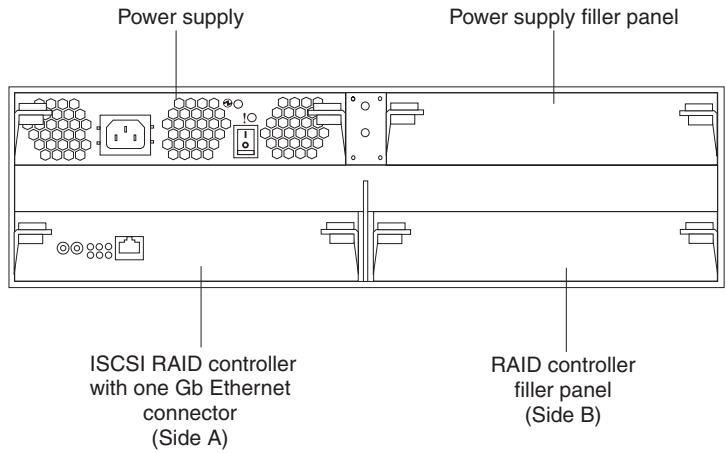


Figure 11. DS300 storage subsystem model 1701-1RL rear view

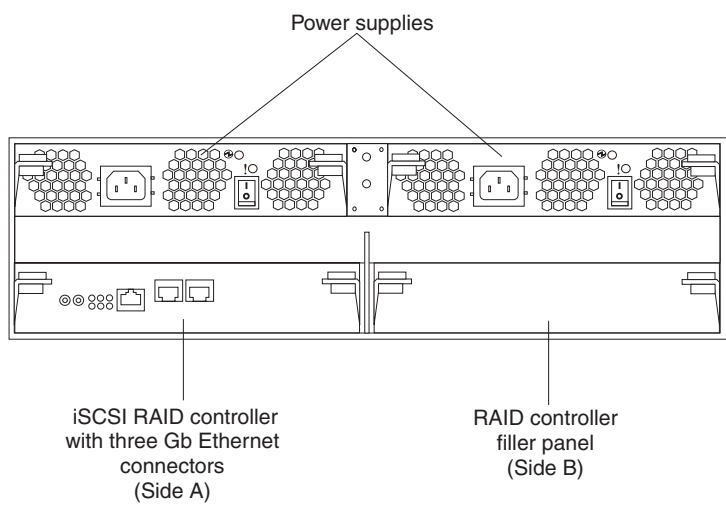


Figure 12. DS300 storage subsystem model 1701-1RS rear view

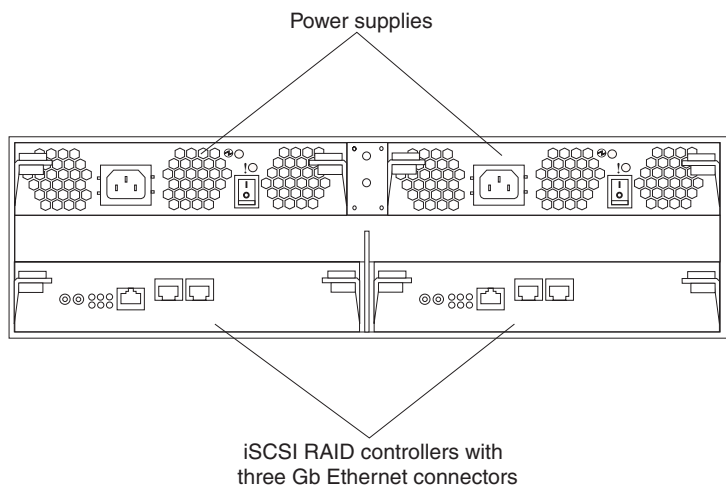


Figure 13. DS300 storage subsystem model 1701-2RD rear view

iSCSI RAID controller

The DS300 storage subsystem models come with one or two iSCSI RAID controllers. DS300 storage subsystem models 1701-1RL and 1701-1RS have a filler panel in the right RAID controller bay (side B), which must remain in place to maintain proper cooling.

The DS300 storage subsystem model 1701-1RL contains one iSCSI RAID controller with one 1 Gb/sec (gigabit per second) Ethernet input connector for data and management and eight LEDs.

The DS300 storage subsystem model 1701-1RS contains one iSCSI RAID controller with one 1 Gb/sec Ethernet input connector for management, two 1 Gb/sec Ethernet input connectors for data, and 12 LEDs.

The DS300 storage subsystem model 1701-2RD contains two iSCSI RAID controllers. Each controller has one 1 Gb/sec Ethernet input connector for management, two 1 Gb/sec Ethernet input connectors for data, and 12 LEDs.

All RAID controller models except the 1701-1RL also contain a cache battery to maintain cache data in the event of a power failure. For more information, see “Cache memory and RAID controller battery.”

Power supply

The DS300 storage subsystem comes with either one or two hot-swap power supplies. Each unit is a self-contained power supply with three integral cooling fans, a power switch, and two status LEDs.

If the storage subsystem comes with only one power supply, there is a filler panel in the right power-supply bay. The filler panel must remain in place to maintain proper cooling.

Note: If DS300 storage subsystem model 1701-1RL has only one power supply installed, both the RAID controller and the power supply must be installed in side A.

Cache memory and RAID controller battery

Each RAID controller contains 256 MB of cache memory. It also contains a sealed, rechargeable lithium ion battery that maintains data in the cache for up to three days in the event of a power failure. The service life of the battery is 36 months, after which time the battery should be replaced. For information about replacing the battery, see “Replacing the cache battery in the RAID controller” on page 66.

Getting started

Use the following list to prepare a storage subsystem for installation:

1. Prepare the site to meet all area, environmental, power, and site requirements. For more information, see “Specifications” on page 4.
2. Move the storage subsystem and its rack cabinet to the site.
3. Remove the storage subsystem from its shipping container and check the contents (for a list of items, see “Inventory checklist” on page 13). If any items are missing, contact your IBM marketing representative or authorized reseller before proceeding.
4. Assemble the tools and equipment that you will need for installation. These might include:
 - Power cords (come with the storage subsystem)

- Screwdrivers (various sizes)
 - Antistatic protection (such as a grounding wrist strap)
 - Small form-factor pluggable (SFP) modules
 - Fibre Channel and Ethernet interface cables and cable straps
 - Rack-mounting hardware (comes with the storage subsystem)
 - IBM ServeRAID Manager software to configure the storage subsystem (comes with the storage subsystem on the *IBM ServeRAID Application CD*)
5. Install the storage subsystem in the rack. Rack mounting instructions and a template for aligning the holes in the rails and the rack come with the storage subsystem.

Connecting secondary interface cables for storage management

Use the Ethernet management connector on the back of the storage subsystem to connect the controller for management of the storage subsystem. Connect one end of an Ethernet cable to the Ethernet connector for controller A (on the left) on the back of the storage subsystem. Connect the other end of the Ethernet cable to an Ethernet switch or directly into the management station. Figure 14 shows the location of the Ethernet management connector on your storage subsystem model.

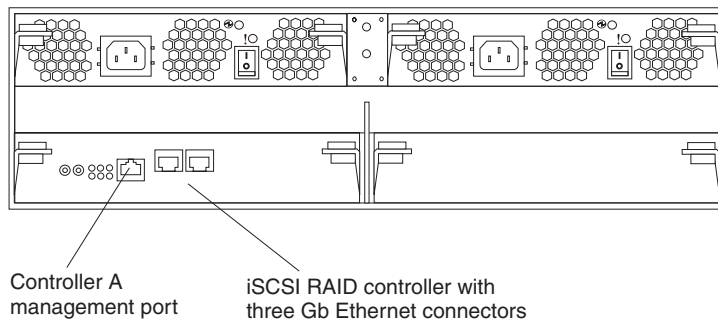


Figure 14. DS300 Ethernet management connector

iSCSI cabling

The DS300 storage subsystem supports standard Category 5, 5e, and 6 Ethernet cables. Insert an Ethernet cable into either of the RJ-45 connectors (labeled “Eth2” or “Eth3”) on the rear of the RAID controller. Connect the other end of the Ethernet cable to an Ethernet network or switch. This connection provides access to the controller.

For the initial startup of the storage subsystem, see Chapter 9, “Turning the storage subsystem on and off,” on page 51.

Chapter 4. DS300 storage subsystem controls and LEDs

This chapter describes the controls and light-emitting diodes (LEDs) and how to turn the storage subsystem on and off.

See the *DS300 Problem Determination Guide* for LED indicator-to-FRU replacement information.

DS300 storage subsystem front view LEDs

The following illustration shows the LEDs on the front of the DS300 storage subsystem.

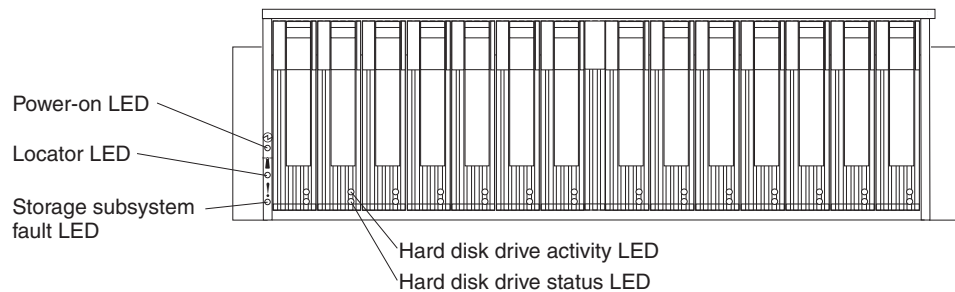


Figure 15. DS300 storage subsystem front LEDs

Table 2. Front view LEDs



Symbol	Description	Color	Indication
	Power on	Green	When this LED is lit, it indicates that the storage subsystem is turned on. When this LED is off, it indicates that dc power is not present, or the power supply or the LED itself has failed. A power LED is also on the power supply. Note: To remove all electrical power from the storage subsystem, you must disconnect the power cord from the electrical outlet.
	Locator	Blue	When this LED is lit, it has been remotely lit by the ServeRAID Manager program (running on the system that is the management station for the storage subsystem), to aid in visually locating the storage subsystem.

Table 2. Front view LEDs (continued)

Symbol	Description	Color	Indication
!	Storage subsystem fault	Amber	When this LED is lit, it indicates that the storage subsystem has a fault, such as in a power supply or hard disk drive. When this LED is flashing, it indicates that an invalid hardware configuration is detected. Note: If the fault LED is lit continuously (not flashing), there is a problem with the storage subsystem. Use the ServeRAID Manager program to diagnose and repair the problem. For more information, see the <i>Problem Determination Guide</i> .
No label	Hard disk drive activity	Green	When this LED is flashing, it indicates that the drive is in use. Each hard disk drive has an activity LED.
No label	Hard disk drive status	Amber	When this LED is lit, it indicates that the drive has failed. When this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the RAID controller is identifying the drive. Each hard disk drive has a status LED.

For information about installing and replacing hard disk drives, see “Installing a hot-swap hard disk drive” on page 60 and “Replacing a hot-swap hard disk drive” on page 61.

DS300 storage subsystem rear view

The following sections show the LEDs, controls, and connectors on the components at the rear of the storage subsystem.

Power supply controls and LEDs

The following illustration shows the LEDs, controls, and connectors on the power supply.

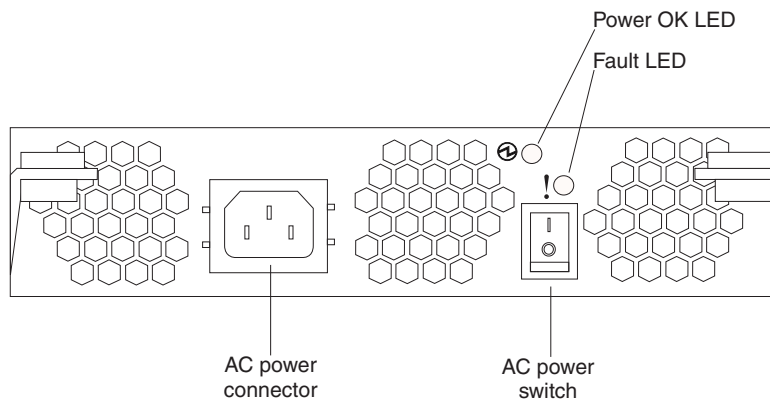


Figure 16. DS300 power supply LEDs, controls, and connectors

Power cord connector

Connect the power cord to this connector.

AC power on/off switch

Use this switch to turn the power supply on and off.

Power OK LED (green)

When this LED is lit, it indicates that the power supply is turned on.

Fault LED (amber)

When this LED is lit, there is a fault with either the power supply or a fan.

iSCSI RAID controller with one Ethernet connector (Model 1701-1RL) controls and LEDs

The following illustration shows an iSCSI RAID controller with one Ethernet connector (Model 1701-1RL).

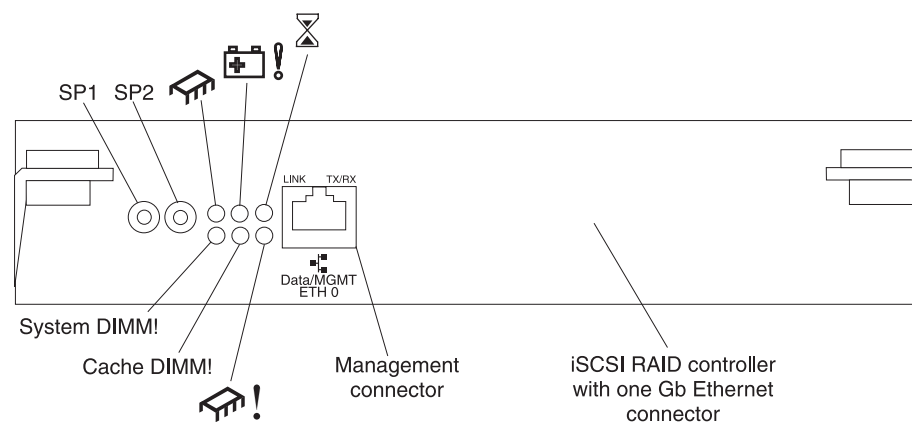


Figure 17. iSCSI RAID controller LEDs, controls, and connectors (model 1701-1RL)

Serial connectors (SP1 and SP2)

The serial connectors are for diagnostic purposes only.

Data and management iSCSI connector

The data and management connector is for ServeRAID Manager function and iSCSI data traffic.

The following table lists the LEDs on the iSCSI RAID controller (Model 1701-1RL).

Table 3. iSCSI RAID controller LEDs (model 1701-1RL)





LED symbol or label	Description	Color	Indication
	Controller ready	Green	When this LED is lit, it indicates that the controller has successfully started or restarted.
	Not used		
	Cache dirty	Amber	When this LED is lit, it indicates that there is data in the cache that has not been written to a disk or synchronized to the redundant controller cache. Note: Do not remove a functioning RAID controller if the cache-dirty LED is lit.

Table 3. iSCSI RAID controller LEDs (model 1701-1RL) (continued)

LED symbol or label	Description	Color	Indication
System DIMM!	DIMM fault	Amber	When this LED is lit, it indicates that the XScale memory has failed. This is based on one of the following conditions: <ul style="list-style-type: none"> • Cannot read the DIMM configuration data • Nonrecoverable ECC failure When this LED is off, it indicates that the XScale memory is operating normally.
Cache DIMM!	RAID cache DIMM fault	Amber	When this LED is lit, it indicates that the cache memory has failed. This is based on one of the following conditions: <ul style="list-style-type: none"> • Cannot read the DIMM configuration data • Nonrecoverable ECC failure When this LED is off, it indicates that the cache memory is operating normally.
	Controller not ready	Amber	When this LED is lit, it indicates that the controller is not ready.
ETH0 Link	GbE link status	Green	When this LED is lit, it indicates that the Gb Ethernet link is operational.
ETH0 TX/RX	GbE activity	Green	When this LED is lit, it indicates that data packets are being transmitted or received.

iSCSI RAID controller with three Ethernet connectors (models 1701-1RS and 1701-2RD) controls and LEDs

The iSCSI RAID controller with three Ethernet connectors has 12 LEDs and several connectors. The following illustration shows the LEDs and connectors on the DS300 storage subsystem iSCSI RAID controller.

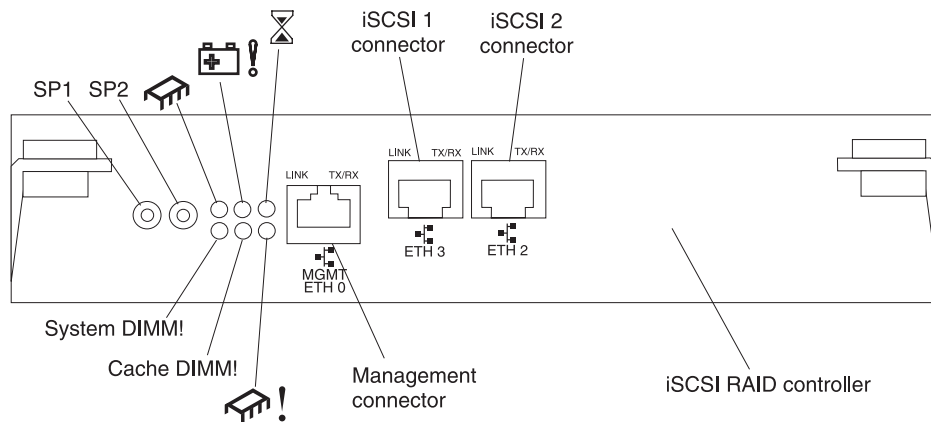


Figure 18. iSCSI RAID controller (Models 1701-1RS and 1701-2RD) LEDs, connectors, and controls

Serial connectors (SP1 and SP2)

The serial connectors are for diagnostic purposes only.

Management connector

The management connector is for ServeRAID Manager function.

ETH 3 connector

The ETH 3 connector is for iSCSI data transfer.

ETH 2 connector

The ETH 2 connector is for iSCSI data transfer.

The following table lists the LEDs on the iSCSI RAID controller (models 1701-1RS and 1701-2RD).

Table 4. iSCSI RAID controller LEDs (models 1701-1RS and 1701-2RD)





LED symbol or label	Description	Color	Indication
	Controller ready	Green	When this LED is lit, it indicates that the controller has successfully started or restarted.
	Battery fault	Amber	When this LED is lit, it indicates that the battery cannot sustain the RAID controller memory in case of power loss. This might be caused by any of the following conditions: <ul style="list-style-type: none">• The battery is removed.• There is a battery-charger circuit failure.• The battery temperature is too high.• The battery voltage is out of range.• The battery charge current is out of range. When this LED is off, it indicates that the battery can sustain the RAID controller memory in case of a power loss.
	Cache dirty	Amber	When this LED is lit, it indicates that there is data in the cache that has not been written to a disk or synchronized to the redundant controller cache.
System DIMM!	xScale DIMM fault	Amber	When this LED is lit, it indicates that the XScale memory has failed. This is based on one of the following conditions: <ul style="list-style-type: none">• Cannot read the DIMM configuration data• Nonrecoverable ECC failure When this LED is off, it indicates that the XScale memory is operating normally.
Cache DIMM!	Cache DIMM fault	Amber	When this LED is lit, it indicates that the cache memory has failed. This is based on one of the following conditions: <ul style="list-style-type: none">• Cannot read the DIMM configuration data• Nonrecoverable ECC failure When this LED is off, it indicates that the cache memory is operating normally.
	Controller not ready	Amber	When this LED is lit, it indicates that the controller is not ready.
ETH 0 Link	GbE link status	Green	When this LED is lit, it indicates that the Gb Ethernet link is operational.

Table 4. iSCSI RAID controller LEDs (models 1701-1RS and 1701-2RD) (continued)

LED symbol or label	Description	Color	Indication
ETH 0 TX/RX	GbE activity	Green	When this LED is lit, it indicates that data packets are being transmitted or received.
ETH 3 Link	GbE link status	Green	When this LED is lit, it indicates that the Gb Ethernet link is operational.
ETH 3 TX/RX	GbE activity	Green	When this LED is lit, it indicates that data packets are being transmitted or received.
ETH 2 Link	GbE link status	Green	When this LED is lit, it indicates that the Gb Ethernet link is operational.
ETH 2 TX/RX	GbE activity	Green	When this LED is lit, it indicates that data packets are being transmitted or received.

Chapter 5. Planning the DS400 storage subsystem configuration

This chapter contains information about planning the DS400 storage subsystem configuration.

Before installing the storage subsystem in a rack, use the information in the following sections to determine the storage subsystem configuration that best meets your storage requirements.

Storage subsystem management

You can manage the storage subsystem by using the direct-management method, which uses Ethernet connections from a management station to each controller. You must install at least one management station. A management station can be either the host server or a workstation on the Ethernet network. Client software is installed on the management station. (For more information, see the *DS300 and DS400 Software Installation Guide*.) Attach Ethernet cables to each management station (one pair per storage subsystem). You will connect the cables to each controller later when you install the storage subsystem. The following illustration shows the direct-management method.

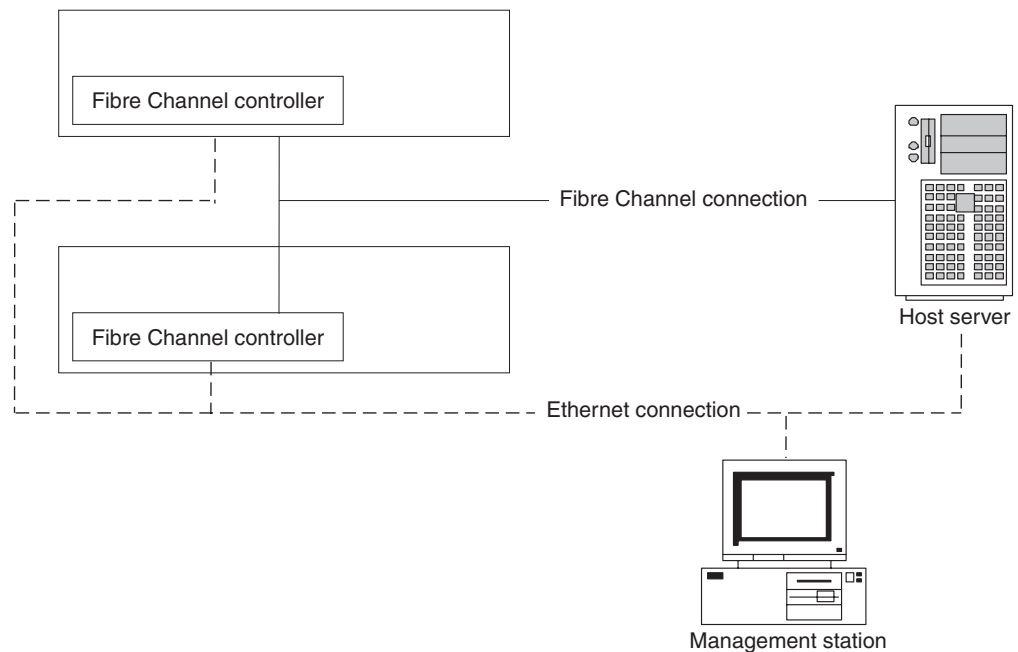


Figure 19. Direct management of Fibre Channel storage subsystems (DS400)

DS400 storage system configuration examples

This section shows basic and complex example configurations that you can use for the Fibre Channel DS400 storage subsystem and storage network.

Note: Switch zoning should be used to isolate data paths from the host server to the storage subsystem, especially in a heterogeneous operating-system environment.

Single server, single storage subsystem configuration

The following illustration is an example of a single server, single storage subsystem configuration.

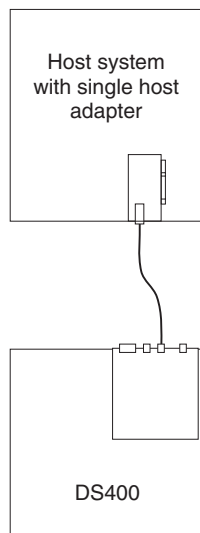


Figure 20. Single server, single storage subsystem configuration (DS400)

Multiple server, single storage subsystem configuration

The following illustration is an example of a multiple server, single storage subsystem configuration.

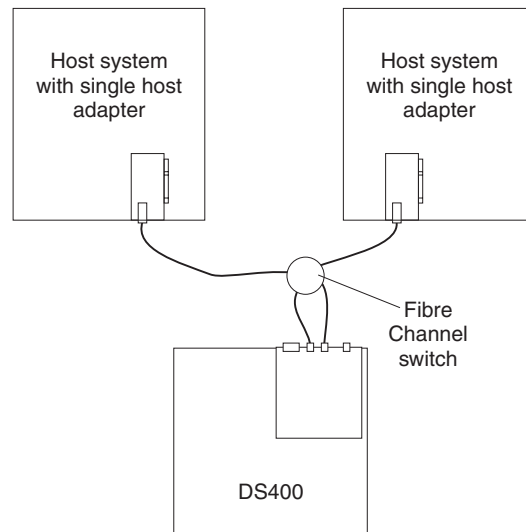


Figure 21. Multiple server, single storage subsystem configuration (DS400)

Multiple server, multiple switch, single storage subsystem configuration

The following illustration is an example of a multiple server, multiple switch, storage subsystem configuration.

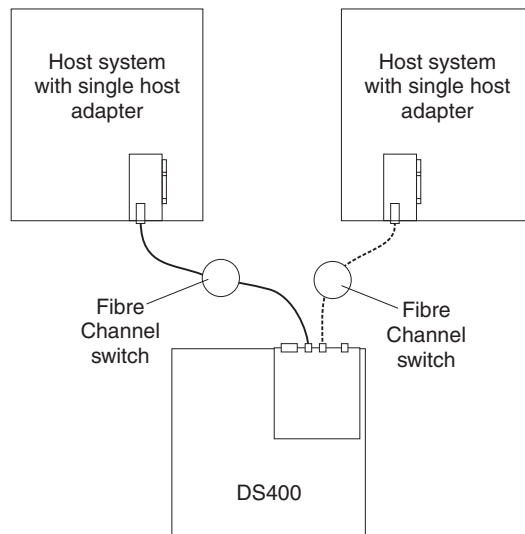


Figure 22. Multiple server, multiple switch, single storage subsystem configuration (DS400)

Multiple port, multiple server, multiple storage subsystem configuration

The following illustration is an example of a multiple port, multiple server, multiple storage subsystem configuration.

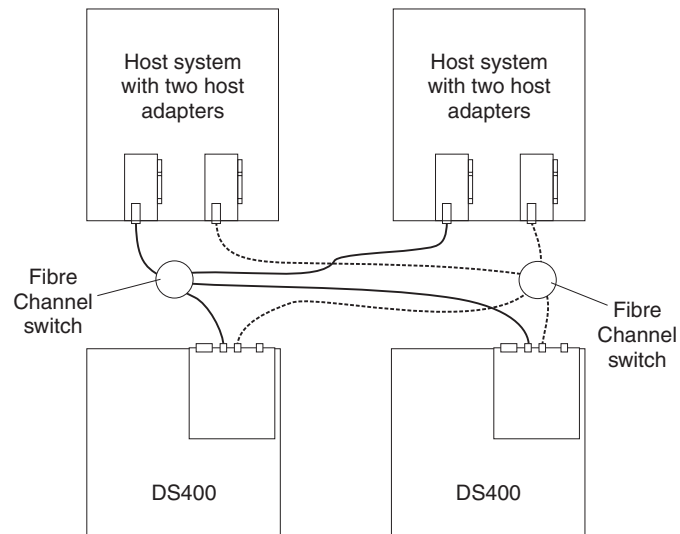


Figure 23. Multiple port, multiple server, multiple storage subsystem configuration (DS400)

Redundant host and drive Fibre Channel configurations

Note: The following configurations have host and drive path failover protection and are preferred for high availability.

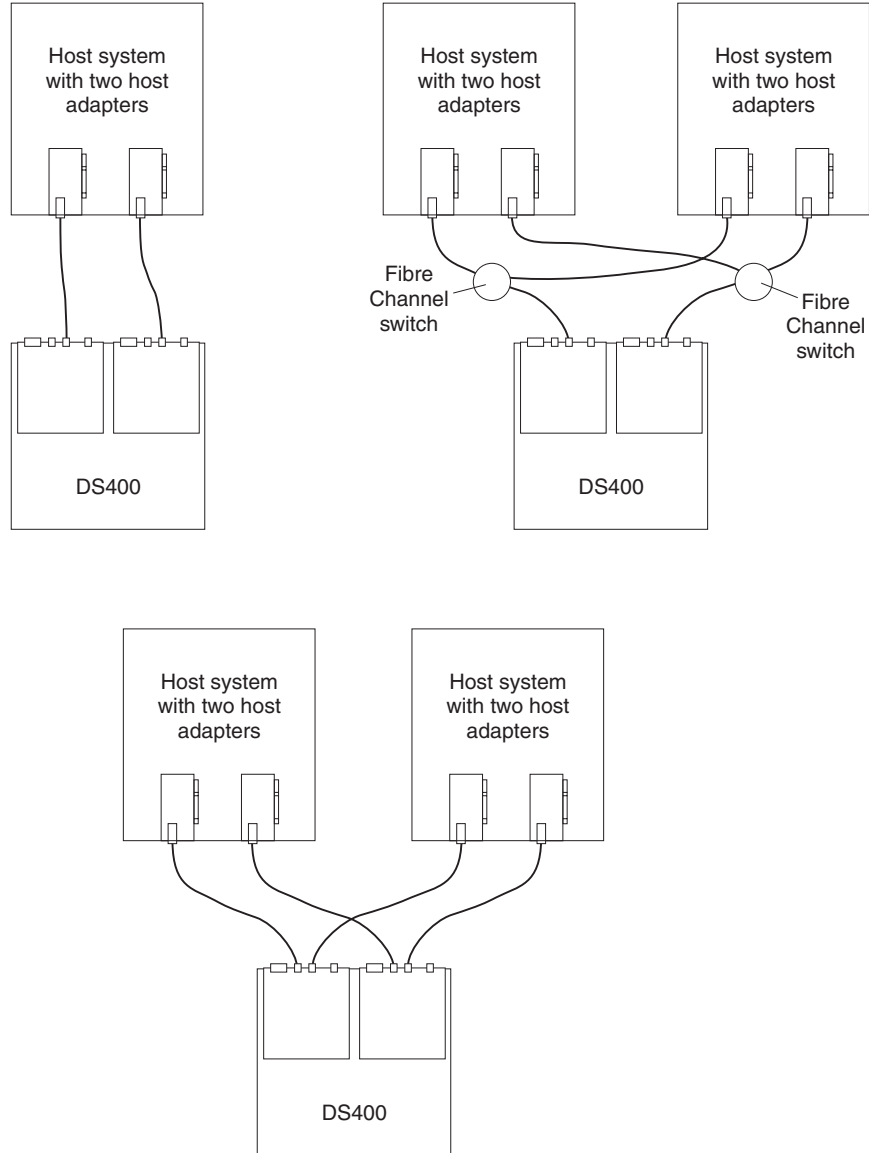


Figure 24. Redundant host and drive Fibre Channel loop configurations

SAN fabric zone configurations

The following illustration is an example of a single SAN fabric zone configuration.

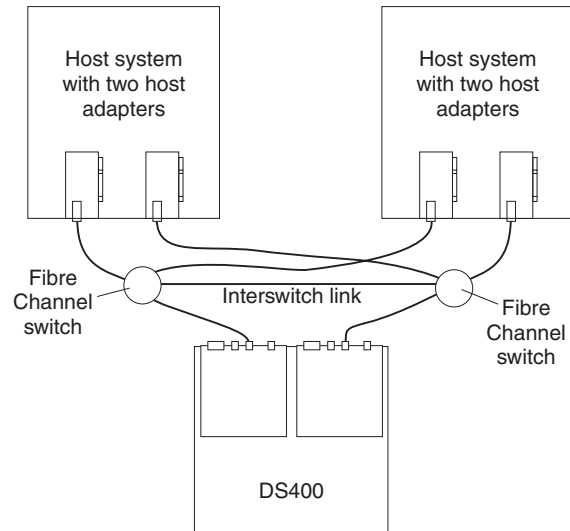


Figure 25. Single SAN fabric zone configuration

The following illustration is an example of a dual SAN fabric zone configuration.

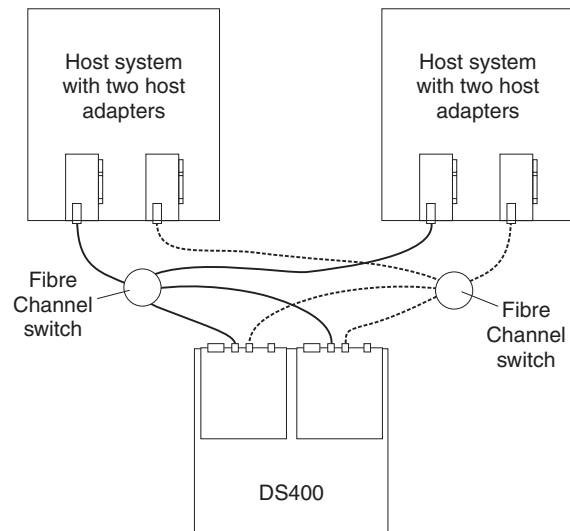


Figure 26. Dual SAN fabric zone configuration

Chapter 6. Installing the DS400 storage subsystem

This chapter describes the DS400 storage subsystem components.

Inventory checklist

After you unpack the storage subsystem, make sure that you have the items that are described in this section.

Hardware

IBM TotalStorage DS400 storage subsystem model 1700-1RS comes with the following components:

- One Fibre Channel RAID controller
- 14 hard disk drive filler panels
- Two power supplies

IBM TotalStorage DS400 storage subsystem model 1700-2RD comes with the following components:

- Two Fibre Channel RAID controllers
- 14 hard disk drive filler panels
- Two power supplies

The following hardware comes with all storage subsystem models:

- One rack-mounting hardware kit
 - Two rack support rails (right and left assembly)
 - Ten M6 hex screws
 - Ten M6 cage nuts
 - Ten M6 clip nuts
- Ethernet wrap plug (for diagnostic purposes only)
- Rack jumper power cords (one or two depending on storage subsystem model)
- Chassis bezel assembly

Software and documentation (all models)

- *IBM ServeRAID 7.20 (or later) Application CD*
- *IBM TotalStorage DS300 and DS400 Support CD*
- *IBM TotalStorage DS300 and DS400 Quick Installation Guide*
- *IBM Documentation CD*, including:
 - *Safety Information* document
 - *IBM TotalStorage DS300 and DS400 Warranty and Support*
- *Rack Mounting Assembly kit*, including:
 - *Rack Installation Instructions*
 - *Rack mounting template* (for aligning the rails properly)

If an item is missing or damaged, contact your IBM marketing representative or authorized reseller.

The following documents are available on the IBM Support Web site:

- *IBM TotalStorage DS300 and DS400 Dual Controller Hardware Installation and User's Guide*
- *IBM TotalStorage DS300 and DS400 Software Installation Guide*
- *IBM TotalStorage DS300 Problem Determination Guide and IBM TotalStorage DS400 Problem Determination Guide*
- *IBM TotalStorage DS300 and DS400 Hardware Maintenance Manual*

If you have not already done so, record the controller serial number in Table 9 on page 81.

Components of DS400 storage subsystems

The following sections show the components of the DS400 storage subsystem.

The hot-swap features of the storage subsystem enable you to remove and replace hard disk drives and power supplies without turning off the storage subsystem. Therefore, you can maintain the availability of the system while a hot-swap device is removed, installed, or replaced.

DS400 storage subsystem front view

The following illustration shows the components and controls on the front of a DS400 storage subsystem.

Note: The illustrations in this document might differ slightly from your hardware.

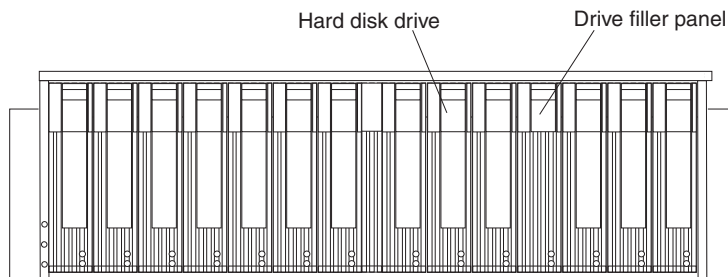


Figure 27. DS400 storage subsystem front components

Hard disk drive

You can install up to 14 Ultra320 hot-swap hard disk drive *customer replaceable units* (CRUs) in the storage subsystem. Each hard disk drive CRU contains a hard disk drive and tray.

Drive filler panel

The storage subsystem comes without installed hard disk drives and contains filler panels in the unused drive bays. Before installing new drives, you must remove the filler panels and save them. Each of the 14 bays must always contain either a filler panel or a hard disk drive to maintain proper cooling and airflow.

Tray handle and latch

Use the blue latch on the tray handle to release or lock the hard disk drive in place.

For information about installing and replacing a hard disk drive, see “Installing a hot-swap hard disk drive” on page 60 and “Replacing a hot-swap hard disk drive” on page 61.

DS400 storage subsystem rear view

The following illustrations show the components on the rear of the DS400 storage subsystems models 1700-1RS and 1700-2RD.

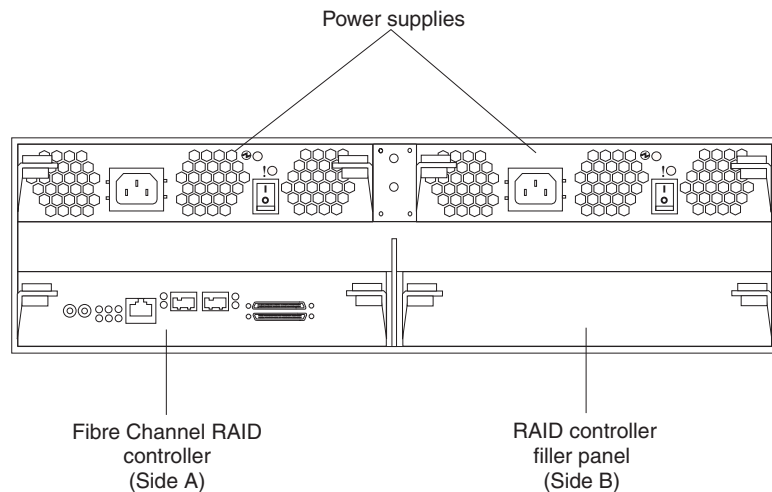


Figure 28. DS400 storage subsystem model 1700-1RS rear view

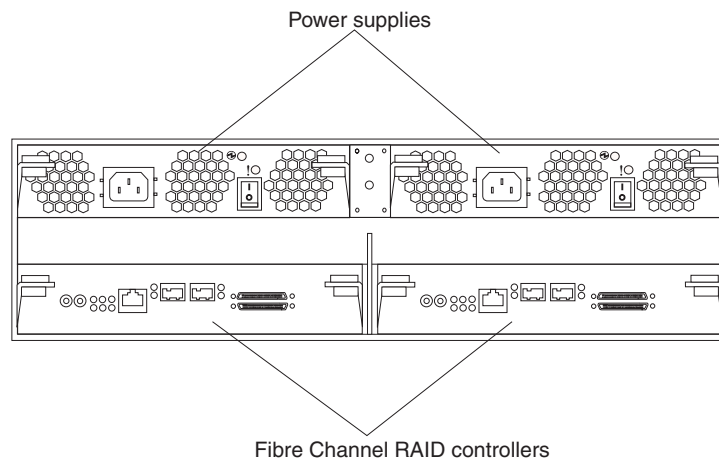


Figure 29. DS400 storage subsystem model 1700-2RD rear view

Fibre Channel RAID controller

The DS400 storage subsystem comes with one or two Fibre Channel RAID controllers. Each Fibre Channel RAID controller has one 1 Gb/sec (gigabit per second) Ethernet connector for management, two 2 Gb/sec Fibre Channel host ports, and 12 LEDs.

If the storage subsystem comes with only one RAID controller, there is a filler panel in the right RAID controller bay (side B). The filler panel must remain in place to maintain proper cooling.

Each RAID controller also contains a battery to maintain cache data in the event of a power failure. For more information, see “Cache memory and RAID controller battery.”

Power supply

The DS400 storage subsystem contains two hot-swap power supplies. Each unit is a self-contained power supply with three integral cooling fans, a power switch, and two status LEDs.

Cache memory and RAID controller battery

Each RAID controller contains 256 MB of cache memory. It also contains a sealed, rechargeable lithium ion battery that maintains data in the cache for up to three days in the event of a power failure. The service life of the battery is 36 months, after which time the battery should be replaced. For information about replacing the battery, see “Replacing the cache battery in the RAID controller” on page 66.

Getting started

Use the following list to prepare a storage subsystem for installation:

1. Prepare the site to meet all area, environmental, power, and site requirements. For more information, see “Specifications” on page 4.
2. Move the storage subsystem and its rack cabinet to the site.
3. Remove the storage subsystem from its shipping container and check the contents (for a list of items, see “Inventory checklist” on page 33). If any items are missing, contact your IBM marketing representative or authorized reseller before proceeding.
4. Assemble the tools and equipment that you will need for installation. These might include:
 - Power cords (come with the storage subsystem)
 - Screwdrivers (various sizes)
 - Antistatic protection (such as a grounding wrist strap)
 - Small form-factor pluggable (SFP) modules
 - Fibre Channel and Ethernet interface cables and cable straps
 - Rack-mounting hardware (comes with the storage subsystem)
 - IBM ServeRAID Manager software to configure the storage subsystem (comes with the storage subsystem on the *IBM ServeRAID 7.20 Application CD*)
5. Install the storage subsystem in the rack. Rack mounting instructions and a template for aligning the holes in the rails and the rack come with the storage subsystem.

Chapter 7. Cabling the DS400 storage subsystem

This chapter provides Fibre Channel storage subsystem cabling information.

For the initial startup of the storage subsystem after you connect the cables, see “Turning on the storage subsystem” on page 51.

Fibre Channel cabling

Use the information in the following sections to connect the storage subsystem to Fibre Channel devices.

Working with SFP modules

The storage subsystem host connectors require small form-factor pluggable (SFP) modules. SFP modules are laser products that are used to convert electrical signals to optical signals that are required for Fibre Channel transmission to and from RAID controllers. The storage subsystem supports two types of SFP modules: one with a plastic tab and one with a wire tab. After you install the SFP modules, you will use fiber-optic cables to connect the storage subsystem to other Fibre Channel devices.

Handling an SFP module

Before installing an SFP module, read the following information:

- The SFP module housing has an integral guide key that is designed to prevent you from inserting the SFP module incorrectly.
- Use minimal pressure when you insert the SFP module into a connector. Forcing the SFP module into a connector can cause damage to the SFP module or the connector.
- You can insert or remove the SFP module while the storage subsystem is turned on.
- The operation of a Fibre Channel loop is not affected when you install or remove an SFP module.
- You must first insert the SFP module into the Fibre Channel connector on the RAID controller before you can connect the fiber-optic cable.
- You must remove the fiber-optic cable from the SFP module before you remove the SFP module from the Fibre Channel connector. See “Removing an SFP module” on page 39 for more information.

Installing an SFP module

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 57.

1. Read the information in “Handling an SFP module” on page 37.
2. Remove the SFP module from its static-protective package.
3. Remove the protective cap from the SFP module, as shown in Figure 30. Save the protective cap for future use.

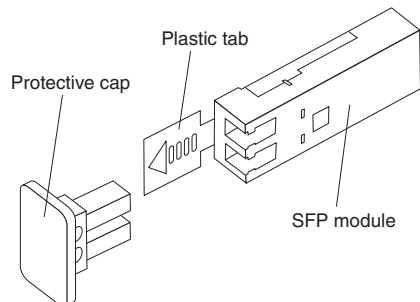


Figure 30. Small form-factor pluggable (SFP) module

4. Rotate the SFP module so that the plastic or wire tab is on the bottom; then, insert it into the host connector until it clicks into place. See Figure 31.

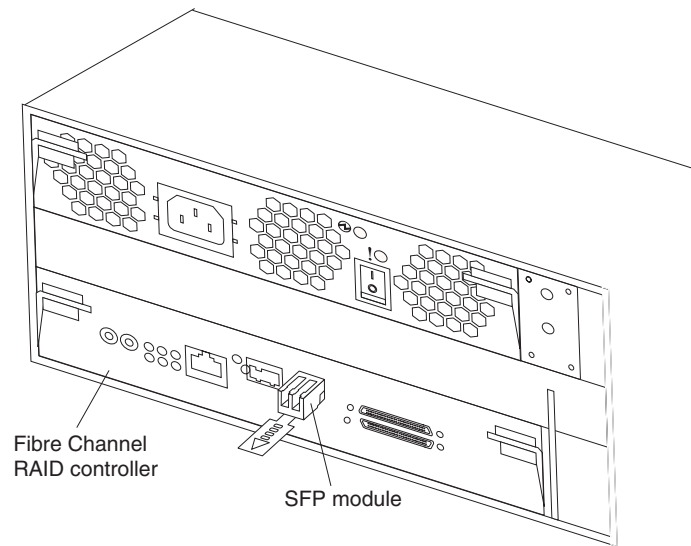


Figure 31. Installing an SFP module into the host connector

Removing an SFP module

Complete the following steps to remove an SFP module from a host connector.

Attention: To avoid damage to the cable or the SFP module, make sure that you disconnect the LC-LC fiber-optic cable *before* you remove the SFP module.

1. Read the information in “Handling an SFP module” on page 37.
2. Remove the LC-LC fiber-optic cable from the SFP module. For more information, see “Removing a fiber-optic cable” on page 41.
3. Remove the SFP module:
 - For an SFP module with a plastic tab:
 - a. Unlock the SFP module by pulling the plastic tab downward 10° (see Figure 32).

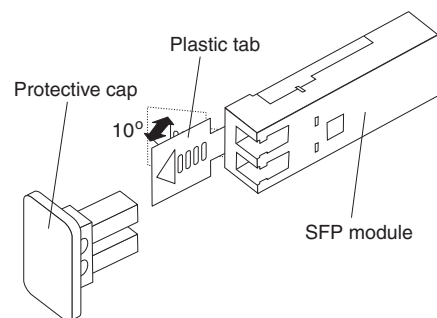


Figure 32. Unlocking an SFP module - plastic tab

- b. Pull the SFP module out of the connector.

- For an SFP module that has a wire tab:
 - a. Unlock the SFP module by pulling the wire tab downward 90° (see Figure 33).

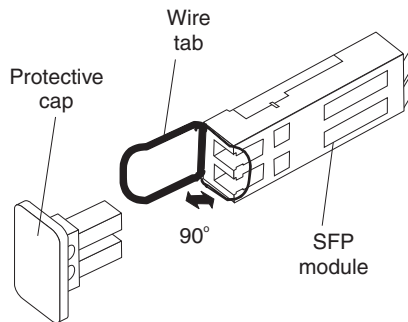


Figure 33. Unlocking an SFP module - wire tab

- b. Pull the SFP module out of the connector.
4. Replace the protective cap on the SFP module.
5. Place the SFP module into a static-protective package.

Working with fiber-optic cables

After the SFP module is installed in the host connector on the RAID controller, you will connect a fiber-optic cable.

Handling a fiber-optic cable

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

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

- Do not route the cable along a folding cable-management arm.
- When attaching the cable 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 the device is extended or become pinched when the device is 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. Make sure that the cable is well supported.

Installing a fiber-optic cable

Complete the following steps to connect a fiber-optic cable:

1. Read the information in “Handling a fiber-optic cable” on page 40.
2. Remove the protective caps from the fiber-optic cable end. See Figure 34.

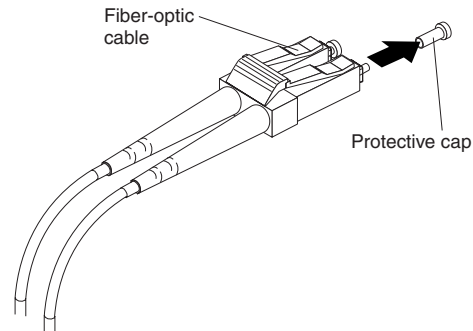


Figure 34. Removing caps from fiber-optic cables

3. Connect the fiber-optic cable to the installed SFP module, as shown in Figure 35.

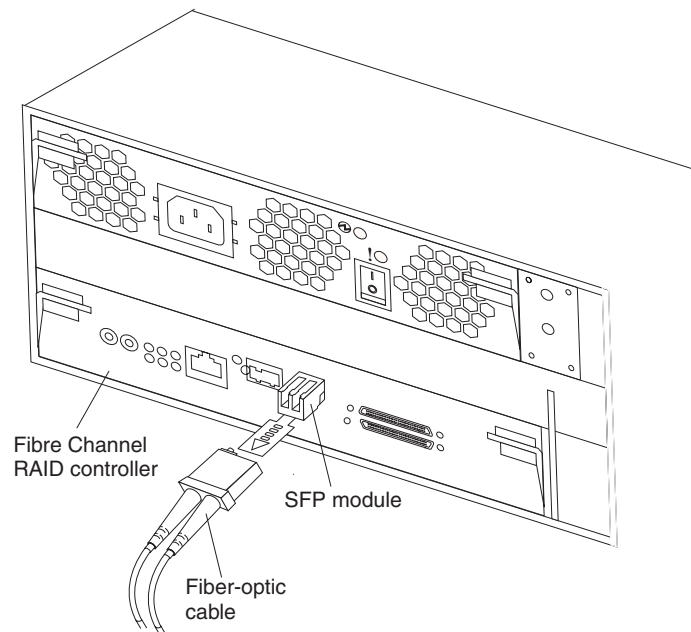


Figure 35. Connecting a fiber-optic cable to the installed SFP module

4. Check the LEDs on the RAID controller. When the RAID controller is operating correctly, the green link LED is lit. For information about the status of the RAID controller LEDs, see “Fibre Channel RAID controller controls and LEDs” on page 47.

Removing a fiber-optic cable

Complete the following steps to remove a fiber-optic cable:

1. Read the information in “Handling a fiber-optic cable” on page 40.
2. Gently pull the fiber-optic cable from the SFP module that is installed in the host connector in a Fibre Channel RAID controller.

3. Replace the protective caps on the end of the fiber-optic cable.

Connecting a host to a Fibre Channel RAID controller

Complete the following steps to connect a host adapter to the Fibre Channel RAID controller:

1. Install an SFP module in a data connector on the RAID controller.
2. Connect the host-system cables to the RAID controller or to switches. Figure 36 shows the location on the RAID controllers where the host-system cables are connected.

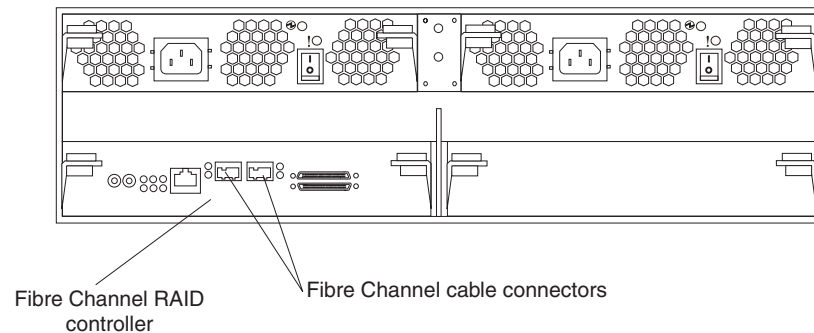


Figure 36. Host-system cable connectors

Connecting secondary interface cables for storage management

Use the Ethernet management connector on the back of the storage subsystem to connect the controller for management of the storage subsystem. Connect one end of an Ethernet cable to the Ethernet connector for controller A (on the left) on the back of the storage subsystem. Connect the other end of the Ethernet cable to an Ethernet switch or directly into the management station. Figure 37 shows the location of the management connector on your storage subsystem model.

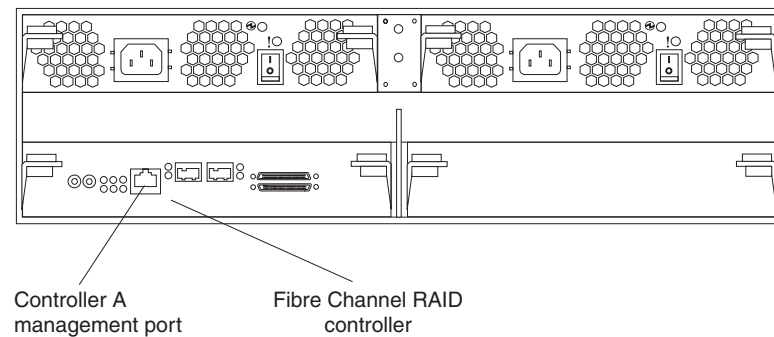


Figure 37. DS400 Ethernet management connector

Chapter 8. DS400 storage subsystem controls and LEDs

This chapter describes the controls and light-emitting diodes (LEDs) on a DS400 storage subsystem.

See the *DS400 Problem Determination Guide* for LED indicator-to-FRU replacement information.

DS400 storage subsystem front view

The following illustration shows the LEDs on the front of the DS400 storage subsystem.

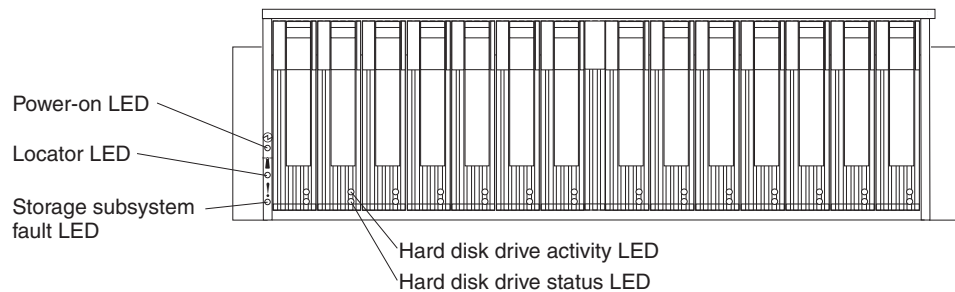


Figure 38. DS400 storage subsystem front LEDs

Table 5. Front view LEDs



Symbol	Description	Color	Indication
	Power on	Green	When this LED is lit, it indicates that the storage subsystem is turned on. When this LED is off, it indicates that dc power is not present, or the power supply or the LED itself has failed. A power LED is also on the power supply. Note: To remove all electrical power from the storage subsystem, you must disconnect the power cord from the electrical outlet.
	Locator	Blue	When this LED is lit, it has been remotely lit by the ServeRAID Manager program (running on the system that is the management station for the storage subsystem), to aid in visually locating the storage subsystem.

Table 5. Front view LEDs (continued)

Symbol	Description	Color	Indication
!	Storage subsystem fault	Amber	When this LED is lit, it indicates that the storage subsystem has a fault, such as in a power supply or hard disk drive. When this LED is flashing, it indicates that an invalid hardware configuration is detected. Note: If the fault LED is lit continuously (not flashing), there is a problem with the storage subsystem. Use the ServeRAID Manager program to diagnose and repair the problem. For more information, see the <i>Problem Determination Guide</i> .
No label	Hard disk drive activity	Green	When this LED is flashing, it indicates that the drive is in use. Each hard disk drive has an activity LED.
No label	Hard disk drive status	Amber	When this LED is lit, it indicates that the drive has failed. When this LED is flashing slowly (one flash per second), it indicates that the drive is being rebuilt. When the LED is flashing rapidly (three flashes per second), it indicates that the RAID controller is identifying the drive. Each hard disk drive has a status LED.

For information about installing and replacing hard disk drives, see “Installing a hot-swap hard disk drive” on page 60 and “Replacing a hot-swap hard disk drive” on page 61.

DS400 storage subsystem rear view

The following sections show the LEDs, controls, and connectors on the components at the rear of the DS400 storage subsystem.

Power supply controls and LEDs

The following illustration shows the LEDs, controls, and connectors on the power supply.

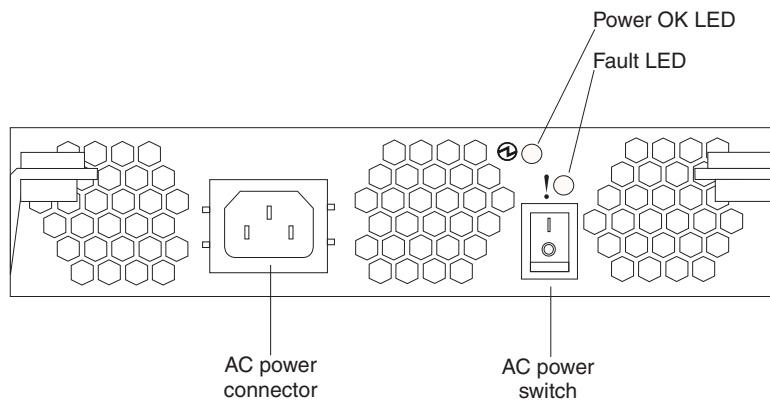


Figure 39. DS400 power supply LEDs, controls, and connectors

Power cord connector

Connect the power cord to this connector.

AC power on/off switch

Use this switch to turn the power supply on and off.

Power OK LED (green)

When this LED is lit, it indicates that the power supply is turned on.

Fault LED (amber)

When this LED is lit, there is a fault with either the power supply or a fan.

Fibre Channel RAID controller controls and LEDs

The Fibre Channel RAID controller has 12 LEDs and several connectors, depending on the storage subsystem model. The following illustration shows the LEDs and connectors on the DS400 storage subsystem Fibre Channel RAID controller.

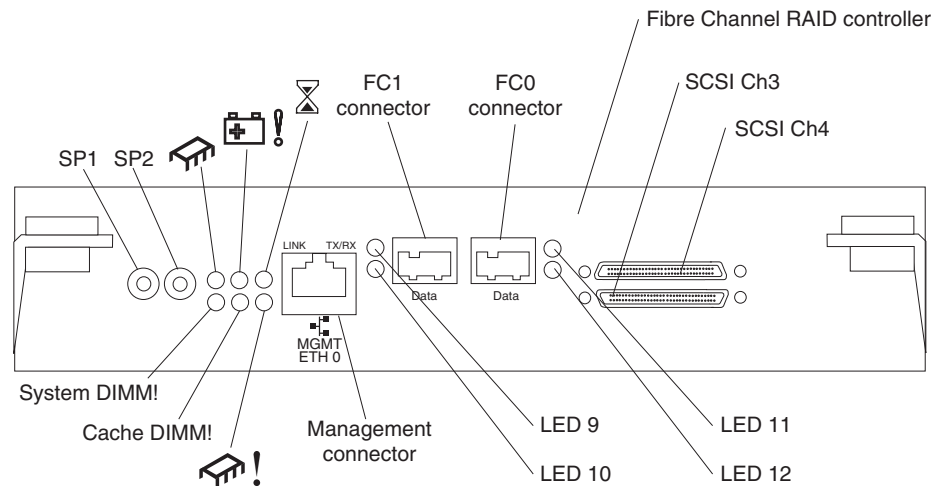


Figure 40. Fibre Channel RAID controller LEDs and connectors

Serial connectors (SP1 and SP2)

The serial connectors are for diagnostic purposes only.

Management connector

The management connector is for ServeRAID Manager function.

FC 1 connector

The FC 1 connector is for Fibre Channel data transfer.

FC 0 connector

The FC 0 connector is for Fibre Channel data transfer.

SCSI channel 4





SCSI channel 4 can be connected to an IBM EXP400 Storage Expansion Unit.

SCSI channel 3

SCSI channel 3 can be connected to an IBM EXP400 Storage Expansion Unit.

The following table lists the LEDs on the Fibre Channel RAID controller.

Table 6. Fibre Channel RAID controller LEDs

LED symbol or label	Description	Color	Indication
	Controller ready	Green	When this LED is lit, it indicates that the controller has successfully started or restarted.
	Battery fault	Amber	<p>When this LED is lit, it indicates that the battery cannot sustain the RAID controller memory in case of power loss. This might be caused by any of the following conditions:</p> <ul style="list-style-type: none"> • The battery is removed. • There is a battery-charger circuit failure. • The battery temperature is too high. • The battery voltage is out of range. • The battery charge current is out of range. <p>When this LED is off, it indicates that the battery can sustain the RAID controller memory in case of a power loss.</p>
	Cache dirty	Amber	When this LED is lit, it indicates that there is data in the cache that has not been written to a disk or synchronized to the redundant controller cache.
System DIMM!	xScale DIMM fault	Amber	<p>When this LED is lit, it indicates that the XScale memory has failed. This is based on one of the following conditions:</p> <ul style="list-style-type: none"> • Cannot read the DIMM configuration data • Nonrecoverable ECC failure <p>When this LED is off, it indicates that the XScale memory is operating normally.</p>
Cache DIMM!	Cache DIMM fault	Amber	<p>When this LED is lit, it indicates that the cache memory has failed. This is based on one of the following conditions:</p> <ul style="list-style-type: none"> • Cannot read the DIMM configuration data • Nonrecoverable ECC failure <p>When this LED is off, it indicates that the cache memory is operating normally.</p>
	Controller not ready	Amber	When this LED is lit, it indicates that the controller is not ready.
ETH0 Link	GbE link status	Green	When this LED is lit, it indicates that the Gb Ethernet link is operational.
ETH0 TX/RX	GbE activity	Green	When this LED is lit, it indicates that data packets are being transmitted or received.

The Fibre Channel RAID controller has two status LEDs on each of the two Fibre Channel host connectors. The following tables show the Fibre Channel host connector status LEDs.

Table 7. Fiber Channel host connector status for LED 9 and LED 10

Name	LED 9 green	LED 10 amber
Power on	Lit continuously	Lit continuously
Loss of sync	Off	Flashes at half-second intervals
Online	Lit continuously	Off
FC chip fault	Flashes at half-second intervals	Flashes at half-second intervals

Table 8. Fibre Channel host connector status for LED 11 and LED 12

Name	LED 11 green	LED 12 amber
Power on	Lit continuously	Lit continuously
Loss of sync	Off	Flashes at half-second intervals
Online	Lit continuously	Off
FC chip fault	Flashes at half-second intervals	Flashes at half-second intervals

Chapter 9. Turning the storage subsystem on and off

This chapter contains instructions for power cabling and turning the storage subsystem on and off under normal and emergency situations.

If you are turning on the storage subsystem after an emergency shutdown or power outage, see “Restoring power after an emergency shutdown” on page 54.

Power cabling

The storage subsystem uses either one or two standard power cords, depending on whether there are one or two power supplies. You can connect the power cords to a primary power unit inside the rack, such as a properly grounded ac power distribution unit, or to an external source, such as a properly grounded electrical outlet.

Complete the following steps to connect the power cords, if you have not already done so:

1. Connect the power cord to the power supply.
2. Untwist the power cord strain-relief plastic tie (located below and to the right of the ac power switch).
3. Wrap the strain-relief tie around the power cord approximately 10 cm (4 in.) from the ac power connector end; then, twist the tie.
4. Connect the power cord to a properly grounded electrical outlet.

Turning on the storage subsystem

Complete the following steps to turn on the power for the initial startup of the storage subsystem.

1. Make sure that:
 - All communication and power cables are connected to the back of the storage subsystem and a properly grounded ac electrical outlet.
 - All hard disk drives are locked securely in place. For more information, see “Installing a hot-swap hard disk drive” on page 60.

Attention: If you are restarting the system after a normal shutdown, wait at least 10 seconds before you turn on the power by using the power-on sequence in step 2.

2. Check the system documentation for the hardware devices that you intend to turn on, and then determine the proper startup sequence. Use the following power-on sequence, where applicable:
 - a. Turn on the power to the supporting devices (for example, Ethernet switches, Fibre Channel switches, and management stations) before the storage subsystem.
 - b. Turn on the expansion units before the storage subsystem. The controllers might not recognize the correct configuration if the drives are powered up after the storage subsystem. For instructions for turning on the expansion units, see the expansion-unit documentation.
 - c. Turn on the power to the storage subsystem
 - d. Restart or turn on the power to the host.
3. Turn on the power to each device, according to the power-on sequence in step 2. To turn on power to the storage subsystem, turn on the power-supply

- switches on the back of the storage subsystem. You must turn on both power-supply switches to take advantage of the redundant power supplies.
4. Use the ServeRAID Manager program and the fault LEDs to check the overall status of the storage subsystem and its components. All LEDs should be green on the front of the storage subsystem. If they are not, use the ServeRAID Manager program to diagnose the problem (see “Monitoring status through software” on page 55).

Note: The green drive-active LED and amber drive-fault LED below each drive might flash intermittently as the drive spins up. Wait until the storage subsystem is finished powering up before checking the LEDs on the front of the storage subsystem. For more information, see “DS300 storage subsystem front view LEDs” on page 19 or “DS400 storage subsystem front view” on page 45.

Turning off the storage subsystem

Attention: Except in an emergency, never turn off the power if any storage subsystem fault LEDs are lit. Correct the fault before you turn off the power by using the proper troubleshooting or servicing procedure. This ensures that the storage subsystem will power up correctly later. For more information, see the DS300 or DS400 *Problem Determination Guide*.

The storage subsystem is designed to run continuously, 24 hours a day. After you turn on the storage subsystem, do not turn it off. Turn off the power only when:

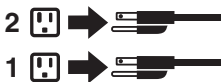
- Instructions in a hardware or software procedure require you to turn off the power.
- A service technician tells you to turn off the power.
- A power outage or emergency situation occurs (see “Performing an emergency shutdown” on page 54).

Statement 5



CAUTION:

The power control button on the device and 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. Before proceeding, use the ServeRAID Manager program to determine the status of the system components and special instructions. The operating-system software might require you to perform other procedures before you turn off the power.
2. Use the ServeRAID Manager program to check the status of the storage subsystem. Correct problems that are reported before you turn off the power.

3. Stop all I/O activity to the storage subsystem and attached expansion units. Make sure that:
 - All of the green drive-active LEDs on the front of the storage subsystem (and on all attached expansion units) are not flashing.
 - The green cache-active LEDs on the back of the storage subsystem are off.
4. From the ServeRAID Manager interface, shut down the RAID controller to flush the data from the cache.
5. If applicable, use the operating-system software to disconnect the storage subsystem logical drives from the host before the storage subsystem is turned off.

Note: To turn off all power to the storage subsystem, you must turn off both power-supply switches and disconnect both power cords. Use the procedure in step 6 for the proper shutdown sequence.

6. Turn off the power to each device according to the following shutdown sequence:
 - a. Turn off power to the host before the storage subsystem. If the host must stay powered on to support an existing network, see the operating-system documentation for information about disconnecting the storage subsystem logical drives from the host before the storage subsystem is powered off.
 - b. Turn off power to the storage subsystem before you turn off power to the expansion units. Turn off both power-supply switches on the back of the storage subsystem.
 - c. Turn off power to other supporting devices, such as management stations, Fibre Channel switches, Fibre Channel managed hubs, or Ethernet switches.

Note: You do not have to perform this step if you are servicing only the storage subsystem.

After you perform the necessary maintenance procedures, turn on the power by using the procedure in “Turning on the storage subsystem” on page 51.

Restoring power after an unexpected shutdown

The storage subsystem might shut down unexpectedly under any of the following conditions.

Attention: There might be data loss in each of the following cases.

- The internal temperature of the storage subsystem exceeds the maximum operating temperature (an overtemperature condition).

If multiple fans fail or are unable to maintain an internal temperature below 70°C (158°F), one or both of the power supplies in the storage subsystem will shut down. If both power supplies shut down, the unit is inoperable.

The ServeRAID Manager program warns you if the temperature of the unit is rising, before it has risen sufficiently to shut down the power supplies.
- There is a general power failure or a loss of power to the unit.
- You are forced to shut down the storage subsystem without performing the normal shutdown procedures (listed in “Turning off the storage subsystem” on page 52) because of an emergency situation.

Attention: To avoid damage to the hardware, take special care when restarting the system after an unexpected shutdown.

If the storage subsystem shuts down unexpectedly but there is still power to the site, use the ServeRAID Manager program to determine whether the storage subsystem has overheated.

- If an overtemperature condition is indicated, use the procedure in “Restoring power after an overtemperature shutdown” to restart the storage subsystem.
- If the storage subsystem has shut down because of a power failure or an emergency shutdown, use the procedure in “Performing an emergency shutdown” to restart the storage subsystem.

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 the equipment from potential damage due to electrical surges when power is restored. If the storage subsystem loses power unexpectedly, it might be due to a hardware failure in the power system or midplane. For more information, see the DS300 or DS400 *Problem Determination Guide*.

Complete the following procedure to shut down the storage subsystem during an emergency:

1. If you have time, stop all I/O activity to the storage subsystem by shutting down the host or disconnecting the storage subsystem logical drives through the host.
2. Check the LEDs (front and back). Make note of any fault LEDs that are lit so that you can correct the problem when you turn on the power again.
3. Turn off all power-supply switches; then, disconnect the power cords from the storage subsystem.

Restoring power after an emergency shutdown

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

1. After the emergency situation or when power is restored, check the storage subsystem for damage. If there is no visible damage, continue with step 2; otherwise, have the system serviced.
2. After you have checked for damage, make sure that the power-supply switches are off; then, connect the power cords to the storage subsystem.
3. Determine the correct power-on sequence for the system using step 2 on page 51.
4. Complete steps 3 on page 51 and 4 on page 52 to turn on power to the devices in the system and to check the status of the storage subsystem.

Restoring power after an overtemperature shutdown

Complete the following steps to restart the storage subsystem after an unexpected shutdown due to of an overtemperature condition:

1. Make sure that the power-supply switches on the back of the storage subsystem are turned off.
2. Do whatever is necessary to cool the unit (replace the power supplies, use external fans to cool the room, and so on).
3. Check all components and cables for visible damage. *Do not start the storage subsystem if you find evidence of damage.*

4. Complete step 2 on page 51 to determine the correct power-on sequence for the system.
5. When the internal temperature of the storage subsystem is below 45°C (113°F), complete steps 3 on page 51 and 4 on page 52 to turn on power to the devices in the system and to check the status of the storage subsystem.

Monitoring status through software

Use the ServeRAID Manager program to monitor the status of the storage subsystem. Run the program constantly, and check it frequently.

The ServeRAID Manager program provides the best way to diagnose and repair storage-subsystem failures. The program can help you:

- Determine the nature of the failure
- Locate the failed component
- Determine the recovery procedures to repair the failure

Although the storage subsystem has fault LEDs, the LEDs do not necessarily indicate which component has failed or must be replaced, or which type of recovery procedure that you must perform. In some cases (such as loss of redundancy in various components), the fault LED is not lit. Only the ServeRAID Manager program can detect the failure.

Chapter 10. Installing and replacing components

This chapter provides instructions for installing and replacing hardware components in the storage subsystem.

Installation guidelines

Before you begin installing options, read the following information:

- Read the safety information beginning on page iii and the guidelines in “Handling static-sensitive devices.” This information will help you work safely.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, external storage subsystem, and other devices.
- Back up all important data before you make changes to disk drives.
- Have a small flat-blade screwdriver available.
- You do not have to turn off the storage subsystem to install or replace a hard disk drive or power supply.
- Blue on a component indicates touch points, where you can grip the component to remove it from or install it in the storage subsystem, open or close a latch, and so on.
- Orange on a component or an orange label on or near a component indicates that the component can be hot-swapped, which means that you can remove or install the component while the storage subsystem is running. (Orange can also indicate touch points on hot-swap components.) See the instructions for removing or installing a specific hot-swap component for any additional procedures that you might have to perform before you remove or install the component.
- For a list of supported options for the storage subsystem, see <http://www.ibm.com/pc/compat/>.

System reliability guidelines

To help ensure proper cooling and system reliability, make sure that:

- Each of the drive bays has a drive or a filler panel and electromagnetic compatibility (EMC) shield installed in it.
- If the storage subsystem has redundant power, each of the power-supply bays has a power supply installed in it.
- There is adequate space around the storage subsystem to allow the storage subsystem cooling system to work properly. Leave approximately 50 mm (2.0 in.) of open space around the front and rear of the storage subsystem. Do not place objects in front of the fans.
- You have replaced a failed power supply within 10 minutes of removal.
- You have replaced a hot-swap drive within 2 minutes of removal.

Handling static-sensitive devices

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

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

- Limit your movement. Movement can cause static electricity to build up around you.
- Wear an electrostatic-discharge wrist strap, if one is available.
- Handle the device carefully, holding it by its edges or its frame.
- Do not touch solder joints, pins, or exposed circuitry.
- Do not leave the device where others can handle and damage it.
- While the device is still in its static-protective package, touch it to an unpainted metal part of the storage subsystem for at least 2 seconds. This drains static electricity from the package and from your body.
- Remove the device from its package and install it directly into the storage subsystem without setting down the device. If it is necessary to set down the device, put it back into its static-protective package. Do not place the device on the storage subsystem cover or on a metal surface.
- Take additional care when handling devices during cold weather. Heating reduces indoor humidity and increases static electricity.

Installing and removing the bezel on DS300 (models 1701-1RS and 1701-2RD) and DS400 storage subsystems

Note: Before installing the bezel on the storage subsystem, install it in the rack. For more information, see the *Rack Mounting Instructions* that come with the storage subsystem.

Complete the following steps to install the storage subsystem bezel:

1. Position the bezel directly in front of the storage subsystem.
2. Insert the three tabs on the bottom of the bezel into the matching holes on the storage subsystem chassis.

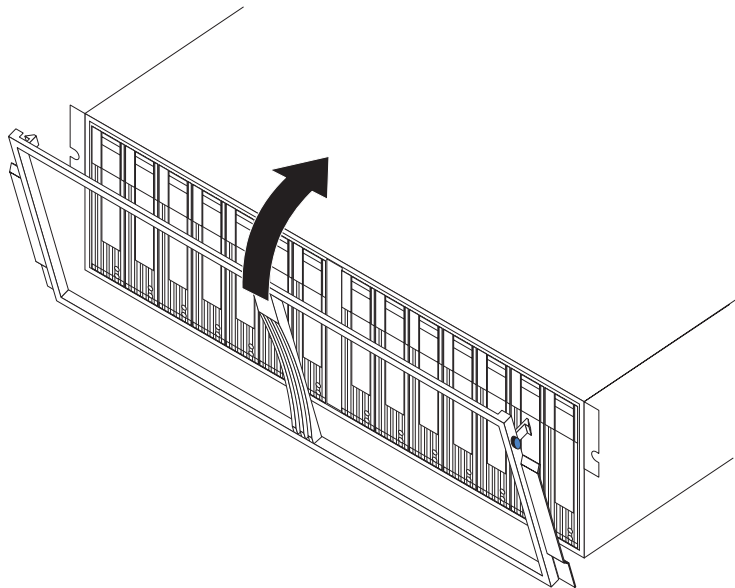


Figure 41. Installing the bezel on DS300 (models 1701-1RS and 1701-2RD) and DS400 storage subsystems

3. Rotate the top of the bezel toward the storage subsystem until the two tabs on the top of the bezel snap into place.

To remove the bezel, complete the following steps:

1. Press in on the blue tab on the top outside edge of both sides of the bezel, and pull the top of the bezel slightly away from the storage subsystem.
2. Pull the bezel up to release the three tabs at the bottom edge of the bezel. Store the bezel in a safe place.

Installing and removing the bezel on the DS300 model 1701-1RL storage subsystem

Note: Before installing the bezel on the storage subsystem, install it in the rack. For more information, see the *Rack Mounting Instructions* that come with the storage subsystem.

Complete the following steps to install the storage subsystem bezel:

1. Make sure that the EMI panel on the left side of the storage subsystem remains in place for proper cooling.

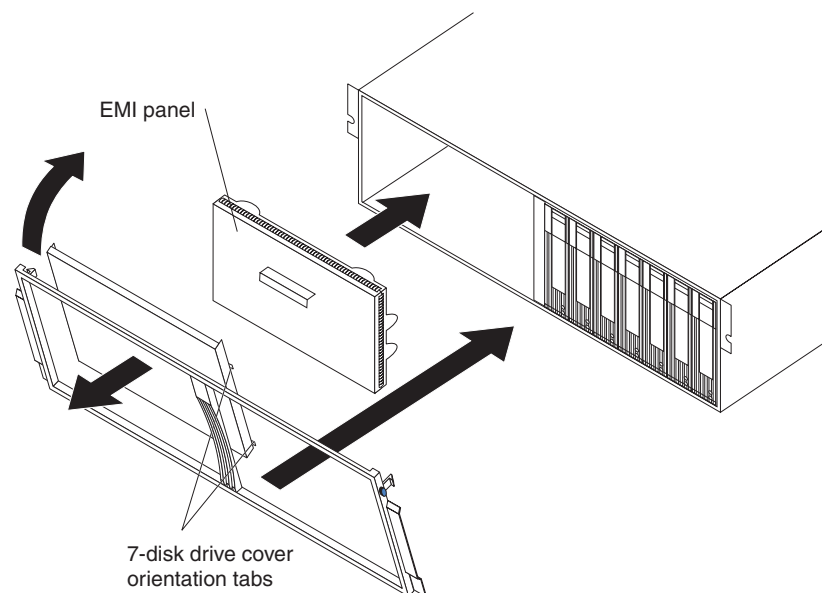


Figure 42. Installing the bezel on the DS300 model 1701-1RL

2. Place the 7-disk drive cover insert into the left side of the bezel. Make sure that the cover insert tabs are flush with the bezel frame.
3. Position the bezel directly in front of the storage subsystem.
4. Insert the three tabs on the bottom of the bezel into the matching holes on the storage subsystem chassis.
5. Rotate the top of the bezel toward the storage subsystem until the two tabs at the top of the bezel snap into place.

To remove the bezel, complete the following steps:

1. Press in on the blue tab on the top outside edge on both sides of the bezel, and pull the top of the bezel slightly away from the storage subsystem.

2. Pull the bezel up to release the three tabs at the bottom edge of the bezel. Store the bezel in a safe place.

Installing a hot-swap hard disk drive

The storage subsystem supports up to 14 IBM Ultra320 SCSI hard disk drives. Each of these IBM drives comes preassembled in a drive tray, ready for installation. (Do not detach the drive from the tray.) Be sure to record the location information for each drive in Table 10 on page 81.

The storage subsystem comes with filler panels in the drive bays. Before installing a new hard disk drive, remove the filler panel and save it for future use. Each of the 14 bays must contain either a filler panel or a hard disk drive.

Complete the following steps to install a hard disk drive in the storage subsystem. You can install drives while the storage subsystem is turned on.

Note: If you are replacing a drive, see “Replacing a hot-swap hard disk drive” on page 61 for more information.

1. Read the instructions that come with the hard disk drive.
2. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
3. Determine the bay into which you want to install the hard disk drive.
4. Remove the filler panel:
 - a. Insert a finger into the square hole at the top of the filler panel to grip and pull the filler panel out of the drive bay.
 - b. Save the filler panel for future use.
5. Install the hard disk drive.

Note: The hard disk drive comes with a tray already attached. Do not attempt to detach the drive from the tray.

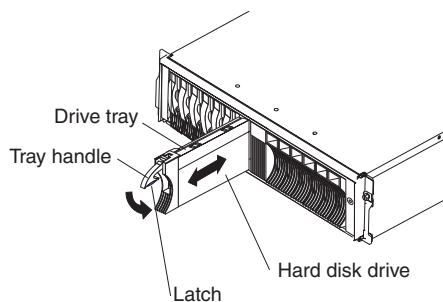


Figure 43. Installing a hard disk drive

- a. Press the latch on the bottom of the tray handle to release it.
 - b. Pull out the tray handle to the open position.
 - c. Gently slide the drive into the empty bay until the tray handle touches the expansion-unit bezel.
 - d. Push down the tray handle into the closed (latched) position.
6. Check the hard disk drive LEDs:
 - When a drive is ready for use, the green activity LED and the amber drive-fault LED are off.

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

ServeRAID information: In some cases, the ServeRAID Manager program will automatically reset the drive to the Hot Spare or Rebuild state. If the drive-state change does not occur automatically (the amber LED stays lit), see the ServeRAID Manager program online help for information about changing the state of the drive from the current state to another state, such as Hot Spare or Ready. The amber LED turns off within 10 seconds after the drive-state change.

7. Configure the hard disk drive by using the applicable software.

Replacing a hot-swap hard disk drive

Hard disk drive problems include any malfunctions that delay, interrupt, or prevent successful I/O activity between the hosts and the hard disk drives in the storage subsystem. This includes transmission problems between the host controllers and the drives. This section explains how to replace a failed drive.

Attention: Failure to replace a hard disk drive in the correct bay might result in loss of data. If data is stored on the hard disk, label the drive before you remove it. Then, when you replace the drive, install it in the same drive bay from which you removed it.

Check the hardware and software documentation that comes with your server to see whether there are restrictions regarding hard disk drive configurations. Some system SCSI configurations might not allow mixing different hard disk drive capacities or types within an array.

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

1. Read the instructions that come with the hard disk drive.
2. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
3. Find the hard disk drive that you want to remove.

Attention: Never hot-swap a hard disk drive when its green activity LED is flashing. Hot-swap a drive only when its amber status LED is lit (not flashing) or when the drive is inactive (the activity LED is off).

4. Remove the hard disk drive.

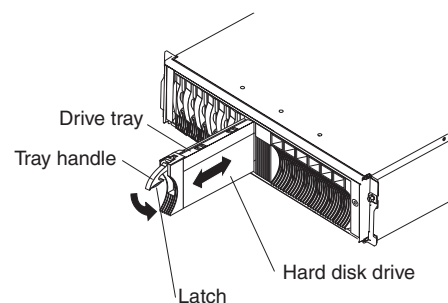


Figure 44. Removing a hard disk drive

- a. Press the latch on the bottom of the tray handle to release it.
- b. Pull out the tray handle to the open position.

- c. Lift the drive partially out of the bay and wait at least 20 seconds before fully removing the drive from the storage subsystem. This enables the drive to spin down and avoids possible damage to the drive.
 - d. Make sure that there is proper identification (such as a label) on the hard disk drive; then, gently slide it completely out of the storage subsystem.
5. Install the new hard disk drive:
 - a. Gently push the drive into the empty bay until the tray handle touches the storage subsystem tray.
 - b. Push down the tray handle into the closed (latched) position.
 6. Check the hard disk drive LEDs:
 - When a drive is ready for use, the green activity LED and the amber status LED are off.
 - If the amber status LED is lit and not flashing, remove the drive from the unit and wait 10 seconds; then, reinstall the drive. If the amber LED is flashing, the drive is being rebuilt.

ServeRAID information: In some cases, the ServeRAID Manager program will automatically reset the drive to the Hot Spare or Rebuild state. If the drive-state change does not occur automatically (the amber LED stays lit), see the ServeRAID Manager program online help for information about changing the state of the drive from the current state to another state, such as Hot Spare or Ready. The amber LED turns off within 10 seconds after the drive-state change.

Adding larger-capacity drives

This section provides guidelines for upgrading the drives in the storage subsystem. Read the software documentation and this entire section to determine whether you should use this procedure, use a modified version of this procedure, or use a different procedure that is provided by your operating system. *Instructions that are provided with your software should supersede anything that is stated in this document.*

To add larger-capacity drives, you must replace them all at the same time. All the data on the drives is lost when you replace the drives; therefore, you must back up all data that is on the drives. This procedure also requires you to turn off the storage subsystem, which makes the storage subsystem (and any attached expansion units) inaccessible to other users. After replacing all the drives, you must reconfigure the new drives and restore data from backup.

Complete the following steps to replace all the drives at the same time:

1. Read the following information:
 - The information in your software documentation regarding drive upgrades and installation.
 - The documentation that comes with the new drives.
Read all precautionary notes, kit instructions, and other information. Kit instructions often contain the most current information regarding the drives and their installation, plus upgrade or servicing procedures. Compare the kit instructions with this procedure to determine whether you must modify this procedure.
2. Use the ServeRAID Manager program to check the status of the storage subsystem. Correct any problems that are reported.
3. Perform a complete backup of the drives that you are replacing.
You need the backup to restore data on the drives later in this procedure.

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 57.

4. Unpack the new drives.

Set the drives on a dry, level surface away from magnetic fields. Save the packing material and documentation in case you have to return the drives.

5. Stop all I/O activity to the storage subsystem and attached expansion units. Make sure that:

- All of the green drive-activity LEDs on the front of the storage subsystem (and on all attached expansion units) are not flashing.
- The green cache-active LEDs are off on the front of the RAID controllers.

6. If applicable, use the operating-system software to disconnect the storage subsystem logical drives from the host before you turn off the storage subsystem.

Attention: To turn off all power to the storage subsystem, you must turn off both power-supply switches and disconnect both power cords. Use the procedure in step 7 for the correct shutdown sequence.

7. Turn off the power to each device according to the following shutdown sequence:
 - a. Turn off power to the host before you turn off power to the storage subsystem. If the host must stay powered-on to support an existing network, see the operating-system documentation for information about disconnecting the storage subsystem logical drives from the host before the storage subsystem is turned off.
 - b. Turn off power to the storage subsystem before you turn off power to the expansion units. Turn off both power-supply switches on the back of the storage subsystem.
 - c. Turn off power to other supporting devices, such as management stations, Fibre Channel switches, or Ethernet switches.

Note: You do not have to perform this step if you are servicing only the storage subsystem.

8. Use the procedures in “Replacing a hot-swap hard disk drive” on page 61 to remove the drives that you want to replace. Use the procedures in “Installing a hot-swap hard disk drive” on page 60 to install the new drives into the storage subsystem.
9. After you install all the new drives, check the system documentation for the hardware devices that you intend to turn on, and then determine the correct startup sequence. Use the following power-on sequence, where applicable:
 - a. Turn on the power to the supporting devices (for example, Ethernet switches and management stations) before you turn off power to the storage subsystem.
 - b. Turn on the expansion units before the storage subsystem. The controllers might not recognize the correct configuration if the drives are turned on after the storage subsystem. For instructions for turning on the expansion units, see the expansion-unit documentation.
 - c. Turn on the power to the storage subsystem; then, restart or turn on the power to the host.
10. Turn on the power to each device, according to the power-on sequence in step 9. To turn on power to the storage subsystem, turn on the power-supply switches on the back of the storage subsystem. You must turn on both power-supply switches to take advantage of the redundant power supplies.

11. Check the green drive-activity LED and the amber drive-fault LED below each new drive.

Make sure that the drive-activity LEDs are lit and the drive-fault LEDs are off.

Note: The drive-fault LEDs might flash intermittently while the drives spin up.

- If the drive-activity LED is off, the drive might not be installed correctly. Remove the drive, wait 30 seconds, and then reinstall it.
 - If the drive-fault LED stays lit or the drive-activity LED stays off, the new drive might be faulty. See the ServeRAID Manager program for problem determination.
12. Use the ServeRAID Manager program to configure the new drives. See the ServeRAID Manager program online help for detailed instructions.
 13. Restore the data from backup to all the drives.

Replacing the round lithium battery in the RAID controller

When replacing the round lithium battery, you must replace it with a lithium battery of the same type.

To order replacement batteries, call 1-800-426-7378 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Statement 2:



CAUTION:

When replacing the lithium battery, use only IBM Part Number 46H4132 or an equivalent type battery. If your system has a module containing a lithium battery, replace it only with the same module type. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

- **Throw or immerse into water**
- **Heat to more than 100°C (212°F)**
- **Repair or disassemble**

Dispose of the battery as required by local ordinances or regulations.

Attention: For storage subsystems with only one controller installed: To prevent data loss, you must shut down the system before you replace the battery. For the correct shutdown sequence, see “Turning off the storage subsystem” on page 52.

1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
2. Label each cable that is connected to the RAID controller so that you can correctly reconnect it to the RAID controller after you replace the battery.
3. **For storage subsystems with only one controller installed:** Stop the host I/O data to the storage subsystem; then, turn off the power-supply switches on the rear of the storage subsystem.

4. **For storage subsystems with two controllers installed:** Move the I/O data to the alternate controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address.
 - b. At the command prompt, enter `admin`.
 - c. Enter the administrator password.
 - d. Enter `controller peer disable`.
 The controller that you are removing will shut down and all I/O data will have moved to the alternate controller.
5. Remove the Ethernet cables from the RAID controller.
6. **For a Fibre Channel RAID controller only:** Remove the fiber-optic cables and the SFP modules from the RAID controller. For more information, see “Removing a fiber-optic cable” on page 41 and “Removing an SFP module” on page 39.
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 57.
7. Remove the RAID controller that contains the battery that you want to replace:
 - a. While squeezing together the latch and lever that are on each side of the controller, press down on the orange area on each latch. The controller will slide out of the bay a short distance.

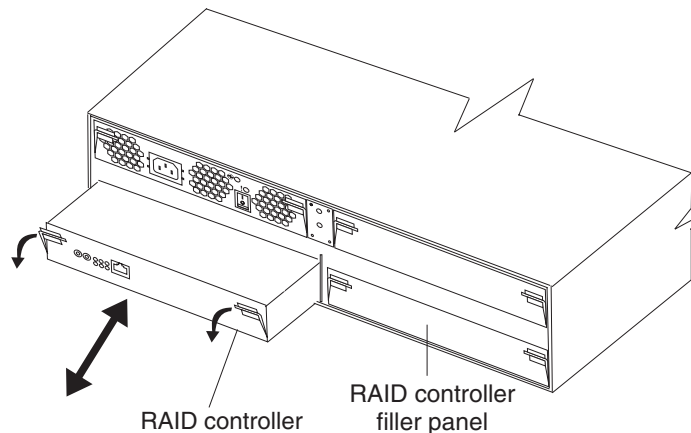
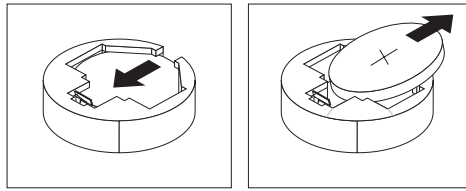


Figure 45. Removing a RAID controller

- b. Grasp both latches and pull the controller out of the bay.
 - c. Place the controller on a dry, level surface.
8. Remove the battery:
 - a. Use a blunt object to press the side of the battery in the direction of the battery socket spring. The battery pops up when released.
 - b. Use your thumb and index finger to lift the battery from the socket.



9. Insert the new battery:
 - a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.
 - b. Press the battery down into the socket until it clicks into place. Make sure that the battery socket holds the battery securely.
10. Install the RAID controller:
 - a. Make sure that the lever on each side of the controller is down as far as it will go.
 - b. Push the controller into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).
 - c. While squeezing together the latch and lever, push both latches up as far as they will go. The controller will slide the rest of the way into the bay.
11. Reconnect the Ethernet cables that you removed in step 6 on page 65 to the RAID controller.
12. **For a Fibre Channel RAID controller only:** Install the SFP modules and the fiber-optic cables that you removed in step 8 on page 67.
13. **For a storage subsystem with only one controller installed:** Turn on the power-supply switches on the rear of the storage subsystem.
14. **For a storage subsystem with two controllers installed:** Move the I/O data back to the original controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address. If the Telnet session is open from step 4 on page 65, go to step 14d.
 - b. At the command prompt, enter admin.
 - c. Enter the administrator password.
 - d. Enter controller peer enable.
 - e. Enter controller info.
Information about the controller is displayed on the screen. If the information shows that the peer controller status is Not Ready, repeat this step until the status is Ready.
 - f. Enter array failback.
The I/O data is moved back to the original controller.
15. Wait approximately 10 minutes for the ServeRAID Manager program to come back online.
16. Use the ServeRAID Manager program to monitor the status of the storage subsystem.

Replacing the cache battery in the RAID controller

Note: The iSCSI RAID controller in the DS300 model 1701-1RL does not contain a cache battery.

Each RAID controller contains a rechargeable battery that maintains the data in the cache memory for three days without power to the unit.

Complete the following steps if the ServeRAID Manager program instructs you to replace the battery because the current battery has failed or is nearing its expiration date. You can also use the ServeRAID Manager program to check the status of the battery.

Attention: For storage subsystems with only one controller installed: To prevent data loss, you must shut down the system before you replace the RAID controller battery. For the correct shutdown sequence, see “Turning off the storage subsystem” on page 52.

1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
2. Label each cable that is connected to the RAID controller so that you can correctly reconnect it to the RAID controller after you replace the battery.
3. **For a storage subsystem with only one controller installed:** Stop the host I/O data to the storage subsystem.
4. **For storage subsystems with two controllers installed:** Move the I/O data to the alternate controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address.
 - b. At the command prompt, enter admin.
 - c. Enter the administrator password.
 - d. Enter controller peer disable.

The controller that you are removing will shut down and all I/O data will have moved to the alternate controller.

5. If you are not using write-cache mirroring, you might have to clear cache memory on the RAID controller that contains the battery that has failed. To clear the cache, either shut down the controller before removing it from the storage subsystem or turn off caching in the storage subsystem by using the ServeRAID Manager program. Follow the steps in the ServeRAID Manager program before you continue with this procedure.
6. **For a storage subsystem with one controller installed:** Turn off the power-supply switches on the rear of the storage subsystem.
7. Remove the Ethernet cables from the RAID controller.
8. **For a Fibre Channel RAID controller only:** Remove the fiber-optic cables and the SFP modules from the RAID controller. For more information, see “Removing a fiber-optic cable” on page 41 and “Removing an SFP module” on page 39.

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 57.

9. Remove the RAID controller that contains the battery that you want to replace:
 - a. While squeezing together the latch and lever that are on each side of the controller, press down on the orange area on each latch. The controller will slide out of the bay a short distance.

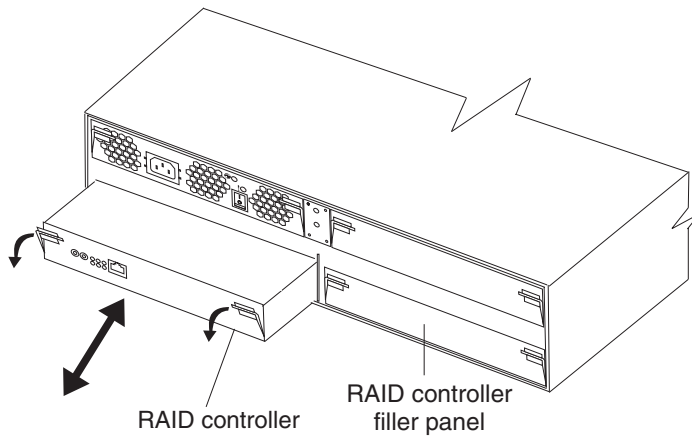


Figure 46. Removing a RAID controller

- b. Grasp both latches and pull the controller out of the bay.
 - c. Place the controller on a dry, level surface.
10. Remove the cache battery from the controller:
- a. Loosen the thumbscrew that holds the battery in place.

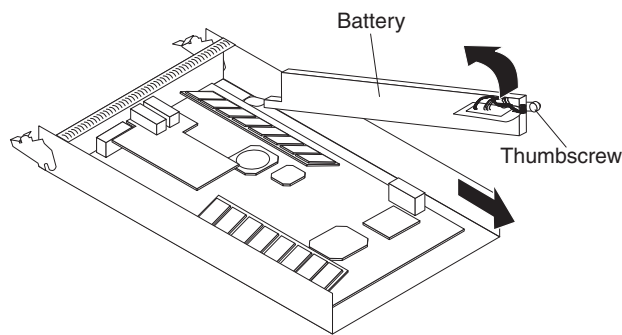


Figure 47. Removing the RAID controller battery

- b. Hold down the edge of the controller base on the battery side (near the thumbscrew).
 - c. Pull up on the blue lift tab on the battery to remove it from the connector.
 - d. Slide the battery toward the open end of the controller to remove it.
 - e. Dispose of the used battery according to local and federal regulations, which might include hazardous material handling procedures. For more information, see "Battery return program" on page 105.
11. Unpack the replacement battery and set it on a dry, level surface. Save the packing material and documentation in case you have to return the battery.
12. Install the new cache battery into the RAID controller:
- a. Slide the battery under the tab near the front of the RAID controller.

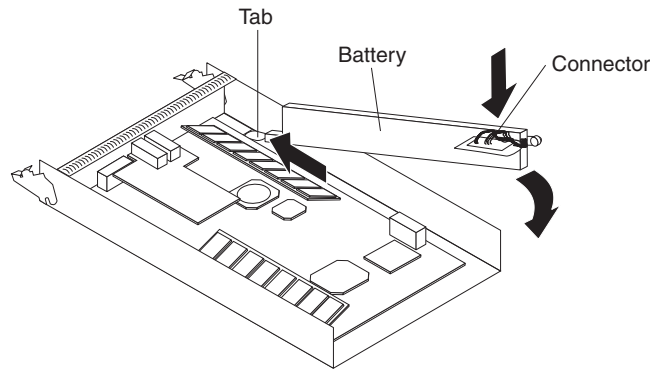


Figure 48. Installing a cache battery in the RAID controller

- b. Press down on the blue lift tab to secure the battery to the connector.
 - c. Tighten the thumbscrew.
13. Install the RAID controller:
 - a. Make sure that the lever on each side of the controller is down as far as it will go.
 - b. Push the controller into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).
 - c. While squeezing together the latch and lever, push both latches up as far as they will go. The controller will slide the rest of the way into the bay.
14. Reconnect the Ethernet cables that you removed in step 7 on page 67 to the RAID controller.
15. **For a Fibre Channel RAID controller only:** Install the SFP modules and the fiber-optic cables that you removed in step 8 on page 67.
16. **For a storage subsystem with one controller installed:** Turn on the power supply switches on the rear of the storage subsystem.
17. **For a storage subsystem with two controllers installed:** Move the I/O data back to the original controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address. If the Telnet session is open from step 4a on page 67, go to step 17d.
 - b. At the command prompt, enter `admin`.
 - c. Enter the administrator password.
 - d. Enter `controller peer enable`.
 - e. Enter `controller info`.
Information about the controller is displayed on the screen. If the information shows that the peer controller status is `Not Ready`, repeat this step until the status is `Ready`.
 - f. Enter `array failback`.
The I/O data is moved back to the original controller.
18. Wait approximately 10 minutes for the ServeRAID Manager program to come back online.

Note: It might take from 15 minutes to a few hours for a new battery to become fully charged. The ServeRAID Manager program might show the battery as failed until it is fully charged. Controller caching is automatically disabled until the new battery becomes fully charged.

19. Use the ServeRAID Manager program to monitor the status of the storage subsystem.

Replacing a cache memory module

Complete the following steps to replace a cache dual inline memory module (DIMM). The cache DIMM amber LED is lit.

1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
2. Label each cable that is connected to the RAID controller so that you can correctly reconnect it to the RAID controller after you replace the cache DIMM.
3. **For a storage subsystem with only one controller installed:** Stop the host I/O data to the storage subsystem.
4. **For a storage subsystem with only one controller installed:** Use the ServeRAID Manager program to shut down the RAID controller; then, turn off the power-supply switches on the rear of the storage subsystem.
5. **For storage subsystems with two controllers installed:** Move the I/O data to the alternate controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address.
 - b. At the command prompt, enter admin.
 - c. Enter the administrator password.
 - d. Enter controller peer disable.

The controller that you are removing will shut down and all I/O data will have moved to the alternate controller.
6. Remove the Ethernet cables from the RAID controller.
7. **For a Fibre Channel RAID controller only:** Remove the fiber-optic cables and the SFP modules from the RAID controller. For more information, see “Removing a fiber-optic cable” on page 41 and “Removing an SFP module” on page 39.

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 57.
8. Remove the RAID controller that contains the RAID cache DIMM that you want to replace:
 - a. While squeezing together the latch and lever that are on each side of the controller, press down on the orange area on each latch. The controller will slide out of the bay a short distance.

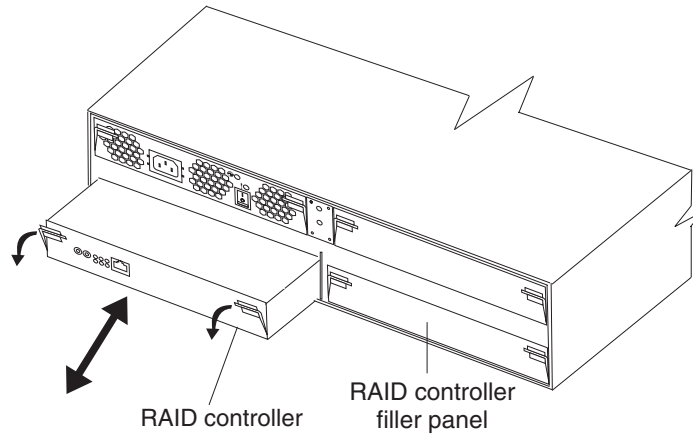


Figure 49. Removing a RAID controller

- b. Grasp both latches and pull the controller out of the bay.
- c. Place the controller on a dry, level surface.

Attention: To avoid breaking the retaining clips or damaging the DIMM connectors, open and close the clips gently.

- 9. Remove the RAID cache DIMM from the RAID controller:
 - a. Open the retaining clip on each end of the RAID cache DIMM connector. Figure 50 shows the cache DIMM that you will replace.

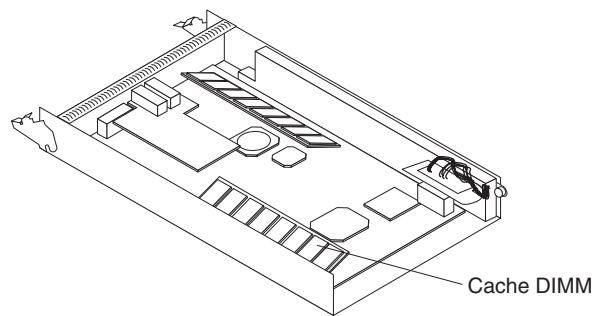


Figure 50. Removing the RAID cache DIMM

- b. Remove the cache DIMM.
- c. Touch the static-protective package that contains the new RAID cache DIMM to any unpainted metal surface on the storage subsystem. Then, remove the DIMM from the package.
- d. Angle the DIMM so that the DIMM keys align correctly with the slot.

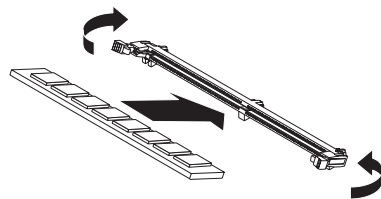


Figure 51. Inserting a DIMM into the connector

- e. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.
10. Install the RAID controller in the storage subsystem:
 - a. Make sure that the lever on each side of the controller is down as far as it will go.
 - b. Push the controller into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).
 - c. While squeezing together the latch and lever, push both latches up as far as they will go. The controller will slide the rest of the way into the bay.
 11. Reconnect the Ethernet cables that you removed in step 6 on page 70.
 12. **For a Fibre Channel RAID controller only:** Install the SFP modules and the fiber-optic cables that you removed in step 7 on page 70.
 13. **For a storage subsystem with only one controller installed:** Turn on the power-supply switches on the rear of the storage subsystem.
 14. **For a storage subsystem with two controllers installed:** Move the I/O data back to the original controller:
 - a. Open a Telnet session and connect to the alternate controller management port IP address. If the Telnet session is open from step 5a on page 70, go to step 14d.
 - b. At the command prompt, enter `admin`.
 - c. Enter the administrator password.
 - d. Enter `controller peer enable`.
 - e. Enter `controller info`.
Information about the controller is displayed on the screen. If the information shows that the peer controller status is Not Ready, repeat this step until the status is Ready.
 - f. Enter `array failback`.
The I/O data is moved back to the original controller.

Replacing a RAID controller

Important: If the storage subsystem has two controllers installed, *do not* use the procedure in this section. See the Technical Update about replacing a controller that comes with the replacement controller and is available on the IBM Support Web site (see page 1).

When instructed to do so by the ServeRAID Manager program, replace a RAID controller that has failed.

Notes:

1. The replacement RAID controller does not come with a cache battery or RAID cache DIMM installed. You must remove the cache battery and cache DIMM that are inside the RAID controller that you are replacing and install them in the replacement RAID controller. The steps to remove and install the battery and DIMM are included in the following procedure.
2. The RAID controller in the DS300 model 1701-1RL does not contain a cache battery.

Complete the following steps to replace a RAID controller:

1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
2. Check the ServeRAID Manager program for instructions for recovering from a RAID controller failure. Follow the instructions in the software documentation before continuing with step 4.
3. Turn off the power-supply switches on the rear of the storage subsystem.
4. Label each cable that is connected to the RAID controller that has failed. This ensures that all cables will be correctly reconnected to the new RAID controller.
5. Remove all Ethernet cables from the RAID controller.
6. **For a Fibre Channel RAID controller only:** Remove the fiber-optic cables and the SFP modules from the RAID controller. For more information, see “Removing a fiber-optic cable” on page 41 and “Removing an SFP module” on page 39.

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 57.

7. Remove the failed RAID controller (the fault LED is lit):
 - a. While squeezing together the latch and lever that are on each side of the controller, press down on the orange area on each latch. The controller will slide out of the bay a short distance.

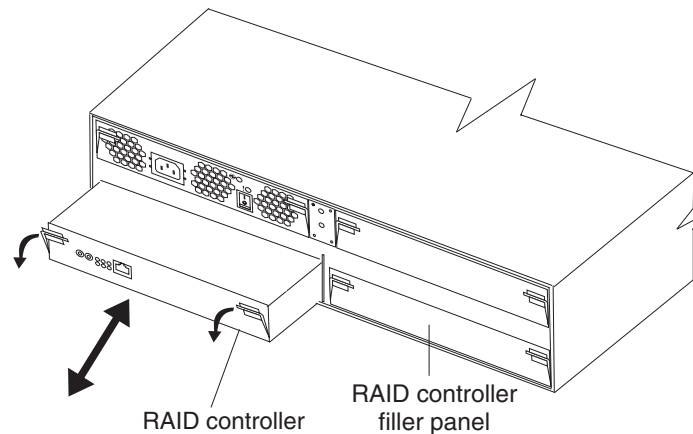


Figure 52. Removing a RAID controller

- b. Grasp both latches and pull the controller out of the bay.
 - c. Place the controller on a dry, level surface.
8. Remove the cache battery (**DS300 model 1700-1RS and DS400 only**):
 - a. Loosen the thumbscrew that holds the battery in place.

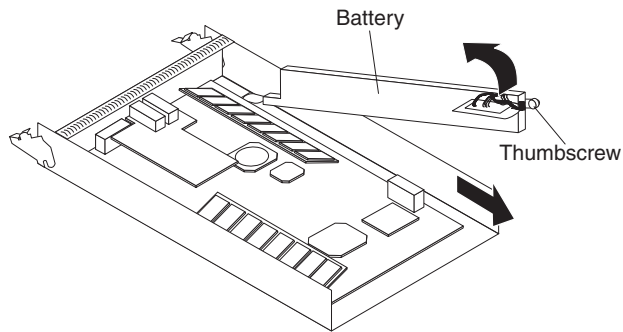


Figure 53. Removing the RAID controller battery

- b. Hold down the edge of the controller base on the battery side (near the thumbscrew).
 - c. Pull up on the blue lift tab on the battery to remove it from the connector.
 - d. Slide the battery toward the open end of the controller to remove it.
 - e. Place the battery on a dry, level surface.
9. Unpack the replacement RAID controller and set it on a dry, level surface. Save the packing material and documentation in case you have to return the RAID controller.
10. Install the battery (which you removed in step 8 on page 73) into the replacement RAID controller:
 - a. Slide the battery under the tab near the front of the RAID controller.

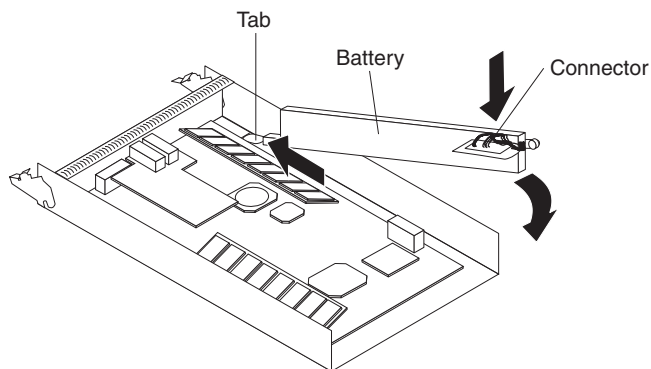


Figure 54. Installing a cache battery in the RAID controller

- b. Press down on the blue lift tab to secure the battery to the connector.
 - c. Tighten the thumbscrew.
11. Remove the RAID cache DIMM from the failed RAID controller:
 - a. Open the retaining clip on each end of the cache DIMM connector. Figure 50 on page 71 shows the cache DIMM that you will remove.

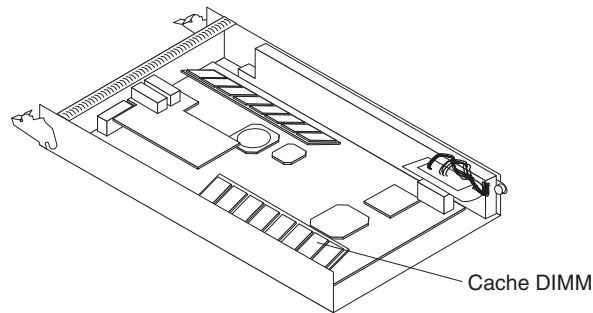


Figure 55. Removing the RAID cache DIMM

- b. Carefully remove the cache DIMM.
12. Install the RAID cache DIMM in the new RAID controller:
 - a. Open the retaining clip on each end of the RAID cache DIMM connector.
 - b. Angle the DIMM so that the DIMM keys align correctly with the slot.

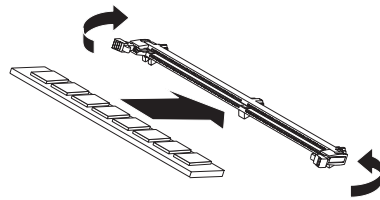


Figure 56. Inserting a DIMM into the connector

- c. Insert the DIMM into the connector by aligning the edges of the DIMM with the slots at the ends of the DIMM connector. Firmly press the DIMM into the connector by applying pressure on both ends of the DIMM simultaneously. The retaining clips snap into the locked position when the DIMM is firmly seated in the connector. If there is a gap between the DIMM and the retaining clips, the DIMM has not been correctly inserted; open the retaining clips, remove the DIMM, and then reinsert it.
13. Install the replacement RAID controller in the storage subsystem:
 - a. Make sure that the lever on each side of the controller is down as far as it will go.
 - b. Push the controller into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).
 - c. While squeezing together the latch and lever, push both latches up as far as they will go. The controller will slide the rest of the way into the bay.
14. Reconnect the Ethernet cables that you removed in step 5 on page 73.
15. **For a Fibre Channel RAID controller only:** Insert the SFP modules and fiber-optic cables that you removed in step 6 on page 73.
16. Turn on the power-supply switches on the rear of the storage subsystem.
17. Wait approximately 10 minutes and then check the status LEDs on the RAID controller. Make sure that:
 - The Ethernet link green LEDs are lit.
 - The Fibre Channel port green LEDs are lit.
 - The controller ready green LED is lit.
 - The controller not ready amber LED is off.

For more information about the RAID controller LEDs, see “DS300 storage subsystem rear view” on page 20 or “DS400 storage subsystem rear view” on page 46.

For more information about network configuration, see Chapter 11, “Configuring the storage subsystem for out-of-band management,” on page 79 and the *DS300 and DS400 Software Installation Guide*.

Replacing a hot-swap power supply

Before replacing a power supply, read the following important information:

- The power supply does not require preventive maintenance.
- The unit must be installed in the correct place to maintain proper expansion-unit cooling.
- Use only power supplies that are supported for your specific storage subsystem.

Complete the following steps to replace a hot-swap power supply:

1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
2. Turn off the power supply.
3. Disconnect the power cord from the electrical outlet and from the power supply.
4. Remove the power supply from the storage subsystem:
 - a. While squeezing together the latch and lever that are on each side of the power supply, press down on the orange area on each latch. The power supply will slide out of the bay a short distance.

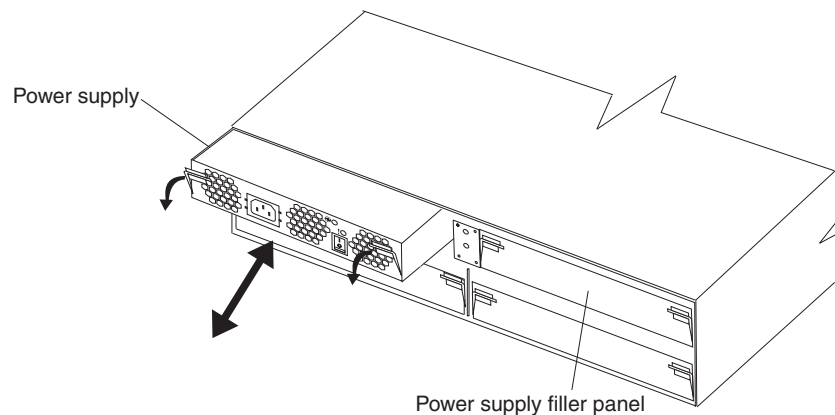


Figure 57. Removing a power supply

- b. Grasp both latches and pull the power supply out of the bay.
 - c. Place the power supply on a dry, level surface.
5. Make sure that the power switch on the replacement power supply is turned off.
 6. Install the replacement power supply in the storage subsystem:
 - a. Make sure that the lever on each side of the power supply is down as far as it will go.
 - b. Push the power supply into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).

- c. While squeezing together the latch and lever, push both latches up as far as they will go. The power supply will slide the rest of the way into the bay.
- 7. Connect the power cord to the power supply.
- 8. Untwist the power cord strain-relief plastic tie (located below and to the right of the ac power switch).
- 9. Wrap the strain-relief tie around the power cord approximately 10 cm (4 in.) from the ac power connector end; then, twist the tie.
- 10. Connect the power-supply cord into a properly grounded electrical outlet.

Note: The fault (amber) LED is lit on the new power supply because its power switch is turned off.

- 11. Turn on the power supply.
After you turn on the power, the fault (amber) LED is off and the power OK (green) LEDs are lit.

Adding a power supply (DS300 model 1701-1RL only)

Complete the following steps to install an additional power supply:

- 1. Read the safety information beginning on page iii and “Installation guidelines” on page 57.
- 2. Remove the power-supply filler panel from the storage subsystem:
 - a. While squeezing together the latch and lever that are on each side of the filler panel, press down on the orange area on each latch. The power-supply filler panel will slide out of the bay a short distance.
 - b. Grasp both latches and pull the filler panel out of the bay.
 - c. Store the power-supply filler panel for future use.

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 57.

- 3. Unpack the new power supply.
Set the unit on a dry, level surface. Save the packing material and documentation in case you have to return the unit.
- 4. Review all documentation that comes with the new power supply for updated replacement procedures and other information.
- 5. Make sure that the power switch on the new power supply is turned off.
- 6. Install the new power supply in the storage subsystem:
 - a. Make sure that the lever on each side of the power supply is down as far as it will go.
 - b. Push the power supply into the bay until it meets resistance (approximately 6 mm [0.25 in.] from the end of the chassis).
 - c. While squeezing together the latch and lever, push both latches up as far as they will go. The power supply will slide the rest of the way into the bay.
- 7. Remove the bezel (see “Installing and removing the bezel on the DS300 model 1701-1RL storage subsystem” on page 59).
- 8. Grasp the handle on the EMI panel and pull it out and away from the 7-disk drive bay. Store the EMI panel for future use.
- 9. Install the seven hard disk drive filler panels in the drive bays.

10. Remove the 7-disk drive cover from the bezel and install the bezel (see “Installing and removing the bezel on DS300 (models 1701-1RS and 1701-2RD) and DS400 storage subsystems” on page 58).
11. Connect the power cord to the power supply.
12. Untwist the power cord strain-relief plastic tie (located below and to the right of the ac power switch).
13. Wrap the strain-relief tie around the power cord approximately 10 cm (4 in.) from the ac power connector end; then, twist the tie.
14. Connect the power-supply cord into a properly grounded electrical outlet.

Note: The fault (amber) LED is lit on the new power supply because its power switch is turned off.

15. Turn on the power supply.
After you turn on the power, the fault (amber) LED is off and the power OK (green) LEDs are lit. For more information about the power-supply LEDs and controls, see “Power supply controls and LEDs” on page 20 and “Power supply controls and LEDs” on page 46.

Chapter 11. Configuring the storage subsystem for out-of-band management

You can manage the storage subsystem from the ServeRAID Manager program or from the command-line interface. Both of these methods are supported by an Ethernet (out-of-band) connection to the management port on the storage subsystem controller.

After you connect the active management port to the network, you can configure the Ethernet port connection in either of the following ways:

- Static IP address (default setting)
- DHCP assigned IP address

The factory-defined static IP address for the management port is 192.168.70.123, the default subnet address is 255.255.0.0, and default host name is DS300 for the DS300 storage subsystem or DS400 for the DS400 storage subsystem. The default password for the storage subsystem is passw0rd (all lowercase letters with a zero, not an O, in passw0rd).

If you have an accessible, active, and configured Dynamic Host Configuration Protocol (DHCP) server on the network, the host name, IP address, gateway address, subnet mask, and Domain Name System (DNS) server IP address can be set automatically.

If the IP address is assigned through a DHCP server, you will have to get the IP address from your network administrator.

Note: The management station computer or any remote host that connects to the management port must be on the same subnet as the storage subsystem management port.

To change the storage subsystem management port network configuration, see the command-line interface section of the *DS300 and DS400 Software Installation Guide* for information about changing the storage subsystem setup and interfaces.

Appendix A. Storage subsystem ID and records

Record information about the storage subsystem in Table 9. You will need this information if you have to call for service.

Table 9. Product identification record

Product name	IBM TotalStorage DS300 or IBM TotalStorage DS400
Machine type	
Model number	
Serial number	
Controller serial number	

The storage subsystem serial number is on the front bezel and on the system label on the rear of the storage subsystem. The controller serial number is on the lower-right side of the RAID controller (at the rear of the storage subsystem).

Use Table 10 to keep a record of the options that are installed in or attached to the storage subsystem. This information can be helpful when you install additional options or if you have to report a hardware problem. Make a copy of this table before recording information in it, in case you need extra space to write new values later, or when you update the storage subsystem configuration.

Table 10. Drive location information record

Drive location	Drive part and model number	Drive serial number	SCSI channel	SCSI ID
Bay 1			2	0
Bay 2			2	1
Bay 3			2	2
Bay 4			2	3
Bay 5			2	4
Bay 6			2	5
Bay 7			2	8
Bay 8			1	9
Bay 9			1	10
Bay 10			1	11
Bay 11			1	12
Bay 12			1	13
Bay 13			1	14
Bay 14			1	15

For a list of supported options for the storage subsystem, see the ServerProven Web site at <http://www.ibm.com/pc/compat/>.

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 @server 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. Information about diagnostic tools is also available in the *DS300 and DS400 Problem Determination Guides* (available on the the IBM Support Web site) and the *DS300 and DS400 Hardware Maintenance Manual* (available on the IBM Support Web site).
- 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 or to submit a request for information.

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 @server 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 @server 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, some publications are available through the IBM Publications Ordering System at <http://www.elink.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 eServer and IntelliStation products, services, and support. The address for IBM xSeries and BladeCenter information is <http://www.ibm.com/eserver/xseries/>. The address for IBM IntelliStation information is <http://www.ibm.com/pc/us/intellistation/>.

You can find service information for your IBM products, including supported options, at <http://www.ibm.com/pc/support/>.

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, BladeCenter products, IntelliStation workstations, and appliances. For information about which products are supported by Support Line in your country or region, see <http://www.ibm.com/services/sl/products/>.

For more information about Support Line and other IBM services, see <http://www.ibm.com/services/>, or see <http://www.ibm.com/planetwide/> for support telephone numbers. In the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

Hardware service and support

You can receive hardware service through IBM Services or through your IBM reseller, if your reseller is authorized by IBM to provide warranty service. See <http://www.ibm.com/planetwide/> for support telephone numbers, or in the U.S. and Canada, call 1-800-IBM-SERV (1-800-426-7378).

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. IBM Statement of Limited Warranty Z125-4753-08 04/2004

Part 1 - General Terms

Part 1 - General Terms

This Statement of Limited Warranty includes Part 1 - General Terms, Part 2 - Country-unique Terms, and Part 3 - Warranty Information. 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. 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. Nothing in this Statement of Limited Warranty affects any statutory rights of consumers that cannot be waived or limited by contract.

What this Warranty Covers

IBM warrants that each Machine 1) is free from defects in materials and workmanship and 2) conforms to IBM's Official Published Specifications ("Specifications") which are available on request. The warranty period for the Machine starts on the original Date of Installation and is specified in Part 3 - Warranty Information. The date on your invoice or sales receipt is the Date of Installation unless IBM or your reseller informs you otherwise. 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. Unless IBM specifies otherwise, these warranties apply only in the country or region in which you purchased the Machine.

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. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OF EXPRESS OR IMPLIED WARRANTIES, SO THE ABOVE EXCLUSION MAY NOT APPLY TO YOU. IN THAT EVENT, SUCH WARRANTIES ARE LIMITED IN DURATION TO THE WARRANTY PERIOD. NO WARRANTIES APPLY AFTER THAT PERIOD. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU.

What this Warranty Does not Cover

This warranty does not cover the following:

- any software programs, whether pre-loaded or shipped with the Machine, or installed subsequently;
- failure resulting from misuse (including but not limited to use of any Machine capacity or capability, other than that authorized by IBM in writing), accident, modification, unsuitable physical or operating environment, or improper maintenance by you;
- failure caused by a product for which IBM is not responsible; and

- any non-IBM products, including those that IBM may procure and provide with or integrate into an IBM Machine at your request.

The warranty is voided by removal or alteration of identification labels on the Machine or its parts.

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 with “how-to” questions and those regarding Machine set-up and installation, is provided **WITHOUT WARRANTIES OF ANY KIND**.

How to Obtain Warranty Service

If the Machine does not function as warranted during the warranty period, contact IBM or your reseller to obtain warranty service. If you do not register the Machine with IBM, you may be required to present proof of purchase as evidence of your entitlement to warranty service.

What IBM Will Do to Correct Problems

When you contact IBM for service, you must follow the problem determination and resolution procedures that IBM specifies. An initial diagnosis of your problem can be made either by a technician over the telephone or electronically by access to an IBM website.

The type of warranty service applicable to your Machine is specified in Part 3 - Warranty Information.

You are responsible for downloading and installing designated Machine Code (microcode, basic input/output system code (called “BIOS”), utility programs, device drivers, and diagnostics delivered with an IBM Machine) and other software updates from an IBM Internet Web site or from other electronic media, and following the instructions that IBM provides.

If your problem can be resolved with a Customer Replaceable Unit (“CRU”) (e.g., keyboard, mouse, speaker, memory, hard disk drive), IBM will ship the CRU to you for you to install.

If the Machine does not function as warranted during the warranty period and your problem cannot be resolved over the telephone or electronically, through your application of Machine Code or software updates, or with a CRU, IBM or your reseller, if approved by IBM to provide warranty service, will either, at its discretion, 1) repair it to make it function as warranted, or 2) replace it with one that is at least functionally equivalent. If IBM is unable to do either, you may return the Machine to your place of purchase and your money will be refunded.

IBM or your reseller will also manage and install selected engineering changes that apply to the Machine.

Exchange of a Machine or Part

When the 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.

Your Additional Responsibilities

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 service request procedures that IBM or your reseller provides;
 - b. backup or secure all programs, data, and funds contained in the Machine;
 - c. provide IBM or your reseller with sufficient, free, and safe access to your facilities to permit IBM to fulfill its obligations; and
 - d. inform IBM or your reseller of changes in the Machine's location.
4. (a) ensure all information about identified or identifiable individuals (Personal Data) is deleted from the Machine (to the extent technically possible), (b) allow IBM, your reseller or an IBM supplier to process on your behalf any remaining Personal Data as IBM or your reseller considers necessary to fulfill its obligations under this Statement of Limited Warranty (which may include shipping the Machine for such processing to other IBM service locations around the world), and (c) ensure that such processing complies with any laws applicable to such Personal Data.

Limitation of Liability

IBM is responsible for loss of, or damage to, your Machine only 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 are responsible for any of your confidential, proprietary or personal information contained in a Machine which you return to IBM for any reason. You should remove all such information from the Machine prior to its return.

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 ("LIC").

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, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING EVEN IF INFORMED OF THEIR POSSIBILITY: 1) THIRD PARTY CLAIMS AGAINST YOU FOR DAMAGES (OTHER THAN THOSE UNDER THE FIRST ITEM LISTED ABOVE); 2) LOSS OF, OR DAMAGE TO, DATA; 3) SPECIAL, INCIDENTAL, OR INDIRECT DAMAGES OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR 4) LOST PROFITS, BUSINESS REVENUE, GOODWILL OR ANTICIPATED SAVINGS. SOME STATES OR JURISDICTIONS DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. SOME STATES OR JURISDICTIONS DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION 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 Statement of Limited Warranty, without regard to conflict of law principles.

THESE WARRANTIES GIVE YOU SPECIFIC LEGAL RIGHTS AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE OR JURISDICTION TO JURISDICTION.

Jurisdiction

All of our rights, duties, and obligations are subject to the courts of the country in which you acquired the Machine.

Part 2 - Country-unique Terms

AMERICAS

ARGENTINA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Ordinary Commercial Court of the city of Buenos Aires.

BOLIVIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of La Paz.

BRAZIL

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the court of Rio de Janeiro, RJ.

CHILE

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Civil Courts of Justice of Santiago.

COLOMBIA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of the Republic of Colombia.

EQUADOR

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Judges of Quito.

MEXICO

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Federal Courts of Mexico City, Federal District.

PARAGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the courts of the city of Asuncion.

PERU

Limitation of Liability: *The following is added at the end of this section:*

In accordance with Article 1328 of the Peruvian Civil Code the limitations and exclusions specified in this section will not apply to damages caused by IBM's willful misconduct ("dolo") or gross negligence ("culpa inexcusable").

URUGUAY

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the City of Montevideo Court's Jurisdiction.

VENEZUELA

Jurisdiction: *The following is added after the first sentence:*

Any litigation arising from this Statement of Limited Warranty will be settled exclusively by the Courts of the Metropolitan Area Of the City of Caracas.

NORTH AMERICA

How to Obtain 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

Limitation of Liability: *The following replaces item 1 of this section:*

1. damages for bodily injury (including death) or physical harm to real property and tangible personal property caused by IBM's negligence; and

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

What this Warranty Covers: *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 AND LAOS

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, United States of America.

CAMBODIA, INDONESIA, AND LAOS

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Singapore in accordance with the Arbitration Rules of Singapore International Arbitration Center ("SIAC Rules") then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the SIAC. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

HONG KONG S.A.R. OF CHINA AND MACAU S.A.R. OF CHINA

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 of China.

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; and
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, the charge paid by you for the individual Machine that is the subject of the claim. For purposes of this item, the term “Machine” includes Machine Code and Licensed Internal Code (“LIC”).

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Bangalore, India in accordance with the laws of India then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Bar Council of India. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

JAPAN

Governing Law: *The following sentence is added to this section:*

Any doubts concerning this Statement of Limited Warranty will be initially resolved between us in good faith and in accordance with the principle of mutual trust.

MALAYSIA

Limitation of Liability: *The word "SPECIAL" in item 3 of the fifth paragraph is deleted.*

NEW ZEALAND

What this Warranty Covers: *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 "laws of the country in which you acquired the Machine" in the first sentence:*

laws of the State of New York, United States of America (except when local law requires otherwise).

PHILIPPINES

Limitation of Liability: *Item 3 in the fifth paragraph is replaced by the following:*

SPECIAL (INCLUDING NOMINAL AND EXEMPLARY DAMAGES), MORAL, INCIDENTAL, OR INDIRECT DAMAGES FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; OR

Arbitration: *The following is added under this heading:*

Disputes arising out of or in connection with this Statement of Limited Warranty shall be finally settled by arbitration which shall be held in Metro Manila, Philippines in accordance with the laws of the Philippines then in effect. The arbitration award shall be final and binding for the parties without appeal and shall be in writing and set forth the findings of fact and the conclusions of law.

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 who shall act as chairman of the proceedings. Vacancies in the post of chairman shall be filled by the president of the Philippine Dispute Resolution Center, Inc. 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.

All proceedings shall be conducted, including all documents presented in such proceedings, in the English language. The English language version of this Statement of Limited Warranty prevails over any other language version.

SINGAPORE

Limitation of Liability: *The words "SPECIAL" and "ECONOMIC" in item 3 in the fifth paragraph are deleted.*

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.

How to Obtain Warranty Service:

*Add the following paragraph in **Western Europe** (Andorra, Austria, Belgium, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, Netherlands, Norway, Poland, Portugal, San Marino, Slovakia, Slovenia, Spain, Sweden, Switzerland, United Kingdom, Vatican State, and any country subsequently added to the European Union, as from the date of accession):*

The warranty for Machines acquired in Western Europe shall be valid and applicable in all Western Europe countries provided the Machines have been announced and made available in such countries.

If you purchase a Machine in one of the Western European countries, as defined above, 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, provided the Machine has been announced and made available by IBM in the country in which you wish to obtain service.

If you purchased a Personal Computer Machine in Albania, Armenia, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Georgia, Hungary, Kazakhstan, Kyrgyzstan, 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 a 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 approved service provider. You are responsible for transportation costs for Machines located outside 50 kilometers of an IBM approved service provider.

Governing Law:

The phrase “the laws of the country in which you acquired the Machine” is replaced by:

1) “the laws of Austria” in **Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia;** 2) “the laws of France” in **Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna;** 3) “the laws of Finland” in **Estonia, Latvia, and Lithuania;** 4) “the laws of England” in **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, the United Kingdom, West Bank/Gaza, Yemen, Zambia, and Zimbabwe;** and 5) “the laws of South Africa” in **South Africa, Namibia, Lesotho and Swaziland.**

Jurisdiction: The following exceptions are added to this section:

1) **In Austria** the choice of jurisdiction for all disputes arising out of this Statement of Limited Warranty and relating thereto, including its existence, will be the competent court of law in Vienna, Austria (Inner-City); 2) **in 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, West Bank/Gaza, Yemen, Zambia, and Zimbabwe** all disputes arising out of this Statement of Limited Warranty or related to its execution, including summary proceedings, will be submitted to the exclusive jurisdiction of the English courts; 3) **in Belgium and Luxembourg,** all disputes arising out of this Statement of Limited Warranty or related to its interpretation or its execution, the law, and the courts of the capital city, of the country of your registered office and/or commercial site location only are competent; 4) **in France, Algeria, Benin, Burkina Faso, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo Republic, Djibouti, Democratic Republic of Congo, Equatorial Guinea, French Guiana, French Polynesia, Gabon, Gambia, Guinea, Guinea-Bissau, Ivory Coast, Lebanon, Madagascar, Mali, Mauritania, Mauritius, Mayotte, Morocco, New Caledonia, Niger, Reunion, Senegal, Seychelles, Togo, Tunisia, Vanuatu, and Wallis & Futuna** all disputes arising out of this Statement of Limited Warranty or related to its violation or execution, including summary proceedings, will be settled exclusively by the Commercial Court of Paris; 5) **in Russia,** all disputes arising out of or in relation to the interpretation, the violation, the termination, the nullity of the execution of this Statement of Limited Warranty shall be settled by Arbitration Court of Moscow; 6) **in South Africa, Namibia, Lesotho and Swaziland,** both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the High Court in Johannesburg; 7) **in Turkey** all disputes arising out of or in connection with this Statement of Limited

Warranty shall be resolved by the Istanbul Central (Sultanahmet) Courts and Execution Directorates of Istanbul, the Republic of Turkey; 8) in each of the following specified countries, any legal claim arising out of this Statement of Limited Warranty will be brought before, and settled exclusively by, the competent court of a) Athens for **Greece**, b) Tel Aviv-Jaffa for **Israel**, c) Milan for **Italy**, d) Lisbon for **Portugal**, and e) Madrid for **Spain**; and 9) **in the United Kingdom**, both of us agree to submit all disputes relating to this Statement of Limited Warranty to the jurisdiction of the English courts.

Arbitration: *The following is added under this heading:*

In Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Georgia, Hungary, Kazakhstan, Kyrgyzstan, FYR Macedonia, Moldova, Poland, Romania, Russia, Slovakia, Slovenia, Tajikistan, Turkmenistan, Ukraine, Uzbekistan, and FR Yugoslavia all disputes arising out of this Statement of Limited Warranty or related to its violation, termination or nullity will be finally settled under the Rules of Arbitration and Conciliation of the International Arbitral Center of the Federal Economic Chamber in Vienna (Vienna Rules) by three arbitrators appointed in accordance with these rules. The arbitration will be held in Vienna, Austria, and the official language of the proceedings will be English. The decision of the arbitrators will be final and binding upon both parties. Therefore, pursuant to paragraph 598 (2) of the Austrian Code of Civil Procedure, the parties expressly waive the application of paragraph 595 (1) figure 7 of the Code. IBM may, however, institute proceedings in a competent court in the country of installation.

In Estonia, Latvia and Lithuania all disputes arising in connection with this Statement of Limited Warranty will be finally settled in arbitration that will be held in Helsinki, Finland in accordance with the arbitration laws of Finland then in effect. Each party will appoint one arbitrator. The arbitrators will then jointly appoint the chairman. If arbitrators cannot agree on the chairman, then the Central Chamber of Commerce in Helsinki will appoint the chairman.

EUROPEAN UNION (EU)

THE FOLLOWING TERMS APPLY TO ALL EU COUNTRIES:

The warranty for Machines acquired in EU countries is valid and applicable in all EU countries provided the Machines have been announced and made available in such countries.

How to Obtain Warranty Service: *The following is added to this section:*

To obtain warranty service from IBM in EU countries, see the telephone listing in Part 3 - Warranty Information.

You may contact IBM at the following address:

IBM Warranty & Service Quality Dept.
PO Box 30
Spango Valley
Greenock
Scotland PA16 0AH

CONSUMERS

Consumers have legal rights under applicable national legislation governing the sale of consumer goods. Such rights are not affected by the warranties provided in this Statement of Limited Warranty.

**AUSTRIA, DENMARK, FINLAND, GREECE, ITALY, NETHERLANDS,
NORWAY, PORTUGAL, SPAIN, SWEDEN AND SWITZERLAND**

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty or due to any other cause related to this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault) or of such cause, for a maximum amount equal to the charges you paid for the Machine. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

FRANCE AND BELGIUM

Limitation of Liability: *The following replaces the terms of this section in its entirety:*

Except as otherwise provided by mandatory law:

1. IBM's liability for any damages and losses that may arise as a consequence of the fulfillment of its obligations under or in connection with this Statement of Limited Warranty is limited to the compensation of only those damages and losses proved and actually arising as an immediate and direct consequence of the non-fulfillment of such obligations (if IBM is at fault), for a maximum amount equal to the charges you paid for the Machine that has caused the damages. For purposes of this item, the term "Machine" includes Machine Code and Licensed Internal Code ("LIC").

The above limitation shall not apply to damages for bodily injuries (including death) and damages to real property and tangible personal property for which IBM is legally liable.

2. **UNDER NO CIRCUMSTANCES IS IBM, ITS SUPPLIERS OR RESELLERS LIABLE FOR ANY OF THE FOLLOWING, EVEN IF INFORMED OF THEIR POSSIBILITY: 1) LOSS OF, OR DAMAGE TO, DATA; 2) INCIDENTAL OR INDIRECT DAMAGES, OR FOR ANY ECONOMIC CONSEQUENTIAL DAMAGES; 3) LOST PROFITS, EVEN IF THEY ARISE AS AN IMMEDIATE CONSEQUENCE OF THE EVENT THAT GENERATED THE DAMAGES; OR 4) LOSS OF BUSINESS, REVENUE, GOODWILL, OR ANTICIPATED SAVINGS.**

THE FOLLOWING TERMS APPLY TO THE COUNTRY SPECIFIED:

AUSTRIA

The provisions of this Statement of Limited Warranty replace any applicable statutory warranties.

What this Warranty Covers: *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 limitation period for consumers in action for breach of warranty is the statutory period as a minimum. 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *The following is added to this section:*

During the warranty period, IBM will reimburse you for the transportation charges for the delivery of the failing Machine to IBM.

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 ("LIC").

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).

GERMANY

What this Warranty Covers: *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 twelve 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.

The second paragraph does not apply.

What IBM Will Do to Correct Problems: *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.

HUNGARY

Limitation of Liability: *The following is added at the end of this section:*

The limitation and exclusion specified herein shall not apply to liability for a breach of contract damaging life, physical well-being, or health that has been caused intentionally, by gross negligence, or by a criminal act.

The parties accept the limitations of liability as valid provisions and state that the Section 314.(2) of the Hungarian Civil Code applies as the acquisition price as well as other advantages arising out of the present Statement of Limited Warranty balance this limitation of liability.

IRELAND

What this Warranty Covers: *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 the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default occurring on the date of occurrence of the last such Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for death or personal injury caused by the negligence of IBM.
2. Subject always to the **Items for Which IBM is Not Liable** below, IBM will accept unlimited liability for physical damage to your tangible property resulting from the negligence of IBM.
3. Except as provided in items 1 and 2 above, IBM's entire liability for actual damages for any one Default will not in any event exceed the greater of 1) EUR 125,000, or 2) 125% of the amount you paid for the Machine directly relating to the Default.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM, its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

SLOVAKIA

Limitation of Liability: *The following is added to the end of the last paragraph:*

The limitations apply to the extent they are not prohibited under §§ 373-386 of the Slovak Commercial Code.

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 the terms of this section in its entirety:*

For the purposes of this section, a "Default" means any act, statement, omission, or negligence on the part of IBM in connection with, or in relation to, the subject matter of this Statement of Limited Warranty in respect of which IBM is legally liable to you, whether in contract or tort. A number of Defaults which together result in, or contribute to, substantially the same loss or damage will be treated as one Default.

Circumstances may arise where, because of a Default, you are entitled to recover damages from IBM.

This section sets out the extent of IBM's liability and your sole remedy.

1. IBM will accept unlimited liability for:
 - a. death or personal injury caused by the negligence of IBM; and
 - b. any breach of its obligations implied by Section 12 of the Sale of Goods Act 1979 or Section 2 of the Supply of Goods and Services Act 1982, or any statutory modification or re-enactment of either such Section.
2. IBM will accept unlimited liability, subject always to the **Items for Which IBM is Not Liable** below, for physical damage to your tangible property resulting from the negligence of IBM.
3. IBM's entire liability for actual damages for any one Default will not in any event, except as provided in items 1 and 2 above, exceed the greater of 1) Pounds Sterling 75,000, or 2) 125% of the total purchase price payable or the charges for the Machine directly relating to the Default.

These limits also apply to IBM's suppliers and resellers. They state the maximum for which IBM and such suppliers and resellers are collectively responsible.

Items for Which IBM is Not Liable

Save with respect to any liability referred to in item 1 above, under no circumstances is IBM or any of its suppliers or resellers liable for any of the following, even if IBM or they were informed of the possibility of such losses:

1. loss of, or damage to, data;
2. special, indirect, or consequential loss; or
3. loss of profits, business, revenue, goodwill, or anticipated savings.

Part 3 - Warranty Information

This Part 3 provides information regarding the warranty applicable to your Machine, including the warranty period and type of warranty service IBM provides.

Warranty Period

The warranty period may vary by country or region and is specified in the table below.

Note: "Region" means either Hong Kong or Macau Special Administrative Region of China.

A warranty period of 3 years on parts and 1 year on labor means that IBM provides warranty service without charge for:

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

Machine types 1700 and 1701

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
Worldwide	1 year	5

Country or Region of Purchase	Warranty Period	Type of Warranty Service*
* See “Types of Warranty Service” for the legend and explanations of warranty-service types.		

Types of Warranty Service

If required, IBM provides repair or exchange service depending on the type of warranty service specified for your Machine in the above table and as described below. Warranty service may be provided by your reseller if approved by IBM to perform warranty service. Scheduling of service will depend upon the time of your call and is subject to parts availability. Service levels are response time objectives and are not guaranteed. The specified level of warranty service may not be available in all worldwide locations, additional charges may apply outside IBM’s normal service area, contact your local IBM representative or your reseller for country and location specific information.

1. Customer Replaceable Unit (“CRU”) Service

IBM provides replacement CRUs to you for you to install. CRU information and replacement instructions are shipped with your Machine and are available from IBM at any time on your request. Installation of Tier 1 CRUs is your responsibility. If IBM installs a Tier 1 CRU at your request, you will be charged for the installation. You may install a Tier 2 CRU yourself or request IBM to install it, at no additional charge, under the type of warranty service designated for your Machine. IBM specifies in the materials shipped with a replacement CRU whether a defective CRU must be returned to IBM. When return is required, 1) return instructions and a container are shipped with the replacement CRU, and 2) you may be charged for the replacement CRU if IBM does not receive the defective CRU within 30 days of your receipt of the replacement.

2. On-site Service

IBM or your reseller will either repair or exchange the failing Machine at your location and verify its operation. You must provide suitable working area to allow disassembly and reassembly of the IBM Machine. The area must be clean, well lit and suitable for the purpose. For some Machines, certain repairs may require sending the Machine to an IBM service center.

3. Courier or Depot Service*

You will disconnect the failing Machine for collection arranged by IBM. IBM will provide you with a shipping container for you to return your Machine to a designated service center. A courier will pick up your Machine and deliver it to the designated service center. Following its repair or exchange, IBM will arrange the return delivery of the Machine to your location. You are responsible for its installation and verification.

4. Customer Carry-In or Mail-In Service

You will deliver or mail as IBM specifies (prepaid unless IBM specifies otherwise) the failing Machine suitably packaged to a location IBM designates. After IBM has repaired or exchanged the Machine, IBM will make it available for your collection or, for Mail-in Service, IBM will return it to you at IBM’s expense, unless IBM specifies otherwise. You are responsible for the subsequent installation and verification of the Machine.

5. CRU and On-site Service

This type of Warranty Service is a combination of Type 1 and Type 2 (see above).

6. CRU and Courier or Depot Service

This type of Warranty Service is a combination of Type 1 and Type 3 (see above).

7. CRU and Customer Carry-In or Mail-In Service

This type of Warranty Service is a combination of Type 1 and Type 4 (see above).

When a 5, 6 or 7 type of warranty service is listed, IBM will determine which type of warranty service is appropriate for the repair.

* This type of service is called ThinkPad® EasyServ or EasyServ in some countries.

The IBM Machine Warranty World Wide Web site at http://www.ibm.com/servers/support/machine_warranties/ provides a worldwide overview of IBM's Limited Warranty for Machines, a Glossary of IBM definitions, Frequently Asked Questions (FAQs) and Support by Product (Machine) with links to Product Support pages. **The IBM Statement of Limited Warranty is also available on this site in 29 languages.**

To obtain warranty service contact IBM or your IBM reseller. In Canada or the United States, call 1-800-IBM-SERV (426-7378). In the EU countries, see the telephone numbers below.

EU Country Telephone List

Phone numbers are subject to change without notice. For the warranty service contact telephone number in a country subsequently added to the EU and not yet reflected in the list below, contact IBM in that country or visit the website above for a current telephone listing.

Austria -- +43-1-24592-5901	Latvia -- +386-61-1796-699
Belgium -- +32-70-23-3392	Lithuania -- +386-61-1796-699
Cyprus -- +357-22-841100	Luxembourg -- +352-298-977-5063
Czech Republic -- +420-2-7213-1316	Malta -- +356-23-4175
Denmark -- +45-4520-8200	Netherlands -- +31-20-514-5770
Estonia -- +386-61-1796-699	Poland -- +48-22-878-6999
Finland -- +358-8001-4260	Portugal -- +351-21-892-7147
France -- +33-238-557-450	Slovakia -- +421-2-4954-1217
Germany -- +49-1805-253553	Slovenia -- +386-1-4796-699
Greece -- +30-210-680-1700	Spain -- +34-91-714-7983
Hungary -- +36-1-382-5720	Sweden -- +46-8-477-4420
Ireland -- +353-1-815-4000	United Kingdom -- +44-0870-550-0900
Italy -- +39-800-820-094	

Appendix D. Notices

This information was developed for products and services offered in the U.S.A.

IBM may not offer the products, services, or features discussed in this document in other countries. Consult your local IBM representative for information on the products and services currently available in your area. Any reference to an IBM product, program, or service is not intended to state or imply that only that IBM product, program, or service may be used. Any functionally equivalent product, program, or service that does not infringe any IBM intellectual property right may be used instead. However, it is the user's responsibility to evaluate and verify the operation of any non-IBM product, program, or service.

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C2T Interconnect	TechConnect
Chipkill	ThinkPad
EtherJet	Tivoli
e-business logo	Tivoli Enterprise Update Connector
@server	Wake on LAN
FlashCopy	XA-32
IBM	XA-64
IBM (logo)	X-Architecture
IntelliStation	XceL4
NetBAY	XpandOnDemand
Netfinity	xSeries
NetView	
OS/2 WARP	

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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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IBM makes no representations or warranties with respect to non-IBM products. Support (if any) for the non-IBM products is provided by the third party, not IBM.

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

Product recycling and disposal

This unit contains materials such as circuit boards, cables, electromagnetic compatibility gaskets, and connectors which may contain lead and copper/beryllium alloys that require special handling and disposal at end of life. Before this unit is disposed of, these materials must be removed and recycled or discarded according to applicable regulations. IBM offers product-return programs in several countries. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

IBM encourages owners of information technology (IT) equipment to responsibly recycle their equipment when it is no longer needed. IBM offers a variety of programs and services to assist equipment owners in recycling their IT products. Information on product recycling offerings can be found on IBM's Internet site at <http://www.ibm.com/ibm/environment/products/prp.shtml>.

Battery return program

This product may contain a sealed lead acid, nickel cadmium, nickel metal hydride, lithium, or lithium ion battery. Consult your user manual or service manual for specific battery information. The battery must be recycled or disposed of properly. Recycling facilities may not be available in your area. For information on disposal of batteries outside the United States, go to <http://www.ibm.com/ibm/environment/products/batteryrecycle.shtml> or contact your local waste disposal facility.

In the United States, IBM has established a return process for reuse, recycling, or proper disposal of used IBM sealed lead acid, nickel cadmium, nickel metal hydride, and battery packs from IBM equipment. For information on proper disposal of these batteries, contact IBM at 1-800-426-4333. Have the IBM part number listed on the battery available prior to your call.

In the Netherlands, the following applies.



For Taiwan: Please recycle batteries.



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. IBM is not responsible for any radio or television interference caused 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。

Chinese Class A warning statement

声 明
此为 A 级产品。在生活环境中，
该产品可能会造成无线电干扰。
在这种情况下，可能需要用户对其
干扰采取切实可行的措施。

Japanese Voluntary Control Council for Interference (VCCI) statement

この装置は、情報処理装置等電波障害自主規制協議会（VCCI）の基準に基づくクラスA情報技術装置です。この装置を家庭環境で使用すると電波妨害を引き起こすことがあります。この場合には使用者が適切な対策を講ずるよう要求されることがあります。

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
02K0546	China
13F9940	Australia, Fiji, Kiribati, Nauru, New Zealand, Papua New Guinea

IBM power cord part number	Used in these countries and regions
13F9979	Afghanistan, Albania, Algeria, Andorra, Angola, Armenia, Austria, Azerbaijan, Belarus, Belgium, Benin, Bosnia and Herzegovina, Bulgaria, Burkina Faso, Burundi, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo (Democratic Republic of), Congo (Republic of), Cote D'Ivoire (Ivory Coast), Croatia (Republic of), Czech Republic, Dahomey, Djibouti, Egypt, Equatorial Guinea, Eritrea, Estonia, Ethiopia, Finland, France, French Guyana, French Polynesia, Germany, Greece, Guadeloupe, Guinea, Guinea Bissau, Hungary, Iceland, Indonesia, Iran, Kazakhstan, Kyrgyzstan, Laos (People's Democratic Republic of), Latvia, Lebanon, Lithuania, Luxembourg, Macedonia (former Yugoslav Republic of), Madagascar, Mali, Martinique, Mauritania, Mauritius, Mayotte, Moldova (Republic of), Monaco, Mongolia, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Reunion, Romania, Russian Federation, Rwanda, Sao Tome and Principe, Saudi Arabia, Senegal, Serbia, Slovakia, Slovenia (Republic of), Somalia, Spain, Suriname, Sweden, Syrian Arab Republic, Tajikistan, Tahiti, Togo, Tunisia, Turkey, Turkmenistan, Ukraine, Upper Volta, Uzbekistan, Vanuatu, Vietnam, Wallis and Futuna, Yugoslavia (Federal Republic of), Zaire
13F9997	Denmark
14F0015	Bangladesh, Lesotho, Macao, Maldives, Namibia, Nepal, Pakistan, Samoa, South Africa, Sri Lanka, Swaziland, Uganda
14F0033	Abu Dhabi, Bahrain, Botswana, Brunei Darussalam, Channel Islands, China (Hong Kong S.A.R.), Cyprus, Dominica, Gambia, Ghana, Grenada, Iraq, Ireland, Jordan, Kenya, Kuwait, Liberia, Malawi, Malaysia, Malta, Myanmar (Burma), Nigeria, Oman, Polynesia, Qatar, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Seychelles, Sierra Leone, Singapore, Sudan, Tanzania (United Republic of), Trinidad and Tobago, United Arab Emirates (Dubai), United Kingdom, Yemen, Zambia, Zimbabwe
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Italy, Libyan Arab Jamahiriya
14F0087	Israel
1838574	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Brazil, Caicos Islands, Canada, Cayman Islands, Costa Rica, Colombia, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Japan, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Taiwan, United States of America, Venezuela
24P6858	Korea (Democratic People's Republic of), Korea (Republic of)
34G0232	Japan
36L8880	Argentina, Paraguay, Uruguay
49P2078	India
49P2110	Brazil

IBM power cord part number	Used in these countries and regions
6952300	Antigua and Barbuda, Aruba, Bahamas, Barbados, Belize, Bermuda, Bolivia, Caicos Islands, Canada, Cayman Islands, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guam, Guatemala, Haiti, Honduras, Jamaica, Mexico, Micronesia (Federal States of), Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Thailand, Taiwan, United States of America, Venezuela

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