IBM TotalStorage™ Network Attached Storage 200
Storage Unit Model EXP

Installation and User's Guide

GA27-4304-01

Note

Before using this information and the product it supports, be sure to read the general information in Appendix E, “Notices” on page 47, product warranty information in Appendix F, “Product warranty information” on page 53, and the safety information in “Basic safety information” on page 55.

Second Edition (April 2002)

This edition applies to the IBM Network Attached Storage 200 Model EXP Storage Unit.

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About this guide

This guide provides instructions for installing and replacing components in your IBM Network Attached Storage 200 Model EXP, hereafter referred to as *NAS EXP*. It also provides information on troubleshooting your NAS EXP. For detailed information on how to set up your NAS EXP, see Chapter 2, “Installing the NAS EXP” on page 9. The procedures in this guide require a basic knowledge of hardware.

How this guide is organized

Chapter 1, “Introduction” describes the NAS EXP. This chapter includes an overview of the NAS EXP features and components.

Chapter 2, “Installing the NAS EXP” contains the information and instructions needed to install the NAS EXP in an Electronic Industries Association (EIA) standard rack. This chapter also contains operating specifications, an inventory checklist, option-switch settings, and power-cord routing information. In addition, this chapter contains instructions for turning the NAS EXP on and off during normal and emergency situations.

Chapter 3, “Installing and replacing devices” contains step-by-step instructions for installing and removing devices such as hard disk drives, power supplies, and environmental services monitor (ESM) boards.

Chapter 4, “Solving problems” contains the problem symptoms and error messages that are specific to your NAS EXP. This chapter also provides warranty information and instructions on how to obtain service and technical assistance for your NAS EXP.

Appendix A, “Records” provides a section to record and update important information about your NAS EXP, including serial number and device records. Whenever you add components to your NAS EXP, be sure to update the information in this appendix.

Appendix B, “Parts listing” provides a list of the parts for the NAS EXP.

Appendix C, “Getting help, service, and information” contains information on getting help and service from IBM.

Appendix D, “Purchasing additional services” contains information on purchasing additonal services from IBM.

Appendix E, “Notices” contains product notices, trademarks, and acknowledgments.

Appendix F, “Product warranty information” contains important product warranty information.

Appendix G, “Safety notices” contains important safety information.

Safety precautions

Be sure to read all caution and danger statements in this publication before performing any of the instructions.

Leia todas as instruções de cuidado e perigo antes de executar qualquer operação.

注意和危险声明(简体中文)

重要事项：

本书中的所有注意和危险声明之前都有编号。该编号用于英语的注意或危险声明与 *Safety Information* 一书中可以找到的翻译版本的注意或危险声明进行交叉引用。

例如，如果一个注意声明以编号 1 开始，那么对该注意声明的翻译出现在 *Safety Information* 一书中的声明 1 中。

在按说明执行任何操作前，请务必阅读所有注意和危险声明。

注意及危險聲明（中文）

重要資訊：

本書中所有「注意」及「危險」的聲明均以數字開始。此一數字是用來作為交互參考之用，英文「注意」或「危險」聲明可在「安全資訊」(Safety Information) 一書中找到相同內容的「注意」或「危險」聲明的譯文。

例如，有一「危險」聲明以數字 1 開始，則該「危險」聲明的譯文將出現在「安全資訊」(Safety Information) 一書的「聲明」1 中。

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

Prenez connaissance de toutes les consignes de type Attention et Danger avant de procéder aux opérations décrites par les instructions.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Accertarsi di leggere tutti gli avvisi di attenzione e di pericolo prima di effettuare qualsiasi operazione.

주의 및 위험 경고문(한글)

중요:

이 책에 나오는 모든 주의 및 위험 경고문은 번호로 시작됩니다. 이 번호는 *Safety Information* 책에 나오는 영문판 주의 및 위험 경고문과 한글판 주의 및 위험 경고문을 상호 참조하는데 사용됩니다.

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Lea atentamente todas las declaraciones de precaución y peligro ante de llevar a cabo cualquier operación.

Notices used in this book

This publication contains notices that relate to a specific topic. The Caution and Danger notices also appear in the multilingual safety book included with the NAS 200. Each notice is numbered for easy reference to the corresponding notices in the safety book.

The notice definitions are as follows:

Notes These notices provide important tips, guidance, or advice.

Attention These notices indicate possible damage to programs, devices, or data. An attention notice appears before the instruction or situation in which damage could occur.

Caution These notices indicate situations that can be potentially hazardous to you. A caution notice appears before the description of a potentially hazardous procedure step or situation.

Danger These notices indicate situations that can be potentially lethal or extremely hazardous to you. A danger notice appears before a description of a potentially lethal or extremely hazardous procedure step or situation.

Publications

Hardcopy publications shipped with the Network Attached Storage 200 Model EXP

The following publications are shipped in hardcopy and are also provided in softcopy form at www.ibm.com/storage/support/

- *IBM TotalStorage Network Attached Storage 200 Hardware Installation Guide*, GA27-4297-02,

  This publication provides procedures for setting up, cabling, and replacing components of the IBM TotalStorage Network Attached Storage 200 Models 201 and 226.

- *Safety Information-Read This First*, SD21-0030

  This publication contains general safety information translated into different languages.

Related publications

The following publications are available on a CD shipped with this product and at www.ibm.com/storage/support/

- *IBM TotalStorage Network Attached Storage 200 User's Reference*, GA27-4263-03

  This manual describes how to configure and use the software provided with the product.

- *IBM TotalStorage Network Attached Storage 200 Hardware Installation Guide*, GA27-4297-02,

  This guide describes the installation procedures for this product and is intended for the customer.

- *IBM TotalStorage Network Attached Storage 200 Hardware Service Guide*, GY27-0409-02

  This guide describes the service procedures for this product and is intended for trained service personnel.

- *IBM TotalStorage Network Attached Storage Translated Safety Notices*, GA67-0043

  This booklet contains translations of safety notices specific to this product.

Accessibility

The softcopy version of this guide and the other related publications are accessibility-enabled for the IBM Home Page Reader.

Web sites

This section lists the Web sites where additional technical information is found.

Getting help online

Be sure to visit the support page that is specific to your hardware, complete with FAQs, parts information, technical hints and tips, technical publications, and downloadable files, if applicable. This page is at www.ibm.com/storage/support/.

Other helpful sites

www.ibm.com	Main IBM home page
www.ibm.com/storage	IBM Storage home page

Online support

Use the following Web site to obtain online support:

www.ibm.com/storage/support/

Chapter 1. Introduction

The NAS EXP is a compact unit that provides high-capacity, small computer system interface (SCSI) disk storage. It supports up to fourteen 36.4-GB or 73.4-GB 10K rpm Ultra160 SCSI drives on a single logical bus. It delivers fast, high-volume data transfer, retrieval, and storage functions across multiple drives. The NAS EXP is designed for continuous, reliable service; the modular, redundant disk drives, power supplies with built-in fans, and environmental services monitor (ESM) boards use hot-swap technology for easy replacement without turning off the engine to which the NAS EXP is attached, and in some cases, without turning off the NAS EXP.

The NAS EXP will support any combination of 36-GB and 73-GB drives with the following restrictions:

- No drive array can contain drives of more than one size (for example, an array must contain only 36-GB drives or only 73-GB drives).
- Each array must contain at least three drives.
- The total number of arrays for the system (engine plus all attached NAS EXPs) cannot exceed eight.

The NAS EXP supports IBM Ultra160 SCSI for the host and drive interfaces and is designed for easy installation and integration into a variety of system environments.

After you review the introductory information provided in this chapter, see Chapter 2, “Installing the NAS EXP” on page 9 to begin the installation process.

Features at a glance

The following table summarizes the features of the NAS EXP. For a list of the operating specifications, such as weight, height, and heat output, see “Operating specifications” on page 9.

General	**User interface**	**ESM boards**
• Modular components: – High-capacity disk drives – ESM boards – Power supplies with built-in fans • Technology: – Supports disk array technology – SCSI (Ultra160) host interface – Redundant data storage, power and cooling system, and ESM boards – Hot-swap technology for drives, power supplies with built-in fans, and ESM boards	• Built-in power, activity, and fault indicators • Identification labeling on devices, rear indicator lights, switches, and connectors • Easy-to-replace drives, power supplies, ESM boards, and fans **Disk drive storage** • Maximum drives per NAS EXP: 14 • Drives available in 36.4 GB or 73.4 GB	• Technology and interfaces: – SCSI: Ultra160 – SCSI bus interface: Two 68-pin, Very High Density Connector Interface (VHDCI) connectors for SCSI bus cables **Note:** Connect only SCSI bus 1 (right side) connector to the Models 201 and 226. SCSI bus 2 (left side) is not used.

Storage unit bays

The following sections describe the hot-swap drive and power supply bays, the switch card bay, and the bridge card bay on the NAS EXP.

With the hot-swap features of the storage unit, you can remove and replace hard disk drives, power supplies/fans, and ESM boards without turning off the NAS EXP. Therefore, you can maintain the availability of your system while a hot-swap device is removed, installed, or replaced. See Chapter 3, “Installing and replacing devices” on page 21 for more information.

Hot-swap drive bays

Figure 1 shows the location of the hot-swap drive bays accessible from the front of your NAS EXP. The NAS EXP supports up to 14 IBM Ultra160 SCSI hard disk drives. You can install the drives in the 14 drive bays on the front of the NAS EXP.

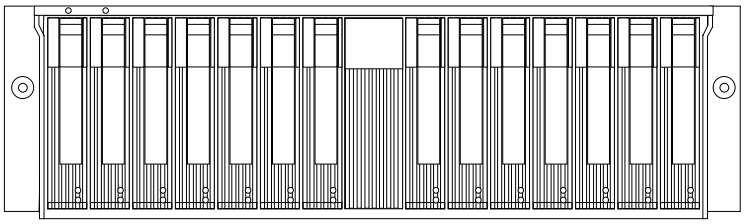


Figure 1. Hot-swap hard drive bays

Attention: Never hot-swap a drive when its green activity light emitting diode (LED) is flashing. Hot-swap a drive only when its amber fault LED is on (not flashing) or when the drive is inactive with the green activity LED off.

Bridge card bay

The bridge card is accessible from the front of the unit. You can replace the bridge card, but you must turn off the NAS EXP before doing so. See “Replacing a bridge card” on page 24 for step-by-step instructions.

Attention: Never remove the bridge card while the NAS EXP is powered on. See “Powering the NAS EXP on and off” on page 18.

ESM and power supply bays

Figure 2 shows the location of the environmental services monitor (ESM) bays (for the hot-swap ESM boards) and the power supply bays where the hot-swap power supplies are located.

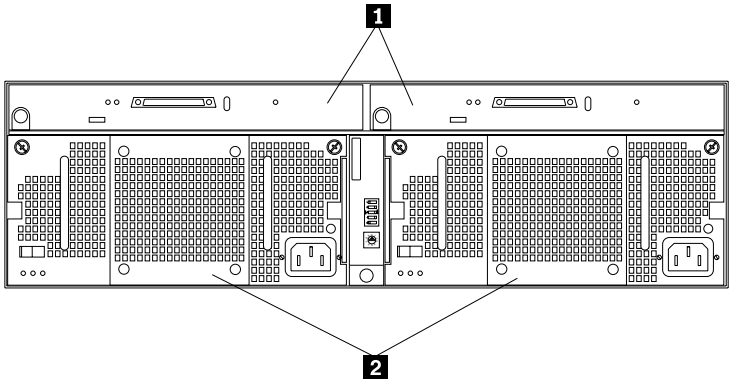


Figure 2. ESM and power supply bays

1 Hot-swap ESM bays. The ESM boards provide a SCSI interface to the drives and monitor the overall status of the NAS EXP. See “Replacing an ESM board” on page 26 for more information.

2 Hot-swap power supply/fan bays. Your NAS EXP comes with two 500-W hot-swap and redundant power supplies with built-in fans. The power supplies are redundant in that a single power supply can provide adequate power and cooling for the entire NAS EXP. A single power supply supports 14 hard disk drives. For correct cooling, both power supplies must be installed, even if one power supply is not operational. See “Working with hot-swap power supply/fan units” on page 28 for step-by-step instructions.

Switch card bay

Your NAS EXP comes with a switch card that contains five external option switches and four internal option switches. The switch card is located on the back of the NAS EXP between the two power supplies. The switch card contains switches that control how power is supplied to the NAS EXP and what NAS EXP services are enabled. The internal option switches are preset to the default position (Off). To access the four internal option switches, you must power off the NAS EXP; then remove the switch card. See “Replacing the switch card” on page 25 for step-by-step instructions.

Attention: Never remove the switch card or change the switch card settings while the NAS EXP and host server is powered on. Refer to “Powering the NAS EXP on and off” on page 18.

In addition to the internal and external option switches, the switch card also has a 10-position unit ID switch for setting the NAS EXP ID using values 0 through 9. System-management software, such as IBM Netfinity Manager™, uses the ID when it provides data and alerts for the NAS EXP.

For more information on option switch settings, see “Setting the interface options and ID settings” on page 11.

Figure 3 on page 4 shows the location of the switch card on the NAS EXP.

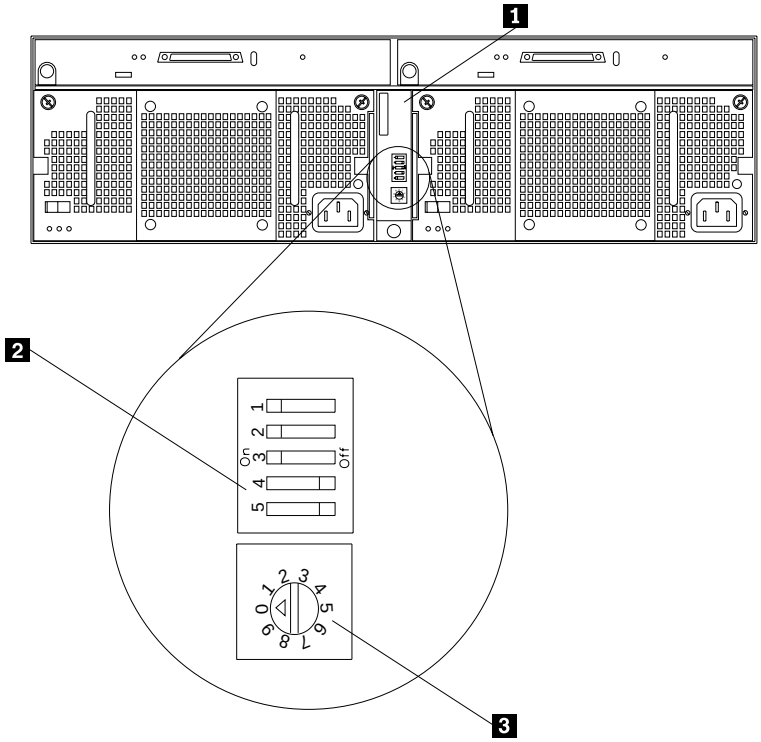


Figure 3. Location of the switch card

1 Switch card

2 External option switches

3 Unit ID switch

Front controls, indicators, and devices

The primary controls on the front of the NAS EXP are shown in Figure 4.

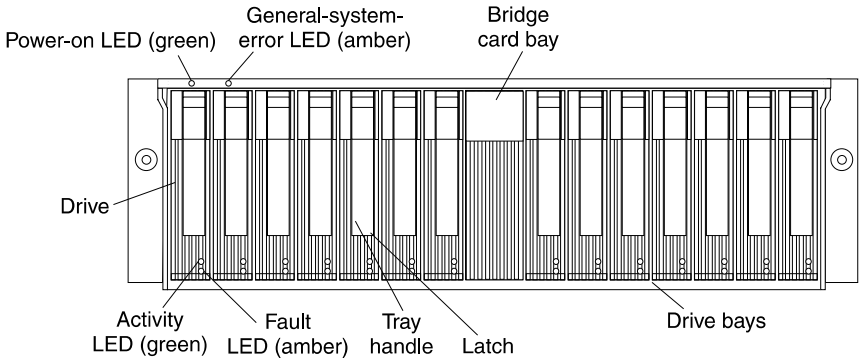


Figure 4. Controls, indicators, and devices on the front of the storage unit

Power-on LED (green)
This green LED indicates that the unit is receiving dc power.

General-system-error LED (amber)
When on, this amber LED indicates that the unit has a fault, such as in a power supply, ESM board, or hard disk drive.

Bridge card bay
This is the location of the bridge card.

Drive bays
There are 14 drive bays.

Latch This multipurpose blue latch releases or locks the drive in place.

Tray handle
You can use this multipurpose handle to insert or remove a drive.

Fault LED (amber)
Each drive has a fault LED. When on, this amber LED indicates a drive failure. When flashing, this amber LED indicates that a drive Identify or Rebuild is in progress.

Activity LED (green)
Each drive has an activity LED. When flashing, this green LED indicates drive activity.

Drive Each drive consists of a slim hard disk drive and tray.

Rear controls, indicators, and connectors

Two hot-swap power supplies with built-in fans and two environmental services monitor (ESM) boards are accessible from the back of the NAS EXP. These components contain several user indicators and connectors.

Power-supply controls, indicators, and connectors

The following is a list of the controls, indicators, and connectors at back of the NAS EXP.

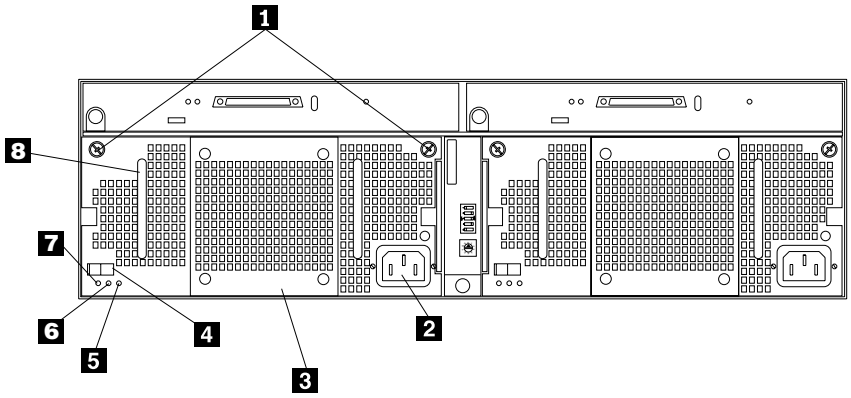


Figure 5. Power-supply controls, indicators, and connectors

1 **Thumbscrews**: Loosen the thumbscrews to remove or install a power supply.

2 **AC power connector**: The power cord connects here.

3 **Power supply/fan**: The two hot-swap power supplies with built-in fans are located on the back of the NAS EXP.

Attention: The NAS EXP comes with two power supply/fan units installed. When one power supply fails, the power-supply unit must be replaced to reestablish redundancy. When replacing the failed unit with the new power-supply unit, ensure that this operation is performed in less than 10 minutes to prevent overheating.

The fan that is visible from the rear of the power supply is an auxiliary fan that is normally off. This fan turns on only when the main fan within the power supply fails.

4 **Power on/off switch**: Use this switch to turn the power supply on and off.

5 **Fault LED (amber)**: When on, this amber fault LED indicates a power-supply failure or that a redundant power supply is not on. This LED also flashes when the built-in fan fails.

6 **DC power LED (green)**: This green LED is on when the NAS EXP is powered on and is supplying both 5 V and 12 V dc power.

7 **AC power LED (green)**: This green LED is on when the NAS EXP is receiving ac power.

8 **Handles**: The two handles are used for installing and removing the power supply.

ESM board user controls

Two ESM boards are accessible from the back of the NAS EXP. These components contain several user controls, indicators, and connectors. Figure 6 shows these controls.

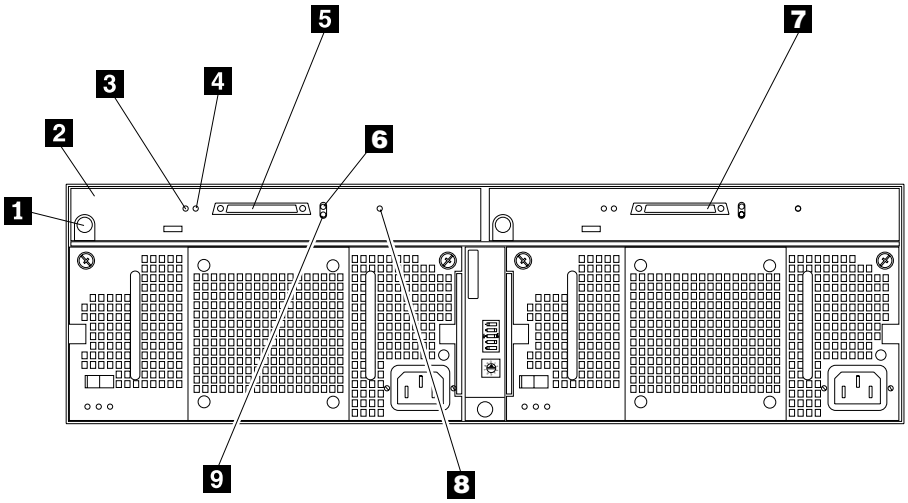


Figure 6. ESM board user controls

1 **Push pins**: Each ESM board has an orange push pin at the lower left of the board. Use the orange push pin and lever to remove and insert the ESM board.

2 **ESM board**: The environmental services monitor (ESM) boards contain the SCSI controls, LEDs, and connectors.

3 **Termination-power LED (green)**: When on, this green LED indicates that termination power is present. When a termination-power LED is on, it indicates that the other end of the cable is connected to a powered-on controller. Each external bus has a separate termination-power LED.

4 **LVD/SE LED (green)**: When on, this green LED indicates that the external host bus is in low voltage differential (LVD) mode. When this LED is off, this indicates that the external host bus is in single-ended (SE) mode. Each external bus has a separate LVD/SE LED. Only LVD host bus controllers are supported.

5 , **7** **SCSI bus connector**: The 68-pin VHDCI connectors are for attaching your SCSI cables to SCSI bus 1 and SCSI bus 2.

6 **Activity LED (green)**: When on, this green LED indicates there is activity on the external SCSI bus. Each external bus has a separate activity LED.

8 **Fault LED (amber)**: When on, this amber LED indicates an ESM board failure.

9 **SCSI reset LED**: When on, this green LED indicates a SCSI bus reset.

System-management software support

The NAS EXP provides software alert functions through the system monitor functions provided in the IBM Director (agent only) and IBM ServeRAID manager software.

The following alerts are supported:

- Disk drive disabled
- Power supply failure
- Cooling failure
- Storage unit too hot
- Vital Product Data for subcomponents

Note: You must have the correct level of system-management software on your server to enable this functionality.

Chapter 2. Installing the NAS EXP

You can install the NAS EXP in an Electronic Industries Association (EIA) 310 standard rack.

You will need a flat-blade screwdriver and a Phillips-head screwdriver to install your NAS EXP. Each type of enclosure comes with general installation instructions for installing optional devices.

Operating specifications

The Table 1 summarizes the operating specifications of the NAS EXP.

Table 1. Operating specifications

Electrical input • Sine-wave input (50 to 60 Hz) is required • Input voltage: – Low range: - Minimum: 90 V ac - Maximum: 127 V ac – High range: - Minimum: 198 V ac - Maximum: 257 V ac – Input kilovolt-amperes (kVA) approximately: - Minimum configuration: 0.06 kVA - Maximum configuration: 0.45 kVA	**Environment** • Air temperature: – NAS EXP on: 10° to 35° C (50° to 95° F) Altitude: 0 to 914 m (3000 ft) – NAS EXP on: 10° to 32° C (50° to 90° F) Altitude: 914 m (3000 ft.) to 2133 m (700 ft) • Humidity: 8% to 80% **Size (with front panel and without mounting rails)** • Depth: 53.8 cm (21.2 in) • Height: 12.8 cm (5 in) • Width: 44.7 cm (17.6 in) **Weight** Typical NAS EXP fully loaded: 36.1 kg (79.4 lbs) Minimum weight (with three drives): 27.5 kg (60.5 lbs)	**Acoustical noise emissions values** For open bay (no drives installed) and typical system configurations (14 hard disk drives installed). • Sound power (idling): – 5.6 bels (open bay) – 5.7 bels (typical) • Sound power (operating): – 5.6 bels (open bay) – 6.5 bels (typical) • Sound pressure (idling): – 44 dBA (open bay) – 47 dBA (typical) • Sound pressure (operating): – 44 dBA (open bay) – 54 dBA (typical) These levels are measured in controlled acoustical environments according to ISO 7779 and are reported in accordance with ISO 9296. The declared sound power levels indicate an upper limit, below which a large portion of machines operate. Sound pressure levels in your location might exceed the average 1-meter values stated because of room reflections and other nearby noise.

Inventory checklist

After you fully unpack your NAS EXP, verify that you have the following items:

- **Hardware:**
  - IBM TotalStorage Network Attached Storage 200 Storage Unit Model EXP
  - Two power cords
  - One 2-m (6.56-ft) SCSI cable
  - One sheet of NAS EXP ID (0 - 9) labels

  - One sheet of four SCSI ID labels
  - One rack-mounting hardware kit
    - Two rails (right and left assembly)
    - Two M5 screws
    - Ten M6 screws
    - Ten M6 cage nuts
    - Ten M6 clip nuts
- **Publications:**
  - *IBM TotalStorage Network Attached Storage 200 Storage Unit Model EXP Installation and User's Guide* (this book)
  - Template for installing the NAS EXP in a rack

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

If you have not already done so, take a moment to review the information in this chapter and record your NAS EXP serial number in the table in "Identification numbers" on page 35. Then, return to this chapter to begin the installation process.

Getting started

Before you begin, review the following assumptions:

- If you are installing the NAS EXP in a rack, you have already installed the other components in the rack and moved the rack to its permanent operating location.
- The installation site meets all area, environmental, power, and site requirements for the NAS EXP. See the NAS EXP requirements listed under "Operating specifications" on page 9.

Preparing the NAS EXP

This section explains how to remove the devices and set the option switches to prepare the NAS EXP for installation.

Removing devices

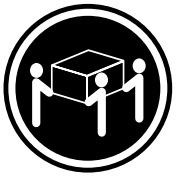
Attention: Static electricity, though harmless to you, can seriously damage NAS EXP components or options. See "Handling electrostatic discharge-sensitive devices" on page 63 for details.

Attention: If you have data stored on the drives, label the drives before you remove them. Then, when you replace the drives, install each one in the same drive bay from which you removed it. Failure to do so could result in a loss of data.

See Chapter 3, "Installing and replacing devices" on page 21 for information on removing the devices.

It is easier to lift the NAS EXP and install it in a rack if you remove all devices (disk drives, power supplies, and ESMs) first. A fully loaded NAS EXP with 14 hard disk drives and two power supplies installed weighs 36.1 kg (79.5 lb) and a NAS EXP with three hard disk drives and two power supplies (minimum configuration) installed weighs 27.5 kg (60.5 lbs). If you remove all the devices, you can reduce the overall weight.

≥18 kg (37 lbs)



≥32 kg (70.5 lbs)

≥55 kg (121.2 lbs)

CAUTION:
<2–17> Use safe practices when lifting.

Setting the interface options and ID settings

When you install a drive in the NAS EXP, the drive tray plugs into a printed circuit board called the *midplane*. The midplane sets the SCSI bus number and ID automatically.

The switch card located on the back of the NAS EXP has five external option switches, four internal option switches, and a unit ID switch. It is easier to set these switches before you install the NAS EXP in a rack or tower enclosure.

Attention: Always set the option switches while the NAS EXP and host server are powered off. Failure to do so will result in loss of data. See “Powering the NAS EXP on and off” on page 18.

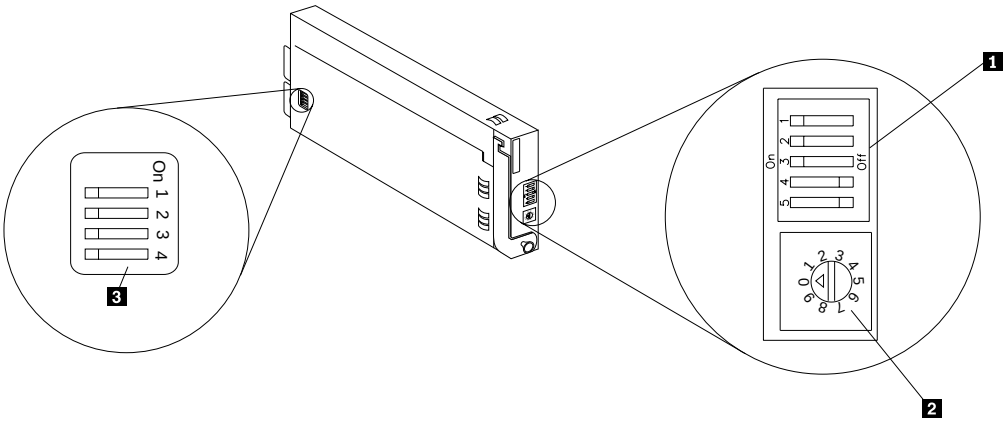


Figure 7. Location of option switches

1. External option switches
2. Unit ID switch
3. Internal options switches

External option switches

The five option switches on the exterior of the switch card are: Option switch 1 controls the power supply to the NAS EXP. Option switches 2 through 5 are reserved; leave these switches in the default positions.

Option switch 1 — Power-control switch

When this option switch is set to Off, the NAS EXP powers on and off automatically when you power the host machine on and off. This occurs only if termination power is present (the termination-power LED is on) at the external SCSI connector.

When this option switch is set to On (the default), you must power the NAS EXP on and off separately.

Option switches 2 through 5 — Reserved

These option switches are reserved; leave these option switches set to the default positions. Set switches 2 through 5 to On, On, Off, Off, respectively.

Unit ID switch

The unit ID switch has 10 settings. You can use these settings (0 through 9) to set an ID for the NAS EXP. System-management software, such as IBM Director, uses this NAS EXP ID when it provides data and alerts for the NAS EXP.

The Unit ID switch comes with a factory default of ID 0. Because each NAS EXP is on a separate SCSI channel connected to the Model 201's optional IBM ServeRAID-4Mx Ultra160 SCSI controller or the Model 226's IBM ServeRAID-4H Ultra160 SCSI controller, you can leave this Unit ID configuration as ID 0 for any attached NAS EXP units.

Internal option switches

All internal option switches must be set to the Off (default) position.

Installing the NAS EXP in a rack

The NAS EXP requires 3U (5.25 in.) of Electronic Industries Association (EIA) rack-mounting space.

Attention: Static electricity, though harmless to you, can seriously damage NAS EXP components or options. See “Handling electrostatic discharge-sensitive devices” on page 63 for details.

Important: Review the documentation that comes with your rack enclosure for safety and cabling considerations. When installing your NAS EXP in a rack, take the following precautions:

- Read “Removing devices” on page 10 about making the NAS EXP easier to handle.
- Install the NAS EXP in a maximum 35 degree C (95 degree F) environment.
- To ensure correct air flow, do not block the air vents; usually 15 cm (6 in.) of air space is sufficient.

  Note: Because of the limited space in some racks, it might be easier to connect and route cables before you install the mounting brackets and hardware devices.
- To ensure stability, take precautions to prevent uneven loading of the rack. Loading of the rack should begin at the bottom.
- When multiple components are installed in a rack, take precautions to prevent overloading of the power outlets.
- The NAS EXP should always be connected to a correctly grounded outlet.
- Refer to the rack documentation for instructions on removing the rack enclosure doors and side panels.

Use the rack-mounting template and installation instructions that come with the NAS EXP to locate the rack-mounting holes and to install the unit in a rack cabinet. If you do not have the template and instructions, you can use the following steps to install your NAS EXP:

1. Use Figure 8 to determine the appropriate rack-mounting holes for installing cage nuts or clip nuts to secure the NAS EXP rails. From left to right, the illustration shows the front and rear rack-mounting flanges, respectively.

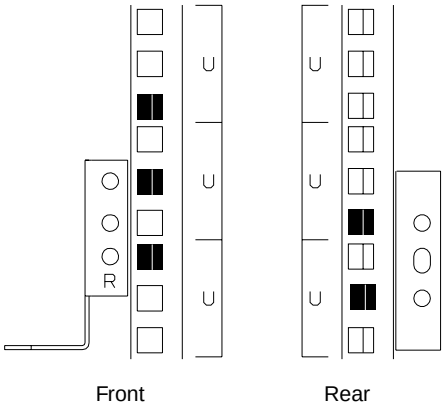


Figure 8. Front and rear flanges

Note: Use clip nuts if your rack has holes. If your rack has square holes, you can use the rack-insertion tool or a flat-blade screwdriver to install cage nuts.

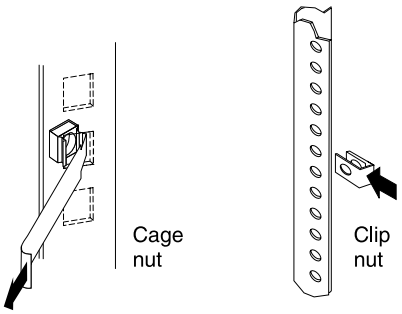


Figure 9. Clip nuts and cage nuts

2. On the rail marked *R*, loosen the four screws **2** .
3. Hold the rail against the outside of the right rack-mounting flange, and loosely insert the two front M6 screws **1** .
4. Extend the rail outside of the rear rack-mounting flange; then, install and tighten two rear M6 screws **3** .
5. Tighten the two front screws **1** ; then, tighten the four screws **2** .

   Repeat step 2 through step 5 to install the rail marked *L* on the left side of the rack.

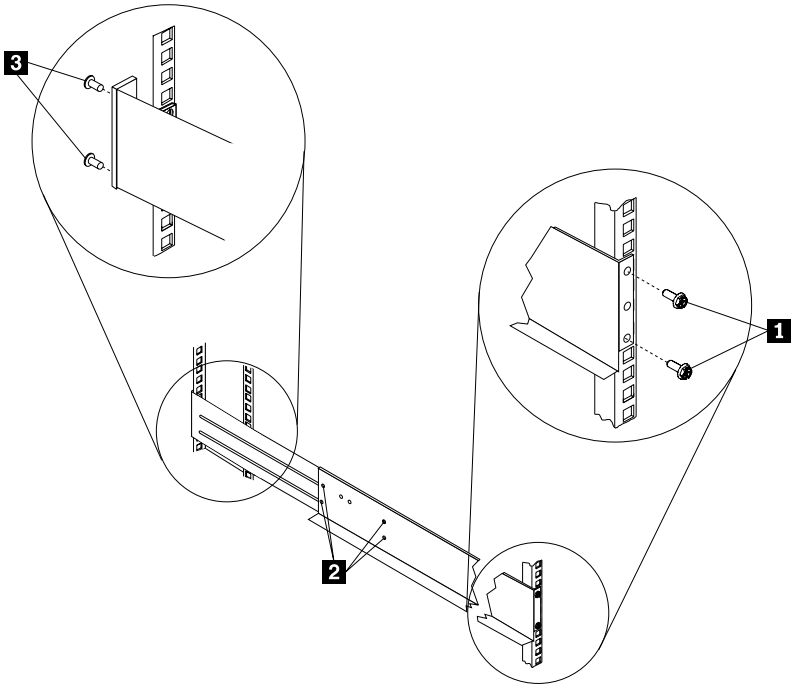


Figure 10. Tightening screws

6. Loosely insert one M5 screw 1 into each rail.

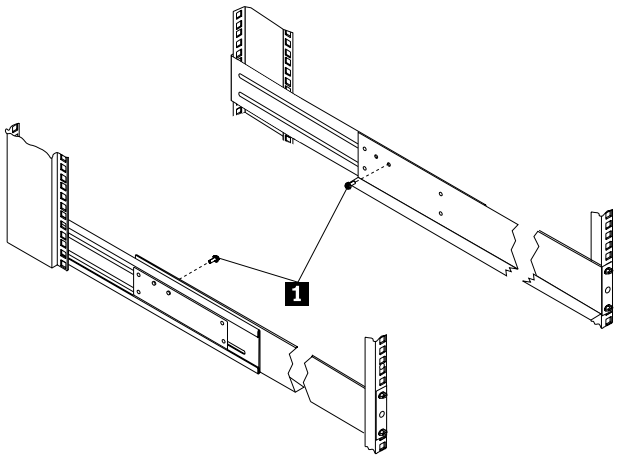
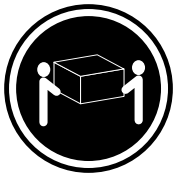


Figure 11. Inserting M5 screw



≥18 kg (37 lbs)

≥32 kg (70.5 lbs)

≥55 kg (121.2 lbs)

CAUTION:
<2–17> Use safe practices when lifting.

7. Slide the NAS EXP into the rack, and insert the M6 screws 1. Do not overtighten the M6 1 screws.

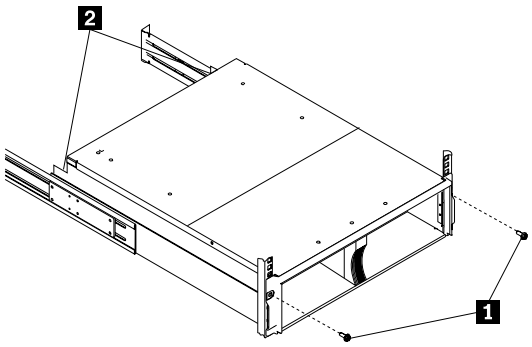


Figure 12. Inserting the storage unit and tightening the M6 screws

8. Tighten the rear screws 2.

9. Verify that option switches 1 and 2 (inside the switch card) are set to Off. See “Setting the interface options and ID settings” on page 11 for more information.
10. Install hard disk drives and power supplies in the NAS EXP according to Chapter 3, “Installing and replacing devices” on page 21; then, return to this step to complete the installation.
11. Continue with “Completing the installation”.

Completing the installation

After you install the hard disk drives and power supplies, follow the instructions in this section to complete the installation. Instructions for installing the identification labels and cabling the NAS EXP are included.

Installing identification labels

Your NAS EXP comes with one sheet of 10 labels (0 - 9) and one sheet of four SCSI ID labels.

Complete the following steps to install the SCSI identification labels:

To install the label:

1. Locate the single-bus SCSI ID label (see Figure 13).
   a. Orient the label so that the printed numbers are legible from left-to-right.
   b. Peel the backing away from the adhesive side of the label.
   c. Carefully butt the edge of the SCSI ID label up against the edge of the serial number label so that the 14 printed ID numbers are located beneath each of the drive bays.
   d. Apply the label to the front of the unit, as shown in Figure 13.

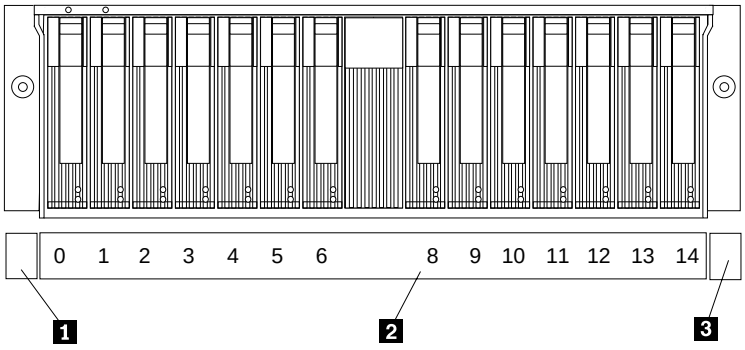


Figure 13. Applying the SCSI ID label to the storage unit

1 Storage unit ID label

2 SCSI ID label

3 Serial number label

2. Install the NAS EXP ID label.
   a. Verify the setting of the NAS EXP ID switch (0 - 9).
   b. Apply the NAS EXP ID label that matches the setting for the unit ID switch in the blank label area directly to the left of the SCSI ID label.
3. Continue with “Cabling the NAS EXP”.

Cabling the NAS EXP

This section provides the SCSI and power cabling information. After you connect your SCSI and power cables, use the instructions provided in “Powering the NAS EXP on and off” on page 18 for the initial startup of the NAS EXP.

SCSI cabling information

The NAS EXP comes with two ESM boards. There are two 68-pin SCSI VHDCI connectors. From left to right as seen from the back, these connectors are for SCSI bus 2 and SCSI bus 1. See “Rear controls, indicators, and connectors” on page 5 for the location of these connectors.

Note: Connect only the SCSI bus 1 (right side) connector to the Model 201 or Model 226. SCSI bus 2 (left side) is not used.

The ServeRAID™ controller inside your engine must have a dedicated SCSI channel for the NAS EXP. Port 1 is used internally by both the Model 201 and Model 226. When connecting to the ServeRAID-4Mx in the Model 201, connect to external Port 2. When connecting to the ServeRAID-4H in the Model 226, connect to external Ports 2, 3, or 4.

Power cabling

The NAS EXP uses two power cords. You can connect the power cords to a primary power unit inside the rack, such as a correctly grounded ac distribution unit or uninterruptible power supply (UPS), or to an external source, such as a correctly grounded electrical outlet.

Attach the power supply power cords as follows:

1. Connect the power cord to the power supply.
2. Plug the power supply cord into a correctly grounded electrical outlet.
3. Go to “Powering the NAS EXP on and off” on page 18 for information about the initial startup of the NAS EXP.

Powering the NAS EXP on and off

This section contains instructions for powering the NAS EXP on and off under normal and emergency circumstances.

If you are powering on the NAS EXP after an emergency shutdown or power outage, see “Powering on the NAS EXP after an emergency” on page 20.

Powering on the NAS EXP

Use this procedure to power on for the initial startup of the NAS EXP.

1. Verify that:
   a. All cables are correctly attached.
   b. Both power cords are plugged into the back of the NAS EXP and into correctly grounded electrical outlets.
   c. All hard disk drives are locked securely in place.
   d. All switches are set correctly: the internal option switches 1 through 4, external option switches 1 through 5, and the unit ID switch on the NAS EXP. See “Setting the interface options and ID settings” on page 11 for more information.
2. Power On the appropriate device:
   - If you are adding a new NAS EXP, power On the engine before the NAS EXP. For engine starting instructions, refer to the *IBM TotalStorage Network Attached Storage 200 Hardware Installation Guide*.
   - If you are restarting the engine with an existing NAS EXP that has already been recognized by the ServeRAID adapter, power On the NAS EXP first (see step 3). Refer to the *IBM TotalStorage Network Attached Storage 200 Hardware Installation Guide* for engine starting instructions.
3. Turn on both power supplies on the back of the NAS EXP.

   The NAS EXP might take a few seconds to power on. During this time, you might see the fault (amber) and the power (green) LEDs on the NAS EXP turn on and off intermittently. When the power-on sequence is complete, only the power (green) LEDs on the front and back should remain on. If one or more fault (amber) LEDs remain on, see “Troubleshooting” on page 31.

   Attention: If you have data stored on the drives, label the drives before you remove them. Then, when you replace the drives, install each one in the same drive bay from which you removed it. Failure to do so will result in a loss of data.

Powering off the NAS EXP

Attention: Except in an emergency situation, never power off the NAS EXP if any fault LEDs are on. Correct the fault before you attempt to power off, using the correct troubleshooting or servicing procedure. This will ensure that the NAS EXP will correctly power on later. See “Troubleshooting” on page 31.

CAUTION:
<2–19> 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.

The NAS EXP is designed to run continuously, 24 hours a day. Power off only when at least one of the following is true:

- Instructions in a hardware or software procedure require you to power off.
- A service technician tells you to power off.
- A power outage or emergency situation occurs, see “Powering off the NAS EXP in an emergency” on page 20.

Use the following procedure to power off the NAS EXP:

1. Power down the engine attached to the NAS EXP.
2. Make sure that all amber fault LEDs are off. If any fault LEDs are on (drives, power supplies, or ESM boards), correct the problem before you power off the engine. For guidance, see “Troubleshooting” on page 31.
3. Turn off both power supplies on the NAS EXP.

Powering off the NAS EXP in an emergency

Attention: Emergency situations might include fire, flood, extreme weather conditions, or other hazardous circumstances. If a power outage or emergency situation occurs, always power off all power switches on all computing equipment. This will help safeguard your equipment from potential damage due to electrical surges when power is restored. If the NAS EXP loses power unexpectedly, it might be due to a hardware failure in the power system or midplane. See “Troubleshooting” on page 31.

Use the following procedure to power off the NAS EXP during an emergency situation:

1. Power down the engine attached to the NAS EXP.
2. If you have time, stop all activity and check the LEDs (front and back). Make note of any fault LEDs that are on so that you can correct the problem when you power on.
3. Turn off all power supplies; then, unplug the power cables from the NAS EXP.

Powering on the NAS EXP after an emergency

Use the following procedure to restart the NAS EXP if you powered off the power supplies during an emergency shutdown, or if a power failure or a power outage occurred:

1. After the emergency situation is over or power is restored, check the NAS EXP for damage. If there is no visible damage, continue with step 2; otherwise, have your unit serviced.
2. Ensure engine is up and running before you continue with step 3.
3. After you have checked for damage, plug in the storage-unit power cables and turn on the power switches.
4. Turn on both power supplies on the back of the NAS EXP.
5. Only the power (green) LEDs on the front and back should be on. If one or more of the fault (amber) LEDs are on, see “Troubleshooting” on page 31 for instructions.
6. Use your installed software application as appropriate to check the status of the NAS EXP.

Chapter 3. Installing and replacing devices

This chapter provides instructions for installing or replacing devices, such as hot-swap drives, ESM boards, the bridge card, the switch card, and power supplies.

Attention: If you have data stored on the drives, label the drives before you remove them. Then, when you replace the drives, install each one in the same drive bay from which you removed it. Failure to do so could result in a loss of data.

Attention: Static electricity can seriously damage NAS EXP components or options. See “Handling electrostatic discharge-sensitive devices” on page 63 for details.

Attention: It is easier to lift the NAS EXP if you remove all disk drives, power supplies, and ESMs first. A fully loaded NAS EXP with 14 hard disk drives and two power supplies installed weighs 36.1 kg (79.5 lbs). A NAS EXP with three hard disk drives and two power supplies (minimum configuration) installed weighs 27.5 kg (60.5 lbs). The standard unit with two power supplies weighs 22.5 kg (49.5 lbs). If you remove all the devices, you can reduce the overall weight.

≥18 kg (37 lbs)

≥32 kg (70.5 lbs)

≥55 kg (121.2 lbs)

CAUTION:
<2–17> Use safe practices when lifting.

Working with hot-swap drives

Before you begin

- Read the safety and handling guidelines provided in “Basic safety information” on page 55.
- Ensure that your current system configuration is working properly.
- Back up all important data before you make changes to storage devices, such as hard disk drives.

Before you replace drives, review the following information:

Replacing hot-swap drives

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

Attention: Failure to replace the drives in their correct bays might result in loss of data. If you are replacing a drive that is part of a RAID-1 or RAID-5 logical drive, ensure that you install the replacement drive in the correct bay.

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

To remove a hot-swap drive, go to “Removing a hot-swap drive”.

To install a hot-swap drive, go to “Installing a hot-swap drive” on page 23.

Removing a hot-swap drive

To remove a hot-swap drive:

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

   Attention: Never hot swap a drive when its green activity LED is flashing. Hot swap a drive only when its amber fault LED is on (not flashing) or when the drive is inactive (activity LED is off).

2. Remove the drive.
   a. Press on the inside of the bottom of the tray handle **2** to release the blue latch **1**.
   b. Pull the handle **2** on the tray **3** out into the open position.
   c. Lift the drive tray partially out of the bay.
   d. To avoid possible damage to the drive **4**, wait at least 20 seconds before fully removing the drive from the NAS EXP, to allow for the drive to spin down.
   e. Verify that there is correct identification (such as a label) on the drive and then slide it completely out of the NAS EXP.

Installing a hot-swap drive

To install a hot-swap drive:

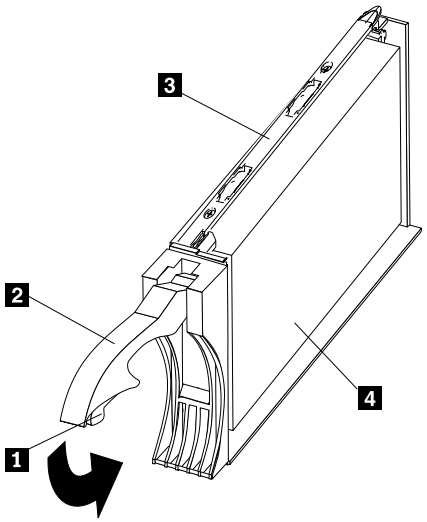


Figure 14. Installing a hot-swap drive

1. If you are installing a hot-swap drive into an unused bay, remove the filler panel from the bay by inserting your finger in the depression on the left side of the filler panel and pulling it away from the appliance. Save the filler panel for later use.
2. Lift the tray handle **2** into the open (unlatched) position.
3. Gently push the drive into the empty bay until the tray handle **2** touches the NAS EXP tray.
4. Push the tray handle **2** down into the closed (latched) position.
5. Check the drive LEDs.
   a. When a drive is ready for use, the green activity LED and the amber fault LED are off.
   b. If the amber fault LED is on, remove the drive from the unit and wait 10 seconds; then, reinstall the drive.

ServeRAID information In some cases, the ServeRAID controller will automatically reset the drive to the Hot Spare or Rebuild state. If the drive state change does not occur automatically (amber LED stays lit), refer to your ServeRAID documentation for information about manually changing the state of the drive from the current state to another state, such as Hot Spare or Ready. The amber LED should turn off within 10 seconds after the drive-state change.

Working with cards and boards

Before you begin

- Read the safety and handling guidelines provided in “Basic safety information” on page 55.
- Ensure that your current system configuration is working properly.
- Back up all important data before you make changes to storage devices, such as hard disk drives.

This section contains step-by-step instructions for removing and replacing storage unit bridge card, switch card, and ESM boards.

Replacing a bridge card

To replace the bridge card in the NAS EXP, follow the instructions for removing the bridge card and installing a bridge card.

Removing a bridge card

Attention: Before removing the NAS EXP bridge card, you must power off the NAS EXP. Refer to “Powering the NAS EXP on and off” on page 18, for detailed instructions.

Complete the following steps to remove the NAS EXP bridge card:

1. Power off the NAS EXP. See “Powering the NAS EXP on and off” on page 18.
2. Remove the drives from the left and right of the bridge card bay. See “Replacing hot-swap drives” on page 22.
3. Squeeze the bridge-card cover **1** clips, and pull the bridge card cover **1** off.
4. Lift the tray handle **2**, and pull the tray **3** that contains the bridge card out of the bridge card bay.

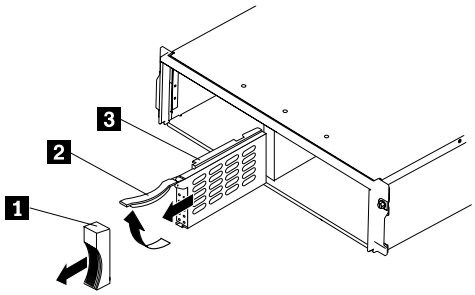


Figure 15. Removing a bridge card from the storage unit

Installing a bridge card

Attention: Make sure the NAS EXP is powered off before installing a bridge card. See “Powering the NAS EXP on and off” on page 18.

Complete the following steps to install the NAS EXP bridge card:

1. Make sure the NAS EXP is powered off.
2. Hold the bridge card tray **3** so the tray handle **2** is at the top of the bridge card tray and pointing outward.
3. Slide the tray **3** that contains the bridge card into the bridge card bay.
4. Push the tray handle **2** down, locking the bridge-card tray into place.

5. Replace the bridge card cover **1** by squeezing each of the four tabs, locking the cover into place.
6. Replace the drives removed when you removed the bridge card.
7. Power on the NAS EXP. See “Powering the NAS EXP on and off” on page 18.

Replacing the switch card

To replace the switch card in the NAS EXP, follow the instructions for removing the switch card and installing the switch card.

Removing the switch card

Attention: Before removing the switch card, be sure to power off the NAS EXP. See “Powering the NAS EXP on and off” on page 18. Make note of the switch card settings so you can set the new card to the same settings. Failure to do so will result in loss of data.

There is one switch card located between the two power supply/fan units at the back of the unit. Complete the following steps to remove the switch card:

1. Power off the NAS EXP.
2. Locate the blue push pin **2** at the bottom of the switch card tray.
3. Pull out the blue push pin **2**.
4. Pull up on the switch-card tray handle **1**.
5. Slide the tray that contains the switch card out of the switch card bay.

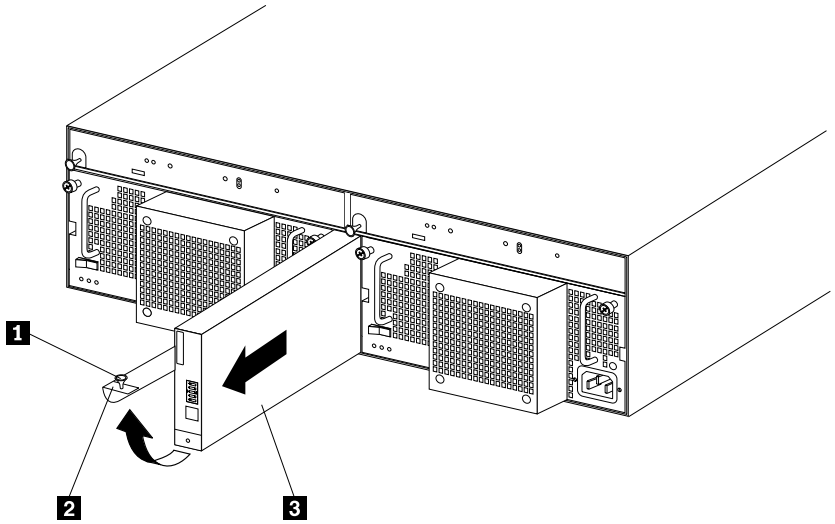


Figure 16. Removing the switch card from the storage unit

Installing a switch card

Attention: Before installing a new switch card, make sure that the switch card settings are the same as the settings on the switch card being replaced, and that the NAS EXP is powered off. See “Powering the NAS EXP on and off” on page 18. Failure to do so will result in loss of data.

There is one switch card located between the two power supply/fan assemblies at the back of the unit. Complete the following steps to install the switch card:

1. Make sure the NAS EXP is powered off.
2. Hold the switch card so the blue push pin **1** is at the bottom of the card and the tray handle **2** is to the left of the card.
3. Hold the tray handle **2** up and slide the card **3** into the bay until it stops.
4. Push the tray handle **2** all the way down; then, push in the push pin **1**.

Replacing an ESM board

To replace an ESM board in the NAS EXP, follow the instructions for removing an ESM board and installing an ESM board.

Removing an ESM board

There are two hot-swap ESM boards at the back of the unit. You can remove the ESM board and SCSI cable without powering off the engine. Complete the following steps to remove a NAS EXP ESM board:

1. Power off the NAS EXP.
2. Disconnect the SCSI cable **1** from the ESM board.
3. Locate the orange push pin **4** to the left of each ESM board.
4. Pull the orange push pin **4** out.
5. Holding the pin, pull the tray handle **3** out and to the right.
6. Slide the ESM board **2** out of the NAS EXP.

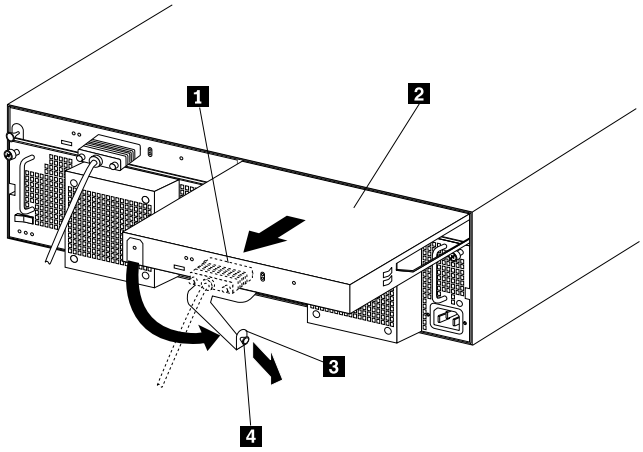


Figure 17. Removing an ESM board from the storage unit

Installing an ESM board

There are two hot-swap ESM boards at the back of the unit. You can install the ESM board and SCSI cable without powering off the engine. Complete the following steps to install a NAS EXP ESM board:

1. Power off the NAS EXP.
2. Hold the board so the tray handle **3** is attached to the bottom of the tray and the tray handle **3** is fully extended.
3. Slide the ESM board **2** into the bay and move the handle **3** to the closed position (left) until it clicks.
4. Push in the orange push pin **4** .
5. Connect the SCSI cable **1** to the ESM board.
6. Power on the NAS EXP.

Working with hot-swap power supply/fan units

Before you begin

- Read the safety and handling guidelines provided in “Basic safety information” on page 55.

The power supplies are customer replaceable and do not require preventive maintenance.

- The power supplies must always be installed in the correct place to maintain correct NAS EXP cooling.
- Use only the supported power supplies for your specific NAS EXP.

Removing a hot-swap power supply/fan unit

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

1. Turn off the power supply.
2. Unplug the power supply cord from the electrical outlet.
3. Disconnect the power cord from the power supply.
4. Loosen the power supply thumbscrews **1** .
5. Grasp the handles **2** on each side of the power supply and pull the unit out of the NAS EXP.

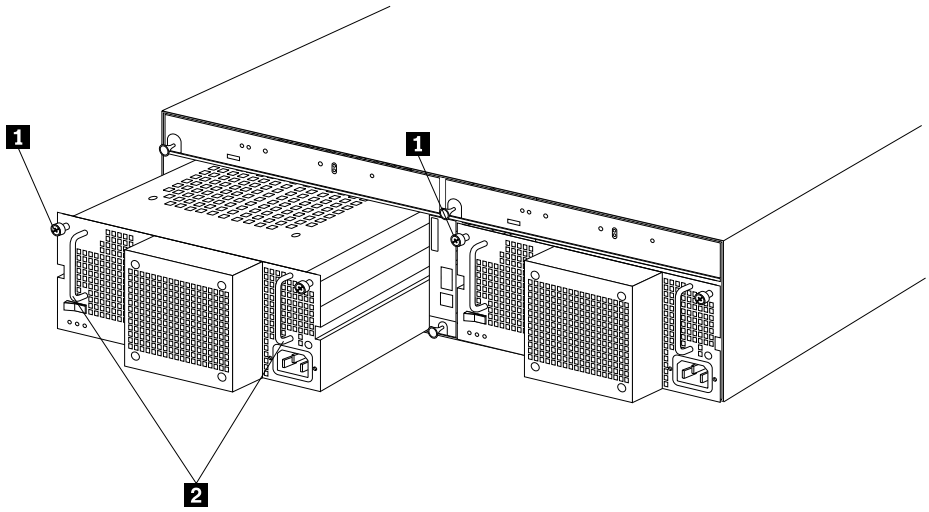


Figure 18. Removing a hot-swap power supply from the storage unit

Installing a hot-swap power supply/fan unit

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

1. Ensure that the power supply you are installing is powered off.
2. Grasp the handles **2** and slide the power supply into the NAS EXP.
3. Tighten the power supply thumbscrews **1** .
4. Connect the power cord to the power supply.
5. Plug the supply power cord into a correctly grounded electrical outlet.

   If you just installed a second (redundant) supply, the fault (amber) LED will light because its power switch is turned off.
6. Turn on the power supply.

   If you just installed a second (redundant) supply, after you turn on the power, the fault (amber) LED will turn off and the ac and dc power (green) LEDs will turn on.

Chapter 4. Solving problems

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

This chapter also provides instructions on how to obtain service and technical assistance for your NAS EXP and other IBM products that you might plan to use.

Note: For product warranty information, see Appendix F, “Product warranty information” on page 53.

Troubleshooting

Use Table 2 to find solutions to problems that have definite symptoms.

Table 2. Troubleshooting the NAS EXP

Problem indicator	Component	Possible cause	Possible solutions
Amber LED on	Drive	Drive failure	Replace the failed drive. See “Replacing hot-swap drives” on page 22.
	ESM board	Board failure	Replace failed board. See “Replacing an ESM board” on page 26.
	Front panel	General machine fault	Indicates that a Fault LED somewhere on the NAS EXP has been turned on. Check for amber LEDs and devices. See “Rear controls, indicators, and connectors” on page 5
Amber LED on and green LED off	Power supplies	Power is powered off	Turn on all power supplies. See “Rear controls, indicators, and connectors” on page 5.
Amber and green LEDs on	Power supplies	Power supply failure	Replace the failed power supply. See “Replacing an ESM board” on page 26.
All green LEDs off	All devices	The NAS EXP is powered off	Check that all NAS EXP power cables are plugged in and the power is on. If applicable, check that the main circuit breakers for the rack are turned on. If the external switch 1 is set to Off, the SCSI controller must be cabled to the NAS EXP and turned on. See “External option switches” on page 12.
		AC power failure	Check the main circuit breaker and ac outlet.
		Power supply failed	Replace the power supply. See “Removing a hot-swap power supply/fan unit” on page 28.
		Midplane failure	Have the NAS EXP serviced.
Amber LED flashing	Drives	Drive rebuild or identity is in process	No corrective action is needed.
	Power supply	Fan failure	Replace the power supply.
Amber LED on and green dc power LED off	Power supply	Power supply failure	If the power switch is on, replace the power supply. See “Removing a hot-swap power supply/fan unit” on page 28.

Table 2. Troubleshooting the NAS EXP (continued)

Problem indicator	Component	Possible cause	Possible solutions
Amber LED on and green ac power LED off	Power supply	No ac power to power supply. Check the ac power cord (cable) or breaker	If ac power is good at the source, replace the power cord. If the power supply has failed, replace the power supply. See “Removing a hot-swap power supply/fan unit” on page 28.
Green LED on	Drive ID=6	Cluster configuration	Clustering not supported. Verify switch settings. Power cycle the NAS EXP.
One or more green LEDs off	One or two drives	No activity to the drives	No action is required.
	All drives or those on one bus	No activity to the drives	No action is required.
		Damaged or loose SCSI cables	Check SCSI-bus cables and connections.
		ESM board failure	Use RAID management software to check the SCSI-bus status. Replace the ESM board. See “Replacing an ESM board” on page 26.
		Midplane failure	Have the NAS EXP serviced.
	Front panel	Power supply	Make sure the cables are plugged in and power supplies are turned on.
		Hardware failure	If any other LEDs are turned on, have the NAS EXP serviced.
Intermittent or sporadic power loss to the NAS EXP	Some or all devices	Defective ac power source or partially plugged power cable	Check the ac power source. Resecure all installed power cables and power supplies. If applicable, check the power components (power units, UPS, and so on). Replace defective power cables.
		Power supply failure	Check for a fault LED on the power supply and replace the failed device. See “Installing a hot-swap power supply/fan unit” on page 29.
		Midplane failure	Have the NAS EXP serviced.
Unable to access drives on one or both SCSI buses	Drives and SCSI bus	Incorrect SCSI ID settings	Make sure SCSI cables are undamaged and properly connected. Check the drive SCSI ID settings. Ensure that option switches 1 and 3 (inside the switch card) are set to the appropriate positions. **Attention:** Change switch positions only when your engine and NAS EXP are powered off.
		ESM board failure	Have the NAS EXP serviced.
	Bridge card	Bridge card failure	All high address or all low address hard-disk drive failed; check the bridge card and replace if necessary. See “Replacing a bridge card” on page 24.
Random errors	Subsystem	Midplane failure	Have the NAS EXP serviced.

Note: If you cannot find the problem in the troubleshooting chart, test the entire engine system. See the *IBM TotalStorage Network Attached Storage 200 User's Reference* for more detailed information on testing and diagnostic tools.

If you already have run the appliance diagnostic program, or if running the test does not reveal the problem, have the system serviced.

Appendix A. Records

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

Identification numbers

Record and retain the following information.

Product name:	IBM Network Attached Storage 200 Model EXP
Machine:	5194
Model number:	EXP
Serial number:	_____

The serial number is located on the front bottom right corner of the bezel and on the inside bottom surface on the rear of the machine.

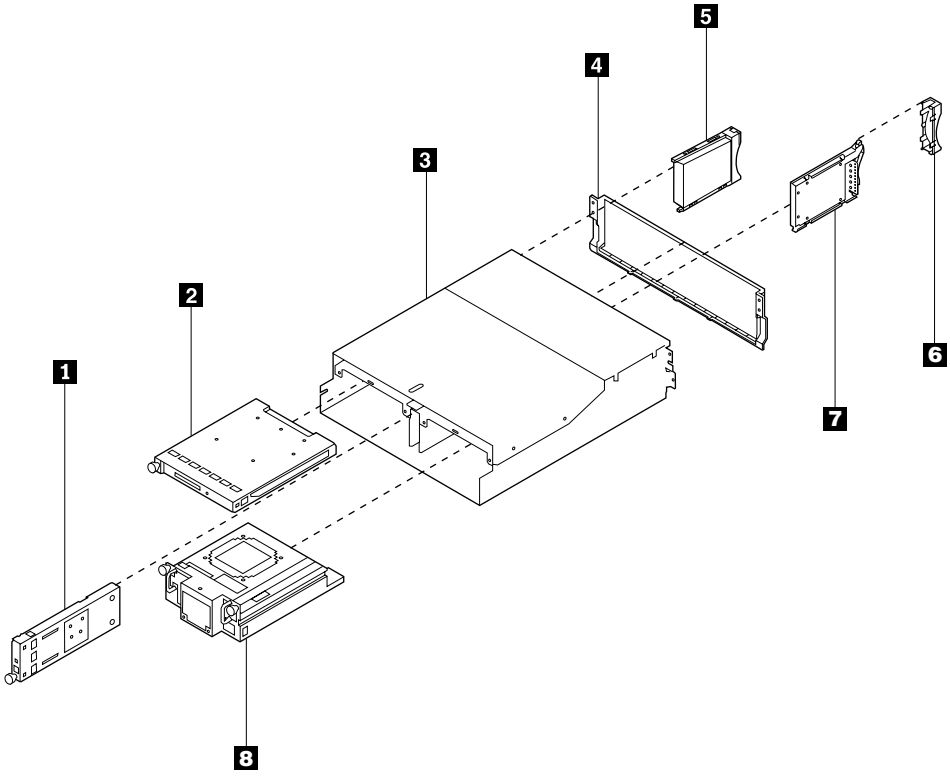
Installed-device records

Use the following table to keep a record of the options installed in or attached to your NAS EXP. This information can be helpful when you install additional options or if you ever need to report a hardware problem. Copy these tables before recording information in them, in case you need extra space to write new values later, when you update your system configuration.

Drive location (SCSI ID)	Drive part number	Drive serial number	Drive size
Bay 1 (SCSI 0)			
Bay 2 (SCSI 1)			
Bay 3 (SCSI 2)			
Bay 4 (SCSI 3)			
Bay 5 (SCSI 4)			
Bay 6 (SCSI 5)			
Bay 7 (SCSI 6)			
Bay 8 (SCSI 8)			
Bay 9 (SCSI 9)			
Bay 10 (SCSI 10)			
Bay 11 (SCSI 11)			
Bay 12 (SCSI 12)			
Bay 13 (SCSI 13)			
Bay 14 (SCSI 14)			

Appendix B. Parts listing

Assembly 1: 5194 - EXP Network Attached Storage Expansion Unit



Assembly 1: (continued)

Asm–Index	Part Number	Units	Description
1–	38P7568	1	5194 - EXP Network Attached Storage Expansion Unit
–1	19K1173	1	• switch card
–2	19K1171	1	• SCSI controller
–4	38P7623	1	• plastic bezel
–5	19K0615	14	• 36.4 GB 10K-4 Ultra 160 SCSI hot-swap SL SCSI hard disk drive (alternate)
–5	06P5759	14	• 36.4 GB 10K-5 Ultra 160 SCSI hot-swap SL SCSI hard disk drive (primary)
–5	06P5760	14	• 73.4 GB 10K-5 Ultra 160 SCSI hot-swap SL SCSI hard disk drive
–6		1	• bridge card bezel
–7	19K1172	1	• bridge card
–8	07K5985	1	• power supply
–	09N7276	1	• 2M SCSI cable
–	19K1169	1	• rack mounting rail kit

Assembly 1: (continued)

Appendix C. Getting help, service, and information

If you need help, service, technical assistance, or just want more information about IBM products, you will find a wide variety of sources available from IBM to assist you.

IBM maintains pages on the World Wide Web where you can get information about IBM products and services and find the latest technical information.

Table 3 lists some of these pages.

Table 3. IBM Web sites for help, services, and information

www.ibm.com	Main IBM home page
www.ibm.com/storage	IBM Storage home page
www.ibm.com/storage/support	IBM Support home page

You might also want to visit the Web pages of other companies for information about other operating systems, software, and accessories. The following are some other Web sites you might find helpful:

www.tivoli.com
www.cdpi.com

Services available and telephone numbers listed are subject to change without notice.

Service support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Support Center (1 800 426-7378 in the U.S.) for hardware product assistance covered under the terms of the IBM hardware warranty.

The following services are available during the warranty period:

- Problem determination: Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.
- IBM hardware repair: If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.
- Engineering change management: Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

Be sure to retain your proof of purchase to obtain warranty service.

Please have the following information ready when you call:

- Machine type and model
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your NAS device when you call.

A compatible monitor, keyboard, and mouse are required for many service activities. Before you have the NAS device serviced, be sure to attach these components to the device, either directly or indirectly through a console switch.

The following items are not covered:

- Replacement or use of non-IBM parts or nonwarranted IBM parts

  Note: All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.
- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOSs)
- Installation and maintenance of application programs

Refer to your IBM hardware warranty for a full explanation of IBM's warranty terms.

Before you call for service

Some problems can be solved without outside assistance, by using the online help, by looking in the online or printed documentation that comes with your network-attached storage appliance, or by consulting the support Web page noted in Table 3 on page 41. Also, be sure to read the information in any README files that come with your software.

Your network-attached storage appliance comes with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your appliance also contains information about the diagnostic tests you can perform.

If you receive a POST error code or beep code when you turn on your Network Attached Server appliance, refer to the POST error-message charts in your hardware documentation. If you do not receive a POST error code or beep code, but suspect a hardware problem, refer to the troubleshooting information in your hardware documentation or run the diagnostic tests.

If you suspect a software problem, consult the documentation (including any README files) for the operating system or application program.

Getting customer support and service

Purchasing an IBM network-attached storage appliance entitles you to standard help and support during the warranty period. If you need additional support and services, a wide variety of extended services are available for purchase that address almost any need.

Getting help online: www.ibm.com/storage/support

Be sure to visit the support page that is specific to your hardware, complete with FAQs, parts information, technical hints and tips, technical publications, and downloadable files, if applicable. This page is at: www.ibm.com/storage/support.

Getting help by telephone

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Support Center (1 800 426-7378 in the U.S.) for hardware product assistance covered under the terms of the IBM hardware warranty. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your network-attached storage appliance
- Arranging for service
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased a network-attached storage appliance, you are eligible for IBM up and running support for 90 days after installation. This service provides assistance for:

- Setting up your network-attached storage appliance
- Limited configuration assistance

Please have the following information ready when you call:

- Machine type and model
- Serial numbers of your IBM hardware products, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

In the U.S. and Canada, these services are available 24 hours a day, 7 days a week. In the U.K., these services are available Monday through Friday, from 9:00 a.m. to 6:00 p.m. In all other countries, contact your IBM reseller or IBM marketing representative.[1]

1. Response time will vary depending on the number and complexity of incoming calls.

Appendix D. Purchasing additional services

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

Warranty and repair services

You can upgrade your standard hardware warranty service or extend the service beyond the warranty period.

Warranty upgrades in the U.S. include:

- On-site service to premium on-site service

  If your warranty provides for on-site service, you can upgrade to premium on-site service (4-hour average on-site response, 24 hours a day, 7 days a week).

You also can extend your warranty. Warranty and Repair Services offers a variety of post-warranty maintenance options. Availability of the services varies by product.

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4343.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Appendix E. Notices

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Electronic emission notices

Federal Communications Commission (FCC) Statement

Federal Communications Commission (FCC) Class A Statement

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

Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. Properly shielded and grounded cables and connectors must be used in order to meet FCC emission limits. IBM is not responsible for any radio or television interference 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 digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus as set out in the interference-causing equipment standard entitled *Digital Apparatus*, ICES-003 of Industry Canada.

Avis de Conformité aux normes d'Industrie Canada

Cet appareil numérique respecte les limites de bruits radioélectriques applicables aux appareils numériques de Classe A prescrites dans la norme sur le matériel brouiller : *Appareils Numériques*, NMB-003 édictée par Industrie 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 (EU) conformity statement

This product has been tested and found to comply with the limits for Class A Information Technology Equipment according to 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.

Warning: 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.

Properly shielded and grounded cables and connectors must be used in order to reduce the potential for causing interference to radio and TV communications and to other electrical or electronic equipment. Such cables and connectors are available from IBM authorized dealers. IBM cannot accept responsibility for any interference caused by using other than recommended cables and connectors.

EMC Directive 89/336/EEC Statements

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 non-recommended modification of the product, including the fitting of non-IBM option cards.

FCCA (Text für alle in Deutschland vertriebenen EN 55022 Klasse A Geräte.)

Zulassungsbescheinigung laut dem Deutschen Gesetz über die elektromagnetische Verträglichkeit von Geräten (EMVG) vom 30. August 1995 (bzw. der EMC EG Richlinie 89/336)

Dieses Gerät ist berechtigt, in Übereinstimmung mit dem Deutschen EMVG das EG-Konformitätszeichen - CE - zu führen.

Verantwortlich für die Konformitätserklärung nach Paragraph 5 des EMVG ist Scott Enke, Director, Worldwide Manufacturing Operations, PO Box 12195, 3039 Cornwallis, Research Triangle Park, NC U.S.A. 27709–2195.

Das Gerät erfüllt die Schutzanforderungen nach EN 50082-1 und EN 55022 Klasse A.

EN 55022 Klasse A Geräte müssen mit folgendem Warnhinweis versehen werden:

“Warnung: Dies ist eine Einrichtung der Klasse A. Diese Einrichtung kann im Wohnbereich Funkstörungen verursachen; in diesem Fall kann vom Betreiber verlangt werden, angemessene Maßnahmen durchzuführen und dafür aufzukommen.”

EN 50082-1 Hinweis:

“Wird dieses Gerät in einer industriellen Umgebung betrieben (wie in EN 50082-2 festgelegt), dann kann es dabei eventuell gestört werden. In solch einem Fall ist der Abstand bzw. die Abschirmung zu der industriellen Störquelle zu vergrößern.”

Anmerkung:

Um die Einhaltung des EMVG sicherzustellen, sind die Geräte, wie in den IBM Handbüchern angegeben, zu installieren und zu betreiben.

Chinese Class A warning 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.

Taiwan electrical emission statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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Appendix F. Product warranty information

This chapter contains the warranty period for your product and the IBM Statement of Limited Warranty.

Warranty period

This warranty period varies by country or region.

Machine: Models 201, 226, and 5194-EXP Storage Unit

Country or region	Warranty period
United States, Canada, and Japan	Parts - 3 years, labor - 1 year
All other countries	Parts - 3 years, labor - 3 years

Notes:

- Contact your place of purchase for warranty service information. Some IBM Machines are eligible for on-site warranty service depending on the country or region where service is performed.
- A warranty period of 3 years on parts and 1 year on labor means that IBM will provide warranty service without charge for:
  1. Parts and labor during the first year of the warranty period
  2. Parts only, on an exchange basis, in the second and third years of the warranty period. IBM will charge you for any labor it provides in performance of the repair or replacement.

IBM statement of limited warranty

Refer to the *IBM Statement of Limited Warranty* document that came with your appliance for detailed information about the country-specific warranty information.

Appendix G. Safety notices

The following sections describe the safety and environmental items you must consider for an IBM NAS Appliance.

Basic safety information

DANGER

Before you begin to install this product, read the safety information in *Caution: Safety Information–Read This First*, SD21-0030. This booklet describes safe procedures for cabling and plugging in electrical equipment.

Gevarr: Voodrat u begint met de installatie van dit produkt, moet u eerst de veiligheidsinstructies lezen in de brochure *PAS OP! Veiligheidsinstructies–Lees dit eerst*, SD21-0030. Hierin wordt beschreven hoe u electrische apparatuur op een veilige manier moet bekabelen en aansluiten

Danger: Avant de procéder à l'nstallation de ce produit, lisez d'abord les consignes de sécurité dans la brochure *ATTENTION: Consignes de sécurité–A lire au préalable*, SD21-0030. Cette brochure décrit les procédures pour câbler et connecter les appareils électriques en toute sécurité.

Perigo: Antes de começar a instaler deste produto, leia as informações de segurança contidas em *Cuidado: Informações Sobre Segurança–Leia Primeiro*, SD21-0030. Esse folheto descreve procedimentos de segurança para a instalação de cabos e conexões em equipamentos elétricos.

危險：安裝本產品之前， 請先閱讀 "Caution: Safety Information--Read This First" SD21-0030 手冊中所提供的安全注意事項。 這本手冊將會說明使用電器設備的纜線及電源的安全程序。

Opasnost: Prije nego sto počnete sa instalacijom produkta, pročitajte naputak o pravilima o sigurnom rukovanju u Upozorenje: Pravila o sigurnom rukovanju - Prvo pročitaj ovo, SD21-0030. Ovaj privitak opisuje sigurnosne postupke za priključrivanje kabela i priključivanje na električno napajanje.

Upozornění: než zahájíte instalaci tohoto produktu, přečtěte si nejprve bezpečnostní informace v pokynech „Bezpečnostní informace“ č. 21-0030. Tato brožurka popisuje bezpečnostní opatření pro kabeláž a zapojení elektrického zařízení.

 **Fare!** Før du installerer dette produkt, skal du læse sikkerhedsforskrifterne i *NB: Sikkerhedsforskrifter – Læs dette først* SD21-0030. Vejledningen beskriver den fremgangsmåde, du skal bruge ved tilslutning af kabler og udstyr.

 **Gevarr:** Voordat u begint met het installeren van dit produkt, dient u eerst de veiligheidsrichtlijnen te lezen die zijn vermeld in de publikatie *Caution: Safety Information - Read This First*, SD21-0030. In dit boekje vindt u veilige procedures voor het aansluiten van elektrische appratuur.

 **VARRA:** Ennen kuin aloitat tämän tuotteen asennuksen, lue julkaisussa *Varoitus: Turvaohjeet–Lue tämä ensin*, SD21-0030, olevat turvaohjeet. Tässä kirjasessa on ohjeet siitä, mitensähkölaitteet kaapeloidaan ja kytketään turvallisesti.

 **Danger :** Avant d’installer le présent produit, consultez le livret *Attention : Informations pour la sécurité–Lisez-moi d’abord*, SD21-0030, qui décrit les procédures à respecter pour effectuer les opérations de câblage et brancher les équipments électriques en toute sécurité.

 **Vorsicht:** Bevor mit der Installation des Produktes begonnen wird, die Sicherheitshinweise in *Achtung: Sicherheitsinformationen–Bitte zuerst lesen*. IBM Form SD21-0030. Diese Veröffentilchung beschreibt die Sicherheitsvorkehrungen für das Verkabien und Anschließen elektrischer Geräte.

Κίνδυνος: Πριν ξεκινήσετε την εγκατάσταση αυτού του προϊόντος, διαβάστε τις πληροφορίες ασφάλειας στο φυλλάδιο *Caution: Safety Information-Read this first,* SD21-0030. Στο φυλλάδιο αυτό περιγράφονται οι ασφαλείς διαδικασίες για την καλωδίωση των ηλεκτρικών συσκευών και τη σύνδεσή τους στην πρίζα.

Vigyázat: Mielôtt megkezdi a berendezés üzembe helyezését, olvassa el a *Caution: Safety Information–Read This First*, SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, miyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozásakor illetve csatlakoztatásakor.

Pericolo: prima di iniziare l'installazione di questo prodotto, leggere le informazioni relatie alla sicurezza riportate nell'opuscolo *Attenzione: Informazioni di sicurezza–Prime informazioni da leggere* in cui sono descritte le procedure per il cablaggio ed il collegamento di apparecchiature elettriche.

危険： 導入作業を開始する前に、安全に関する
小冊子SD21-0030 の「最初にお読みください」
(Read This First)の項をお読みください。
この小冊子は、電気機器の安全な配線と接続の
手順について説明しています。

위험: 이 제품을 설치하기 전에 반드시
"주의: 안전 정보-시작하기 전에"
(SD21-0030) 에 있는 안전 정보를
읽으십시오.

ОПАСНОСТ
Пред да почнете да го инсталирате овој продукт, прочитајте ја информацијата за безбедност:
"Предупредување: Информација за безбедност: Прочитајте го прво ова", SD21-0030.
Оваа брошура опишува безбедносни процедури за каблирање и вклучување на електрична опрема.

Fare: Før du begynner å installere dette produktet, må du lese sikkerhetsinformasjonen i *Advarsel: Sikkerhetsinformasjon – Les dette forst*, SD21-0030 som beskriver sikkerhetsrutinene for kabling og tilkobling av elektrisk utstyr.

Uwaga:
Przed rozpoczęciem instalacji produktu należy zapoznać się z instrukcją:
"Caution: Safety Information - Read This First", SD21-0030.
Zawiera ona warunki bezpieczeństwa przy podłączaniu do sieci elektrycznej
i eksploatacji.

Perigo: Antes de iniciar a instalação deste produto, leia as informações de segurança *Cuidado: Informações de Segurança–Leia Primeiro*, SD21-0030. Este documento descreve como efectuar, de um modo seguro, as ligações eléctricas dos equipamentos.

ОСТОРОЖНО: Прежде чем инсталлировать этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочесть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.

Nebezpečenstvo: Pred inštaláciou výrobku si prečítajte
bezpečnosté predpisy v
Výstraha: Bezpeč osté predpisy - Prečítaj ako prvé,
SD21 0030. V tejto brožúrke sú opísané bezpečnosté
postupy pre pripojenie elektrických zariadení.

Pozor: Preden zaènete z instalacijo tega produkta
preberite poglavje: 'Opozorilo: Informacije
o varnem rokovanju-preberi pred uporabo,"
SD21-0030. To poglavje opisuje pravilne
postopke za kabliranje,

Peligro: Antes de empezar a instalar este producto, lea la información de seguridad en *Atención: Información de Seguridad–Lea Esto Primero*, SD21-0030. Este documento describe los procedimientos de seguridad para cablear y enchufar equipos eléctricos.

Varning — livsfara: Innan du börjar installera den här produkten bör du läsa säkerhetsinformationen i dokumentet *Varning: Säkerhetsforeskrifter – Läs detta först*, SD21-0030. Där beskrivs hur du på ett säkert satt ansluter elektrisk utrustning.

危險：

開始安裝此產品之前，請先閱讀安全資訊。

注意：

請先閱讀 - 安全資訊 SD21-0030

此冊子說明插接電器設備之電纜線的安全程序。

General safety

Follow these rules to ensure general safety:

- Observe good housekeeping in the area of the machines during and after maintenance.
- When lifting any heavy object:
  1. Ensure you can stand safely without slipping.
  2. Distribute the weight of the object equally between your feet.
  3. Use a slow lifting force. Never move suddenly or twist when you attempt to lift.
  4. Lift by standing or by pushing up with your leg muscles; this action removes the strain from the muscles in your back. *Do not attempt to lift any objects that weigh more than 16 kg (35 lb.) or objects that you think are too heavy for you.*
- Do not perform any action that causes hazards to the customer, or that makes the equipment unsafe.
- Before you start the machine, ensure that other service representatives and the customer's personnel are not in a hazardous position.
- Place removed covers and other parts in a safe place, away from all personnel, while you are servicing the machine.
- Keep your tool case away from walk areas so that other people will not trip over it.
- Do not wear loose clothing that can be trapped in the moving parts of a machine. Ensure that your sleeves are fastened or rolled up above your elbows. If your hair is long, fasten it.
- Insert the ends of your necktie or scarf inside clothing or fasten it with a nonconductive clip, approximately 8 centimeters (3 inches) from the end.

- Do not wear jewelry, chains, metal-frame eyeglasses, or metal fasteners for your clothing.

  Remember: Metal objects are good electrical conductors.
- Wear safety glasses when you are: hammering, drilling soldering, cutting wire, attaching springs, using solvents, or working in any other conditions that might be hazardous to your eyes.
- After service, reinstall all safety shields, guards, labels, and ground wires. Replace any safety device that is worn or defective.
- Reinstall all covers correctly before returning the machine to the customer.

Electrical safety

Caution:
Electrical current from power, telephone, and communication cables can be hazardous. To avoid personal injury or equipment damage, disconnect the attached power cords, telecommunication systems, networks, and modems before you open the appliance covers, unless instructed otherwise in the installation and configuration procedures.

Observe the following rules when working on electrical equipment.

Important: Use only approved tools and test equipment. Some hand tools have handles covered with a soft material that does not insulate you when working with live electrical currents.

Many customers have, near their equipment, rubber floor mats that contain small conductive fibers to decrease electrostatic discharges. Do not use this type of mat to protect yourself from electrical shock.

- Find the room emergency power-off (EPO) switch, disconnecting switch, or electrical outlet. If an electrical accident occurs, you can then operate the switch or unplug the power cord quickly.
- Do not work alone under hazardous conditions or near equipment that has hazardous voltages.
- Disconnect all power before:
  - Performing a mechanical inspection
  - Working near power supplies
  - Removing or installing main units
- Before you start to work on the machine, unplug the power cord. If you cannot unplug it, ask the customer to power-off the wall box that supplies power to the machine and to lock the wall box in the off position.
- If you need to work on a machine that has exposed electrical circuits, observe the following precautions:
  - Ensure that another person, familiar with the power-off controls, is near you.

    Remember: Another person must be there to switch off the power, if necessary.
  - Use only one hand when working with powered-on electrical equipment; keep the other hand in your pocket or behind your back.

Remember: There must be a complete circuit to cause electrical shock. By observing the above rule, you may prevent a current from passing through your body.

- When using testers, set the controls correctly and use the approved probe leads and accessories for that tester.
- Stand on suitable rubber mats (obtained locally, if necessary) to insulate you from grounds such as metal floor strips and machine frames.

Observe the special safety precautions when you work with very high voltages; these instructions are in the safety sections of maintenance information. Use extreme care when measuring high voltages.

- Regularly inspect and maintain your electrical hand tools for safe operational condition.
- Do not use worn or broken tools and testers.
- *Never assume* that power has been disconnected from a circuit. First, *check* that it has been powered-off.
- Always look carefully for possible hazards in your work area. Examples of these hazards are moist floors, nongrounded power extension cables, power surges, and missing safety grounds.
- Do not touch live electrical circuits with the reflective surface of a plastic dental mirror. The surface is conductive; such touching can cause personal injury and machine damage.
- Do not service the following parts with the power on when they are removed from their normal operating places in a machine:
  - Power supply units
  - Pumps
  - Blowers and fans
  - Motor generators
  - Similar units

This practice ensures correct grounding of the units.

- If an electrical accident occurs:
  - Use caution; do not become a victim yourself.
  - Switch off power.
  - Send another person to get medical aid.

Safety inspection guide

The intent of this inspection guide is to assist you in identifying potentially unsafe conditions on these products. Each machine, as it was designed and built, had required safety items installed to protect users and service personnel from injury. This guide addresses only those items. However, good judgment should be used to identify potential safety hazards due to attachment of non-IBM features or options not covered by this inspection guide.

If any unsafe conditions are present, you must determine how serious the apparent hazard could be and whether you can continue without first correcting the problem.

Consider these conditions and the safety hazards they present:

- Electrical hazards, especially primary power (primary voltage on the frame can cause serious or fatal electrical shock).
- Explosive hazards, such as a damaged CRT face or bulging capacitor
- Mechanical hazards, such as loose or missing hardware

The guide consists of a series of steps presented in a checklist. Begin the checks with the power off, and the power cord disconnected.

Checklist:

1. Check exterior covers for damage (loose, broken, or sharp edges).
2. Power-off the computer. Disconnect the power cord.
3. Check the power cord for:
   a. A third-wire ground connector in good condition. Use a meter to measure third-wire ground continuity for 0.1 ohm or less between the external ground pin and frame ground.
   b. The power cord should be the appropriate type as specified in the parts listings.
   c. Insulation must not be frayed or worn.
4. Remove the cover.
5. Check for any obvious non-IBM alterations. Use good judgment as to the safety of any non-IBM alterations.
6. Check inside the unit for any obvious unsafe conditions, such as metal filings, contamination, water or other liquids, or signs of fire or smoke damage.
7. Check for worn, frayed, or pinched cables.
8. Check that the power-supply cover fasteners (screws or rivets) have not been removed or tampered with.

Handling electrostatic discharge-sensitive devices

Any computer part containing transistors or integrated circuits (ICs) should be considered sensitive to electrostatic discharge (ESD). ESD damage can occur when there is a difference in charge between objects. Protect against ESD damage by equalizing the charge so that the machine, the part, the work mat, and the person handling the part are all at the same charge.

Notes:

1. Use product-specific ESD procedures when they exceed the requirements noted here.
2. Make sure that the ESD protective devices you use have been certified (ISO 9000) as fully effective.

When handling ESD-sensitive parts:

- Keep the parts in protective packages until they are inserted into the product.
- Avoid contact with other people.
- Wear a grounded wrist strap against your skin to eliminate static on your body.
- Prevent the part from touching your clothing. Most clothing is insulative and retains a charge even when you are wearing a wrist strap.
- Use the black side of a grounded work mat to provide a static-free work surface. The mat is especially useful when handling ESD-sensitive devices.
- Select a grounding system, such as those listed below, to provide protection that meets the specific service requirement.

  Note: The use of a grounding system is desirable but not required to protect against ESD damage.

  – Attach the ESD ground clip to any frame ground, ground braid, or green-wire ground.
  – Use an ESD common ground or reference point when working on a double-insulated or battery-operated system. You can use coax or connector-outside shells on these systems.
  – Use the round ground-prong of the AC plug on AC-operated computers.

Grounding (earthing) requirements

Electrical grounding (earthing) of the computer is required for operator safety and correct system function. Proper grounding of the electrical outlet can be verified by a certified electrician.

Glossary of terms and abbreviations

This glossary includes terms and definitions from:

- *The American National Standard Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies can be purchased from the American National Standards Institute, 1430 Broadway, New York, New York 10018. Definitions are identified by the symbol (A) after the definition.
- The *ANSI/EIA Standard - 440A: Fiber Optic Terminology*, copyright 1989 by the Electronics Industries Association (EIA). Copies can be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue N.W., Washington, D.C. 20006. Definitions are identified by the symbol (E) after the definition.
- The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). Definitions of published parts of this vocabulary are identified by the symbol (I) after the definition; definitions taken from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T) after the definition, indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

Numerics

10BASE2. The IEEE 802.3 Ethernet standard that supports a transmission rate of 10 Mbps using RG 58 A/U and RG 58 C/U coaxial cable and BNC connectors. 10BASE2 is sometimes called thin Ethernet or thinnet.

10BASE5. The IEEE 802.3 Ethernet standard that supports a transmission rate of 10 Mbps using a 50-ohm coaxial cable with Type N connectors over a distance of up to 500 m (1640 ft) without using repeaters. 10BASE5 is sometimes called thick Ethernet or thicknet.

10BASE-FL. The IEEE 802.3 Ethernet standard that supports a transmission rate of 10 Mbps using optical fiber.

10BASE-T. The IEEE 802.3 Ethernet standard that supports a transmission rate of 10 Mbps using two twisted-pair wires (Category 3 telephone wiring). 10BASE-T is the most widely deployed 10-Mbps Ethernet transmission protocol in use today.

100BASE-T. The IEEE 802.3 Ethernet standard that supports a transmission rate of 100 Mbps using 2 twisted-pair wires (Category 5 telephone wiring).

A

access control. In computer security, the process of ensuring that the resources of a computer system can be accessed only by authorized users in authorized ways.

access control list (ACL). (1) In computer security, a collection of all access rights for one object. (2) In computer security, a list associated with an object that identifies all the subjects that can access the object and their access rights; for example, a list associated with a file that identifies users who can access the file and identifies their access rights to that file.

accessory. An IBM designation for a separately orderable part that (a) has no type number, (b) is for purchase only, and (c) does not receive normal IBM maintenance.

active-backup. A type of bond group that provides high availability. Two or more ports are combined under a logical bond group with one link active and the other link or links left idle. The idle links are ready to take over in the event that the currently active link fails. See bond group.

active dispatcher node. The engine within a load-balancing group that functions as the load balancer for that group. Because each NAS engine can have multiple physical and bonded interfaces, there can be more than one load-balancing engine per set of engines. Each load-balancing engine acts as an active backup for another load-balancing engine within that set. Alternatively, there can be only one active load-balancing engine per set of engines and one passive backup (standby) load-balancing engine.

actual data transfer rate. The average number of bits, characters, or blocks per unit of time transferred from a data source and received by a data sink.

adapter address. The hexadecimal digits that identify an adapter.

adaptive cut-through switching. A mode of operation for LAN switches in which they will automatically alternate between cut-through switching and store-and-forward switching depending on user-configurable, per port, error-rate thresholds.

advertise. To pass routing reachability information along from one router to another.

all-routes broadcast frame. A frame that has bits in the routing information field set to indicate that the frame is to be sent to all LAN segments in the network (across all bridges, even if multiple paths allow multiple copies of the frame to arrive at some LAN segments). The destination address is not examined and plays no role in bridge routing.

all-stations broadcast frame. A frame whose destination address bits are set to all ones. All stations on any LAN segment on which the frame appears will copy it. The routing information, not the destination address, determines which LAN segments the frame appears on. All-stations broadcasting is independent of all-routes broadcasting; the two can be done simultaneously or one at a time.

alternate adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses alternate (not standard or default) mapping between adapter-shared RAM, adapter ROM, and designated computer memory segments. The alternate adapter is usually designated as adapter 1 in configuration parameters. Contrast with primary adapter.

alternate memory mapping. The mapping between adapter-shared RAM, adapter ROM, and the designated computer memory segments for an alternate network adapter.

assigned disk. A disk that is mapped to a logical drive.

asynchronous. A class of data transmission service whereby all requests for service contend for a pool of dynamically allocated ring bandwidth and response time.

asynchronous data transfer. A physical transfer of data to or from a device that occurs without a regular or predictable time relationship following execution of an I/O request. Contrast with synchronous data transfer.

asynchronous transfer mode (ATM). A transfer mode in which the information is organized into cells; it is asynchronous in the sense that the recurrence of cells containing information from an individual user is not necessarily periodic. ATM is specified in international standards such as ATM Forum UNI 3.1.

asynchronous transmission. A method of transmission in which the time intervals between characters do not have to be equal. Start and stop bits are added to coordinate the transfer of characters.

ATM. See asynchronous transfer mode.

attach. To make a device a part of a network logically. Not to be confused with connect, which implies physically connecting a device to a network. Contrast with connect.

attachment. A port or a pair of ports, optionally including an associated optical bypass, that are managed as a functional unit. A dual attachment includes two ports: a port A, and a port B. A single attachment includes a Port S.

attachment feature. (1) The circuitry by which some host processors or controllers are connected to a LAN access unit or connection point. (2) A feature that can be added to enhance the capability, storage capacity, or performance of a product, but is not essential for its basic work; for example, an adapter that allows a device to attach to a network.

attachment unit interface (AUI). Also known as thick Ethernet, thicknet or 10BASE5. This type of Ethernet connector has a 15-pin D type connector.

attention (ATTN). An occurrence external to an operation that could cause an interruption of the operation.

AUI. See attachment unit interface.

authentication. In computer security, verification of the identity of a user or the user's eligibility to access an object.

auto-removal. The removal of a device from data-passing activity without human intervention. This action is accomplished by the adapter in the device, and can be initiated by a network management program.

B

balun. A transformer used to connect balanced cables, such as twisted-pair cables, to unbalanced cables, such as coaxial cables, by matching the electrical characteristics of the cables.

bandwidth aggregation. The ability to establish more than one communication channel per connection.

bandwidth augmentation. The ability to add another communication channel to an already existing communication channel.

bandwidth-distance product. The parameter specified for bulk fiber that defines the distance that a signal at a defined frequency can be transmitted with a specified loss, usually half the power at zero frequency. Use of a fiber with a bandwidth-distance product of 500 MHz-km would support 250 MHz for a distance of 2 km.

baseband LAN. A local area network in which data are encoded and transmitted without modulation of a carrier (T).

Basic Input/Output System. The personal computer code that controls basic hardware operations, such as interactions with diskette drives, hard disk drives, and the keyboard.

baud. (1) A unit of signaling speed equal to the number of discrete conditions or signal events per second; for example, one baud equals one-half dot cycle per second in Morse code, one bit per second in a train of binary signals, and one 3-bit value per second in a train of signals each of which can assume one of eight different states (A). Contrast with bits per second. (2) In asynchronous transmission, the unit of modulation rate corresponding to one unit interval per second; that is, if the duration of the unit interval is 20 milliseconds, the modulation rate is 50 baud.

BIOS. See Basic Input/Output System.

bit-time. (1) The time required to transmit 1 bit on the network. For example, the IBM PC Network bit-time equals 500 nanoseconds (ns). (2) The reciprocal of the line data rate (or network data transfer rate).

bits per second (bps). The rate at which bits are transmitted per second. Contrast with baud.

block delay time. The time delay permitted for received frames to be assembled into blocks for retransmission.

bond group. A logical collection of two or more physical ports (on a per engine basis only) that becomes one interface on the network. You can create two kinds of bond groups in the NAS appliance: aggregated links (see link aggregration) and active-backup.

bonded interface. See bond group.

bonding. The act of combining two or more physical ports to create one logical network interface with one associated IP address. Bonding can improve performance by either increasing bandwidth (see link aggregation) or providing port backup (see active-backup).

bootstrap. (1) A sequence of instructions whose execution causes additional instructions to be loaded and executed until the complete computer program is in storage (T). (2) A technique or device designed to bring itself into a desired state by means of its own action, for example, a machine routine whose first few instructions are sufficient to bring the rest of itself into the computer from an input device (A).

bps. See bits per second.

broadcast frame. A frame that is simultaneously transmitted to more than one destination. A broadcast frame is forwarded by all bridges, unless otherwise restricted.

broadcast topology. A network topology in which all attaching devices are capable of receiving a signal transmitted by any other attaching device on the network.

buffer storage. (1) A special-purpose storage or storage area allowing, through temporary storage, the data transfer between two functional units having different transfer characteristics. A buffer storage is used between non-synchronized devices, or where one is serial and the other is parallel or between those having different transfer rates. Synonymous with buffer (T). (2) In word processing, a temporary storage in which text is held for processing or communication (T).

building cable. The permanently installed cable within a building that interconnects offices to wiring closets, wiring closets to wiring closets, and wiring closets to computer rooms of building entrances.

building entrance. The entry point in a building where external communication cables are interconnected with internal building cables.

C

cache. A high-speed buffer storage that contains frequently accessed instructions and data to reduce access time.

cascade. To connect in a series or in a succession of stages so that each stage derives from or acts upon the product of the preceding stage.

catenet. A network in which hosts are connected to networks and the networks are interconnected by gateways. The Internet is an example of a catenet.

CDDI. See Copper Distributed Data Interface.

Challenge Handshake Authorization Protocol (CHAP). A password protection protocol that describes how to authenticate incoming data calls. The password is encrypted over the access line.

CHAP. See Challenge Handshake Authorization Protocol.

CIFS. See Windows networking.

client. A computer system or process that requests access to the data, services, or resources of a server (another computer system or process). Multiple clients may share access to a common server. Synonym for requester.

client-server model. A common way to describe network services and the model user processes (programs) of those services.

closed network. Synonym for closed path.

closed path. A network in which all of the cable paths and wiring closets are directly or indirectly connected. Synonymous with closed network.

cluster. In high-availability cluster multiprocessing (HACMP), a set of independent systems (called nodes) that are organized into a network for the purpose of sharing resources and communicating with each other. .

collision avoidance. In carrier sense multiple access with collision avoidance (CSMA/CA), the action of sending a jam signal and waiting for a variable time before transmitting data, to avoid two or more simultaneous transmissions.

Common Internet File System (CIFS). A protocol that enables collaboration on the Internet by defining a remote file-access protocol that is compatible with the way applications already share data on local disks and network file servers (MS).

configuration list. In a LAN, a list of all of the names and addresses of stations attached to a LAN segment.

connect. In a LAN, to physically join a cable from a station to an access unit or network connection point. Contrast with attach.

connection-oriented. The communication process that proceeds through three well-defined phases: connection establishment, data transfer, and connection release. Examples are: X.25, Internet TCP, and ordinary telephone calls.

connection-oriented network. A network that requires a setup procedure to be executed to establish an information channel between two logical nodes before they can interchange information.

control port. An alternate port that you can use to access the configuration when the data ports are not available.

control unit. A processor electronics assembly in a storage controller that exposes LUNs to the storage network and connects internally to the storage controllers' disk drives. A storage controller can have 1 to *n*, but typically has one for each path group.

Copper Distributed Data Interface (CDDI). A proposed ANSI standard that defines a dual counter-rotating ring which operates at a rate of 100 Mbps over Category 5 copper wire.

coprocessor. A secondary processor used to speed up operations by handling some of the workload of the main CPU.

CRC. See cyclic redundancy check.

CRU. See customer-replaceable unit.

customer-replaceable unit (CRU). An assembly or part that a customer can replace in its entirety when any of its components fail. Contrast with field-replaceable unit (FRU).

cyclic redundancy check (CRC). (1) A redundancy check in which the check key is generated by a cyclic algorithm (T). (2) A system of error checking performed at both the sending and receiving station after a block-check character has been accumulated.

D

daemon. A program that runs unattended to perform a standard service. Some daemons are triggered automatically to perform their task; others operate periodically.

data port. Ethernet ports used for storage-traffic and configuration purposes.

DASD queue. A queue that resides on a direct access storage device (DASD).

data store. An abstraction for a repository where data is kept, independent of underlying implementation. Data stores can be block based (a LUN or set of LUNs); file based (a local or remote file system); or relational (a database). Since IBM TotalStorage™ NAS family appliances are file based, all of their datastores must be kept in file systems, directories, or files which are kept on LUNs.

data bus. A bus used to communicate data internally and externally to and from a processing unit, storage, and peripheral devices (A).

data integrity. (1) The condition that exists as long as accidental or intentional destruction, alteration, or loss of data does not occur (T). (2) Preservation of data for its intended use.

DDP. See distributed data processing.

default route. A route, in the routing table, that is used when no other route is specified or appropriate.

device address. (1) In data communication, the identification of any device to which data can be sent or from which data can be received. (2) The first subchannel address recognized by a channel-attached device.

device identifier (ID). An 8-bit identifier that uniquely identifies a physical I/O device.

device parity protection. A function that protects data stored on a disk unit subsystem from being lost because of the failure of a single disk unit in the disk unit subsystem. When a disk unit subsystem has device parity protection and one of the disk units in the subsystem fails, the system continues to run. The disk unit subsystem reconstructs the data after the disk unit in the subsystem is repaired or replaced. See RAID and RAID-5.

DHCP. See Dynamic Host Configuration Protocol.

diagnostic diskette. A diskette containing diagnostic modules or tests used by computer users and service personnel to diagnose hardware problems.

direct access storage device (DASD). A mass-storage medium on which a computer stores data. Contrast with random access memory (RAM).

Direct Memory Access (DMA). A technique in which an adapter bypasses a computer's CPU, and handles the transfer of data between itself and the system's memory directly.

distributed data processing (DDP). Synonym for distributed processing.

DLR. See dynamic link routine.

DMA. See Direct Memory Access.

DNS. See domain name system.

Domain Name System (DNS). In the Internet suite of protocols, the distributed database system used to map domain names to IP addresses.

drive bay. A receptacle into which you insert a disk drive module in an appliance. The bays are in storage units that can be physically located in a separate rack from the appliance.

dual inline memory module (DIMM). A small circuit board with memory-integrated circuits containing signal and power pins on both sides of the board.

Dynamic Host Configuration Protocol (DHCP). A protocol defined by the Internet Engineering Task Force (IETF) that is used for dynamically assigning IP addresses to computers in a network.

dynamic link routine (DLR). A program or routine that can be loaded by an application or as part of a program.

E

EIA. See Electronic Industries Association.

EISA. See Extended Industry Standard Architecture.

ELAN. See emulated LAN.

electromagnetic interference. A disturbance in the transmission of data on a network resulting from the magnetism created by a current of electricity.

Electronic Industries Association (EIA). An organization of electronics manufacturers that advances the technological growth of the industry, represents the views of its members, and develops industry standards.

Electronic Industries Association (EIA) unit. A unit of measure equal to 4.45 cm (1.75 in).

electrostatic discharge (ESD). An undesirable discharge of static electricity that can damage equipment and degrade electrical circuitry.

EMC. Electromagnetic compatibility.

emulate. To imitate one system with another, primarily by hardware, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system (A).

emulated LAN (ELAN). A specific implementation of a virtual LAN, as it relates to LAN Emulation in ATM networks. An ELAN consists of one or more LAN Emulation clients (LECs) that share the same LAN Emulation Server and Broadcast and Unknown Server (LES/BUS). LECs gain membership in an ELAN based on configurable policies. Like devices on traditional LANs, each ELAN member has a MAC address and can use the LES/BUS to send unicast and broadcast packets to other members based on MAC addresses.

emulation. (1) The use of a data processing system to imitate another data processing system, so that the imitating system accepts the same data, executes the same programs, and achieves the same results as the imitated system. Emulation is usually achieved by means of hardware or firmware (T). (2) The use of programming techniques and special machine features to permit a computing system to execute programs written for another system.

engine. The unit that contains the processors that respond to requests for data from clients. This is where the operating software for the TotalStorage NAS 200 appliance resides.

equivalent paths. A collection of paths to the storage device. The paths have no switchover time penalty when changing from one path group to another while accessing the storage device.

error. A discrepancy between a computed, observed, or measured value or condition and the true, specified, or theoretically correct value or condition (A) (I).

ESD. See electrostatic discharge.

ESM. See environmental service monitor.

Ethernet. A standard protocol for a 10-Mbps baseband local area network (LAN) that allows multiple access and handles contention by using Carrier Sense Multiple Access with Collision Detection (CSMA/CD) as the access method.

Ethernet network. A baseband LAN with a bus topology in which messages are broadcast on a coaxial cable using a carrier sense multiple access/collision detection (CSMA/CD) transmission method.

event message. Synonym for call-progress event message.

executable statement. A statement that specifies one or more actions to be taken by a computer program at execution time; for example, instructions for calculations to be performed, conditions to be tested, flow of control to be altered (T).

expansion slot. In personal-computer systems, one of several receptacles in the rear panel of the system unit into which a user can install an adapter.

extended configuration services. Configuration services that reside outside a CP processor. Extended configuration services keeps a local cache of transmission group locations. Extended configuration services do not handle activation and deactivation. See configuration services.

Extended Industry Standard Architecture (EISA). The PC bus standard that extends the AT bus (ISA bus) to 32 bits and provides busmastering. It was announced in 1988 as a 32-bit alternative to the Micro Channel that would preserve investment in existing boards. PC and AT cards (ISA cards) can plug into an EISA bus.

F

failback. The restoration of the appliance to its initial configuration after detection and repair of a failed network or appliance component.

failover. (1) The automatic recovery of resources in the event of a network outage, or failure of the hardware or software. (2) A cluster event where the primary database server or application server switches over to a backup system due to the failure of the primary server.

failover group. A type of virtual network interface. It is a collection of physical and bonded interfaces that provide backup for each other. Each member of the failover group must have the same front-end and backend connectivity.

failure. (1) The termination of the ability of a functional unit to perform its required function. (2) An uncorrected hardware error. Failures are either recoverable or not recoverable by the software or the operator. The operator is always notified when failures occur. Contrast with error.

Fast Ethernet. An Ethernet standard that provides a data rate of 100 Mbps.

feature code. A code used by IBM to process hardware and software orders.

Federal Communications Commission (FCC). A board of commissioners appointed by the President under the Communications Act of 1934, having the power to regulate all interstate and foreign communications by wire and radio originating in the United States.

fiber optic cable. See optical cable.

Fiber Optic Inter-Repeater Link (FOIRL). An IEEE standard for fiber optic Ethernet.

FIC. See File Image Capture.

field-replaceable unit (FRU). An assembly that is replaced in its entirety when any one of its components fails. In some cases, a field replaceable unit may contain other field replaceable units. Contrast with customer-replaceable unit (CRU).

File Image Capture (FIC). Function that takes a file system clone and a read-only copy of the certain read-write (active) file system. File Image Capture reflects the state of the file system at the time it was created.

File Image Restore. Function that allows a file system to revert to the state and contents of a previous File Image Capture. This function can be used to recover a corrupted file system.

File Transfer Protocol (FTP). In the Internet suite of protocols, an application layer protocol that uses TCP and Telnet services to transfer bulk-data files between machines or hosts.

FIR. See File Image Restore

firewall. A logical barrier around systems in a network. A firewall consists of hardware, software, and a security policy that control the access and flow of information between secure or trusted systems and nonsecure or untrusted systems.

fixed-length record. A record having the same length as all other records with which it is logically or physically associated.

flash memory. A memory chip that holds its content without power but must be erased in fixed blocks rather than single bytes.

floating virtual connection (FVC). The ability to resume a virtual connection on a port other than the port connection on which the original virtual connection was established.

frame alignment error. An error in a frame, indicated by a frame check sequence (FCS) indicator. When excessive or missing bits occur during the reception of a frame, the frame is misaligned.

free disk. A physical disk that is not assigned as a hot-spare, as a standby hot-spare, or to a logical drive.

FRU. See field-replaceable unit.

FTP. See File Transfer Protocol.

FVC. See floating virtual connection.

G

gateway. A device that acts as a router, but occurs at the transport layer, to transfer packets between networks.

group definition. A list of directory numbers.

group definition ID. The identifier of a group definition.

group SAP. A single address assigned to a group of service access points (SAPs).

group separator (GS) character. The information separator intended to identify a logical boundary between groups.

H

hard failure. An error condition on a network that requires that the network be reconfigured or that the source of the error be removed before the network can resume reliable operation. Synonym for hard error.

hertz (Hz). A unit of frequency equal to one cycle per second.

Note: In the United States, line frequency is 60 Hz or a change in voltage polarity 120 times per second; in Europe, line frequency is 50 Hz or a change in voltage polarity 100 times per second.

higher level. In the hierarchical structure of a data station, the conceptual level of control or processing logic, above the data link level that determines the performance of data link level functions such as device control, buffer allocation, and station management.

host. (1) In TCP/IP, any system that has at least one internet address associated with it. A host with multiple network interfaces may have multiple internet addresses associated with it. The host can be (a) a client, (b) a server, or (c) both a client and a server simultaneously. (2) In Fibre Channel, any system that has at least one worldwide name associated with it. A host with multiple network interfaces may have multiple worldwide names associated with it.

host application program. An application program processed in the host computer.

host attachment. A mode of SNA communication in which the processor acts as a secondary SNA device.

host computer. (1) In a computer network, a computer that usually performs network control functions and provides end users with services such as computation and database access (T). (2) The primary or controlling computer in a multiple computer installation or network. (3) A computer used to prepare programs for use on another computer or on another data processing system; for example, a computer used to compile, link edit, or test programs to be used on another system. (4) Synonym for host processor.

hot-spare disk. A physical disk that is automatically mapped to a logical drive if one of the logical drive's disks goes offline.

HTTP. See Hypertext Transfer Protocol.

Hypertext Transfer Protocol. In the Internet suite of protocols, the protocol that is used to transfer and display hypertext documents.

I

IBM Disk Operating System (DOS). A disk operating system based on MS-DOS that operates with all IBM-compatible personal computers.

IETF. See Internet Engineering Task Force.

iLUN. iSCSI client logical-unit number.

initial microcode load (IML). The action of loading the operational microcode.

initialize. In a LAN, to prepare the adapter (and adapter support code, if used) for use by an application program.

inoperative. The condition of a resource that has been active, but is no longer active. The resource could have failed or could have been suspended while a reactivate command was being processed.

interference. (1) The prevention of clear reception of broadcast signals. (2) The distorted portion of a received signal. (3) In optics, the interaction of two or more beams of coherent or partially coherent light.

Internet Engineering Task Force (IETF). The task force of the Internet Architecture Board (IAB) that is responsible for solving the short-term engineering needs of the Internet. The IETF consists of numerous working groups, each focused on a particular problem. Internet standards are typically developed or reviewed by individual working groups before they can become standards.

Internet Protocol (IP). A protocol that routes data through a network or interconnected networks. IP acts as an intermediary between the higher protocol layers and the physical network.

Internetwork Packet Exchange (IPX). The routing protocol used to connect Novell's servers or any workstation or router that implements IPX with other workstations. Although similar to TCP/IP, it uses different packet formats and terminology.

interrupt level. The means of identifying the source of an interrupt, the function requested by an interrupt, or the code or feature that provides a function or service.

IOPS. Input/output operations.

IP. See Internet Protocol.

IPX. Internetwork Packet Exchange

IRQ. Interrupt request.

iSCSI. A technology that enables the SCSI transport protocol over an IP network by connecting clients (initiators) and servers to storage.

iSCSI client. A device that creates and sends SCSI commands to the target IBM IP Storage appliance.

iSCSI client logical-unit number (iLUN). A unique number that is assigned to each VLUN. The iLUN for a single client starts at zero and increments sequentially.

J

jumper. A connector between two pins on a network adapter that enables or disables an adapter option, feature, or parameter value.

jumper cable. Synonym for patch cable.

K

Kerberos. Pertaining to the security system of the Massachusetts Institute of Technology's Project Athena. It uses symmetric key cryptography to provide security services to users in a network.

L

LAN. See local area network.

local area network. A network in which a set of devices are connected to one another for communication and that can be connected to a larger network.

LAN emulation client (LEC). A LAN emulation component that represents users of the emulated LAN.

LAN emulation configuration server (LECS). A LAN emulation service component that centralizes and disseminates configuration data.

LAN multicast. Sending of a transmission frame that is intended to be accepted by a group of selected data stations on the same local area network.

LAN Segment Number. The identifier that uniquely distinguishes a LAN segment in a multi-segment LAN.

LAN-to-LAN. An access mode for connecting remote LAN sites.

large-scale integration (LSI). The process of integrating large numbers of circuits on a single chip of semiconductor material.

LBG. See load-balancing group.

LDAP. See Lightweight Directory Access Protocol.

Lightweight Directory Access Protocol. In TCP/IP, a protocol that enables users to locate people, organizations, and other resources in an Internet directory or intranet directory.

limited broadcast. Synonym for single-route broadcast.

link aggregation. A type of bond group that combines the bandwidth of two or more ports to serve as one IP address. The bond group distributes data across the bonded ports by using an algorithm. See bond group.

LIP. Loop initialization process

load-balancing group (LBG). A type of virtual network interface that comprises a set of physical and bonded interfaces. A set of nodes within a virtual server that has layer-2 front-end connectivity can be collectively identified by a unique IP address and grouped into a load-balancing group (LBG). The intent of such a grouping is to enable all

nodes in the LGB to share the file serving load. A unique IP address and DNS host name combination identify each load-balancing group. Depending on the front-end connectivity, you can configure a node to be a member of more than one load-balancing group.

locally administered address. In a local area network, an adapter address that the user can assign to override the universally administered address. Contrast with universally administered address.

logical connection. In a network, devices that can communicate or work with one another because they share the same protocol.

logical drive. A unit of virtual storage that is made available to the network through VLUNs and iLUNs. It is made up of one or more physical disks that are combined using RAID 0, 1, 1E, 5, or 5E technology.

logical node. Logical nodes exist and operate in the physical context of the primary devices. There are different types of logical nodes and each is associated with a specific protocol stack.

loop. A closed unidirectional signal path connecting input/output devices to a system.

low-smoke fire-retardant zero halogen. Describes materials that are not flammable and do not emit large amounts of smoke or toxic gasses when burnt.

low-smoke zero halogen. Describes materials that do not emit large amounts of smoke or toxic gasses when burnt.

LSFR0H. See low-smoke fire-retardant zero halogen.

LS0H. See low-smoke zero halogen.

M

macro. An instruction that causes the execution of a predefined sequence of instructions in the same source language.

main storage. Program-addressable storage from which instructions and other data can be loaded directly into registers for subsequent execution or processing (A) (I).

management information base (MIB). SNMP units of managed information that specifically describe an aspect of a system, such as the system name, hardware number, or communications configuration. A collection of related MIB objects is defined as a MIB.

megahertz (MHz). A unit of measure of frequency. One megahertz = 1 000 000 hertz.

MES. See miscellaneous equipment specification.

MIB. Management information base.

MIB browser. In the Simple Network Management Protocol (SNMP), a small PC or workstation application that can load MIB definitions, query or set data items in a managed node, and decode returned values and results in an easily readable form.

microinstruction. An instruction for operations at a level lower than machine instructions (T).

microprogram. A sequence of microinstructions. Microprograms are mainly used to implement machine instructions (T).

migrate. To move to a changed operating environment, usually to a new release or version of a program, system, or device.

miscellaneous equipment specification (MES). Any equipment that is added after the time of the initial order.

mode field diameter. A measure of the width of the guided optical power's intensity distribution in the core and the cladding of a single-mode fiber.

modulation. (1) The process by which a characteristic of a carrier is varied in accordance with a characteristic of an information-bearing signal (T). (2) The process by which a message signal is impressed upon a carrier signal so that the carrier is altered to represent the message signal.

multicast address. See LAN multicast.

multimode optical fiber. (1) A graded-index or step-index optical fiber that allows more than one bound mode to propagate (E). Contrast with single-mode optical fiber. (2) In FDDI, an optical fiber waveguide usually characterized by a core diameter of 50 to 100 micron that will allow a large number of modes to propagate.

multiplexing. In data transmission, a function that permits two or more data sources to share a common transmission medium so that each data source has its own channel (A) (I).

N

N. See Newton.

nanosecond (ns). One thousand millionth of a second.

NAS. Network-attached storage.

NDMP. See network data management protocol.

network-attached storage (NAS). A task-optimized storage device directly attached to a network that works independent of the general-purpose file servers.

network data management protocol (NDMP). An open standard protocol for enterprise-wide network-based backup for network attached storage.

Network File System (NFS). A protocol, developed by Sun Microsystems, Incorporated, that allows any host in a network to mount another host's file directories. After a file directory is mounted, it appears to reside on the local host.

network information services (NIS). A set of UNIX® network services (for example, a distributed service for retrieving information about the users, groups, network addresses, and gateways in a network) that resolve naming and addressing differences among computers in a network.

newton (N). The force that when applied to a body having a mass of one kilogram gives it an acceleration of one meter per second per second (1 m/s(2)).

NFS. See network file system.

NI. See network interface.

NIS. See network information services.

non-broadcast frame. A frame containing a specific destination address and that can contain routing information specifying which bridges are to forward it. A bridge will forward a non-broadcast frame only if that bridge is included in the frame's routing information.

non-canonical. In this form, the most significant bit of an octet is transmitted first.

ns. See nanosecond.

O

ODI. See Open Data-Link Interface.

Open Data-Link Interface (ODI). A common interface for network drivers developed by Novell. It allows multiple transport protocols to run on one network adapter.

optical cable. A fiber, multiple fibers, or a fiber bundle in a structure built to meet optical, mechanical, and environmental specifications (E).

optical fiber. Any filament made of dielectric materials that guides light, regardless of its ability to send signals.

optical fiber coupler. (1) A device whose purpose is to distribute optical power among two or more ports (A). (2) A device whose purpose is to couple power between a fiber and a source or detector (A).

P

packet internet groper (PING). In Internet communications, a program used in TCP/IP networks to test the ability to reach destinations by sending the destinations an Internet Control Message Protocol (ICMP) echo request and waiting for a reply.

parity check. (1) A redundancy check by which a recalculated parity bit is compared to the pre-given parity bit (T). (2) A check that tests whether the number of ones (or zeros) in an array of binary digits is odd or even (A).

passive hub. A hub that adds nothing to the data being transmitted through it.

path. The connection between a storage port and the WWN (World Wide Name): target : LUN of a storage device.

path group. A collection of equivalent paths. Storage devices may have one, two or *n* path groups.

PCI. See Peripheral Component Interconnect.

PCNFSD. See personal-computer NFS daemon.

PCMCIA. See Personal Computer Memory Card International Association.

PDU. Power distribution unit.

Peripheral Component Interconnect (PCI). A local bus for PCs from Intel that provides a high-speed data path between the CPU and up to 10 peripherals (video, disk, network, and so on). The PCI bus coexists in the PC with the ISA or EISA bus. ISA and EISA boards still plug into an ISA or EISA slot, while high-speed PCI controllers plug into a PCI slot.

Persistent Storage Manager (PSM). Columbia Data Products software that creates multiple point-in-time persistent True Image data views of any or all system and data volumes residing on the NAS. All persistent images survive system a power loss or a planned or unplanned reboot. Each instance of PSM seamlessly handles 250 concurrent images of up to 255 independent volumes for a total of 63,750 independent data images.

personal-computer NFS daemon (PCNFSD). A daemon that manages user authentication and print spooling.

Personal Computer Memory Card International Association (PCMCIA). An organization that standardizes credit-card size memory and I/O adapters for personal computers.

PING. See packet internet groper.

pinout. Information that specifies which signal, signal line, or cable wire maps to each pin on a module, card, or cable connector. A module is usually keyed to allow for pin number identification.

primary adapter. In a personal computer that is used on a LAN and that supports installation of two network adapters, the adapter that uses standard (or default) mapping between adapter-shared RAM, adapter ROM, and designated computer memory segments. The primary adapter is usually designated as adapter 0 in configuration parameters. Contrast with alternate adapter.

promiscuous mode. In a local area network (LAN), a method of processing and monitoring LAN frames that does not discriminate based on address.

PSM. See Persistent Storage Manager.

Q

QoS. Quality of service.

R

RAID. See redundant array of independent disks.

RAID-5. The RAID method used by the high-performance models of the IBM 9337 Disk Array Subsystem. See redundant array of independent disks and device parity protection.

RAM. See random access memory.

random access memory (RAM). A temporary storage location in which the central processing unit (CPU) stores and executes its processes. Contrast with direct access storage device.

redundant array of independent disks (RAID). A method of protecting data loss due to disk failure based on the Redundant Array of Independent Disks specification published by the University of California in 1987. See device parity protection and RAID-5.

remote procedure call (RPC). A facility that a client uses to request the execution of a procedure call from a server. This facility includes a library of procedures and an external data representation.

S

Samba. A UNIX implementation of CIFS that enables Windows networking-file-system protocol to communicate with UNIX operating systems.

SAN. Storage area network.

SCSI. See small computer system interface.

shared LAN. A LAN in which the total bandwidth is shared among all nodes attached to the LAN segment.

shared RAM. Shared memory provided by an adapter with onboard memory and requiring use of system CPU.

shielded twisted pair (STP). A cable medium consisting of a telephone wire wrapped in a metal sheath to eliminate external interference.

Simple Mail Transfer Protocol (SMTP). In the Internet suite of protocols, an application protocol for transferring mail among users in the Internet environment. SMTP specifies the mail exchange sequences and message format. It assumes that the Transmission Control Protocol (TCP) is the underlying protocol.

Simple Network Management Protocol (SNMP). In the Internet suite of protocols, a network management protocol that is used to monitor routers and attached networks. SNMP is an application layer protocol. Information on devices managed is defined and stored in the application's Management Information Base (MIB).

single system image (SSI). A system architecture in which a cluster of engines provides an external view of the system such that it appears as a single entity in terms of administration, client-side attachment or both.

single-mode optical fiber. An optical fiber in which only the lowest-order bound mode (which can consist of a pair of orthogonally polarized fields) can propagate at the wavelength of interest. Contrast with multimode optical fiber.

single-route broadcast. The forwarding of specially designated broadcast frames only by bridges which have single-route broadcast enabled. If the network is configured correctly, a single-route broadcast frame will have exactly one copy delivered to every LAN segment in the network. Synonym for limited broadcast.

small computer system interface (SCSI). A standard hardware interface that enables a variety of peripheral devices to communicate with one another.

SMTP. See Simple Mail Transfer Protocol.

SNMP. See Simple Network Management Protocol.

splitter. In a local area network (LAN), a passive device used at a node to connect two or more branches (T).

standby hot-spare disk. A physical disk that is automatically mapped to a logical drive when no suitable hot-spare disk is available.

storage area network (SAN). A dedicated storage network tailored to a specific environment, combining servers, storage products, networking products, software, and services.

storage controller. A device (such as a RAID Controller) that creates and manages other storage devices.

storage device. A LUN that terminates a collection of ports on the storage network.

storage network. Provides shared access to a set of LUNs across one to *n* storage client networks.

storage network device. A type of hub, switch, director or router on the Fibre Channel fabric that is directly connected to the storage client network. A storage network device is part of the fabric infrastructure, but does not directly provide LUNs.

storage client network. A classic interconnected Fibre Channel fabric with a single Fibre Channel fabric name.

storage port. A NAS 200 engine's connection point to a storage client network. A storage port is a member of a single fabric.

storage unit. Hardware that contains one or more drive bays, power supplies, and network interface. Some storage units contain RAID controllers; their storage unit is accessed by the appliance.

store-and-forward. A mode of operation for a LAN switch in which it completely checks every frame before forwarding, so customers can use the switch to isolate erroneous frames generated on one segment so they do not traverse the switch onto another segment.

STP. See shielded twisted pair.

SVN. See switched virtual network.

switched LAN. A LAN that has a dedicated connection for each user whereby the full bandwidth is available to the workstation.

switched virtual networks (SVN). A comprehensive approach for building and managing switched-based networks. It combines the virtues of LAN switching, bridging, routing, ATM switching and other switched services.

synchronous data transfer. A physical transfer of data to or from a device that has a predictable time relationship with the execution of an I/O request.

synchronous transmission. A method of transmission in which characters are synchronized by the transmission of initial sync characters and a common clock signal.

T

tape device. A collection of tape units that come from one model type and serial number (such as all the LUNs of a tape library).

tape unit. A tape drive or a robotics controller that is visible over a storage network. A tape unit is a member of a single storage network (of 1 to *n* fabrics), but can have 1 to *n* equivalent paths.

target. A collection of logical units that are directly addressable on the network. The target corresponds to the server in a client-server model.

TCP. See Transmission Control Protocol.

TCP/IP. See Transmission Control Protocol/Internet Protocol.

Telnet. In the Internet suite of protocols, a protocol that provides remote terminal connection service. It allows users of one host to log on to a remote host and interact as directly attached terminal users of that host.

timeout. A time interval that is allotted for certain operations to occur, for example, a response to polling or addressing before system operation is interrupted and must be restarted.

Tivoli Storage Manager (TSM). A client/server product that provides storage management and data access services in a heterogeneous environment.

Transmission Control Protocol (TCP). In TCP/IP, a host-to-host protocol that provides transmission in an internet environment. TCP assumes Internet Protocol (IP) is the underlying protocol.

Transmission Control Protocol/Internet Protocol (TCP/IP). The Transmission Control Protocol and the Internet Protocol, which together provide reliable end-to-end connections between applications over interconnected networks of different types.

True Image data view. A data view that allows the file to be restored in the event of accidental deletion. It consists of 'point-in-time' images that provide a near-instant virtual copy of an entire storage volume.

TSM. See Tivoli Storage Manager.

twinaxial cable. A three-conductor cable with the two inner conductors serving to carry the signal energy, and the outer conductor serving as ground. The three conductors are insulated from each other.

U

universal serial bus (USB). A serial interface standard for telephony and multimedia connections to personal computers.

unshielded twisted pair (UTP). A cable medium with one or more pairs of twisted insulated copper conductors bound in a single plastic sheath.

USB. See universal serial bus.

V

VLAN. See virtual local area network.

VLU. Volume logical unit.

VLUN. See virtual logical unit.

virtual connection. A connection set up between two points that appears to the user to be available as a dedicated connection. This phantom connection can be maintained indefinitely or can be ended at will. The three states of a virtual connection are up, down or suspended.

virtual local area network (VLAN). A logical association of switch ports based upon a set of rules or criteria such as MAC addresses, protocols, network address, or multicast address. This permits resegmentation of the LAN without requiring physical rearrangement.

virtual logical unit (VLUN). A subset of a logical drive.

virtual port. Logical construct that corresponds to a logical adapter for a switched network port. A virtual port organizes outgoing switched logical links by specifying incoming call acceptance criteria, by dynamically building and relating logical adapters with selected hardware adapter ports, and by specifying adapter-related data link control (DLC) profiles for use with those logical adapters.

VNI. Virtual network interface.

volume. (1) Unit of storage on disk, tape, or other data recording media. (2) A logical disk visible to the appliance over a storage network. A member of a single storage network of 1 to *n* fabrics. It can have 1 to *n* path groups of 1 to *n* equivalent paths.

W

Windows Internet Name Service (WINS). Program that provides a distributed database for registering and querying dynamic NetBIOS names to IP address mapping in a routed network environment.*

WINS. See Windows Internet Naming Service.

Windows networking. Networking file-system protocol for the Windows operating system.

X

Xmodem. A public-domain asynchronous data link control (DLC) protocol that provides packet numbering and checksum error control for the transfer of binary files.

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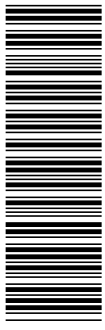

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