

IBM TotalStorage NAS 200 Model 25T Hardware Service Guide



Correction to GY27-0415-00

The following correction should be made in the text of this publication:

Memory	Corrected part number	Page
256 MB 133 MHz ECC SDRAM RDIMM	09N4306	233
512 MB 133 MHz ECC SDRAM RDIMM	09N4307	233
1 GB 133 MHz ECC SDRAM RDIMM	09N4308	233

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IBM TotalStorage™ NAS 200
Model 25T



Hardware Service Guide

NOTE:

Before using this information and the product it supports, read the general information and safety notices in Appendix D, "Notices" on page 239.

First Edition (October 2002)

This edition applies to the IBM TotalStorage™ NAS 200 Model 25T.

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About this guide

This guide describes the service procedures for the IBM TotalStorage™ NAS 200 Model 25T. The term NAS 200 is used in this manual when referring to both the tower and rack configurations.

Who should read this guide

This guide is intended for trained service personnel.

How this guide is organized

The chapters in this guide contain the following information:

- Chapter 1, “General checkout” on page 1 contains general procedures for verifying the operation of the NAS appliance and starting a service call.
- Chapter 2, “General information” on page 3 contains general information on the NAS appliance.
- Chapter 3, “Troubleshooting” on page 11 provides troubleshooting information for the NAS appliance.
- Chapter 4, “Symptom-to-part index” on page 41 lists symptoms, errors, and possible causes of problems with the NAS appliance.
- Chapter 5, “Adding and replacing components” on page 73 provides instructions for adding and replacing parts.
- Chapter 6, “Configuring the appliance” on page 207 provides an overview of the configuration programs included with the NAS appliance.
- Appendix A, “Communication adapters” on page 217 provides descriptions and placement locations for optional adapters.
- Appendix B, “Using the Recovery and Supplementary CDs” on page 227 contains information about using the recovery CD-ROM.
- Appendix C, “Parts listings” on page 231 provides a list of part numbers.
- Appendix D, “Notices” on page 239 provides important notices and trademark information.

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 NAS 200

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

- *IBM TotalStorage NAS 200 Hardware Installation Guide*, GA27-4322,
This publication provides procedures for setting up, cabling, and replacing components of the NAS 200.
- *IBM TotalStorage NAS 200 Quick Start Instructions*
This fanfold publication describes how to install the appliance as it is shipped.
- *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 NAS 200 User's Reference*, GA27-4323
This manual describes how to configure and use the software provided with the product.
- *IBM TotalStorage NAS 200 Hardware Installation Guide*, GA27-4322,
This guide describes the installation procedures for this product and is intended for the customer.
- *IBM TotalStorage NAS 200 Quick Start Instructions*
This publication describes how to install the appliance as it is shipped.
- *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*, GA27-4324
This guide describes the installation, configuration, and operating procedures for this option and is intended for the customer.
- *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

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.

예를 들어 주의 경고문이 번호 1로 시작되면 *Safety Information* 책에서 이 주의 경고문은 경고문 1번 아래에 나옵니다.

지시를 따라 수행하기 전에 먼저 모든 주의 및 위험 경고문을 읽도록 하십시오.

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

Chapter 1. General checkout

This chapter describes general checkout for the IBM™ TotalStorage™ NAS 200. Use these procedures at the beginning of a service call.

Base System Diagnostics are stored in upgradable read-only memory (ROM) on the system board, CD-ROMs, and software. These programs are the primary method of testing the major components of the engine (the system board, Ethernet controller, random access memory [RAM], CD-ROM, serial ports, and hard disk drives). See “Diagnostic tools overview” on page 13.

General tips

- For safety information, see Appendix D, “Notices” on page 239.
- If multiple error codes are displayed, diagnose the first error code displayed (see “Diagnostic programs” on page 18).
- If you cannot determine whether a problem is caused by the hardware or by the software, you can run the Base System Diagnostics to confirm that the hardware is working correctly.
- If the engine hangs with a POST error, go to “POST error codes” on page 55.
- For power supply problems, see “Power checkout” on page 40.
- For intermittent problems, check the error log; see “Event and error logs” on page 17.

Checkout steps

As you perform these steps, refer to “Engine controls and indicators” on page 7 as needed.

1. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine.
2. Check all cables and power cords.
3. Attach a monitor, keyboard, and mouse.
4. Power ON the engine.
5. Check the system error LED on the operator information panel on the front of the engine (see “Operator information panel” on page 10); if it is on, see “Identifying problems using LEDs” on page 14.
6. Check the test log as described in “Event and error logs” on page 17. If an error was recorded by the system, see Chapter 4, “Symptom-to-part index” on page 41.
7. Start the Base System Diagnostics programs. See “Starting the diagnostic programs” on page 20.
8. Check for the following responses:
 - a. Beeps
 - b. Readable instructions or the Main Menu
9. If the Base System Diagnostics completed successfully and you still suspect a problem, see “Undetermined problems” on page 70.

Chapter 2. General information

This guide provides instructions for servicing the IBM® TotalStorage NAS 200 Model 25T or Model 25T with the rack-mount conversion feature. *Model 25T* and *Model 25T with the rack-mount conversion feature* are used in this guide when specifying a particular configuration. The term *NAS 200* will be used in this guide when referring to both configurations.

The NAS 200 is a storage appliance that consists of one machine, along with associated optional features:

- The Model 25T is a tower-based engine that provides hard-disk-drive storage. It requires only power and network connections for setup. A kit is available to convert the Model 25T for rack mounting the engine in a 5U (approx. 8.75 in. or 222.25 mm) rack.
- A conversion kit (feature code number 3621) allows the conversion of a Model 25T to a Model 25T with the rack-mount conversion feature.
- Up to three 5194-EXP storage units can be attached to the Model 25T to extend storage capacity, for a total rack requirement of 14U (approx. 24.5 in. or 622.3 mm).
- Up to three 5194-EXP storage units can be attached to the to the NAS 200 when the appropriate RAID features are installed.

The appliance is already configured; aside from the initial configuration to determine the IP address, you do not need to configure hardware or install any components for the base model configurations.

Standard features

Table 1 lists the standard features of the Model 25T or Model 25T with the rack-mount conversion feature.

Table 1. Standard features of the Model 25T

Hardware	Model 25T
Engine	Single
System	<ul style="list-style-type: none">• One 2.4-GHz processor• 512-KB Level-2 cache per processor• Integrated 10/100/1000 Ethernet• Two integrated Ultra320 SCSI connectors• Advanced System Management support• Six PCI expansion slots
Memory	<ul style="list-style-type: none">• 2 x 256 MB• Type: Double data rate (DDR) Synchronous DRAM (SDRAM) with RDIMM connectors• Upgradable to a maximum of 4.5 GB
Expansion bays	Hot-swap: six hot-swap SCSI hard disk drive bays
Hot-swap hard disk drives in SCSI expansion bays	Three Ultra160 10 000 rpm 36.4 GB Total: 109 GB
Service processor	Imbedded system management processor
Power supplies	Two 560W (180 - 256V)

Optional features

Table 2 lists the optional features of the Model 25T or Model 25T with the rack-mount conversion feature.

Table 2. Optional features of Model 25T or Model 25T with the rack-mount conversion feature

Feature type	Feature	Model 25T	Feature code
System	One 2.4-GHz processor upgrade	Option	3225
Memory	Add or replace with one or two of these combinations:	Option	0300
	2 x 256 MB		
	2 x 512 MB	Option	0301
	2 x 1 GB	Option	0302
Adapters	IBM Gigabit Ethernet SX Server Adapter	Option	3302
	PRO/1000 XT Server Adapter by Intel	Option	3303
	Alacritech 100x4 Quad-Port Server Accelerated Adapter	Option	3304
	Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter	Option	3305
	IBM PCI Ultra160 SCSI adapter (LVD/SE)	Option	3702
	Qlogic 2340 1-port Fibre Channel adapter	Option	3705
RAID controllers	ServeRAID™-5i 128-MB cache	Option, but at least one ServeRAID controller must be selected (see Table 34 on page 203 for the possible combinations)	3903
	ServeRAID-4H	Option, but at least one ServeRAID controller must be selected (see Table 34 on page 203 for the possible combinations)	3902
	ServeRAID-4Mx	Option, but at least one ServeRAID controller must be selected (see Table 34 on page 203 for the possible combinations)	3901
Service processor	Remote Supervisor Adapter	Option	3821

Table 2. Optional features of Model 25T or Model 25T with the rack-mount conversion feature (continued)

Feature type	Feature	Model 25T	Feature code
Storage	Model EXP 5194-EXP storage unit	Option to add up to three storage units with three to fourteen 36.4-GB or 73.4-GB hard disk drives (see Table 34 on page 203)	None
	IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit	Option to add one IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit with three 36.4-GB or 73.4-GB hard disk drives	3151
	36.4 GB 10K Ultra160 SCSI Hot-Swap SL expansion hard disk drives	Option to add up to three additional hard disk drives (if three 36.4-GB hard disk drives are already installed)	3121
	73.4 GB 10K Ultra160 SCSI Hot-Swap SL expansion hard disk drives	Option to add up to three additional hard disk drives (if three 73.4-GB hard disk drives are already installed)	3124
	36.4 GB 10K Ultra160 SCSI Hot-Swap SL hard disk drive spare	Option	3123
	73.4 GB 10K Ultra160 SCSI Hot-Swap SL hard disk drive spare	Option	3126
Conversion kit	Tower-to-rack conversion kit	Option	3602

Specifications

Dimensions

	Model 25T	Model 25T with the rack-mount conversion feature
Width	221 mm (8.7 in.)	440 mm (17.3 in.)
Height	440 mm (17.3 in.)	216 mm (8.5 in.)
Depth	700 mm (27.5 in.)	674 mm (26.5 in.)

Weight

	Model 25T
Minimum configuration (approximate)	33.5 kg (74 lb.)
Maximum configuration (approximate)	45.8 kg (101 lb.)

Operating environment

	Model 25T
Air temperature [at maximum altitude of 2134 m (7000 ft.)]	10° - 35° C (50.0° - 95.0° F)
Humidity	8% - 80%

Nonoperating (power-off) environment

	Model 25T
Air temperature (at maximum altitude of 2134 m [7000 ft.]	-40° - 60° C (-40.0° - 140° F)
Humidity	8% - 80%

Heat output

	Model 25T
Minimum configuration	341 BTU (100 W)
Maximum configuration	2600 BTU (760 W)

Power requirements

	Model 25T
Voltage low range	90 - 137 Vac, 47- 53Hz
Voltage high range	180 - 265 Vac, 57 - 63 Hz
Power consumption	0.1 - 0.8 kVA

Software applications

See the *IBM TotalStorage NAS 200 User's Reference* for a list of applications included with the Model 25T or Model 25T with the rack-mount conversion feature.

Engine controls and indicators

This section describes the controls and indicators on the Model 25T or Model 25T with the rack-mount conversion feature.

Engine front view

Figure 1 and Figure 2 illustrate the controls and indicators on the front of the engine of the Model 25T or Model 25T with the rack-mount conversion feature.

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

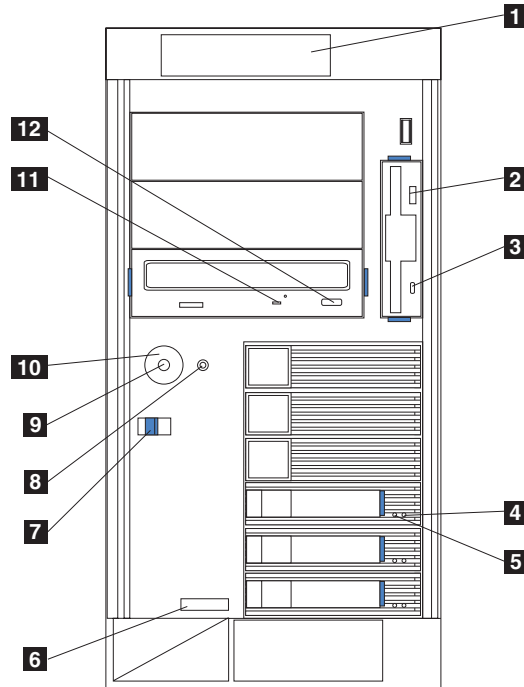


Figure 1. Model 25T front view

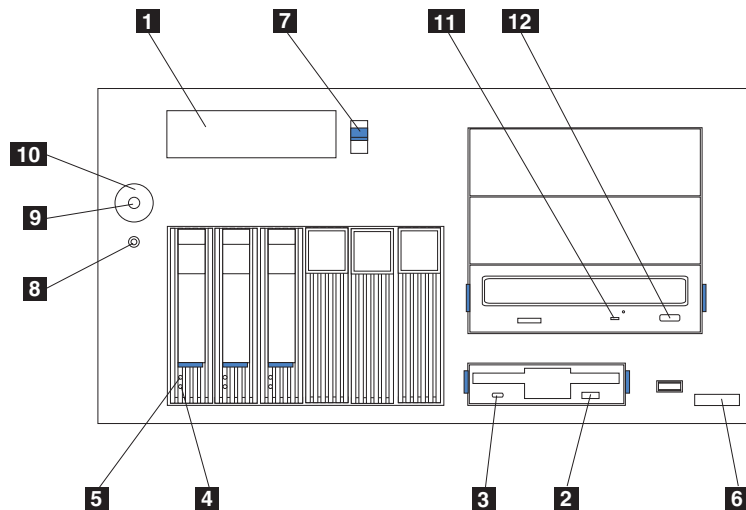


Figure 2. Model 25T with the rack-mount conversion feature front view

- 1** **Operator information panel:** The LEDs on this panel give status information for your appliance.
- 2** **Diskette eject button:** Use this button to remove a floppy disk from the drive.
- 3** **Diskette drive activity LED:** This LED is on or flashing when the controller is accessing the drive. Do *not* remove a diskette when this LED is on.
- 4** **Hard disk drive status LED:** Each of the hot-swap drives has a hard disk drive status LED. When this amber LED is on continuously, the drive has failed. When the LED flashes slowly (one flash per second), the drive is being rebuilt. When the LED flashes rapidly (three flashes per second), the controller is identifying the drive.
- 5** **Hard disk drive activity LED:** Each of the hot-swap drives has a hard disk drive activity LED. When this green LED is on or flashing, the controller is accessing the drive.
- 6** **Machine type, model number, and serial number:** The machine type, model number, and serial number of your Model 25T or Model 25T with the rack-mount conversion feature.
- 7** **Blue cover release latch:** Use this latch when removing the cover.
- 8** **Reset button:** Press this button to reset the engine and run the power-on self-test (POST).

Attention: Press this button only when the engine is hung. Pressing this button when the engine is booting or operating may make the appliance nonoperational or corrupt the drives.
- 9** **Power button:** Powers the Model 25T or Model 25T with the rack-mount conversion feature on and off.
- 10** **Power-button shield (if installed):** This prevents accidentally powering off the engine.
- 11** **CD-ROM drive activity LED:** This green LED is on or flashing when the controller is accessing the drive.
- 12** **CD-eject button:** Use this button to remove the CD-ROM from the drive.

Engine rear view

Figure 3 on page 9 and Figure 4 on page 9 illustrate the controls and indicators on the back of the engine of the Model 25T or Model 25T with the rack-mount conversion feature.

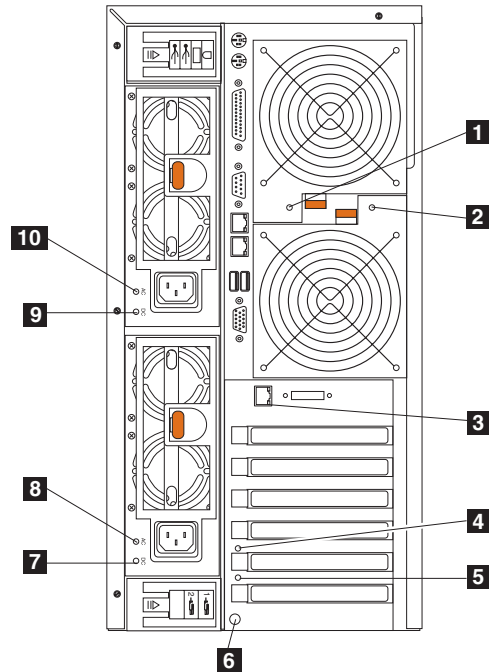


Figure 3. Model 25T rear view

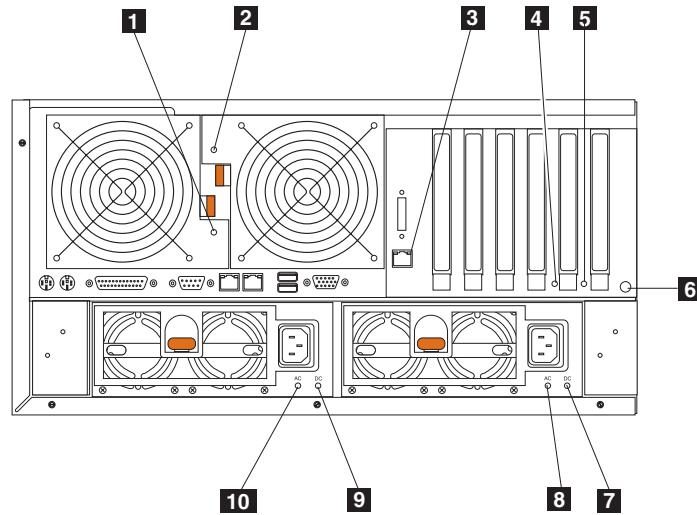


Figure 4. Model 25T with the rack-mount conversion feature rear view

- 1 Fan 1 LED:** This LED provides status information about Fan 1 (rear fan). During normal operation, this LED is off.
- 2 Fan 2 LED:** This LED provides status information about Fan 2 (rear fan). During normal operation, this LED is off.
- 3 Ethernet link status LED:** This LED is on the Ethernet connector. When this LED is on, there is an active connection on the Ethernet port.
- 4 PCI-X slot 5 attention LED:** This LED is disabled on the engine. It is shown only for reference. For an illustration showing this LED on the system board, see Figure 15 on page 82.
- 5 PCI-X slot 6 attention LED:** This LED is disabled on the engine. It is shown only for reference. For an illustration showing this LED on the system board, see Figure 15 on page 82.

- 6** **NMI button:** The Non-Maskable Interrupt button is for service use only.
- 7** **DC power LED for power supply 2:** This LED provides status information about the power supply. During normal operation, the DC power LED is on.
- 8** **AC power LED for power supply 2:** This LED provides status information about the power supply. During normal operation, the AC power LED is on.
- 9** **DC power LED for power supply 1:** This LED provides status information about the power supply. During normal operation, the DC power LED is on.
- 10** **AC power LED for power supply 1:** This LED provides status information about the power supply. During normal operation, the AC power LED is on.

Operator information panel

The operator information panel on the front of the appliance contains status LEDs.

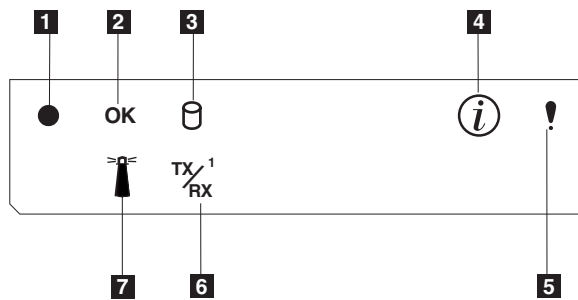


Figure 5. Operator information panel

- 1** **Power-on LED:** This green LED is on when system power is present in the appliance. When this LED flashes, the appliance is in standby mode (the system power supply is turned off and ac power is present). If this LED is not on, the power cord is not connected, the power supply has failed, or this LED has failed.
- 2** **POST complete (OK) LED:** This green LED is on when when POST completes without any errors.
- 3** **Hard disk drive activity LED:** This green LED is on when there is activity on the internal hard disk drive.
- 4** **Information LED:** This amber LED is on when the information log contains information about certain conditions in your appliance that might affect performance. For example, the LED is on if your appliance does not have functioning redundant power. An LED on the diagnostic panel on the system board will also be on.
- 5** **System error LED:** This amber LED is on when a system error occurs. An LED on the diagnostic panel on the system board will also be on to further isolate the error.
- 6** **Ethernet transmit/receive activity (TX/RX¹) LED:** This green LED is on when there is transmit or receive activity to or from the appliance on the integrated Ethernet port.
- 7** **System locator LED:** This blue LED can be turned on remotely to identify a specific engine.

Chapter 3. Troubleshooting

This chapter provides basic troubleshooting information to help you resolve common problems that might occur with your appliance.

Use Table 3 as an index into this information.

Table 3. Troubleshooting index

Topic	Located on page
Diagnostic tools	13
Identifying problems using LEDs	14
POST diagnostics	17
Diagnostic programs	18
Troubleshooting adapters	22
Power checkout	40

Powering on and shutting down the appliance

This section describes steps for powering on and off the appliance.

Powering on the NAS 200 and the 5194-EXP storage units

This section describes three different procedures required to power on the NAS 200, depending on the options that are installed. Make sure that you follow the correct procedure. To power on the NAS 200 and the NAS EXP:

1. Verify that:
 - There is no visible damage, in the event of an emergency powering off. If there is damage, have the unit serviced.
 - All cables are correctly attached.
 - All power cords are plugged into the back of the NAS 200 engine (2 cords) and optional 5194-EXP Storage Expansion Unit (2 cords).
 - All hard disk drives are locked securely in place.
 - All switches on the optional 5194-EXP Storage Expansion Unit are set correctly: the internal option switches 1 through 4, external option switches 1 through 5, and the unit ID switch. For more information on these switch settings, refer to the *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*.
2. Wait at least 20 seconds after connecting the power cords.
3. Power on the appropriate device:
 - If you are restarting the engine when all optional NAS EXPs are already recognized by the ServeRAID controller (for example, after a power failure), power on the devices in this order:
 - a. NAS EXPs
 - 1) Switch on both power supplies in the back of the NAS EXP.
The NAS EXP may 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.

- 2) When the power-on sequence is complete, verify that only the power (green) LEDs on the front and back are on. If one or more fault (amber) LEDs remain on, refer to the *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*.

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

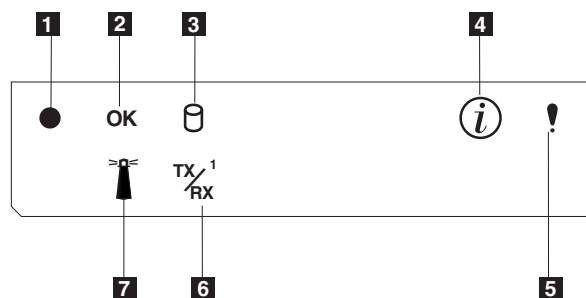
b. Engine

- 1) Press the power button on the front of the engine to power on the appliance.

Attention: The first time you start the appliance, a series of configuration and system preparation programs that finish configuring the *Network Operating System (NOS)* run automatically. These programs must complete before you use any included applications to connect to or configure your appliance. Wait at least 5 minutes before connecting to or configuring the appliance after the initial system start.

- 2) Verify that the the Power-on LED is **on** and the Information LED and System Error LED are both **off**.

Note: Depending on the system status, other LEDs may be on.



- 1** Power-on LED
- 2** POST complete (OK) LED
- 3** Hard disk drive activity LED
- 4** Information LED
- 5** System error LED
- 6** Ethernet transmit/receive activity (TX/RX¹) LED
- 7** System locator LED

If a problem is detected during the diagnostics, refer to the *IBM TotalStorage NAS 200 User's Reference*.

- If you are not using a NAS EXP, power on the engine using the procedure in step 3b.
- If you are adding one or more new NAS EXPs, then power on the devices in the following order:
 - a. Already recognized NAS EXPs. These are any NAS EXPs that are already recognized by the ServeRAID controller (see step 3a on page 11 for instructions explaining how to start the NAS EXPs).
 - b. Engine (see step 3b for instructions explaining how to start the engine).
 - c. New NAS EXPs. These are all NAS EXPs that are new to the configuration and not recognized by the ServeRAID controller (see step 3a on page 11 for instructions explaining how to start the NAS EXPs).

Shutting down the appliance



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.

Note: For translations of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.

Attention: Powering off the appliance using the power button can result in a loss of data. Instead, it is recommended you use the following procedure to shut down.

To shut down the appliance:

1. Select *Shut Down...* from the Windows Start Menu.
2. Disconnect the appliance power cords from the electrical outlets.

Note: Wait approximately 15 seconds after disconnecting the power cords for your appliance to stop running. Watch for the Power-on LED on the operator information panel to stop blinking.

Diagnostic tools overview

The following tools are available to help you identify and resolve hardware-related problems:

- **Light-path diagnostics**

LEDs help you identify problems with engine components. These LEDs are part of the light-path diagnostics that are built into your engine. Using the LEDs, you can quickly identify the type of system error that occurred. See “Identifying problems using LEDs” on page 14 for more information.

- **POST beep codes, error messages, and error logs**

The POST generates the beep codes and messages to indicate successful test completion or the detection of a problem. See “POST diagnostics” on page 17 for more information.

- **Diagnostic programs and error messages**

The Base System Diagnostics are stored in upgradable read-only memory (ROM) on the system board, on CD-ROMs, and in the software. These programs are the primary method of testing the major components of your engine. See “Diagnostic programs” on page 18 for more information.

Note: To view error messages, attach a monitor, keyboard, and mouse to each engine. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

Identifying problems using LEDs

Each appliance engine has LEDs to help you identify problems with some engine components. These LEDs are part of the light-path diagnostics built into the engine. By following the *path of lights*, you can identify the type of system error that occurred. There are three sources of LED information:

- Operator information panel
- Power supply
- Diagnostics panel

Operator information panel

The System Error LED on the operator information panel on the front of the appliance is on when certain system errors occur. Refer to “Operator information panel” on page 10 for more information on the operator information panel.

Power-supply LEDs

The AC Power LED and DC Power LED on the power supply provide status information about the power supply. Figure 6 and Figure 7 on page 15 show the location of the power-supply LEDs.

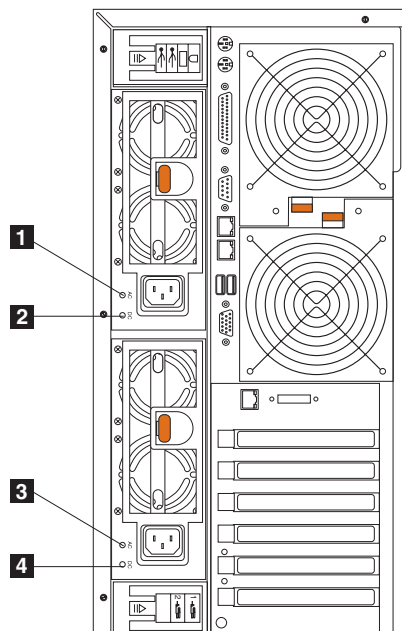


Figure 6. Location of the power-supply LEDs (Model 25T)

- | | |
|----------|-------------------------------------|
| 1 | Power supply 1 AC power LED (green) |
| 2 | Power supply 1 DC power LED (green) |
| 3 | Power supply 2 AC power LED (green) |
| 4 | Power supply 2 DC power LED (green) |

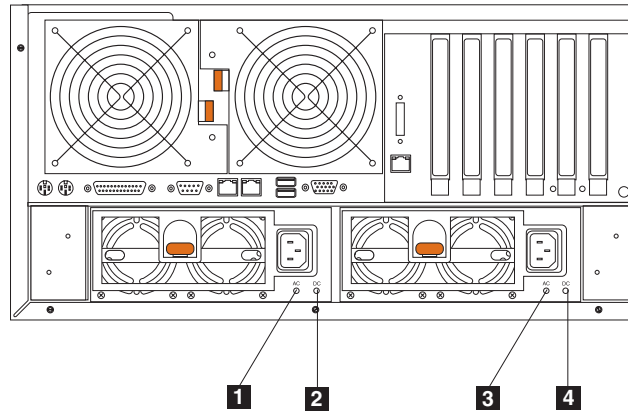


Figure 7. Location of the power-supply LEDs (Model 25T with the rack-mount conversion feature)

- | | |
|----------|-------------------------------------|
| 1 | Power supply 1 AC power LED (green) |
| 2 | Power supply 1 DC power LED (green) |
| 3 | Power supply 2 AC power LED (green) |
| 4 | Power supply 2 DC power LED (green) |

See “Power error messages” on page 62 for error messages.

Diagnostics panel LEDs

You can use the light-path diagnostics to quickly identify the type of system error that occurred. The diagnostics panel is under the cover. If your configuration is a Model 25T with the rack-mount conversion feature, you can also view the diagnostics panel through the cover by partially sliding the engine out of the rack. Each engine is designed so that any LEDs that are on, remain on when the engine shuts down if the ac power source is good and the power supplies can supply +5 V dc current to the engine. This feature helps isolate the problem if an error causes the engine to shut down.

Figure 8 on page 16 shows the LEDs on the diagnostics panel.

Note: You might have to remove the cover to view these LEDs. (For more information on removing the cover, see “Removing the cover” on page 93). See Table 30 on page 83 for more information on the LEDs.

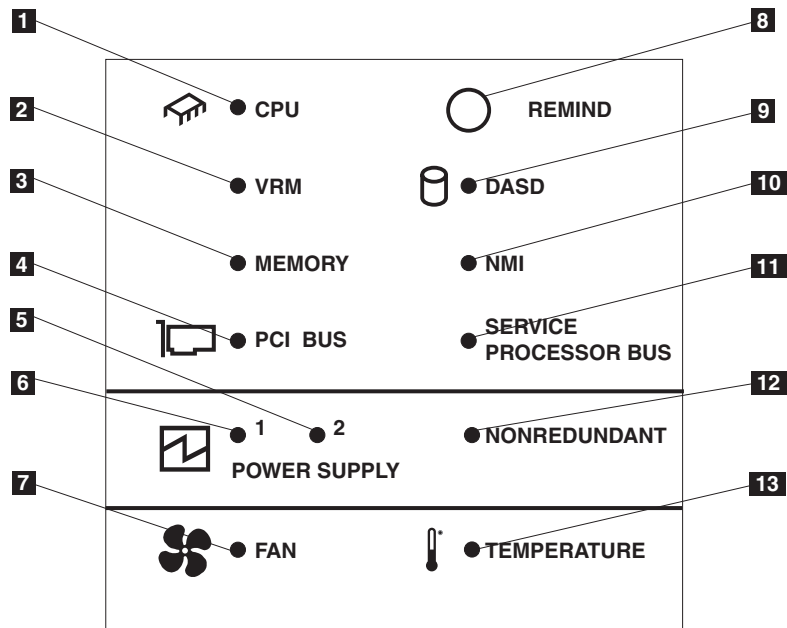


Figure 8. LED diagnostics panel

- 1** CPU LED
- 2** VRM LED
- 3** Memory LED
- 4** PCI Bus LED
- 5** Power supply 1 LED
- 6** Power supply 2 LED
- 7** Fan LED
- 8** Remind button
- 9** DASD LED
- 10** NMI LED
- 11** Service Processor Bus LED
- 12** Nonredundant LED
- 13** Temperature LED

POST diagnostics

Note: You must connect a keyboard, mouse, and monitor to your appliance in order to see error messages. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

When you switch on the appliance, it performs a series of tests to check the operation of appliance components and some of the options installed in the appliance. This series of tests is called the power-on self-test (POST).

If POST finishes without detecting any problems, a single beep sounds.

If POST detects a problem, more than one beep sounds and an error message appears on your screen. See “Beep symptoms” on page 41 and “POST error codes” on page 55 for more information.

Notes:

1. If you have a power-on password or administrator password set, you must type the password and press **Enter**, when prompted, before POST will continue.
2. A single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After you correct the cause of the first error message, the other error messages usually will not occur the next time you run the test.

Error messages

The table, “POST error codes” on page 55, provides information about the POST error messages that can appear during startup.

Event and error logs

The POST error log contains the three most recent error codes and messages that the system generated during POST. The System Event/Error Log contains all error messages issued during POST and all system status messages from the Advanced System Management Processor.

To view the contents of the error logs:

1. Attach a keyboard and monitor to the appliance.
2. Restart the appliance.
3. Press **F1** to enter the Configuration/Setup Utility.
4. Follow the on-screen prompts.

You can also access the error logs using the optional Remote Supervisor Adapter. See the *Remote Supervisor Adapter User's Guide* provided on the Documentation CD-ROM.

Diagnostic programs

Note: You must connect a keyboard, mouse, and monitor to your appliance in order to see error messages. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

The Base System Diagnostics are stored in upgradable read-only memory (ROM) on the system board and on the software. These programs are the primary method of testing the major components of your appliance.

Diagnostic error messages indicate that a problem exists; they are not intended for use in identifying a failing part.

Sometimes the first error to occur causes additional errors. In this case, the appliance displays more than one error message. Always follow the suggested action instructions for the *first* error message that appears.

Format of an error code

The error code format is as follows:

fff-ttt-iii-date-cc-text message

where:

fff is the three-digit function code that indicates the function being tested when the error occurred. For example, function code 089 is for the microprocessor.

ttt is the three-digit failure code that indicates the exact test failure that was encountered.

iii is the three-digit device ID.

date is the date when the diagnostic test was run and the error recorded.

cc is the check digit that is used to verify the validity of the information.

text message

is the diagnostic message that indicates the reason for the problem.

The diagnostic text message format is as follows:

Function Name: Result (test-specific string)

where:

Function Name

is the name of the function being tested when the error occurred.

This corresponds to the function code (fff) given in the previous list.

Result can have one of the following values:

Passed

The diagnostic test completed without any errors.

Failed The diagnostic test discovered an error.

User Aborted

You stopped the diagnostic test before it was complete.

Not Applicable

You specified a diagnostic test for a device that is not present.

Aborted

The test could not proceed because of the system configuration.

Warning

A possible problem was reported during the diagnostic test, such as when a device that was to be tested was not installed.

Test-specific string

is additional information that you can use to analyze the problem.

Starting the diagnostic programs

To start the diagnostic programs:

1. Power ON the appliance.
2. When the message F2 for Diagnostics appears, press **F2**.

Note: To run the diagnostic programs, you must start the appliance with the highest-level password that is set. That is, if an administrator password is set, you must enter the administrator password, not the power-on password, to run the diagnostic programs.

3. Type the appropriate password; then, press **Enter**.
4. Select either **Extended** or **Basic** from the top of the panel.
5. When the Diagnostic Programs panel appears, select the test you want to run from the list that appears; then, follow the instructions on the panel.

Notes:

1. You can also press **F1** while running the diagnostic programs to obtain Help information, or press **F1** from within a help window to obtain online documentation. To exit Help and return to where you left off, press **Esc**.
2. If the appliance stops during testing and you cannot continue, restart the appliance and try running the diagnostic programs again.
3. The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the appliance.
4. If you run the diagnostic programs with no mouse attached to your appliance, you will not be able to navigate between test categories using Next Cat and Prev Cat. All other functions provided by mouse-selectable buttons are also available using the function keys.
5. You can view appliance configuration information (such as system configuration, memory contents, interrupt request [IRQ] use, direct memory access [DMA] use, device drivers, and so on) by selecting **Hardware Info** from the top of the panel.

When the tests have completed, you can view the Test Log by selecting **Utility** from the top of the panel.

If the hardware tests complete successfully, but the problem persists during normal appliance operations, an error might be the cause. If you suspect a software problem, refer to the *IBM TotalStorage NAS 200 User's Reference*, included on the Documentation CD.

Viewing the test log

The test log does not contain any information until after the diagnostic program has run.

Note: If you are already running the diagnostic program, begin with step 3.

To view the test log:

1. Power ON the appliance.
If the appliance is on, shut down your operating system and restart the appliance.
2. When the message F2 for Diagnostics appears, press **F2**.
If a power-on password or administrator password is set, the appliance prompts you for it. Type in the appropriate password; then, press **Enter**.
3. When the Diagnostic Programs panel appears, select **Utility** from the top of the panel.
4. Select **View Test Log** from the list that appears; then, follow the instructions on the panel.

The system maintains the test-log data while the appliance is powered on. When you switch off the appliance, the test log is cleared.

Diagnostic error-message tables

The tables in “Diagnostic error codes” on page 44 provide descriptions of the error messages that might appear when you run the diagnostic programs.

Note: If diagnostic error messages appear that are not listed in the tables, make sure that your appliance has the latest levels of BIOS, Integrated System Management (ISM) Processor, and diagnostic microcode installed.

Troubleshooting adapters

This section explains how to troubleshoot adapters. When troubleshooting adapters, check the status indicators and run the diagnostics.

Ethernet adapters

Refer to these sections when troubleshooting the Ethernet adapter.

Gigabit Ethernet controller troubleshooting chart

Use the following troubleshooting chart to find solutions to Gigabit Ethernet controller problems that have definite symptoms.

Table 4. Ethernet controller troubleshooting chart

Ethernet controller problem	Suggested action
Ethernet-link status light is not on.	<ul style="list-style-type: none">• Ensure that the engine is powered on.• Check all connections at the Ethernet Controller.• Check the cable.• If you manually configured the duplex mode, ensure that you also manually configured the speed.• Run Base System Diagnostics on the LEDs. <p>If the problem remains, go to “Starting the diagnostic programs” on page 20 to run all of the diagnostic programs.</p>
The Ethernet transmit/receive activity light is not on.	<p>Note: The Ethernet Transmit/Receive Activity LED is on only when data is sent to or by this Ethernet Controller.</p> <ul style="list-style-type: none">• Ensure that you have loaded the network device drivers.• The network might be idle. Attempt to send data from this workstation.• Run Base System Diagnostics on the LEDs.• The function of this LED can be changed by device-driver load parameters. If necessary, remove any LED parameter settings when you load the device drivers.
Data is incorrect or sporadic.	<ul style="list-style-type: none">• Ensure that you are using Category 5 cabling when operating the appliance engine at 100 Mbps or 1000 Mbps.• Make sure that the cables do not run close to noise-inducing sources, such as fluorescent lights.
The Ethernet Controller stopped working when another adapter was added to the appliance engine.	<ul style="list-style-type: none">• Ensure that the cable is connected to the Ethernet Controller.• Ensure that your PCI system BIOS is current.• Reseat the adapter.• Ensure that the adapter you are testing is supported by the appliance engine. <p>If the problem remains, go to “Starting the diagnostic programs” on page 20 to run the diagnostic programs.</p>
The Ethernet Controller stopped working without apparent cause.	<ul style="list-style-type: none">• Run Base System Diagnostics for the Ethernet Controller.• Use a different connector.• Reinstall the device drivers. Refer to your operating-system documentation and to the <i>IBM TotalStorage NAS Gateway 300 User's Reference</i> for more information. <p>If the problem remains, go to “Starting the diagnostic programs” on page 20 to run the diagnostic programs.</p>

IBM Gigabit Ethernet SX Server Adapter troubleshooting chart

Use the troubleshooting chart in Table 5 on page 23 to find solutions to the IBM Gigabit Ethernet SX Server Adapter problems that have definite symptoms.

Table 5. IBM Gigabit Ethernet SX Server Adapter troubleshooting chart

IBM Gigabit Ethernet SX Server Adapter problem	Suggested action
LINK LED is not on.	<ol style="list-style-type: none"> 1. Ensure that you have loaded the adapter driver. 2. Check all connections at the adapter and the buffered repeater or switch. 3. Use another port on the buffered repeater or switch. 4. Ensure that the buffered repeater or switch port is configured for 1000 Mbps and full-duplex. 5. Change the auto-negotiation setting on the link partner, if possible.
RX or TX LED is not on.	<ol style="list-style-type: none"> 1. Check the cables. 2. Ensure that you have loaded the adapter driver. 3. The network might be idle; log in from a workstation. 4. The adapter is not transmitting or receiving data; use another adapter.
No Link or TX/RX activity.	<p>If you cannot link to your switch:</p> <ol style="list-style-type: none"> 1. Check the following LED lights on the adapter: <ul style="list-style-type: none"> TX — On The adapter is sending data. RX — On The adapter is receiving data. Link — On The adapter is connected to a valid link partner and is receiving link pulses. Link — Off Link is inoperative. <ul style="list-style-type: none"> • Check all connections at the adapter and link partner • Make sure the link partner is set to 1000 Mbps and full-duplex • Ensure that the required drivers are loaded PRO — Programmable LED Identifies the adapter by blinking. Use the Identify Adapter push-button in Intel PROSet II to control blinking. 2. Ensure that the cable is installed correctly. The network cable must be securely attached at all connections. If the cable is attached but the problem persists, try a different cable.
Your engine cannot find the IBM Gigabit Ethernet SX Server Adapter.	<ol style="list-style-type: none"> 1. Verify that the adapter is seated firmly in the slot. 2. Try a different IBM Gigabit Ethernet SX Server Adapter. 3. Try a different slot to verify that the slot on the system board is not the problem.
Diagnostics pass but the connection fails.	<p>Ensure that the network cable is securely attached.</p>
Another adapter stopped operating correctly after you installed the IBM Gigabit Ethernet SX Server Adapter.	<ol style="list-style-type: none"> 1. Verify that the cable is connected to the IBM Gigabit Ethernet SX Server Adapter and not to another adapter. 2. Check for a resource conflict indicated by a problem icon in the Device Manager. To access Device manager: <ol style="list-style-type: none"> a. Right-click on My Computer, and and select <i>Manage</i>. b. Select <i>Device Manager</i>. 3. Ensure that both adapters are seated firmly in the slot. 4. Check all cables.

Table 5. IBM Gigabit Ethernet SX Server Adapter troubleshooting chart (continued)

IBM Gigabit Ethernet SX Server Adapter problem	Suggested action
The adapter stopped working without apparent cause.	<ol style="list-style-type: none"> 1. Check the cables. 2. Reseat the adapter. 3. The network driver files might be damaged or deleted. Reinstall the drivers. 4. Use a different IBM Gigabit Ethernet SX Server Adapter.

PRO/1000 XT Server Adapter by Intel troubleshooting chart

Use the troubleshooting chart in Table 6 to find solutions to the PRO/1000 XT Server Adapter by Intel problems that have definite symptoms.

Table 6. PRO/1000 XT Server Adapter by Intel troubleshooting chart

PRO/1000 XT Server Adapter by Intel problem	Suggested action
The appliance engine cannot find the PRO/1000 XT Server Adapter by Intel.	<ol style="list-style-type: none"> 1. Verify that the adapter is seated firmly in the slot. 2. Reboot the engine. 3. Try a different PRO/1000 XT Server Adapter by Intel.
Diagnostics pass but the connection fails.	<ol style="list-style-type: none"> 1. Verify that the responding link is operating correctly. 2. Ensure that the network cable is securely attached. 3. Try a different cable.
Another adapter stopped operating correctly after you installed the PRO/1000 XT Server Adapter by Intel.	<ol style="list-style-type: none"> 1. Verify that the cable is securely connected to the PRO/1000 XT Server Adapter by Intel and not to another adapter. 2. Check for a resource conflict indicated by a problem icon in the Device Manager. To access Device manager: <ol style="list-style-type: none"> a. Right-click on My Computer, and and select <i>Manage</i>. b. Select <i>Device Manager</i>. 3. Reload all PCI device drivers. 4. Ensure that both adapters are seated firmly in the slot. 5. Check all cables.
PRO/1000 XT Server Adapter by Intel is unable to connect at 1000 Mbps, instead it connects at 100 Mbps.	<ol style="list-style-type: none"> 1. Ensure that the cable is CAT-5 or better. 2. Try another cable.
The adapter stopped working without apparent cause.	<ol style="list-style-type: none"> 1. Reseat the adapter. 2. The network driver files might be damaged or deleted. Reinstall the drivers using Device Manager. To access Device manager: <ol style="list-style-type: none"> a. Right-click on My Computer, and and select <i>Manage</i>. b. Select <i>Device Manager</i>. c. Select <i>Update Drivers</i>. d. Reload the appropriate driver found in c:\drivers. 3. Reboot the engine. 4. Try a different cable. 5. Use a different PRO/1000 XT Server Adapter by Intel.

Table 6. PRO/1000 XT Server Adapter by Intel troubleshooting chart (continued)

PRO/1000 XT Server Adapter by Intel problem	Suggested action
LINK LED is off.	<ol style="list-style-type: none"> 1. Ensure that you have loaded the adapter driver. 2. Check all connections at the adapter and the buffered repeater or switch. 3. Use another port on the buffered repeater or switch. 4. Ensure that the cable is securely attached. 5. Change the auto-negotiation setting on the link partner, if possible.
The link light is on, but communications are not correctly established.	<ol style="list-style-type: none"> 1. Ensure that the latest drivers are loaded. 2. Ensure that the adapter and its link partner are set to either auto-negotiate or set to the same speed and duplex settings.
The ACT light is off.	<ol style="list-style-type: none"> 1. Ensure that the cable is securely attached. 2. Ensure that the drivers are loaded. 3. Try accessing a server. 4. Try another PRO/1000 XT Server Adapter by Intel.
Operating system message: Unable to remove PROSet in SAFE mode.	<p>If the engine hangs after configuring the adapters with the PROSet utility, perform the following steps:</p> <ol style="list-style-type: none"> 1. Start Windows in Safe mode. 2. Access the Device Manager and disable the network adapters and teams. 3. Restart the engine. 4. Windows should operate normally if the disabled adapters were causing the problem.
LED indicators	<ul style="list-style-type: none"> • ACT/LNK <ul style="list-style-type: none"> Green on The adapter is connected to a valid link partner. Green flashing Data activity is detected. Off No link is detected. Yellow flashing There is an identity problem. Use the Identify Adapter button in Intel PROSet II to control the blinking. See the PROSet online help for more information. • 10=OFF 100=GRN 1000=YLW <ul style="list-style-type: none"> Off The adapter is operating at a 10-Mbps data rate. Green on The adapter is operating at a 100-Mbps data rate. Yellow on The adapter is operating at a 1000-Mbps data rate

Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter troubleshooting chart

Use the troubleshooting chart in Table 7 on page 26 to find solutions to the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter problems that have definite symptoms.

Table 7. Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter troubleshooting chart

Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter problem	Suggested action
Error message: "Setup cannot find OEMSETUP.INF or OEMSETNT.INF"	<ul style="list-style-type: none"> • Make sure that you are installing from the Adapters tab of the Network Control Panel Applet. • Make sure that you are specifying the correct drive letter for your CD-ROM drive.
Error message: "No SLIC adapters found"	Make sure that the adapter has been correctly installed in the PCI slot and that the PCI slot is enabled.
Event log reports "SLIC <x> Has determined that the adapter is not functioning properly"	<ul style="list-style-type: none"> • Run the diagnostics Network Control Panel Applet. • Replace the adapter.
Event log reports "SLIC <x>: Could not find an adapter"	<ul style="list-style-type: none"> • Ensure that the card was not moved from its original slot. • Uninstall the adapter from the adapters tab of the Network Control Panel Applet, reboot, and then reinstall.
Event log reports "The Alacritech 100 or 1000 Series Server Adapter service failed to start due to the following error: The system cannot find the file specified."	Update the drivers with the drivers found at: www.ibm.com/storage/support
There is no connectivity with other computers on the network. Pinging does not work.	<ul style="list-style-type: none"> • Make sure that the cables are attached securely at both RJ-45 connections (adapter and switch) and that the network cable is functional. • Check the LEDs on the adapter. These LEDs help indicate if there are problems with the adapter, switch, or cable.
TCP connections can be established to other systems on the same subnet, but connections cannot be established to systems on the other side of a router.	<p>If you have a Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter and an adapter from another manufacturer installed on your system, and your network is configured such that the route from your system to the remote system is different than the route from the remote system back to your system (a routing loop), then it might not be possible to establish a TCP connection. To solve this problem, perform one of the following solutions:</p> <ul style="list-style-type: none"> • Replace the existing adapter with an Alacritech 100 or 1000 Series Server Adapter, or • Reconfigure the network to eliminate the routing loop, or • Disable TCP/IP Offload on the interfaces associated with the routing loop by completing this procedure: Note: Disabling SLI TCP/IP Offload will disable the performance benefits of the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter on that interface. Complete these steps only when required. <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.

Table 7. Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter troubleshooting chart (continued)

Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter problem	Suggested action
IPSEC does not function through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter interface.	<p>In order to use IPSEC with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interface through which you want to establish the IPSEC connection. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.
QOS does not work through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter interface	<p>In order to use QOS with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interface through which you want to establish the QOS connection. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.
Network monitoring does not function through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter.	<p>Network monitoring applications require packet access to the network, and are incompatible with the session layer interface provided by the SLIC TCP/IP Offload. In order to use network monitoring with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interface through which you want to use network monitoring. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.
Firewall software does not work through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter interface.	<p>Firewall applications require packet access to the network, and are incompatible with the session layer interface provided by the SLIC TCP/IP Offload. In order to use network monitoring with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interface through which you want to use for a firewall. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.

Table 7. Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter troubleshooting chart (continued)

Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter problem	Suggested action
Microsoft Network Load Balancing does not work through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter interface.	<p>In order to use Microsoft Network Load Balancing with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interfaces which you want to use for Microsoft Network Load Balancing. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.
Point-to-Point Tunneling Protocol (PPTP) does not work through the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter interface.	<p>PPTP connections cannot be established through a SLIC TCP/IP Offload-enabled interface. In order to use PPTP with the Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter, disable SLIC TCP/IP Offload on the interfaces through which you want to establish a PPTP connection. To disable the SLIC TCP/IP Offload, complete these steps:</p> <ol style="list-style-type: none"> 1. From the start menu, open the Network & Dial-up Connections folder located in the <i>Settings</i> menu. 2. Double-click the LAN connection of the interface you wish to disable TCP Offload. 3. Click the Properties button. Deselect the box labeled <i>Alacritech TCP Fast-path driver</i>. Click OK. 4. Restart the engine.
<p>When uninstalling the Alacritech TCP Fast-path driver, an error message appears with the message:</p> <p>"Could not uninstall the Alacritech TCP Fast-path driver component. The error is 0x800F020B"</p>	No corrective action is necessary.

Alacritech 100x4 Quad-Port Server Accelerated Adapter

Table 8 displays the LED definitions for the Alacritech 100x4 Quad-Port Server Accelerated Adapter LED definitions.

Table 8. Alacritech 100x4 Quad-Port Server Accelerated Adapter LED definitions

LED	Indication	Meaning
LNK	Off	Either the adapter or the switch (or both) are not receiving power, or the cable connection between them is faulty.
	Green	The adapter and switch are receiving power. The cable connection between them is good. A 100 Mbps link has been established.
	Amber	The adapter and switch are receiving power. The cable connection between them is good. A 10 Mbps link has been established.
ACT	Off	The adapter is not sending or receiving network data.
	Flashing amber	The adapter is sending or receiving network data.

ServeRAID controller troubleshooting chart

Table 9 shows some common troubleshooting error messages when using the ServeRAID controller.

Table 9. ServeRAID troubleshooting messages

Message	Explanation and possible recovery actions
A new drive was installed.	<p>Explanation: When the ServeRAID controller detects a new drive that is not part of the current configuration, the following message appears:</p> <p>x new Ready drives found</p> <p>where x is the number of Ready drives found.</p> <p>Action: This is an information message. No action is required.</p>
Auto rearrange.	<p>Explanation: Auto rearrange is enabled or disabled.</p> <p>Action: This is an information message. No action is required.</p>
Battery-backup cache not responding	<p>Explanation: BIOS code detected a bad or failed battery-backup cache.</p> <p>Action: Press F9 to remove the battery-backup cache from the configuration, or press F10 to exit without change.</p>
Battery-backup cache replacement	<p>Explanation: The ServeRAID controller detects that the battery-backup cache is defective.</p> <p>Action: If the battery-backup cache must be replaced, contact your IBM service representative. Press F8 if you replaced the battery-backup cache, or press F10 if you have not replaced the battery-backup cache.</p>

Table 9. ServeRAID troubleshooting messages (continued)

Message	Explanation and possible recovery actions
Configured drives are missing.	<p>Explanation: When the ServeRAID controller detects that a previously configured drive is missing, the following message appears:</p> <p style="padding-left: 20px;">x Online drives not responding or found at new location(s)</p> <p>where x is the number of drives not responding.</p> <p>After pressing F2, a more detailed message appears:</p> <p>Online Drive on Channel x SCSI ID y is not responding.</p> <p>where x is the channel ID and y is the SCSI ID.</p> <p>Action: Press one of the following keys:</p> <p>F2 Detailed description. Press this key for a detailed description of the problem, such as the example message above.</p> <p>F4 Retry. Press this key after correcting a problem. For example, press F4 after you turn on the external storage enclosure that contains the physical drive.</p> <p>F5 Change the configuration and set the drives to defunct. Press this key to accept the new state that the ServeRAID controller will assign to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty.</p> <p>You can also press F5 when you must remove a drive. RAID level-1 and RAID level-5 logical drives are present, and performance in a degraded mode is acceptable. The ServeRAID controller will assign the drive a state of defunct, but the server can complete startup. However, the array will remain in critical mode and the potential for data loss will exist until you replace and rebuild the defunct drive. To prevent the loss of data, replace and rebuild the defunct drive in a timely manner.</p> <p>Note: A physical drive in the defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:</p> <ol style="list-style-type: none"> 1. All cables are connected correctly to the backplane and to the physical drive. Also, ensure that all cables inside the engine are connected correctly. 2. The hot-swap drive trays are seated correctly in the drive bay. 3. If multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. If multiple physical drives fail at the same time within the same array, contact your IBM service representative. See "Rebuilding a defunct drive" in the <i>IBM ServeRAID User's Reference</i> on the Documentation CD for more information. <p>After you perform these steps, if the physical drive does not function correctly, replace the drive.</p> <p>F10 Continue starting without changing the configuration. Press this key to continue without change to the configuration.</p>

Table 9. ServeRAID troubleshooting messages (continued)

Message	Explanation and possible recovery actions
<p>Configured drives are not in the configured location.</p>	<p>Explanation: When the ServeRAID controller detects that a previously configured drive is present, but the drive is in a new location, the following message appears:</p> <p>x Online drive has been rearranged</p> <p>where x is the number of drives that have been rearranged.</p> <p>After pressing F2, a more detailed message appears:</p> <p>Online Drive on Channel w SCSI ID x moved to Channel y SCSI ID z</p> <p>where w and y are the channel numbers, and x and z are the SCSI IDs.</p> <p>Action: Press one of the following keys:</p> <p>F2 Detailed description. Press this key for a detailed description of the problem, such as the example messages above.</p> <p>F4 Retry. Press this key after correcting a problem. For example, press F4 after you move the physical drive to its previously assigned location.</p> <p>F5 Change the configuration and set the drive to defunct. Press this key to accept the new state that the ServeRAID controller will assign to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty.</p> <p>Note: A physical drive in the defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:</p> <ol style="list-style-type: none"> 1. All cables are connected correctly to the backplane and to the physical drive. Also, ensure that all cables inside the server are connected correctly. 2. The hot-swap drive trays are seated correctly in the drive bay. 3. If multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. If multiple physical drives fail at the same time within the same array, contact your IBM service representative. See "Rebuilding a defunct drive" in the <i>IBM ServeRAID User's Reference</i> on the Documentation CD for more information. <p>After you perform these steps, if the physical drive does not function correctly, replace the drive.</p> <p>F6 Change the configuration and accept the rearrangement. Press this key to change the configuration to match the current drive location.</p> <p>You might remove the hot-swap drives from the server for security or maintenance reasons. If you replace the drives but install them in different drive bays, you can press F6 to accept the new locations, and the ServeRAID controller will update the configuration.</p> <p>F10 Continue startup without changing the configuration. Press this key to continue without change to the configuration.</p>
<p>Controller is not responding to commands. No logical drives are installed.</p>	<p>Explanation: The ServeRAID controller is not operational.</p> <p>Action: Have the engine serviced.</p>

Table 9. ServeRAID troubleshooting messages (continued)

Message	Explanation and possible recovery actions
Error: Cannot disable this controller BIOS.	<p>Explanation: The ServeRAID controller was unable to prevent an extra copy of its BIOS code from being stored on the engine. This condition occurs when the server contains multiple ServeRAID controllers.</p> <p>Action: Have the engine serviced.</p>
Installation stopped.	<p>Explanation: The engine cannot access the ServeRAID controller.</p> <p>Action: This is a follow-on message to a preceding message. Follow the Action instructions for the preceding message to resolve the problem.</p>
New controller installed in a configured server or drives are imported.	<p>Explanation: When the ServeRAID controller detects that the identifiers of the drives do not match the controller configuration information, the following message appears:</p> <p>x Online drive(s) found with incorrect configuration</p> <p>where x is the number of drives found with incorrect configuration.</p> <p>After pressing F2, a more detailed message appears:</p> <p>Configuration mismatch Channel x with Host ID y</p> <p>where x is the channel number, and y is the Host ID.</p> <p>Action: Press one of the following keys:</p> <p>F2 Detailed description. Press F2 for a detailed description of the problem, such as the example message above.</p> <p>F4 Retry. Press F4 after correcting a problem. For example, press F4 after you power on the external storage enclosure that contains the physical drive.</p>

Table 9. ServeRAID troubleshooting messages (continued)

Message	Explanation and possible recovery actions
<p>New controller installed in a configured server or drives are imported (continued)</p>	<p>F5 Change the configuration and set the drives to defunct. Press F5 to accept the new state that the ServeRAID controller will assign to the drive. For example, the ServeRAID controller will assign the drive a state of defunct or empty.</p> <p>You can also press F5 when you must remove a drive. RAID level-1 and RAID level-5 logical drives are present, and performance in a degraded mode is acceptable. The ServeRAID controller will assign the drive a state of defunct, but the server can complete startup. However, the array will remain in Critical mode and the potential for data loss will exist until you replace and rebuild the defunct drive. To prevent the loss of data, replace and rebuild the defunct drive in a timely manner.</p> <p>Note: A physical drive in the defunct state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:</p> <ol style="list-style-type: none"> 1. All cables are connected correctly to the backplane and to the physical drive. Also, ensure that all cables inside the engine are connected correctly. 2. The hot-swap drive trays are seated correctly in the drive bay. 3. If multiple drives fail in separate arrays (one physical drive per array), then replace each of the defunct physical drives. If multiple physical drives fail at the same time within the same array, contact your IBM service representative. See “Rebuilding a defunct drive” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information. <p>If the physical drive does not function correctly after you perform these steps, replace the drive.</p> <p>F7 Import configuration information from drive. Press F7 to restart the engine. Use F7 to import the configuration information from the drive and to update the configuration information for the ServeRAID controller. This choice is useful when you replace the ServeRAID controller in an existing ServeRAID subsystem.</p> <p>You also might press F7 if you replace a whole set of drives with drives that were configured in another server with a ServeRAID controller.</p> <p>Note: When you install drives in a server that has no logical drives defined, the F7 choice will not appear. The ServeRAID controller does not contain any logical drives in its factory configuration. Therefore, F7 will not appear. In this case, do the following:</p> <ol style="list-style-type: none"> 1. Restart the engine and press Ctrl+I to enter the Mini-Configuration program. (See “Using the Mini-Configuration program” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information.) 2. Select Advanced Functions. 3. Select Copy the Configuration from Drives to the Controller and follow the instructions on the screen.

Table 9. ServeRAID troubleshooting messages (continued)

Message	Explanation and possible recovery actions
Recoverable configuration error	<p>Explanation: The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu. (See “Using the Mini-Configuration program” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD-ROM for more information.) 2. Select Advanced Functions from the Main Menu. 3. select Copy the Configuration from Drives to the Controller. (See “Using the advanced configuration functions” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information.)
Unrecoverable configuration error	<p>Explanation: The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.</p> <p>Action:</p> <ol style="list-style-type: none"> 1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu. (See “Using the Mini-Configuration program” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information.) 2. Select Advanced Functions from the Main Menu. Attention: Restoring to factory default settings sets all online drives in an array to ready. You must import the configuration from the drives or diskette. Otherwise, you must create a new array and logical drives. When you create new logical drives, they are automatically initialized. All data is lost and you must re-install the operating system and data. 3. Select Restore to the Factory Default Settings. (See “Using the advanced configuration functions” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information.)
WARNING: <i>n</i> logical drives are critical; <i>n</i> logical drives are offline.	<p>Explanation: One or more physical drives have failed.</p> <p>Action: Replace the defunct drives as soon as possible to prevent data loss.</p>
Your server has an error due to a Blocked Logical Drive.	<p>Explanation: One or more logical drives are blocked. A blocked logical drive cannot be accessed. See “Logical drive-state descriptions” in the <i>IBM ServeRAID User’s Reference</i> on the Documentation CD for more information.</p> <p>Action: Press F4 to unblock the logical drive, or press F5 to continue without unblocking.</p>

Running adapter diagnostics

This section describes how to test the adapter using the diagnostics. Note that running the adapter diagnostics will disrupt the network connection.

Ethernet adapters

This section explains how to test Ethernet adapters.

Intel PROSet II utility: The NAS 200 is equipped with the Intel® PROSet II utility for:

- Monitoring the status of the Ethernet adapter PCI cards
- Testing the Ethernet adapter to see if there are any problems with the adapter hardware, the cabling, or the network connection
- Isolating problems during troubleshooting

To access the PROSet utility, you must first go into Terminal Services. For instructions on how to invoke Terminal Services, refer to “Terminal Services and the IBM NAS Administration Console” in the *IBM TotalStorage NAS 200 User's Reference*. Within Terminal Services perform the following steps:

1. Double-click the **INTEL PROSet II** icon in the Control Panel to start the Intel PROSet II utility.
2. In Intel PROSet II, select the Ethernet adapter you want to test (IBM Gigabit Ethernet SX Server Adapter, integrated Gigabit Ethernet controller, or the PRO/1000 XT Server Adapter by Intel).
3. Select the **Diagnostics** tab. A list of available tests is displayed.
4. Select **Run Tests**.
You can also select or deselect individual tests with the check boxes. If an error is detected, information about the error is displayed.
5. Repeat steps 2 through 4 for each Ethernet adapter installed in the engine.

Alacritech 100x4 Quad-Port Server Accelerated Adapter and Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter: Note that running these diagnostic tests will disrupt all ports of the adapter.

Use the following procedure to run diagnostic tests on this adapter:

1. Open the Control Panel.
2. In the Network dialog box, select the *Adapters* tab.
3. Select one of the Alacritech 100x4 Quad-Port Server Accelerated Adapter or Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter ports.
4. Click **Properties**.
5. Select the *Diagnostics* tab.
6. Click **Run**. The adapter will complete the self-test of the IPP and the selected port of the adapter.
7. Close the Network Control Panel by clicking **OK**.

Fibre Channel adapter (Single-port Fibre Channel)

Note: The Fibre Channel adapter diagnostics utility that was used in earlier versions was FAST Check.

Each engine has FAST MSJ for viewing the status of your Fibre Channel connection as well as testing the adapter. To use FAST MSJ utility, you must first go into Terminal Services. For instructions on how to invoke Terminal Services, refer to “Terminal Services and the IBM NAS Administration Console” in the *IBM TotalStorage NAS 200 User's Reference*.

Access FAST MSJ by going into the IBM NAS Admin console and selecting **NAS Management** → **Storage** → **NAS Utilities** → **FAST MSJ**. Then select **Connect**. A diagnostic panel displays the following general information related to your Fibre Channel adapter, which can be useful if you need to place a support call:

- Node name (the world-wide name or MAC address of the Fiber Channel adapter)
- Loop ID
- BIOS version
- Firmware version number
- Device-driver version number
- PCI slot number

Note: Ensure that there is no adapter activity before running the test or data can be lost.

To test the Fibre Channel adapter, select the adapter and then select **Diagnostic**.

Remote Supervisor Adapter

1. Insert the Remote Supervisor Adapter Support CD-ROM into the CD-ROM drive and restart the engine. If the engine does not boot from the CD-ROM, use POST/BIOS setup to configure the CD-ROM drive as a boot device.
2. After the engine boots, the main menu appears. The main menu contains the following selections:
 - Hardware Status and Information
 - Configuration Settings
 - Update System Management firmware
3. Use the Up and Down arrow keys to select **Hardware Status and Information** and press **Enter**. The Hardware Status and Information menu reports on the Advanced System Management devices in the NAS 200 in the following manner:

```
System Management Processor Communication : Passed
-> Built in Self Test Status ..... : Passed
   Boot Sector Code Revision ... :16, Build ID: CNET15A
   Main Application Code Revision :16, Build ID: TUET15A
```

ServeRAID controller

This section applies to the IBM ServeRAID-5i Ultra320 SCSI Controller, IBM ServeRAID-4H Ultra160 SCSI Controller, or IBM ServeRAID-4Mx Ultra160 SCSI Controller, unless otherwise noted.

Error codes and messages display on the screen at power-on in a line of text immediately after the adapter BIOS version.

If POST detects changes in the controller configuration or detects a controller hardware problem, messages appear on the screen. Refer to “POST (ISPR) error procedures” on page 37 and correct the problem.

If there is no POST Error or Configuration Error message, the BIOS screen messages resemble the sample shown below. Note that your version may be different from the one shown.

```
IBM ServeRAID BIOS
Copyright IBM Corp. 1995, 2001
Ver: 3.00.12 08/14/2000, 2001

Press Ctrl+I to access the Mini-Configuration Program.

Initializing ServeRAID Controller 1 in Slot 1.
Power-on self-test can take up to 59 Second(s) -- test Passed.
Drive configuration can take up to 6 Minute(s) 0 Second(s) -- test Passed.
ServeRAID Firmware Version:2.82.00
No logical drives found; none are installed.
Non-Disk SCSI Devices Found: CD-ROM 0, Tape 0, Removable-media 0, Other 1.

BIOS not loaded no devices found - Installation stopped.
```

If there is a POST Error message, the BIOS screen resembles the sample shown below. Refer to “POST (ISPR) error procedures” on page 37 and correct the problem. Note that your version may be different from the one shown. The characters XXXX indicate the POST (ISPR) error.

```
IBM ServeRAID BIOS
Copyright IBM Corp. 1995, 2001
Ver: 3.00.12 08/14/2000, 2001
```

```
Press Ctrl+I to access the Mini-Configuration Program.
Initializing ServeRAID Controller 1 in Slot 1.
Power-on self-test can take up to 59 Second(s) -- test Failed.
Controller is not responding properly - Run Diagnostics.
Error Code: XXXX-YY
```

```
BIOS not loaded no devices found - Installation stopped.
```

The sample BIOS screen below shows configuration status and error information.

```
IBM ServeRAID BIOS
Copyright IBM Corp. 1995, 2001
Ver: 3.00.12 08/14/2000, 2001
```

```
Press Ctrl+I to access the Mini-Configuration Program.
Initializing ServeRAID Controller 1 in Slot 1.
Power-on self-test can take up to 59 Second(s) -- test Passed.
Drive configuration-can take up to 6 Minute(s) 0 Second(s) -- test Failed.
Controller POST and Config Error Codes: ISPR = EF10 BCS = 09 ECS = 20.
Following drives not responding (old state: new state: ch SID)
```

```
(RDY:EMP: 2:0)
```

```
The system has a configuration error due to above condition(s). Press: F4 - Retry
the command F5 - Update Controller configuration to exclude
NON-RESPONDING drives Warning: NON-RESPONDING drives will be set to
DDD, DHS, or EMP state F10 - Exit without change
```

POST (ISPR) error procedures: The Interrupt Status Port Register (ISPR) Error Procedures list errors, symptoms, and the possible causes. The most probable cause is listed first. Use these procedures to help you solve ServeRAID problems when servicing the computer. A complete list of error codes is in “ServeRAID” on page 65.

EF 10 Default ISPR. No ISPR error present.

9ZXX thru BZXX

SCSI bus error caused either by cables, termination, defective drives, and so on.

1. Isolate the error between SCSI subsystem and controller by disconnecting all SCSI cables from suspect card, and reboot.

Attention: Do not press F5, as this changes the configuration.

If an ISPR error is still present, take the following actions until the error is no longer present:

- a. Reseat the controller
- b. Replace the controller

Note: If the controller detects a configuration change, do not choose Save Changes. Instead, press **F10** to bypass any options to this effect.

2. If the ISPR error is EF10 after disconnecting cables:
 - a. Identify which channel is causing the error by the second digit (Z) of the original ISPR code as indicated in Table 10:

Note: IBM ServeRAID-4H Ultra160 SCSI Controllers have four channels. IBM ServeRAID-5i Ultra320 SCSI Controllers have two channels, one internal and one external channel located on the back of the engine. The IBM ServeRAID-4Mx Ultra160 SCSI Controllers have 2 channels.

Table 10. SCSI identifier

Code (z)	Channel
1	1
2	2
3	1 and 2
4	3
5	1 and 3
6	2 and 3
7	1, 2, and 3
8	4
9	1 and 4
A	2 and 4
B	1, 2, and 4
C	3 and 4
D	1, 3, and 4
E	2, 3, and 4
F	1, 2, 3, and 4

- b. Confirm that any channels are the cause of the error by verifying that the error presents itself **only** when the offending channel is reconnected.
- c. Check termination of identified channel.
- d. Check for correct backplane jumper configuration.
- e. Check for correct cabling configuration in systems that use DASD status cables. Reconnect all cables that you disconnected at the beginning of this procedure.
- f. Disconnect one drive at a time attached to the channel you previously identified Table 10, then reboot to determine which drive is causing the error.
- g. Replace the SCSI cable.
- h. Replace the SCSI backplane.

FFFF (or other code not listed)

1. Isolate the area between the SCSI Subsystem and the controller by disconnecting all SCSI cables attached to the suspect card, and reboot.

Attention: Do not press F5. Doing so changes the configuration. If the ISPR code is EF10 after disconnecting cables, follow the steps below until the error is eliminated:

- a. Identify which channel is causing the error by reconnecting cables one at a time and rebooting until the error returns.
 - b. Check the termination of the channel you identified in step 1a.
 - c. Disconnect one drive at a time attached to the identified channel and reboot each time to determine which drive is causing the problem.
 - d. Replace the SCSI cable attached to the identified channel.
 - e. Replace the backplane attached to the identified channel
2. If the original ISPR code is still present after disconnecting all SCSI cables and rebooting, take the following actions until the error is no longer present:
 - a. Reseat the controller
 - b. Replace the controller

SCSI messages

If you receive a SCSI error message while using the SCSISelect Utility, use the following list to determine the cause of the error and the action to take.

One or more of the following conditions might be causing the problem:

- A failing SCSI adapter or drive
- An incorrect SCSI configuration
- Duplicate SCSI IDs in the same SCSI chain
- An incorrectly installed SCSI terminator
- A defective SCSI terminator
- An incorrectly installed cable
- A defective cable

Verify that:

- The external SCSI devices are powered on. External devices must be powered on before the engine.
- The cables or all external SCSI devices are connected correctly.
- The last device in each SCSI chain is terminated correctly.
- The SCSI devices are configured correctly.

You will receive these messages only when running the SCSISelect Utility. See "Using the SCSISelect Utility program" on page 213.

Power checkout

Power problems can be difficult to troubleshoot. For example, a short circuit can exist anywhere on any of the power distribution buses. Usually, a short circuit will cause the power subsystem to shut down because of an overcurrent condition.

A general procedure for troubleshooting power problems is as follows:

1. Shut down (see “Powering on and shutting down the appliance” on page 11) the system and disconnect the ac cords.
2. Check for loose cables in the power subsystem. Also check for short circuits; for example, if there is a loose screw causing a short circuit on a circuit board.
3. Remove adapters and disconnect the cables and power connectors to all internal and external devices until the system is at the minimum configuration required for power-on (see page 63).
4. Reconnect the ac cord and power ON the system. If the system powers on successfully, replace adapters and devices one at a time until the problem is isolated. If the system does not power on from minimal configuration, replace parts of the minimal configuration one at a time until the problem is isolated.

To use this method it is important to know the minimum configuration required for a system to start (see page “Power-supply LED errors” on page 63). For specific problems, see “Power error messages” on page 62.

Temperature checkout

Cooling of the system is important for correct operation and system reliability. Make sure that:

- Each of the drive bays has either a drive or a filler panel installed.
- Each of the power supply bays has either a power supply or a filler panel installed.
- The top cover is in place during normal operation.
- There is at least 50 mm (2 in.) of ventilated space at the sides of the appliance and 100 mm (4 in.) at the rear of the appliance.
- The top cover is removed for no longer than 30 minutes while the appliance is operating.
- The processor housing cover covering the processor and memory area is removed for no longer than 10 minutes while the appliance is operating.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters (ensure that cables are not restricting air flow).
- The fans are operating correctly and the air flow is good.
- A failed fan is replaced within 48 hours.

In addition, ensure that the environmental specifications for the system are met. See “Specifications” on page 6.

For more information on specific temperature error messages, see “Temperature error messages” on page 69.

Chapter 4. Symptom-to-part index

This index lists symptoms, errors, and the possible causes. Use this symptom-to-part index to help you decide which parts to have available when servicing the product.

The POST BIOS displays POST error codes and messages on the panel.

Table 11. Error-symptoms index

Symptom	Located on page
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Diagnostic error codes	44
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POST error codes	55
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Beep symptoms

A beep symptom is an audio signal consisting of a short tone or a series of short tones separated by pauses. For example, beep symptom **1-2-3** consists of:

- One beep
- A pause
- Two beeps
- A pause
- Three beeps

If the POST completes successfully, one beep indicates that the system is operating correctly.

Table 12 on page 42 describes the beep symptoms, the suspected parts to be replaced, and recommended actions.

Table 12. Beep symptoms

Beep symptom	Description	Part/action
1-1-2	Microprocessor register test failed.	1. Optional microprocessor (if installed) 2. Microprocessor 3. System board
1-1-3	CMOS write/read test failed.	1. Battery 2. System board
1-1-4	BIOS EEPROM checksum failed.	1. Recover BIOS 2. System board
1-2-1	Programmable Interval Timer failed.	System board
1-2-2	DMA initialization failed.	System board
1-2-3	DMA page register write/read failed.	System board
1-2-4	RAM refresh verification failed.	1. DIMM 2. System board
1-3-1	First 64K RAM test failed	DIMM
2-1-1	Secondary DMA register failed.	System board
2-1-2	Primary DMA register failed.	System board
2-1-3	Primary interrupt mask register failed.	System board
2-1-4	Secondary interrupt mask register failed.	System board
2-2-1	Interrupt vector loading failed.	System board
2-2-2	Keyboard controller failed.	1. System board 2. Keyboard
2-2-3	CMOS power failure and checksum checks failed.	1. Battery 2. System board
2-2-4	CMOS configuration information validation failed.	1. Battery 2. System board
2-3-1	Screen initialization failed.	System board
2-3-2	Screen memory failed.	System board
2-3-3	Screen retrace failed.	System board
2-3-4	Search for video ROM failed.	System board
2-4-1	Video failed; screen believed operable.	System board
3-1-1	Timer tick interrupt failed.	System board
3-1-2	Interval timer channel 2 failed.	System board

Table 12. Beep symptoms (continued)

Beep symptom	Description	Part/action
3-1-3	RAM test failed above address X'OFFFHH'.	1. DIMM 2. System board
3-1-4	Time-Of-Day clock failed.	1. Battery 2. System board
3-2-1	Serial port failed.	System board
3-2-2	Parallel port failed.	System board
3-2-3	Math coprocessor test failed.	1. Microprocessor 2. System board
3-2-3	Failure comparing CMOS memory size against actual.	1. DIMM 2. Battery
3-3-1	Memory size mismatch occurred.	1. DIMM 2. Battery
3-3-2	Critical SMBUS error occurred.	1. Disconnect the engine power cord from outlet, wait 30 seconds and retry. 2. System board. 3. DIMMs. 4. DASD backplane. 5. Power supply. 6. Power cage assembly. 7. I ² C Cable.
3-3-3	No operational memory in system.	1. Install or reseal the memory modules, and then do a 3 boot reset. (For more information on a 3 boot reset, see "Using the Configuration/Setup Utility program" on page 207.) 2. DIMMs. 3. Memory board. 4. System board.
4-4-4	Optional Remote Supervisor Adapter not installed in slot 1 or not functioning correctly.	1. Verify that the adapter is installed in slot 1. 2. Adapter. 3. System board.
Two short beeps	Information only, the configuration has changed.	1. Run Base System Diagnostics. 2. Run the Configuration/Setup Utility program.
Three short beeps		1. DIMM 2. System board
One continuous beep		1. Microprocessor 2. Optional microprocessor (if installed) 3. System board
Repeating short beeps		1. Keyboard 2. System board
One long and one short beep		System board

Table 12. Beep symptoms (continued)

Beep symptom	Description	Part/action
One long and two short beeps		System board
One long and three short beeps		1. Monitor 2. System board
Two long and two short beeps		System board

Symptoms that have no beep codes

Table 13 describes the symptoms with no beep codes, the suspected parts to be replaced, and recommended actions.

Table 13. Symptoms that have no beep codes

No-beep symptom	Part/action
No beep and the system operates correctly.	1. Verify that the speaker cables are securely connected 2. Speaker. 3. System board.
No beeps occur after successfully completing POST (the power-on status is disabled)	1. Run the Configuration/Setup Utility program, and set the Start Options Power-On Status to enable. 2. Check the speaker connection. 3. System board.
No ac power (power supply ac LED is off)	1. Check the power cord. 2. Power supply. (If two are installed, swap them to determine if one is defective.) 3. Power cage assembly. 4. Hot-swap power ac inlet box.
No beep and no video	See "Undetermined problems" on page 70.
System will not start (power supply ac LED is on)	See "Power-supply LED errors" on page 63.

Diagnostic error codes

Note: In the following error codes, if XXX is 000, 195, or 197, **do not** replace a part. These error codes have the following meanings:

- 000** The test passed.
- 195** Esc was pressed to end the test.
- 197** This is a warning error and may not indicate a hardware failure.

For all other error codes, replace the part or perform the actions indicated.

Table 14 on page 45 describes diagnostic error codes, the suspected parts to be replaced, and recommended actions.

Table 14. Diagnostic error codes

Error code/symptom	Meaning	Part/action
001-XXX-000	Failed core tests.	System board
001-XXX-001	Failed core tests.	System board
001-250-000	Failed system board ECC.	System board
001-250-001	Failed system board ECC.	System board
005-XXX-000	Failed video test.	System board
011-XXX-000	Failed COM1 serial port test.	System board
011-XXX-001	Failed COM2 serial port test.	System board
014-XXX-000	Failed parallel port test.	System board
015-XXX-001	USB interface not found, board damaged.	System board
015-XXX-015	Failed USB external loopback test.	No action required. USB is not required for normal functioning.
015-XXX-198	USB device connected during USB test.	No action required. USB is not required for normal functioning.
020-XXX-000	Failed PCI interface test.	System board
020-XXX-001	Failed hot-swap slot 1 PCI latch test.	1. PCI hot-swap latch assembly 2. System board
020-XXX-002	Failed Hot-swap slot 2 PCI latch test.	1. PCI hot-swap latch assembly 2. System board
020-XXX-003	Failed hot-swap slot 3 PCI latch test.	1. PCI hot-swap latch assembly 2. System board
020-XXX-004	Failed hot-swap slot 4 PCI latch test.	1. PCI hot-swap latch assembly 2. System board
030-XXX-000	Failed internal SCSI interface test.	System board
035-XXX-099		1. No adapters were found. 2. If adapter is installed recheck connection.
035-XXX-S99	Failed RAID test on PCI slot <i>S</i> , where <i>S</i> = number of failing PCI slot. Check System Error Log before replacing a part.	1. Adapter 2. SCSI backplane 3. Cable
035-XXX-SNN	Check System Error Log before replacing a part. <i>s</i> = number of failing PCI slot, <i>nn</i> = SCSI ID of failing fixed disk.	Hard disk drive with SCSI ID <i>nn</i> on RAID adapter in PCI slot <i>s</i> .
035-253-S99	RAID adapter initialization failure.	1. ServeRAID adapter in slot <i>s</i> is not configured properly. Obtain the basic and extended configuration status and see the <i>ServeRAID User's Reference</i> on the documentation CD-ROM for more information. 2. Cable. 3. SCSI backplane. 4. Adapter.
075-XXX-000	Failed power supply test.	Power supply

Table 14. Diagnostic error codes (continued)

Error code/symptom	Meaning	Part/action
089-XXX-001	Failed microprocessor test.	<ol style="list-style-type: none"> 1. VRM 1 for microprocessor 1 2. Microprocessor 1
089-XXX-002	Failed optional microprocessor test.	<ol style="list-style-type: none"> 1. VRM 2 for optional microprocessor 2 2. Optional microprocessor 2
166-198-000 System Management: Aborted	Unable to communicate with ASM. It may be busy. Run the test again.	<ol style="list-style-type: none"> 1. Run the diagnostic test again. 2. Correct other error conditions and retry. These include other failed system management tests and items logged in the System Error Log of the optional Remote Supervisor Adapter. 3. Disconnect all engine and option power cords from the engine, wait 30 seconds, reconnect, and retry. 4. Remote Supervisor Adapter, if installed. 5. System board.
166-201-001 System Management: Failed	I ² C bus error(s) See SERVPROC and DIAGS entries in event log.	<ol style="list-style-type: none"> 1. If installed, reseal the I²C cable between the Remote Supervisor Adapter (in PCI slot 1/J32) and the system board (J27). 2. Reseat memory DIMMs. 3. Memory DIMMs. 4. System board.
166-201-002 System Management: Failed	I ² C bus error(s) See SERVPROC and DIAGS entries in event log.	<ol style="list-style-type: none"> 1. Reseat I²C cable between the operator information panel and the system board (J24). 2. Reseat I²C cable between the diagnostics panel and the system board (J23). 3. Operator information panel. 4. Diagnostics panel. 5. System board.
166-201-003 System Management: Failed	I ² C bus error(s) See SERVPROC and DIAGS entries in event log.	<ol style="list-style-type: none"> 1. Reseat cables between the system board and the power supply or power cage assembly. 2. Power cage assembly. 3. System board.
166-201-004 System Management: Failed	I ² C bus error(s) See SERVPROC and DIAGS entries in event log.	<ol style="list-style-type: none"> 1. DASD backplane 2. System board
166-201-005 System Management: Failed	I ² C bus error(s) See SERVPROC and DIAGS entries in event log.	<ol style="list-style-type: none"> 1. Reseat Memory DIMMs. 2. Reseat microprocessors. 3. Memory DIMMs. 4. Microprocessors. 5. System board.
166-250-000 System Management: Failed	I ² C cable is disconnected. Reconnect I ² C cable between Remote Supervisor Adapter and system board.	<ol style="list-style-type: none"> 1. Reseat I²C cable between the Remote Supervisor Adapter (in PCI slot 1/J32) and the system board (J27). 2. I²C cables. 3. Replace the Remote Supervisor Adapter. 4. System board.

Table 14. Diagnostic error codes (continued)

Error code/symptom	Meaning	Part/action
166-260-000 System Management: Failed	Restart Remote Supervisor Adapter Error. After restarting, Remote Supervisor Adapter communication was lost. Unplug and cold boot to reset Remote Supervisor Adapter.	<ol style="list-style-type: none"> 1. Disconnect all engine and option power cords from the engine, wait 30 seconds, reconnect, and retry. 2. Reseat the Remote Supervisor Adapter (in PCI slots 1/J32). 3. Remote Supervisor Adapter.
166-342-000 System Management: Failed	Remote Supervisor Adapter adapter BIST indicate failed tests.	<ol style="list-style-type: none"> 1. Ensure that the latest firmware levels for Remote Supervisor Adapter and BIOS. 2. Disconnect all engine and option power cords from engine, wait 30 seconds, reconnect, and retry. 3. Remote Supervisor Adapter.
166-400-000 System Management: Failed	ISMP self test result failed tests: x where x = Flash, RAM, or ROM.	<ol style="list-style-type: none"> 1. Reflash or update firmware for ISMP. 2. System board.
180-XXX-000	Diagnostics panel LED failure.	Run diagnostics panel LED test for the failing LED.
180-XXX-001	Failed front LED panel test.	<ol style="list-style-type: none"> 1. Operator information panel 2. System board
180-XXX-002	Failed diagnostics LED panel test.	<ol style="list-style-type: none"> 1. Diagnostics panel 2. System board
180-361-003	Failed fan LED test.	<ol style="list-style-type: none"> 1. Fan(s) 2. System board
180-XXX-003	Failed system board LED test.	System board
180-XXX-005	Failed SCSI backplane LED test.	<ol style="list-style-type: none"> 1. SCSI backplane 2. SCSI backplane cable 3. System board
201-XXX-0NN	Failed memory test.	<ol style="list-style-type: none"> 1. DIMM Location slots 1-6 where <i>nn</i> = DIMM location. Note: <i>nn</i> : 1=DIMM 1 2=DIMM 2 3=DIMM 3 4=DIMM 4 5=DIMM 5 6=DIMM 6. 2. System board
201-XXX-999	Multiple DIMM failure, see error text.	<ol style="list-style-type: none"> 1. See error text for failing DIMMs. 2. System board.
202-XXX-001	Failed system cache test.	<ol style="list-style-type: none"> 1. VRM 1 2. Microprocessor 1
202-XXX-002	Failed system cache test.	<ol style="list-style-type: none"> 1. VRM 2 2. Microprocessor 2

Table 14. Diagnostic error codes (continued)

Error code/symptom	Meaning	Part/action
206-XXX-000	Failed diskette drive test.	<ol style="list-style-type: none"> 1. Cable 2. Diskette drive 3. System board
215-XXX-000	Failed IDE CD-ROM drive test.	<ol style="list-style-type: none"> 1. CD-ROM drive cables 2. CD-ROM drive 3. System board
217-198-XXX	Could not establish drive parameters.	<ol style="list-style-type: none"> 1. Check cable and termination. 2. SCSI backplane. 3. Hard disk.
217-XXX-000	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 1
217-XXX-001	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 2
217-XXX-002	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 3
217-XXX-003	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 4
217-XXX-004	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 5
217-XXX-005	Failed BIOS hard disk test. Note: If RAID is configured, the hard disk number refers to the RAID logical array.	Logical drive 6
264-XXX-0NN	Failed tape drive test.	<ol style="list-style-type: none"> 1. Tape cartridge, if user executed the Read/Write Tape Drive test (failure code of XXX = 256) 2. SCSI or power cable connected to tape drive with SCSI ID <i>nn</i> 3. Tape drive with SCSI ID <i>nn</i> (refer to the Help and Service Information appendix of the tape drive's User Guide) 4. System board or SCSI controller (run SCSI controller diagnostic to determine if the SCSI bus is functioning correctly.)
264-XXX-999	Errors on multiple tape drives, see error text for more information.	See error messages/text in the Base System Diagnostics error log for detailed information on each individual tape drive error.
301-XXX-000	Failed keyboard test.	Keyboard

Table 14. Diagnostic error codes (continued)

Error code/symptom	Meaning	Part/action
405-XXX-000	Failed Ethernet test on controller on the system board.	1. Verify that Ethernet is not disabled in BIOS. 2. System board.
405-XXX-00N	Failed Ethernet test on adapter in PCI slot <i>n</i> .	1. Adapter in PCI slot <i>n</i> 2. System board
415-XXX-000	Failed Modem test.	No corrective action. A modem is not required for correct operation.

System Error LED

The System Error LED is switched on when an error is detected. If the System Error LED is on, remove the cover and check the diagnostic-panel LEDs. Table 15 is a complete list of diagnostic-panel LEDs and recommended actions.

If a diagnostic-panel LED is on and the information LED panel System Error LED is off, there is probably an LED problem. Run the light-panel diagnostics by pressing **F2** (see “Diagnostics panel LEDs” on page 15).

Notes:

1. To locate the LEDs on the processor board see “Identifying problems using LEDs” on page 14.
2. Check the System Error Log for additional information before replacing a part.
3. The DIMM error LEDs, microprocessor error LEDs, and VRM error LEDs turn off when the system is shut down.

Table 15 describes diagnostic-panel LED symptoms, the suspected parts to be replaced, and recommended actions.

Table 15. Diagnostic-panel LED symptoms

Diagnostics panel LED	Part/action
All LEDs off (Check System Error Log for error condition, and then clear System Error Log when the problem is found.)	1. System Error Log is 75% full; clear the log. 2. PFA alert; check log for failure; clear PFA alert; remove ac power for at least 20 seconds, reconnect, and then power on the system. 3. Run light path diagnostics.
MEMORY LED on (The LED next to the failing DIMM is on.)	1. Failing DIMM 2. System board
CPU LED on (The LED next to the failing CPU is on.)	1. Microprocessor 1 or 2 2. System board
PCI BUS LED on	1. Remove all PCI adapters from slots on affected bus (see “Adapters” on page 99). 2. System board.
VRM LED on (The LED next to the failing VRM is on.)	1. Voltage regulator module indicated by the lit VRM LED. 2. Microprocessor indicated by the microprocessor LED.

Table 15. Diagnostic-panel LED symptoms (continued)

Diagnostics panel LED	Part/action
DASD LED on (The LED located next to the drive bay that the failing drive is installed in is lit. Check the amber drive LED for the failing hard drive.)	<ol style="list-style-type: none"> 1. Be sure that the fans are operating correctly and the airflow is good. 2. If installed, reseal I²C cable between DASD backplane and DASD I²C on the system board (J10). 3. Failing drive. SCSI channel A has failed. (This is the SCSI channel for the hot-swap hard disk drives). 4. If the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit is installed, check SCSI channel B. 5. SCSI backplane.
SERVICE PROCESSOR BUS LED	<ol style="list-style-type: none"> 1. Unplug the power supplies from the engine for 30 seconds, then plug in and retry. 2. Reflash or update firmware for ISMP, BIOS. 3. System board.
POWER SUPPLY 1 LED on	<ol style="list-style-type: none"> 1. Check the dc power LED on power supply 1. If it is off, replace power supply 1. 2. Power cage assembly.
POWER SUPPLY 2 LED on	<ol style="list-style-type: none"> 1. Check the dc power LED on power supply 2. If it is off, replace power supply 2. 2. Power cage assembly.
NONREDUNDANT LED on	<ol style="list-style-type: none"> 1. Check the PS1 and PS2 LEDs and replace any indicated power supply. 2. Install an additional power supply or remove optional devices from the engine.
NMI LED on	<ol style="list-style-type: none"> 1. Restart the engine. 2. Check the System Error Log.
TEMPERATURE LED on	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications. See "Specifications" on page 6. 2. Ensure filler panels are installed in all empty bays. 3. Ensure fans are operating correctly by checking the fan LEDs. 4. Examine System Error Log. <ol style="list-style-type: none"> a. System over recommended temperature <ul style="list-style-type: none"> • Information LED panel b. DASD over recommended temperature (DASD LED also on) <ol style="list-style-type: none"> 1) Overheating hard drive 2) DASD backplane c. System over recommended temperature for CPU x (where x is 1 or 2) (CPU LED is also on) <ol style="list-style-type: none"> 1) CPU x 2) System board 5. If the CPU LED on the diagnostics panel is also on, one of the microprocessors has caused the error.
FAN LED on	<ol style="list-style-type: none"> 1. Check individual fan LEDs. 2. Replace respective fan. 3. Fan cable. 4. System board. 5. Power cage assembly.

Error symptoms

Table 16 describes the error symptoms, the suspected parts to be replaced, and recommended actions.

Table 16. Error symptoms

CD-ROM drive problems	
Symptom	Part/action
CD-ROM drive is not recognized.	<ol style="list-style-type: none"> Verify that: <ul style="list-style-type: none"> The primary IDE channel to which the CD-ROM drive is attached is enabled in the Configuration/Setup Utility program. <p>Note: On a engine with a single IDE channel, only the primary channel can be used.</p> All cables and jumpers are installed correctly. The correct device driver is installed for the CD-ROM drive. Run CD-ROM drive diagnostics. CD-ROM drive.
Diskette drive problems	
Symptom	Part/action
Diskette drive activity LED stays on, or the system bypasses the diskette drive.	<ol style="list-style-type: none"> If there is a diskette in the drive, verify that: <ul style="list-style-type: none"> The diskette drive is enabled in the Configuration/Setup utility program. The diskette is good and not damaged. (Try another diskette if you have one.) The diskette is inserted correctly in the drive. The diskette contains the necessary files to start the engine. The software program is working properly. The cable is installed correctly (in the proper orientation). Run diskette drive diagnostics. Cable. Diskette drive. System board.
5194-EXP storage unit	
Symptom	Part/action
The 5194-EXP storage unit used to work but does not work now.	<ol style="list-style-type: none"> If the 5194-EXP storage unit is the only thing on the channel, verify that: <ul style="list-style-type: none"> The cables for all external SCSI options are connected correctly. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. Any external SCSI option is turned on. You must turn on 5194-EXP storage unit option before turning on the engine. For more information, see your 5194-EXP storage unit documentation.
Hard disk drive problems	
Symptom	Part/action
Not all drives are recognized by the hard disk drive diagnostic test (Fixed Disk test).	<ol style="list-style-type: none"> Remove the first drive not recognized and try the hard disk drive diagnostic test again. If the remaining drives are recognized, replace the drive you removed with a new one.
System stops responding during hard disk drive diagnostic test.	<ol style="list-style-type: none"> Remove the hard disk drive being tested when the engine stopped responding and try the diagnostic test again. If the hard disk drive diagnostic test runs successfully, replace the drive you removed with a new one.

Table 16. Error symptoms (continued)

Intermittent problems	
Symptom	Part/action
A problem occurs only occasionally and is difficult to detect.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • All cables and cords are connected securely to the rear of the engine and attached options. • When the engine is turned on, air is flowing from the rear of the engine at the fan grill. If there is no airflow, the fan is not working. This causes the engine to overheat and shut down. • Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. 2. Check the system error log from Setup or through the diagnostics in the optional Remote Supervisor Adapter.
Keyboard, mouse, or point-device problems	
Symptom	Part/action
All or some keys on the keyboard do not work.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • The keyboard cable is securely connected to the system, and the keyboard and mouse cables are not reversed. • The engine and the monitor are turned on. 2. Keyboard. 3. System board.
The mouse or pointing device does not work.	<ol style="list-style-type: none"> 1. Verify that the mouse or pointing-device cable is securely connected, and that the keyboard and mouse cables are not reversed. 2. Mouse or pointing device. 3. System board.
Memory problems	
Symptom	Part/action
The amount of system memory displayed is less than the amount of physical memory installed.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • The memory modules are seated correctly. • You have installed the correct type of memory. • Ensure that the memory is in the correct slots (see “Memory modules” on page 148). • If you changed the memory, you updated the memory configuration with the Configuration/Setup Utility program. • All banks of memory on the DIMMs are enabled. The engine might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. 2. Check POST error log for error message 289: <ul style="list-style-type: none"> • If the DIMM was disabled by a system-management interrupt (SMI), replace the DIMM. • If the DIMM was disabled by the user or by POST: <ol style="list-style-type: none"> a. Start the Configuration/Setup Utility program. b. Enable the DIMM. c. Save the configuration and restart the engine. 3. DIMM. 4. System board.

Table 16. Error symptoms (continued)

Microprocessor problems	
Symptom	Part/action
The engine emits a continuous tone during POST. Microprocessor 1 is not working correctly.)	<ol style="list-style-type: none"> 1. Verify that the startup microprocessor is seated correctly. 2. Startup microprocessor.
Monitor problems	
Symptom	Part/action
Testing the monitor.	See the information that comes with the monitor for adjusting and testing instructions. (Some IBM monitors have their own self-tests.)
The screen is blank.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • The engine power cord is plugged into the engine and a working electrical outlet. • The monitor cables are connected properly. • The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. <p>Important: In some memory configurations, the 3-3-3 beep code might sound during POST followed by a blank display screen. If this occurs and the Boot Fail Count feature in the Start Options of the Configuration/Setup Utility program is set to Enabled (its default setting), you must restart the engine three times to force the system BIOS to reset the CMOS values to the default configuration (memory connector or bank of connectors enabled).</p> 2. If you have verified these items and the screen remains blank, replace: <ol style="list-style-type: none"> a. Monitor b. System board
Only the cursor appears.	See "Undetermined problems" on page 70.
The monitor works when you turn on the engine but goes blank when you start some application programs.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • The application program is not setting a display mode higher than the capability of the monitor. • You installed the necessary device drivers for the applications. 2. If you have verified these items and the screen remains blank, replace the monitor.
The screen is wavy, unreadable, rolling, distorted, or has screen jitter.	<ol style="list-style-type: none"> 1. If the monitor self-tests show the monitor is working correctly, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor. <p>Notes:</p> <ol style="list-style-type: none"> a. To prevent diskette drive read/write errors, be sure the distance between monitors and diskette drives is at least 76 mm (3 in.). b. Non-IBM monitor cables might cause unpredictable problems. c. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, contact your IBM reseller or IBM marketing representative. 2. System board.

Table 16. Error symptoms (continued)

Wrong characters appear on the screen.	<ol style="list-style-type: none"> 1. If the wrong language is displayed, update the BIOS code with the correct language. 2. System board.
Option problems	
Symptom	Part/action
An IBM option that was just installed does not work.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • You followed the installation instructions that came with the option. • The option is installed correctly. • You have not loosened any other installed options or cables. • You updated the configuration information in the Configuration/Setup Utility program. Whenever memory or an option is changed, you must update the configuration. 2. Option you just installed.
An IBM option that used to work does not work now.	<ol style="list-style-type: none"> 1. Verify that all of the option hardware and cable connections are secure. 2. If the option comes with its own test instructions, use those instructions to test the option. 3. If the failing option is a SCSI option, verify that: <ul style="list-style-type: none"> • The cables for all external SCSI options are connected correctly. • The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. • Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the engine. 4. Failing option.
Power problems	
Symptom	Part/action
The engine does not turn on.	<ol style="list-style-type: none"> 1. Verify that: <ul style="list-style-type: none"> • The power cables are properly connected to the engine. • The electrical outlet functions properly. • The type of memory installed is correct. • If you just installed an option, remove it, and restart the engine. If the engine now turns on, you might have installed more options than the power supply supports. 2. If LEDs for CPUs or VRMs are on, verify that: <ol style="list-style-type: none"> a. A VRM is populated for each microprocessor. b. Override front panel pushbutton by turning on switch 7 of SW1; if power comes on: <ol style="list-style-type: none"> 1) Service processor error. 2) Power reset card. 3. See “Undetermined problems” on page 70.
The engine does not turn off.	<ol style="list-style-type: none"> 1. Verify whether you are using an ACPI or non-ACPI operating system. If you are using a non-ACPI operating system: <ol style="list-style-type: none"> a. Press Ctrl+Alt+Delete. b. Turn off the system by holding the power-control button for 4 seconds. c. If engine fails during BIOS POST and power-control button does not work, remove the AC power cord. 2. If the problem remains or if you are using an ACPI-aware operating system, suspect the system board.

Table 16. Error symptoms (continued)

Serial port problems	
Symptom	Part/action
The number of serial ports identified by the operating system is less than the number of serial ports installed.	<ol style="list-style-type: none"> Verify that: <ul style="list-style-type: none"> Each port is assigned a unique address by the Configuration/Setup Utility program and none of the serial ports is disabled. The serial-port adapter, if you installed one, is seated properly. Failing serial port adapter.
A serial device does not work.	No corrective action required. No serial device is needed to operate correctly.
Software problem	
Symptom	Part/action
Suspected software problem.	<ol style="list-style-type: none"> To determine if problems are caused by the software, verify that: <ul style="list-style-type: none"> Your engine has the minimum memory needed to use the software. For memory requirements, see the information that comes with the software. <p>Note: If you have just installed an adapter or memory, you might have a memory address conflict.</p> The software is designed to operate on your engine. Other software works on your engine. The software that you are using works on another system. <p>If you received any error messages when using the software program, see the information that comes with the software for a description of the messages and suggested solutions to the problem.</p> If you have verified these items and the problem remains, contact your IBM representative.
Universal Serial Bus (USB) port problems The USB port is not enabled.	
Symptom	Part/action
A USB device does not work.	No corrective action is required. No USB device is required for correct operation.

POST error codes

Table 17 describes POST error codes, the suspected parts to be replaced, and recommended actions. X can be any number or letter.

Table 17. POST error codes

Error code/symptom	Meaning	Part/action
062	Three consecutive startup failures using the default configuration.	<ol style="list-style-type: none"> Run the Configuration/Setup Utility program. Battery. System board. Microprocessor.
101, 102	System and processor error.	System board
106	System and processor error.	System board
111	Channel check error.	<ol style="list-style-type: none"> Memory DIMM System board
114	Adapter read-only memory error.	<ol style="list-style-type: none"> Failing adapter. Run Base System Diagnostics.
129	Internal cache error.	<ol style="list-style-type: none"> Microprocessor Optional microprocessor (if installed)

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
151	Real time clock error.	<ol style="list-style-type: none"> 1. Run Base System Diagnostics. 2. Battery. 3. System board.
161	Real time clock battery error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Battery. 3. System board.
162	Device configuration error. Note: Be sure to load the default settings and any additional desired settings; then, <i>save the configuration</i> .	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Battery. 3. Failing device. 4. System board.
163	Real-time clock error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Battery. 3. System board.
164	Memory configuration changed.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. DIMM. 3. System board.
175	Hardware error.	System board
176	Computer cover or cable cover was removed without a key being used.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
177, 178	Security hardware error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
184	Power-on password damaged.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
185	Drive startup sequence information corrupted.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
186	Security hardware control logic failed.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
187	VPD serial number not set.	<ol style="list-style-type: none"> 1. Set serial number in the Configuration/Setup Utility program. 2. System board.
188	Bad EEPROM CRC #2.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. System board.
189	An attempt was made to access the engine with invalid passwords.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, and type the administrator password.
201	Memory test error. If the engine does not have the latest level of BIOS installed, update the BIOS to the latest level and run the diagnostic program again.	<ol style="list-style-type: none"> 1. DIMM 2. System board

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
229	Cache error.	<ol style="list-style-type: none"> 1. Microprocessor 2. Optional microprocessor (if installed)
262	DRAM parity configuration error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Battery. 3. System board.
289	DIMM disabled by POST or user.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program, if the DIMM was disabled by the user. 2. Disabled DIMM, if not disabled by user.
301	Keyboard or keyboard controller error.	<ol style="list-style-type: none"> 1. Keyboard 2. System board
303	Keyboard controller error.	System board
602	Invalid diskette boot record.	<ol style="list-style-type: none"> 1. Diskette 2. Diskette drive 3. Cable 4. System board
604	Diskette drive error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and Base System Diagnostics. 2. Diskette drive. 3. Drive cable. 4. System board.
605	Unlock failure.	<ol style="list-style-type: none"> 1. Diskette drive 2. Drive cable 3. System board
662	Diskette drive configuration error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and Base System Diagnostics. 2. Diskette drive. 3. Drive cable. 4. System board.
762	Coprocessor configuration error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Battery. 3. Microprocessor.
962	Parallel port error.	No corrective actions is required. No parallel port is required for correct functioning.
11XX	System board serial port 1 or 2 error.	<ol style="list-style-type: none"> 1. Disconnect the external cable on the serial port. 2. Run the Configuration/Setup Utility program. 3. System board.
1301	I ² C cable to front panel not found.	<ol style="list-style-type: none"> 1. Cable 2. Front panel 3. Power switch assembly 4. System board

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
1302	I ² C cable from system board to power on and reset switches not found.	<ol style="list-style-type: none"> 1. Cable 2. Power switch assembly 3. System board
1303	I ² C cable from system board to power backplane not found.	<ol style="list-style-type: none"> 1. Cable 2. Power cage assembly, if installed 3. System board
1304	I ² C cable to diagnostic LED board not found.	<ol style="list-style-type: none"> 1. Power switch assembly 2. System board
1600	<p>The system management processor is not functioning. Do the following before replacing a part:</p> <ol style="list-style-type: none"> 1. Ensure that a jumper is not installed on J34. 2. Remove the ac power to the engine, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, turn on the engine. 	System board
1601	<p>The system is able to communicate to the system management processor, but the system management processor failed to respond at the start of POST. Do the following before replacing a part:</p> <ol style="list-style-type: none"> 1. Remove the ac power to the engine, wait 20 seconds; then, reconnect the ac power. Wait 30 seconds; then, turn on the engine. 2. Flash update the Remote Supervisor Adapter. See the <i>Remote Supervisor Adapter User's Guide</i> provided on the Documentation CD-ROM for more information. 	<ol style="list-style-type: none"> 1. Remote Supervisor Adapter, if installed 2. System board
1602	Cable for optional service processor adapter not installed.	Disconnect all engine and option power cords from engine, wait 30 seconds, reconnect, and retry.
1762	Hard disk configuration error.	<ol style="list-style-type: none"> 1. Hard disk drive. 2. Hard disk cables. 3. Run the Configuration/Setup Utility program. 4. Hard disk adapter. 5. SCSI backplane. 6. System board.

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
178X	Fixed disk error.	<ol style="list-style-type: none"> 1. Hard disk cables. 2. Run Base System Diagnostics. 3. Hard disk adapter. 4. Hard disk drive. 5. System board.
1800	No more hardware interrupt available for PCI adapter.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Failing adapter. 3. System board.
1962	Drive does not contain a valid boot sector.	<ol style="list-style-type: none"> 1. Verify that a startable operating system is installed. 2. Run Base System Diagnostics. 3. Hard disk drive. 4. SCSI backplane. 5. Cable. 6. System board.
2400	Video controller test failure.	System board
2462	Video memory configuration error.	System board
5962	IDE CD-ROM drive configuration error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program and load the default values. 2. CD-ROM drive. 3. CD-ROM power cable. 4. IDE cable. 5. System board. 6. Battery.
8603	Pointing-device error.	<ol style="list-style-type: none"> 1. Pointing device 2. System board
0001200	Machine check architecture error.	<ol style="list-style-type: none"> 1. Microprocessor 1 2. Optional microprocessor 2
00012000	Microprocessor machine check.	<ol style="list-style-type: none"> 1. Microprocessor 2. System board
00019501	Microprocessor 1 is not functioning - check VRM and microprocessor LEDs.	<ol style="list-style-type: none"> 1. VRM 1 2. Microprocessor 1 3. System board
00019502	Microprocessor 2 is not functioning - check VRM and microprocessor LEDs.	<ol style="list-style-type: none"> 1. VRM 2 2. Microprocessor 2
00019701	Microprocessor 1 failed.	<ol style="list-style-type: none"> 1. Microprocessor 1 2. System board
00019702	Microprocessor 2 failed.	<ol style="list-style-type: none"> 1. Microprocessor 2 2. System board

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
00180100	A PCI adapter has requested memory resources that are not available.	<ol style="list-style-type: none"> 1. Ensure that the PCI adapter and all other adapters are set correctly in the Configuration/Setup Utility program Utility program. If the memory resource settings are not correct, change the settings. 2. If all memory resources are being used, you might need to remove an adapter to make memory available to the PCI adapter. Disabling the adapter BIOS on the adapter might correct the error. (See the documentation provided with the adapter.)
00180200	No more I/O space available for PCI adapter.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Failing adapter. 3. System board.
00180300	No more memory (above 1MB for PCI adapter).	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Failing adapter. 3. System board.
00180400	No more memory (below 1MB for PCI adapter).	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Failing adapter. 3. System board.
00180500	PCI option ROM checksum error.	<ol style="list-style-type: none"> 1. Remove failing PCI card. 2. System board.
00180600	PCI to PCI bridge error.	<ol style="list-style-type: none"> 1. Run the Configuration/Setup Utility program. 2. Failing adapter. 3. System board.
00180700, 00180800	General PCI error.	<ol style="list-style-type: none"> 1. System board 2. PCI card
00181000	PCI error.	<ol style="list-style-type: none"> 1. Adapter 2. System board
01295085	ECC checking hardware test error.	<ol style="list-style-type: none"> 1. System board 2. Microprocessor
01298001	System BIOS installed on this engine does not support level of processor.	Microprocessor 1.
01298002	System BIOS installed on this engine does not support level of processor.	Microprocessor 2.
01298101	System BIOS installed on this engine does not support level of processor.	Microprocessor 1.
01298102	System BIOS installed on this engine does not support level of processor.	Microprocessor 2.

Table 17. POST error codes (continued)

Error code/symptom	Meaning	Part/action
I9990301	Hard disk sector error.	<ol style="list-style-type: none"> 1. Hard disk drive 2. SCSI backplane 3. Cable 4. System board
I9990305	Hard disk sector error, no operating system installed.	Install operating system to hard disk using the Recovery CD.
I9990650	AC power has been restored.	<ol style="list-style-type: none"> 1. Check cable. 2. Check for interruption of power. 3. Power cable.

Fan error messages

Table 18 describes fan error messages, the suspected parts to be replaced, and recommended actions.

Note: You must connect a keyboard, mouse, and monitor to your appliance in order to see error messages. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

Table 18. Fan errors and actions

Message	Action
Fan x failure (level-critical; fan x had a failure)	<ol style="list-style-type: none"> 1. Check connections to fan x. 2. Replace fan x. <p>Note: See Figure 65 on page 132 or Figure 66 on page 132 for the location of the specific fan.</p>
Fan x fault (level-critical; fan x beyond recommended RPM range)	<ol style="list-style-type: none"> 1. Check connections to fan x. 2. Replace fan x. <p>Note: See Figure 65 on page 132 or Figure 66 on page 132 for the location of the specific fan.</p>
Fan x outside recommended speed action	<p>Replace fan x.</p> <p>Note: See Figure 65 on page 132 or Figure 66 on page 132 for the location of the specific fan.</p>

Power error messages

Table 19 describes power error messages, the suspected parts to be replaced, and recommended actions.

Note: You must connect a keyboard, mouse, and monitor to your appliance in order to see error messages. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

Table 19. Power errors and actions

Message	Action
Power supply x current share fault (level-critical; excessive current demand on power supply x)	Replace power supply x.
Power supply x DC good fault (level-critical; power good signal not detected for power supply x)	Replace power supply x.
Power supply x temperature fault	Replace power supply x.
Power supply x removed	No action required - information only.
Power supply x fan fault (level-critical; fan fault in power supply x)	Replace power supply x.
Power supply x 12 V fault (level-critical; overcurrent condition detected)	See "Power checkout" on page 40.
Power supply x 3.3 V fault (level-critical; 3.3 V power supply x had an error)	See "Power checkout" on page 40.
Power supply x 5 V fault (level-critical; 5 V power supply x had an error)	See "Power checkout" on page 40.
System running non-redundant power (level-noncritical; system does not have redundant power)	Replace power supply. Note: System can continue to operate without redundancy protection.
System under recommended voltage for x (level-warning; indicated voltage supply under nominal value; value for x can be +12, -12, or +5)	<ol style="list-style-type: none"> 1. Check connections to the power subsystem. 2. Power supply. 3. Power cage assembly.

Power-supply LED errors

Use the information in the Table 20 to troubleshoot power-supply problems.

Minimum configuration requirements: The minimum configuration required to enable the DC Power LED is:

- Power supply
- Power backplane
- Processor/PCI board (with pins 2 and 3 on J23 extension cable connected together to bypass the power switch).
- Processor/PCI board (verify that the Processor/PCI board and the system board are connected correctly).

Table 20. Power-supply LED errors

AC good LED	DC good LED	Description	Part/action
Off	Off	No power to system or ac problem.	<ol style="list-style-type: none"> 1. Check ac power to the system. 2. Power supply.
On	Off	Standby mode or dc problem.	<ol style="list-style-type: none"> 1. Check system board cable connectors J4 and J10. Move switch 7 of SW 1 to bypass power control. If the dc good LED is lit, press Ctrl+Alt+Delete. Watch the screen for any POST errors. Check the System Error Log for any listed problems. If the system starts with no errors: <ol style="list-style-type: none"> a. Power switch assembly b. System board 2. Remove the adapters and disconnect the cables and power connectors to all internal and external devices. Turn on the system. If the dc power LED is lit, replace the adapters and devices one at a time until you isolate the problem. 3. Power supply. 4. Power cage assembly. 5. System board.
On	On	Power is working correctly.	N/A

SCSI error codes

Table 21 describes SCSI error codes, the suspected parts to be replaced, and recommended actions.

Table 21. SCSI error codes

Error code	Part/action
<p>All SCSI Errors One or more of the following might be causing the problem:</p> <ul style="list-style-type: none">• A failing SCSI device (adapter, drive, controller)• An incorrect SCSI configuration or SCSI termination jumper setting• Duplicate SCSI IDs in the same SCSI chain• A missing or incorrectly installed SCSI terminator• A defective SCSI terminator• An incorrectly installed cable• A defective cable	<ol style="list-style-type: none">1. External SCSI devices must be turned on before you turn on the engine.2. Make sure that the cables for all external SCSI devices are connected correctly.3. If you have attached an external SCSI device to the engine, make sure that the external SCSI termination is set to automatic.4. Make sure that the last device in each SCSI chain is terminated correctly.5. Make sure that the SCSI devices are configured correctly.

ServeRAID

Table 22 describes the symptoms and fault messages from the RAID controller, the suspected parts to be replaced, and recommended actions.

Table 22. RAID fault messages

Error code	Description	Parts and recommended actions
1XXX	Microcode checksum error	Replace the ServeRAID controller.
2XXX - 5XXX	Code DRAM error	<ol style="list-style-type: none"> 1. Install download jumpers. Flash latest level BIOS and firmware for controller. Remove jumpers. 2. Replace the ServeRAID controller.
6XXX	Cache DRAM error) (ServeRAID-4H only	<ol style="list-style-type: none"> 1. Reseat daughter card. 2. Install download jumpers. Flash latest level BIOS and firmware for controller. Remove jumpers. 3. ServeRAID controller.
7XXX thru 8XXX	Host/local PCI bus interface error	<ol style="list-style-type: none"> 1. Install download jumpers. Flash latest level BIOS and firmware for controller. Remove jumpers. 2. Replace the ServeRAID controller.
9ZXX - BZXX	SCSI bus error caused by cables, termination, defective drives, and so on). Z identifies the specific channel or channels that cause the error.	<ol style="list-style-type: none"> 1. Follow indications in the POST error procedures in "ServeRAID controller" on page 36. Follow the instructions in "ServeRAID controller" on page 36 before continuing with the next steps listed in this index. 2. Replace the SCSI cable. 3. Replace the SCSI backplane. 4. Replace the hard disk drive. 5. Replace the ServeRAID controller.
EFFE	Firmware code corrupt or download jumpers are in place	<ol style="list-style-type: none"> 1. Flash latest level BIOS and firmware for controller. Remove jumpers. 2. Replace the ServeRAID controller.
FFFF or other code not listed.		<ol style="list-style-type: none"> 1. Follow indications in the POST (ISPR) error procedures in "POST (ISPR) error procedures" on page 37. 2. Replace the SCSI cable. 3. Replace the SCSI backplane. 4. Replace the hard disk drive. 5. Replace the ServeRAID controller.

Appliance shutdown

Refer to Table 23 and Table 24 on page 67 when experiencing system shutdown related to voltage or temperature problems.

Voltage-related system shutdown

Table 23 describes voltage-related system-shutdowns messages, the suspected parts to be replaced, and recommended actions.

Table 23. Voltage-related system-shutdown messages

Message	Action
System shutoff due to x current over max value (level-critical; system drawing too much current on voltage x bus)	See "Power checkout" on page 40.
System shutoff due to x V over voltage (level-critical; system shutoff due to x supply over voltage)	<ol style="list-style-type: none">1. Check the power-supply connectors2. Power supply.3. Power cage assembly.
System shutoff due to x V under voltage (level-critical system shutoff due to x supply under voltage)	<ol style="list-style-type: none">1. Check the power-supply connectors.2. Power supply.3. Power cage assembly.
System shutoff due to VRM x over voltage	Replace VRM x.
System shutoff due to excessive (< 240 VA) loading	<ol style="list-style-type: none">1. See "Power checkout" on page 40.2. Cycle ac on/off.

Temperature-related system shutdown

Table 24 describes temperature-related-shutdown messages, the suspected parts to be replaced, and recommended actions.

Table 24. Temperature-related-shutdown messages

Message	Action
System shutoff due to board over temperature (level-critical; board is over temperature)	<ol style="list-style-type: none"> 1. Ensure that the system is being correctly cooled; see “Specifications” on page 6. 2. Replace board.
System shutoff due to CPU x over temperature (level-critical; CPU x is over temperature)	<ol style="list-style-type: none"> 1. Ensure that the system is being correctly cooled; see “Specifications” on page 6. 2. Replace CPU x.
System shutoff due to CPU x under temperature (level-critical; CPU x is under temperature)	Ambient temperature must be within normal operating specifications; see “Specifications” on page 6.
System shutoff due to DASD temperature (sensor x) (level-critical; DASD area reported temperature outside recommended operating range)	Ensure that the system is being correctly cooled; see “Specifications” on page 6.
System shutoff due to high ambient temperature (level-critical; high ambient temperature)	Ambient temperature must be within normal operating specifications; see “Specifications” on page 6.
System shutoff due to system board under temperature (level-critical; system board is under temperature)	Ambient temperature must be within normal operating specifications; see “Specifications” on page 6.

Bus fault messages

Table 25 describes bus fault messages, the suspected parts to be replaced, and recommended actions.

Table 25. Bus fault messages

Message	Action
Failure reading I²C device. Check devices on bus 0.	<ol style="list-style-type: none">1. If installed, reseal the I²C cable between Remote Supervisor Adapter (in PCI slot 1/J32) and system board (J45).2. Memory DIMMs.3. System board.
Failure reading I²C device. Check devices on bus 1.	<ol style="list-style-type: none">1. Reseat the I²C cable between the operator information panel and system board (J24).2. Operator information panel.3. System board.
Failure reading I²C device. Check devices on bus 2.	<ol style="list-style-type: none">1. Reseat the cable between system board and the power supply (power cage assembly) (J10).2. Power cage assembly.3. Power supply.4. System board.
Failure reading I²C device. Check devices on bus 3.	<ol style="list-style-type: none">1. Reseat the cable between the DASD backplane and connector (J10) of system board.2. DASD backplane.3. System board.
Failure reading I²C device. Check device on bus 4.	System board

DASD checkout

Table 26 describes a DASD checkout message, the suspected parts to be replaced, and recommended actions.

Table 26. DASD checkout message

Note: If the replacement procedure is not provided in the <i>IBM TotalStorage NAS 200 Hardware Installation Guide</i> , then it is a service procedure only.	
Message	Action
Hard drive x removal detected (level-critical; hard drive x has been removed)	Information only, take action as appropriate.

Host built-in self-test

Table 27 describes the built-in self-test (BIST) message, the suspected parts to be replaced, and recommended actions.

Table 27. Host BIST message

Note: If the replacement procedure is not provided in the <i>IBM TotalStorage NAS 200 Hardware Installation Guide</i> , then it is a service procedure only.	
Message	Action
Host fail (level-informational; built-in self-test for the host failed)	<ol style="list-style-type: none">1. Reseat the microprocessor.2. Reseat the VRM.3. Replace the microprocessor CPU.

Temperature error messages

Table 28 describes temperature error messages, the suspected parts to be replaced, and recommended actions.

Note: You must connect a keyboard, mouse, and monitor to your appliance in order to see error messages. If the engine does not recognize the monitor, keyboard, and mouse, reboot the engine while they are connected. If a Remote Supervisor Adapter is used for system management, the logs can be accessed remotely.

Table 28. Temperature error messages

Message	Action
DASD Over Temperature (level-critical; direct access storage device bay <i>x</i> was over temperature)	Ensure that the system is being correctly cooled; see “Specifications” on page 6.
DASD Over recommended Temperature (sensor <i>x</i>) (level-warning; DASD bay <i>x</i> had over temperature condition)	Ensure that the system is being correctly cooled; see “Specifications” on page 6.
DASD under recommended temperature (sensor <i>x</i>) (level-warning; direct access storage device bay <i>x</i> had under temperature condition)	Ambient temperature must be within normal operating specifications; see “Specifications” on page 6.
DASD Over Temperature (level-critical; sensor for DASD1 reported temperature over recommended range)	Ensure that the system is being correctly cooled; see “Specifications” on page 6.
Power supply <i>x</i> Temperature Fault (level-critical; power supply <i>x</i> had over temperature condition)	<ol style="list-style-type: none">1. Ensure that the system is being correctly cooled; see “Specifications” on page 6.2. Replace power supply <i>x</i>
System board is over recommended temperature (level-warning; system board is over recommended temperature)	<ol style="list-style-type: none">1. Ensure that the system is being correctly cooled; see “Specifications” on page 6.2. Replace the system board.
System board is under recommended temperature (level-warning; system board is under recommended temperature)	Ambient temperature must be within normal operating specifications; see “Specifications” on page 6.
System over temperature for CPU <i>x</i> (level-warning; CPU <i>x</i> reporting over temperature condition)	Ensure that the system is being correctly cooled; see “Specifications” on page 6.

Table 28. Temperature error messages (continued)

Message	Action
System under recommended CPU x temperature (level-warning; system reporting under temperature condition for CPU x)	Ambient temperature must be within normal operating specifications; see "Specifications" on page 6.

Undetermined problems

Use the information in this section if the diagnostic tests did not identify the failure, the devices list is incorrect, or the system is inoperative. Make sure that the default settings are loaded in the Configuration/Setup Utility.

Notes:

1. Damaged data in CMOS can cause undetermined problems.
2. Damaged data in BIOS code can cause undetermined problems.

Check the LEDs on all the power supplies. If the LEDs indicate the power supplies are working correctly, complete the following steps:

1. Shut down (see "Powering on and shutting down the appliance" on page 11) the engine.
2. Be sure that the engine is cabled correctly.
3. Remove or disconnect the following devices (one at a time) until you find the failure (turn on the engine and reconfigure each time):

Any external devices

Surge suppressor device (on the engine)

Mouse, or non-IBM devices

Each adapter

Drives

Memory modules [minimum requirement = 512 MB (2 banks of 256 MB DIMMs)]

Note: Minimum operating requirements are:

- a. One power supply
 - b. Power cage assembly
 - c. System board
 - d. One microprocessor and VRM
 - e. Memory module (with a minimum of two 256 MB DIMMs)
4. Turn on the engine. If the problem remains, suspect the following parts in the order listed:
 - Power supply
 - Power cage assembly
 - System board

Notes:

1. If the problem goes away when you remove an adapter from the system and replacing that adapter does not correct the problem, suspect the system board.
2. If you suspect a networking problem and all the system tests pass, suspect a network cabling problem external to the system.

Problem determination tips

Due to the variety of hardware and software combinations that can be encountered, use the following information to assist you in problem determination. If possible, have this information available when requesting assistance from Service Support and Engineering functions.

- Machine type 5194 and Model 25T
- Microprocessor or hard disk upgrades
- Failure symptom
 - Do Base System Diagnostics fail?
 - What, when, where, single, or multiple systems?
 - Is the failure repeatable?
 - Has this configuration ever worked?
 - If it has been working, what changes were made prior to it failing?
 - Is this the original reported failure?
- Base System Diagnostics version
 - Type and version level
- Hardware configuration
 - Print (print screen) configuration currently in use
 - BIOS level
- Operating system software
 - Type and version level

Note: To eliminate confusion, identical systems are considered identical only if they:

1. Are the exact machine type and models.
2. Have the same BIOS level.
3. Have the same adapters/attachments in the same locations.
4. Have the same address jumpers/terminators/cabling.
5. Have the same software versions and levels.
6. Have the same diagnostics code (version).
7. Have the same configuration options set in the system.
8. Have the same setup for the operation system control files.

Comparing the configuration and software setup between “working” and “non-working” systems will often lead to problem resolution.

Chapter 5. Adding and replacing components

This chapter explains how to add and replace components, informs you about safety and system reliability, and shows you the location of the major components.

Before you begin

Before you begin to install options in the Model 25T or Model 25T with the rack-mount conversion feature, read the following information:

- Become familiar with the safety and handling guidelines specified under:
 - “Handling static-sensitive devices” on page 74
 - “Safety notices” on page 243
 - “Working inside an appliance while power is on” on page 74
- You do not need to shut down the Model 25T or Model 25T with the rack-mount conversion feature or remove covers to install or replace hot-swap power supplies or hot-swap hard drives.
- The blue color on components and labels inside your Model 25T or Model 25T with the rack-mount conversion feature identifies touch points where a component can be gripped, a latch moved, and so on.
- The orange color on components and labels in your engine indicates hot-swap components. Hot-swap components can be installed or removed while the system is running, provided that your system is configured to support this function.
- Ensure that you have an adequate number of grounded electrical outlets for the Model 25T or Model 25T with the rack-mount conversion feature and any other options that you intend to install.
- Back up all important data before you make changes to hard drives.
- Have a small, flat-blade screwdriver available.

Safety information

Before you begin installing components, read the safety information found in “Basic safety information” on page 243. For translations of the safety notices that are included in this guide, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.

System reliability considerations

Adding non-supported options to the base configurations could increase power requirements beyond the limit for redundancy. To ensure that redundancy is maintained, check the status of the Nonredundant LED on the system board after you install any option. For information on the Nonredundant LED, see “LEDs” on page 81.

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

- Each of the drive bays has either a drive or a filler panel installed.
- The cover is in place during normal operations, or is removed for no longer than 30 minutes while the appliance is operating.

Note: The front door of the Model 25T can be removed permanently without affecting system reliability.

- There is space around the appliance to allow the appliance cooling system to operate correctly.
 - For the Model 25T, leave about 127 mm (5 in.) of space around the front and rear of the appliance.
 - For the Model 25T with the rack-mount conversion feature, refer to the documentation that comes with the rack.
- A removed hot-swap drive is replaced within 2 minutes of removal.
- Cables for optional adapters are routed according to the instructions provided with the adapters.
- A failed fan is replaced within 48 hours.

Working inside an appliance while power is on

Your appliance is designed to operate safely while powered on with the cover removed. Follow these guidelines when you work inside an appliance that is powered on:

- Avoid loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the appliance; do not wear cuff links while you are working inside the appliance.
- Do not allow your necktie or scarf to hang inside the appliance.
- Remove jewelry, such as bracelets, rings, necklaces, and loose-fitting wrist watches.
- Remove items from your shirt pocket (such as pens or pencils) that could fall into the appliance as you lean over it.
- Take care to avoid dropping any metallic objects, such as paper clips, hair pins, or screws, into the appliance.

Handling static-sensitive devices

When you handle devices that are sensitive to electrostatic discharge (ESD), take precautions to avoid damage from static electricity. For details on handling these devices, see “Handling electrostatic discharge-sensitive devices” on page 252.

Location of components and indicators

This section explains the location of the engine’s components and indicators.

Major components of the NAS 200

Figure 9 on page 75 and Figure 10 on page 76 show the locations of major components in your appliance.

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

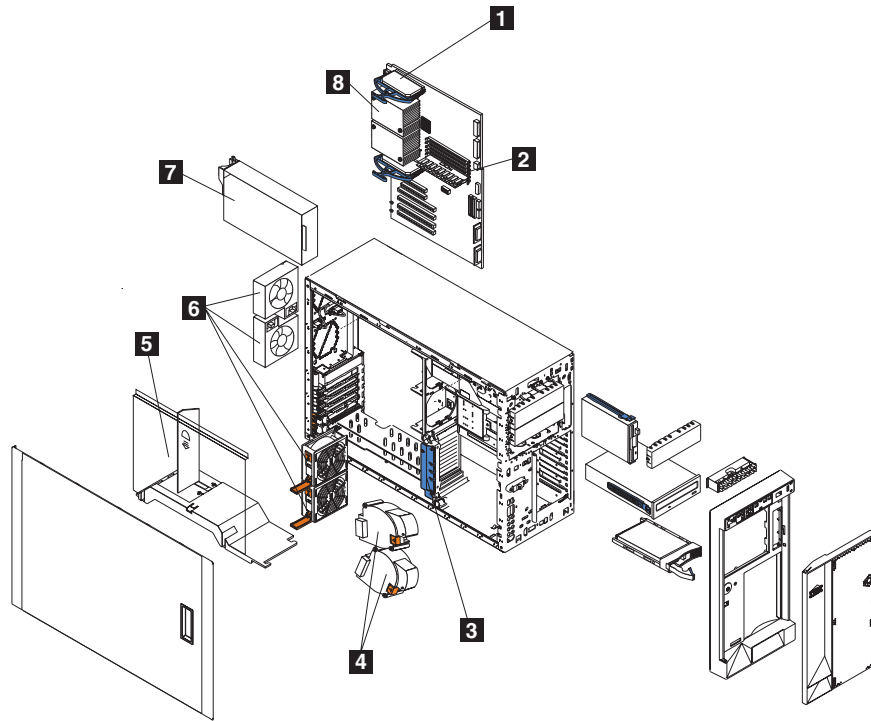


Figure 9. Locations of major components (Model 25T)

- 1** Voltage regulator module (VRM)
- 2** Memory modules
- 3** Adapter-support bracket
- 4** Blower fans (larger fans)
- 5** Air baffle
- 6** Fans (smaller fans)
- 7** Power supply
- 8** Microprocessor

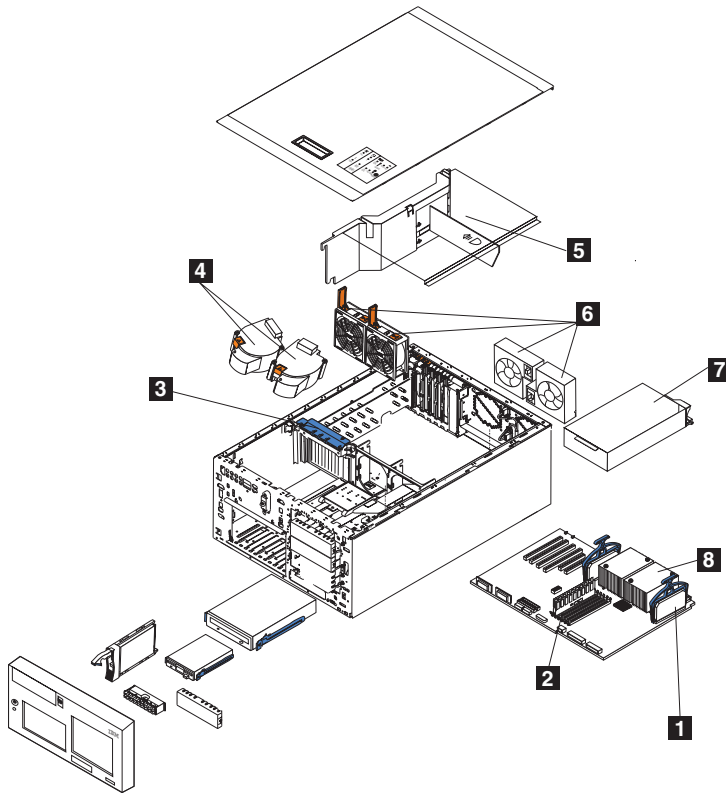


Figure 10. Locations of major components (Model 25T with the rack-mount conversion feature)

- 1** Voltage regulator module (VRM)
- 2** Memory modules
- 3** Adapter-support bracket
- 4** Blower fans (larger fans)
- 5** Air baffle
- 6** Fans (smaller fans)
- 7** Power supply
- 8** Microprocessor

System board component locations

This section contains information about components on the system board.

System-board connectors

Figure 11 identifies system-board connectors.

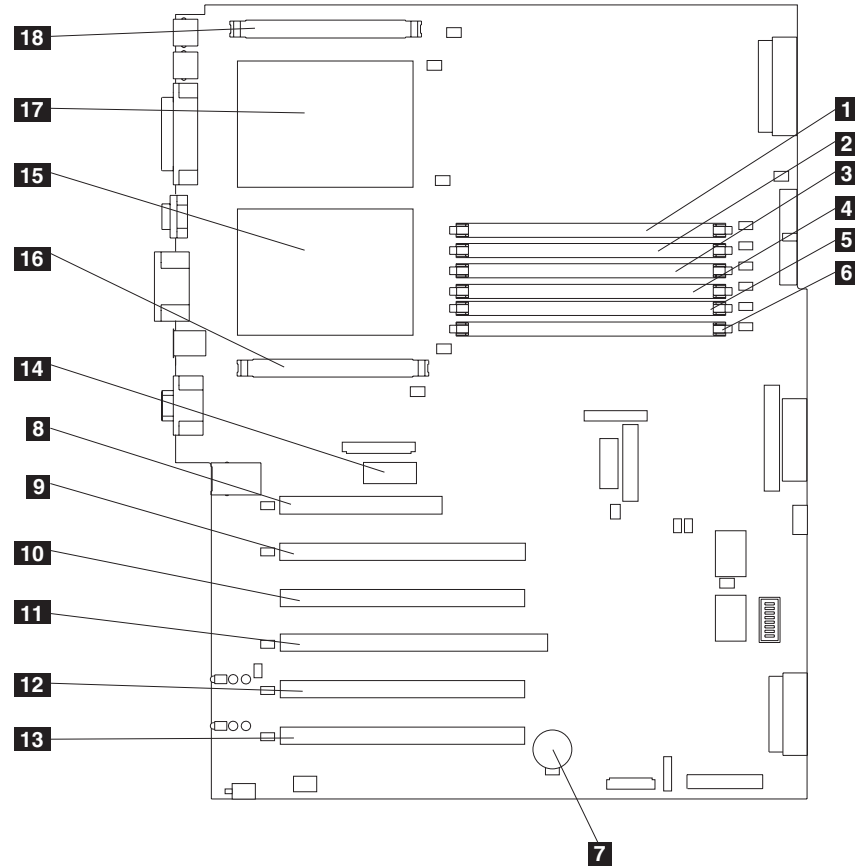


Figure 11. System board connectors

Note: The number in parentheses is the location on the system board.

- 1** DIMM slot 1 (J7)
- 2** DIMM slot 2 (J9)
- 3** DIMM slot 3 (J11)
- 4** DIMM slot 4 (J12)
- 5** DIMM slot 5 (J14)
- 6** DIMM slot 6 (J15)
- 7** Battery (BH1)
- 8** PCI slot 1 32-bit 5.0 v (J32)
- 9** PCI slot 2 64-bit 3.3 v (J36)
- 10** PCI slot 3 64-bit 3.3 v (J38)
- 11** PCI slot 4 64-bit 3.3 v (J41)
- 12** PCI slot 5 64-bit 3 v 133-MHz (J43)
- 13** PCI slot 6 64-bit 3 v 133-MHz (J45)
- 14** Remote Supervisor Adapter (J27)
- 15** Microprocessor 1 (U13)
- 16** VRM 1 (J17)
- 17** Microprocessor 2 (U9)
- 18** VRM 2 (J1)

Internal cables

Figure 12 identifies system-board connectors for internal cables.

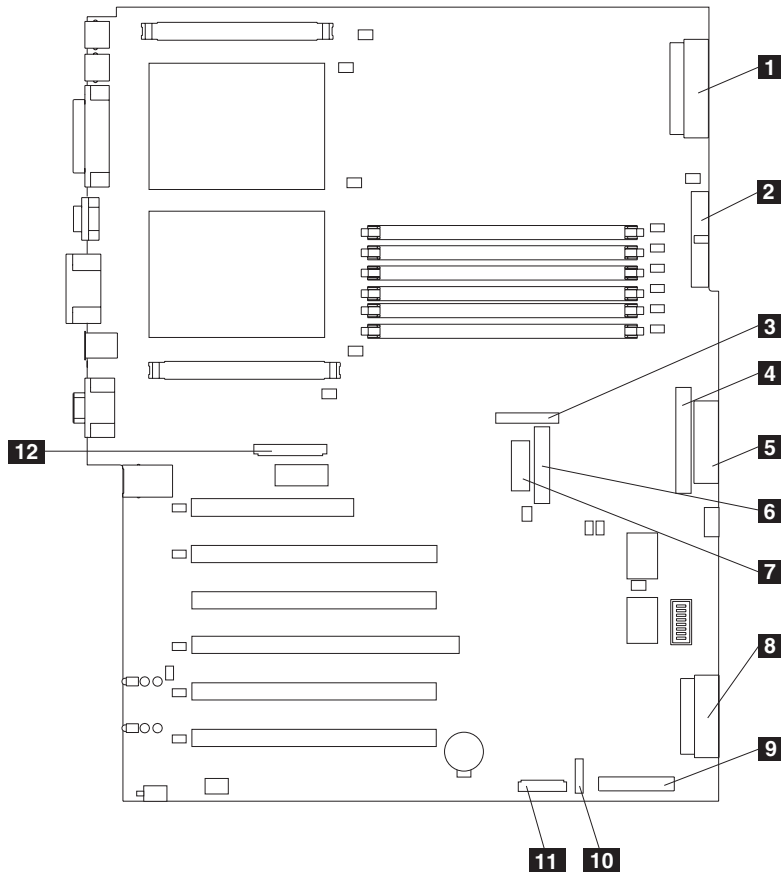


Figure 12. System-board internal cable connectors

- 1** Power (J4)
- 2** Power signal (J10)
- 3** Center fans (J18)
- 4** IDE CD-ROM drive (J21)
- 5** Diskette drive (J22)
- 6** Diagnostics panel (J23)
- 7** Operator-information panel (J24)
- 8** SCSI channel A (J44)
- 9** SCSI channel B (J51)
- 10** On/off/reset panel (J47)
- 11** Front fans (J50)
- 12** Rear fans (J25)

External devices

Figure 13 identifies system-board connectors for external devices.

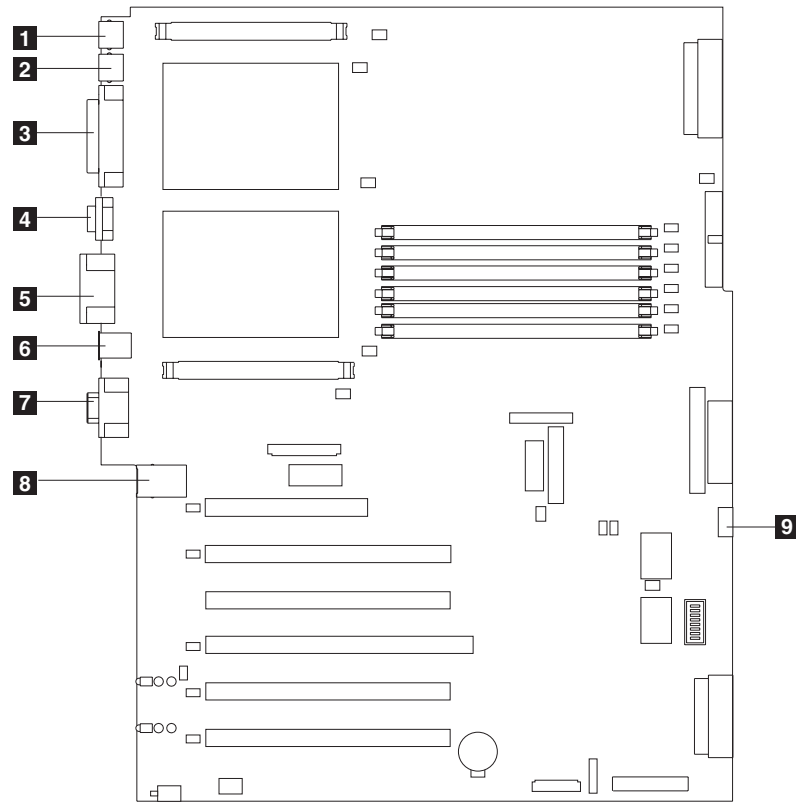


Figure 13. System-board external port connectors

- 1** Keyboard port (J2)
- 2** Mouse port (J3)
- 3** Parallel port (Not supported) (J5)
- 4** Serial port (Not supported) (J8)
- 5** RS-485 port (J13)
- 6** Rear USB port (Not supported) (J16)
- 7** Video port (J19)
- 8** Ethernet port (J26)
- 9** Front USB port (Not supported) (J29)

Switches and jumpers

Figure 14 identifies the switch block (SW1) and jumper blocks (J28 and J42) on the system board.

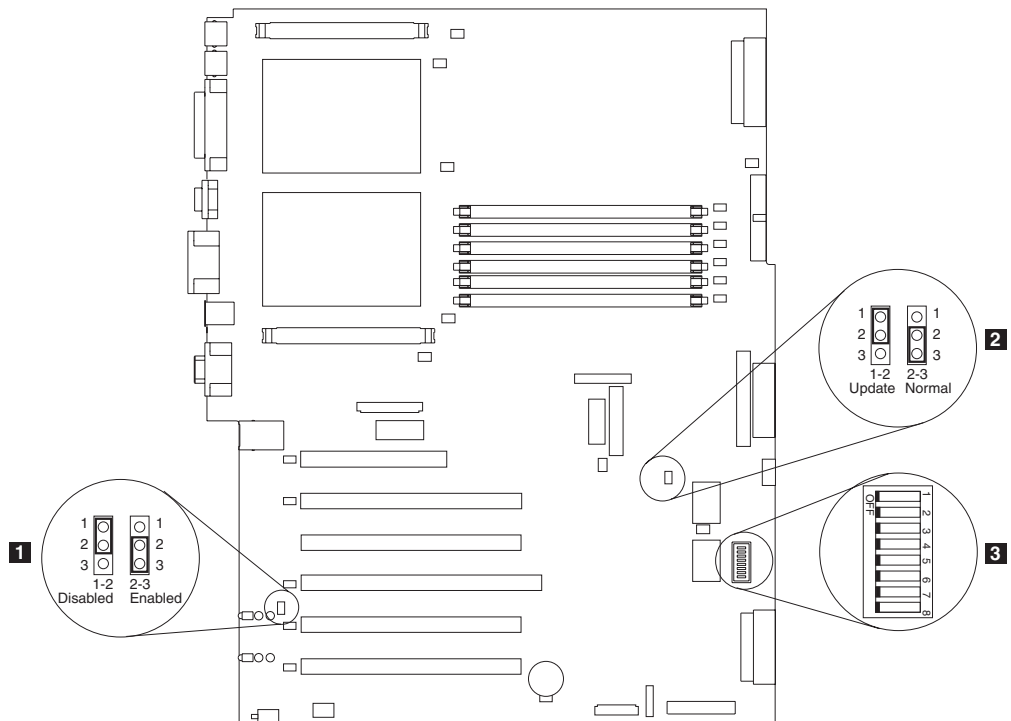


Figure 14. System-board switches and jumpers

- 1** Adapter jumper (J42)
- 2** Boot block recovery jumper (J28)
- 3** System board switch block (SW1)

System-board jumper blocks

Any jumper blocks on the system board that are not shown in Figure 14 are reserved. For normal operation of the system, the jumpers are already installed and positioned correctly.

Switches

The switch block contains microswitches 1 - 8. Switch 8 is at the left of the switch block when looking from the front of the engine, and switch 1 is at the right. The Off position for each switch is toward the rear of the engine.

The switches are already set to the correct settings for normal operation. Do not modify the settings unless instructed to do so by an IBM support representative.

Table 29 describes the function for each switch.

Table 29. Switches 1-8

Switch number	Default value	Switch description
8	Off	Reserved.
7	Off	Power-on override. When toggled to the on position, this switch forces the engine to turn on, overriding the power-on button.
6	Off	Power-on password override. Changing the position of this switch bypasses the power-on password check the next time the engine is turned on and starts the Configuration/Setup Utility program so that you can change or delete the power-on password. You do not need to move the switch back to the default position after the password is overridden. Changing the position of this switch does not affect the administrator password check if an administrator password is set.
5	Off	Reserved.
4	Off	Reserved.
3	Off	Reserved.
2	Off	Reserved.
1	Off	Reserved.

LEDs

Figure 15 on page 82 identifies system-board LEDs. You might need to refer to this figure when troubleshooting a problem.

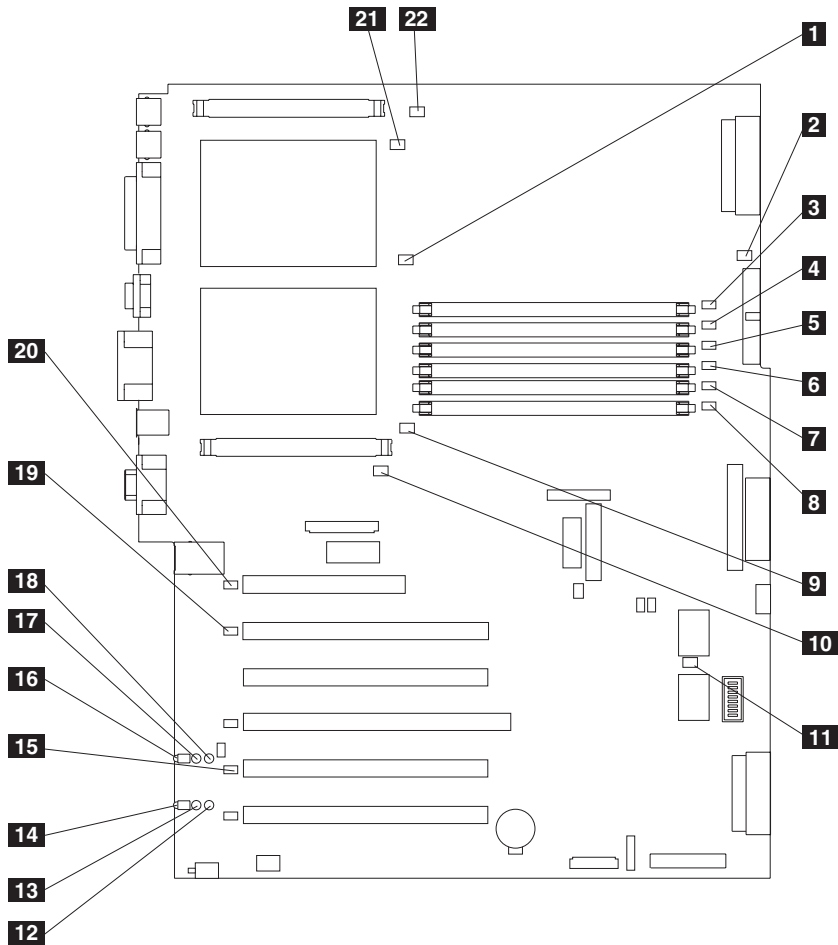


Figure 15. System-board LED locations

- 1** CPU mismatch error LED (CR14)
- 2** Power error LED (CR15)
- 3** DIMM 1 error LED (CR16)
- 4** DIMM 2 error LED (CR17)
- 5** DIMM 3 error LED (CR18)
- 6** DIMM 4 error LED (CR20)
- 7** DIMM 5 error LED (CR22)
- 8** DIMM 6 error LED (CR23)
- 9** CPU 1 error LED (CR24)
- 10** VRM 1 error LED (CR33)
- 11** Service processor activity LED (CR67)
- 12** PCI-X slot 6 power LED (CR79)
- 13** PCI-X slot 6 internal attention LED (CR78) (Disabled)
- 14** PCI-X slot 6 external attention LED (CR77) (Disabled)
- 15** PCI-X bus C error LED (CR76)
- 16** PCI-X slot 5 external attention LED (CR74) (Disabled)
- 17** PCI-X slot 5 internal attention LED (CR73) (Disabled)
- 18** PCI-X slot 5 power LED (CR75)
- 19** PCI-X bus B error LED (CR68)
- 20** PCI bus A error LED (CR66)
- 21** CPU 2 error LED (CR4)
- 22** VRM 2 error LED (CR1)

Diagnostics-panel LEDs viewed with the cover off:

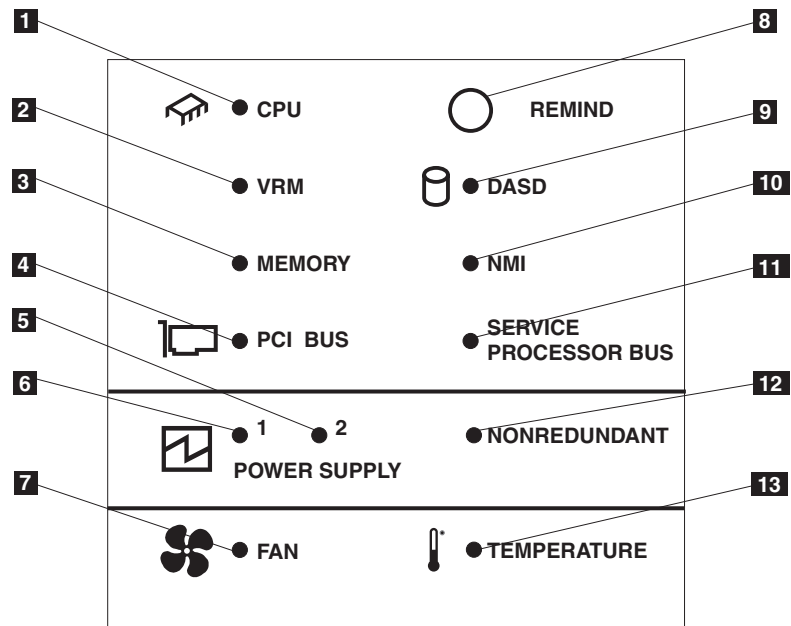


Figure 16. Diagnostics panel LEDs (viewed with the cover off)

Table 30. Diagnostics-panel LED descriptions

Index	Name	Meaning
1	CPU	Microprocessor failure. One or both microprocessors have failed.
2	VRM	Error on VRM or on integrated voltage regulator. The LED next to the affected VRM will also be on.
3	Memory	Memory failure. One or more memory DIMMs have failed.
4	PCI BUS	Error on the PCI bus or system board.
5	Power supply 2	Power supply 2 failure.
6	Power supply 1	Power supply 1 failure.
7	Fan	A fan failed or is operating slowly.
8	Remind button	Press this button to temporarily reset the LEDs on the diagnostics panel.
9	DASD	A hot-swap hard disk drive, backplane, or other part of SCSI channel A has failed. The amber LED next to the drive bay with the failing drive will also be on.
10	NMI	A non-maskable interrupt occurred.
11	Service Processor bus	The system environmental monitor detected an error.
12	Nonredundant	Nonredundant power.
13	Temperature	The operating temperature inside the engine was exceeded.

Internal drive bays

Internal hard disk drives are installed in *bays*. The drive bays of the Model 25T or Model 25T with the rack-mount conversion feature are in the front of the engine, as shown in Figure 17 and Figure 18 on page 85.

Model 25T

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

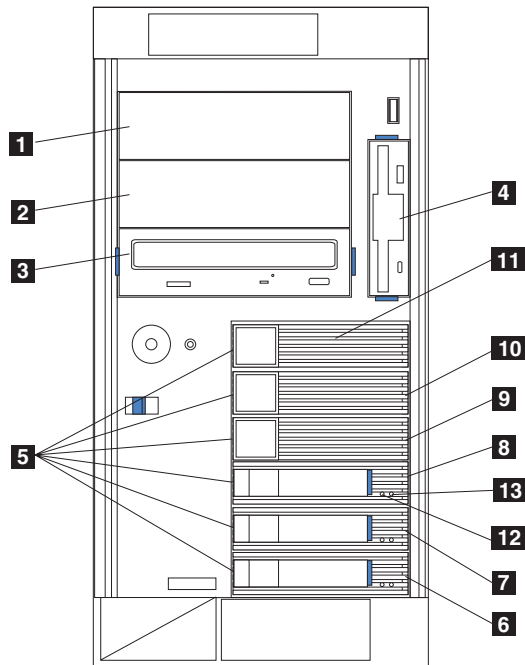


Figure 17. Installing internal drive bays for the Model 25T

- 1** Non-hot-swap bay A
- 2** Non-hot-swap bay B
- 3** Non-hot-swap bay C
- 4** Non-hot-swap bay D
- 5** Hot-swap bays
- 6** Hot-swap SCSI hard-disk-drive bay 0 (SCSI ID 0)
- 7** Hot-swap SCSI hard-disk-drive bay 1 (SCSI ID 1)
- 8** Hot-swap SCSI hard-disk-drive bay 2 (SCSI ID 2)
- 9** Hot-swap SCSI hard-disk-drive bay 3 (SCSI ID 3)
- 10** Hot-swap SCSI hard-disk-drive bay 4 (SCSI ID 4)
- 11** Hot-swap SCSI hard-disk-drive bay 5 (SCSI ID 5)
- 12** Hard disk drive activity light
- 13** Hard disk drive status light

Note: The SCSI IDs for the slim-high and half-high hot-swap hard disk drives are on a label on the bezel, immediately adjacent to the hot-swap hard disk drive bays.

Model 25T with the rack-mount conversion feature

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

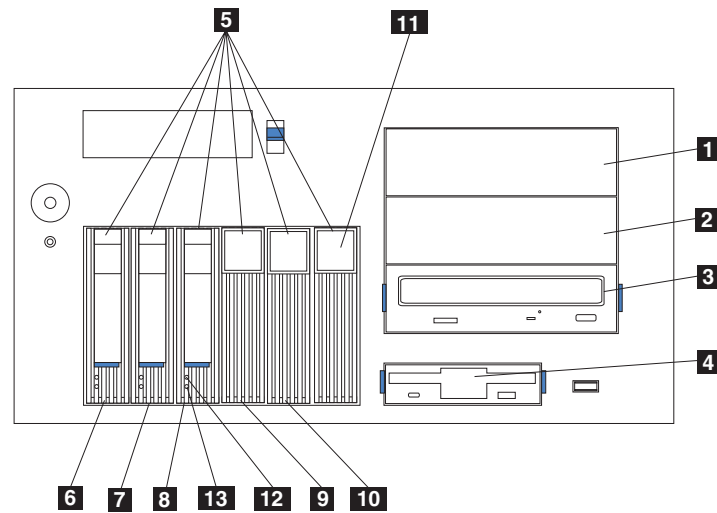


Figure 18. Installing internal drive bays for the Model 25T with the rack-mount conversion feature

- | | |
|-----------|---|
| 1 | Non-hot-swap bay A |
| 2 | Non-hot-swap bay B |
| 3 | CD-ROM drive |
| 4 | Diskette drive |
| 5 | Hot-swap bays |
| 6 | Hot-swap SCSI hard-disk-drive bay 0 (SCSI ID 0) |
| 7 | Hot-swap SCSI hard-disk-drive bay 1 (SCSI ID 1) |
| 8 | Hot-swap SCSI hard-disk-drive bay 2 (SCSI ID 2) |
| 9 | Hot-swap SCSI hard-disk-drive bay 3 (SCSI ID 3) |
| 10 | Hot-swap SCSI hard-disk-drive bay 4 (SCSI ID 4) |
| 11 | Hot-swap SCSI hard-disk-drive bay 5 (SCSI ID 5) |
| 12 | Hard disk drive activity light |
| 13 | Hard disk drive status light |

Connecting external options

This section provides information about the following I/O ports on your engine. Most of these ports are on the rear of the engine.

- One keyboard port
- One auxiliary-device port (pointing device) port
- One parallel port (not enabled)
- One serial port (not enabled)
- Two RS-485 ports dedicated to the system service processor
- Two Universal Serial Bus (USB) version 1.1 ports (not enabled)
- One video port
- One Gigabit Ethernet port
- One SCSI port on the rear of the engine

This section shows you the location of the parts to which you can connect any external devices.

Before attaching an external device, read “Before you begin” on page 73 and the documentation that comes with your options. Use the information in this section to understand the input/output ports on the appliance.

The NAS 200 is a headless appliance. It is not necessary to attach a keyboard or monitor to the appliance during installation or normal operation.

Input/output connector locations

Figure 19 on page 87 and Figure 20 on page 88 show the input/output connectors (ports) on the rear of the engine.

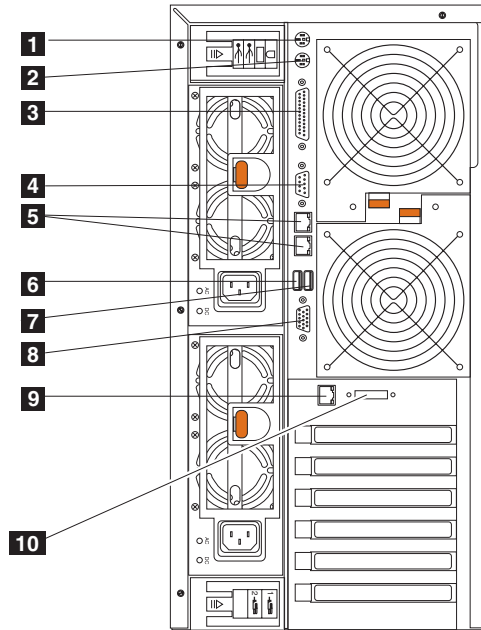


Figure 19. Input and output connector ports for the Model 25T

- 1** Keyboard port
- 2** Mouse port
- 3** Parallel port (not enabled)
- 4** Serial port (not enabled)
- 5** RS-485 port (ASM interconnect)
- 6** Universal Serial Bus (USB) port 2 (not enabled)
- 7** USB port 1 (not enabled)
- 8** Video port
- 9** Ethernet port
- 10** External SCSI port

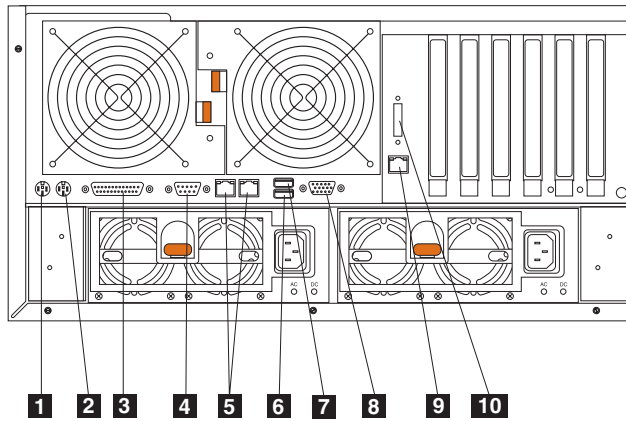


Figure 20. Input and output connector ports for the Model 25T with the rack-mount conversion feature

- 1** Keyboard port
- 2** Mouse port
- 3** Parallel port (not enabled)
- 4** Serial port (not enabled)
- 5** RS-485 port (ASM interconnect)
- 6** Universal Serial Bus (USB) port 2 (not enabled)
- 7** USB port 1 (not enabled)
- 8** Video port
- 9** Ethernet port
- 10** External SCSI port

Note: The ASM connectors are dedicated for use by the Remote Supervisor Adapter.

Input/output ports

This section provides information about the input/output (I/O) ports.

Keyboard port: There is one keyboard connector on the rear of your engine.

The Figure 21 shows the keyboard connector on the rear of your engine. This connector conforms to the industry standard for a PS/2[®] keyboard.

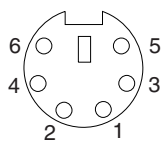


Figure 21. Keyboard port

Auxiliary-device (pointing device) port: The system board has one auxiliary-device port that supports a mouse or other pointing device.

The following illustration shows the auxiliary-device connector on the rear of the engine. This connector conforms to the industry standard for a PS/2 pointing device.

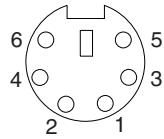


Figure 22. Mouse port

Parallel port:

Note: This port is not enabled. It is shown for reference only.

Figure 23 shows the 25-pin, female D-shell parallel-port connector on the rear of the engine.

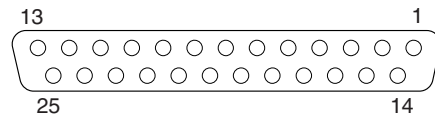


Figure 23. Parallel port

Serial port:

Note: The serial port is not enabled. It is shown for reference only.

Each engine has one standard serial port.

Figure 24 shows the 9-pin, male D-shell serial-port connector on the rear of the engine. This connector conforms to the industry standard.

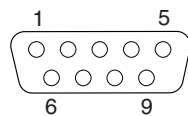


Figure 24. Serial port

RS-485 (ASM interconnect) port: For information about the RS-485 port, see “Remote Supervisor Adapter” on page 171.

Universal Serial Bus version 1.1 ports:

Note: The USB ports are not enabled. They are shown for reference only.

Each USB port has an external connector on the front and rear of the engine for attaching USB compatible devices.

Figure 25 shows the USB-port connectors on the front and rear of your engine. These connectors conform to the USB version 1.1 standard.

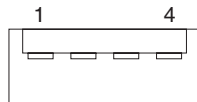


Figure 25. USB ports

Video port: Each engine has an integrated super video graphics array (SVGA) video controller. This controller is not removable, but you can disable it through the Configuration/Setup Utility program or by installing a PCI video adapter.

Note: If you install a PCI video adapter, the BIOS will automatically disable the integrated video controller.

Figure 26 shows the 15-pin analog video connector on the rear of the engine. This connector conforms to the industry standard.

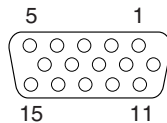


Figure 26. Video port

Gigabit Ethernet port: Each engine comes with an integrated Gigabit Ethernet controller. This controller provides an interface for connecting to 10-Mbps, 100-Mbps, or 1000-Mbps networks and provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

To access the Ethernet connector, connect a Category 3, 4, or 5 unshielded twisted-pair (UTP) cable to the Ethernet (RJ-45) connector on the rear of the engine. See Figure 13 on page 79.

Note: The 100BASE-TX Fast Ethernet standard and 1000BASE-T standard require that the cabling in the network be Category 5 or higher.

The Ethernet (RJ-45) connector has one LED that indicates Ethernet-link status. When this green LED is on, there is an active connection on the Ethernet port. Activity between the engine and the network is indicated by the Ethernet transmit/receive activity LED on the front of the engine (see Figure 5 on page 10).

Ethernet connector: There is an RJ-45 Ethernet connector on the back of the engine. See Figure 19 on page 87 or Figure 20 on page 88 for the location of this connector. Figure 27 shows the pin-number assignments for the RJ-45 connector. These assignments apply to 10BASE-T, 100BASE-TX, and 1000BASE-T devices.

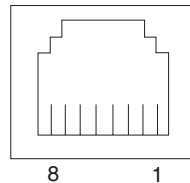


Figure 27. Integrated Gigabit Ethernet controller port

SCSI ports:

The engine has one SCSI port located on the rear of the engine. If there is a ServeRAID-5i controller installed in the engine and no IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, this connector provides an external connection to attach a Model EXP 5194-EXP storage unit. If there is an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit and a ServeRAID-5i controller installed, this port can be used for tape backup.

If you want to attach external SCSI devices to the engine without using the internal SCSI channel B, you must install an optional SCSI adapter.

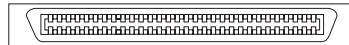


Figure 28. External SCSI port on the rear of the engine

Notes:

1. External SCSI devices connected to internal SCSI channel B will operate asynchronously.
2. Because the ServeRAID controller installed configures and manages the internal hot-swap drives, the SCSI cable from the system-board SCSI connector will already be connected to an internal channel connector on the ServeRAID controller (except for the ServeRAID-5i controller, which uses the system-board integrated SCSI controller with RAID capabilities). See “ServeRAID controller” on page 180 for additional information.

SCSI cabling requirements: For information about the maximum length of SCSI cable, see the American National Standards Institute (ANSI) SCSI standards on the ANSI Web site at <http://www.ansi.org/> on the World Wide Web. Adhering to these standards will help to ensure that your engine operates correctly.

SCSI IDs: Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID. This ID enables the SCSI controller to identify the device and ensure that different devices on the same SCSI channel do not attempt to transfer data simultaneously. SCSI devices that are connected to different SCSI channels can have duplicate SCSI IDs. Table 31 on page 92 and Table 32 on page 92 list the

SCSI IDs for the hard disk drives and backplanes that are connected to one channel. In the typical configuration, the standard hard disk drives and backplane are connected to channel A or internal channel 1 when using a ServeRAID-4H or ServeRAID-4Mx controller, and the optional 3-Pack hard disk drives and backplane are connected to channel B. See “IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit” on page 140 for instructions for installing the 3-Pack option.

Table 31. SCSI IDs for standard hot-swap hard disk drives and backplane

Device	SCSI ID
Drive bay 5	5
Drive bay 4	4
Drive bay 3	3
Drive bay 2	2
Drive bay 1	1
Drive bay 0	0
Backplane	8

Table 32. SCSI IDs for optional 3-Pack hot-swap hard disk drives and backplane

Device	SCSI ID
Drive bay 14	14
Drive bay 13	13
Drive bay 12	12
Backplane	9

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. However, when you attach an external SCSI device to an optional SCSI adapter, you must set a unique ID for the device. See the information that comes with the device for instructions to set its SCSI ID.

SCSI system-board connectors: Figure 29 shows the 68-pin, female D-shell SCSI connectors. These connectors conform to the SCSI standard.

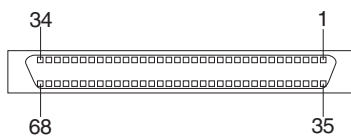


Figure 29. SCSI connectors

Installation and replacement procedures

This section describes how to install or replace internal hardware components.

Removing the cover

This section provides steps for removing the cover from the Model 25T or Model 25T with the rack-mount conversion feature.

Model 25T

To remove the left-side cover of the Model 25T:

1. Review the information in “Before you begin” on page 73.
2. If you are planning to install or remove any part other than a hot-swap hard disk drive or hot-swap power supply, shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and all attached devices. Disconnect all external cables and power cords.
3. Push the plastic cover-release latch on the front of the engine in the direction indicated in Figure 30 to release the cover.
4. While pushing the plastic cover-release latch, slide the left-side cover slightly toward the rear of the engine; the cover will stop after approximately 25 mm (1 inch). Release the cover-release latch; then, lift the cover off the engine and set the cover aside.

Attention: For correct cooling and airflow, replace the cover before powering on the appliance. Operating the appliance for extended periods of time (over 30 minutes) with the cover removed might damage appliance components.

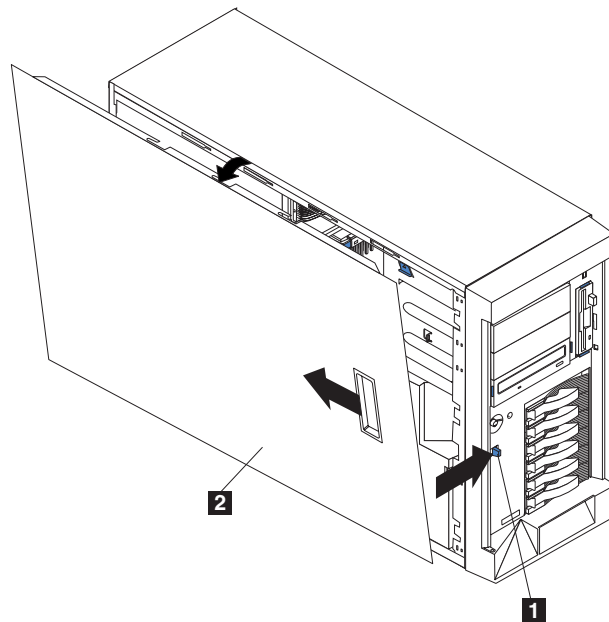


Figure 30. Removing the cover of the Model 25T

- | | |
|----------|---------------------|
| 1 | Cover-release latch |
| 2 | Cover |

Model 25T with the rack-mount conversion feature

To remove the top cover:

1. Review the information in “Before you begin” on page 73.
2. If you are planning to install or remove any part other than a hot-swap hard disk drive or hot-swap power supply, shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and all attached devices and disconnect all external cables and power cords.
3. Push the plastic cover-release latch on the front of the engine down to release the cover.
4. While pushing the plastic cover-release latch, slide the cover slightly toward the rear of the engine; the cover will stop after approximately 25 mm (1 inch). Release the cover-release latch; then, lift the cover off the engine and set the cover aside.

Attention: For correct cooling and airflow, replace the cover before powering on the appliance. Operating the appliance for extended periods of time (over 30 minutes) with the cover removed might damage appliance components.

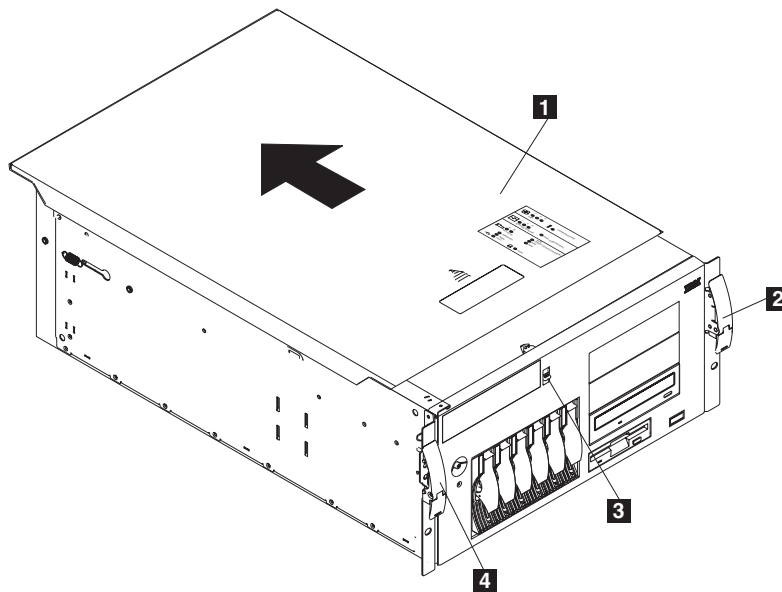


Figure 31. Removing the cover of the Model 25T with the rack-mount conversion feature

- | | |
|----------|---------------------|
| 1 | Cover |
| 2 | Right-side latch |
| 3 | Cover-release latch |
| 4 | Left-side latch |

Removing the door

Model 25T

To remove the appliance door:

1. Unlock and open the appliance door.
2. Locate the flange on the top edge of the door (see Figure 32).
3. Press down on the flange while pressing out on the door; then, lift the appliance door up and off the hinge. Set the door aside in a safe place.

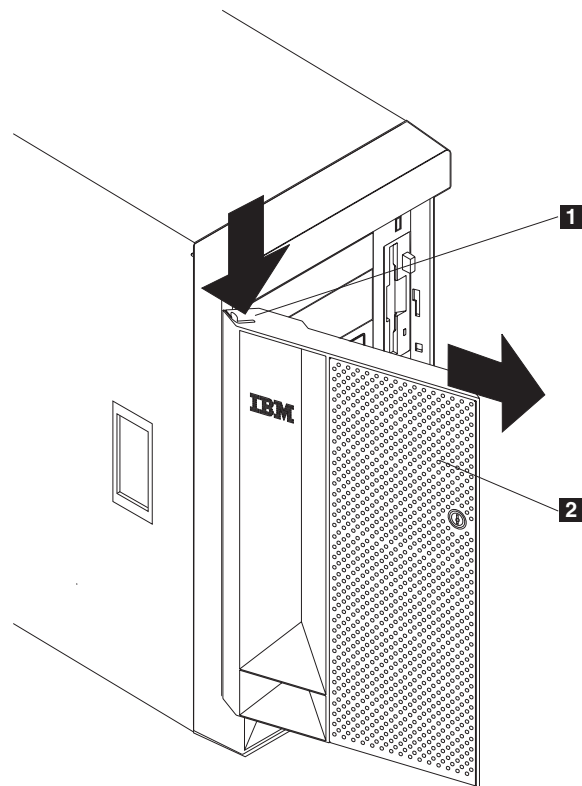


Figure 32. Removing the appliance door of the Model 25T

- | | |
|----------|--------|
| 1 | Flange |
| 2 | Door |

Removing the bezel

Model 25T

To remove the bezel:

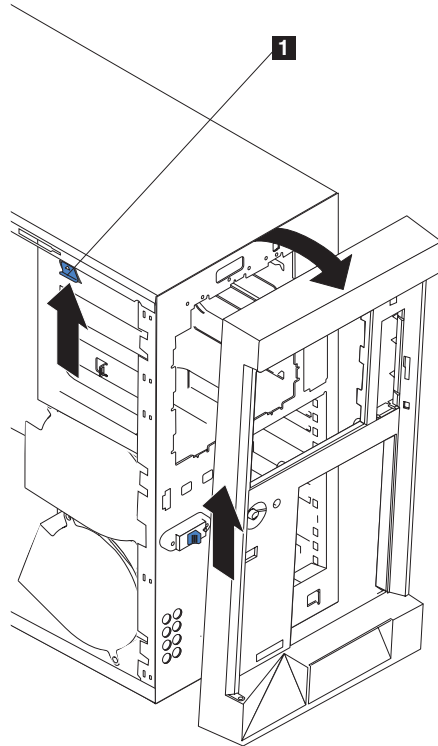


Figure 33. Removing the bezel of the Model 25T

1 Bezel-release lever

1. Press up on the bezel-release lever.
2. Pull the top of the bezel away from the chassis; then, lift the bezel to disengage the bottom tabs.
3. Remove the bezel from the engine and store the bezel in a safe place.

Model 25T with the rack-mount conversion feature

To remove the bezel:

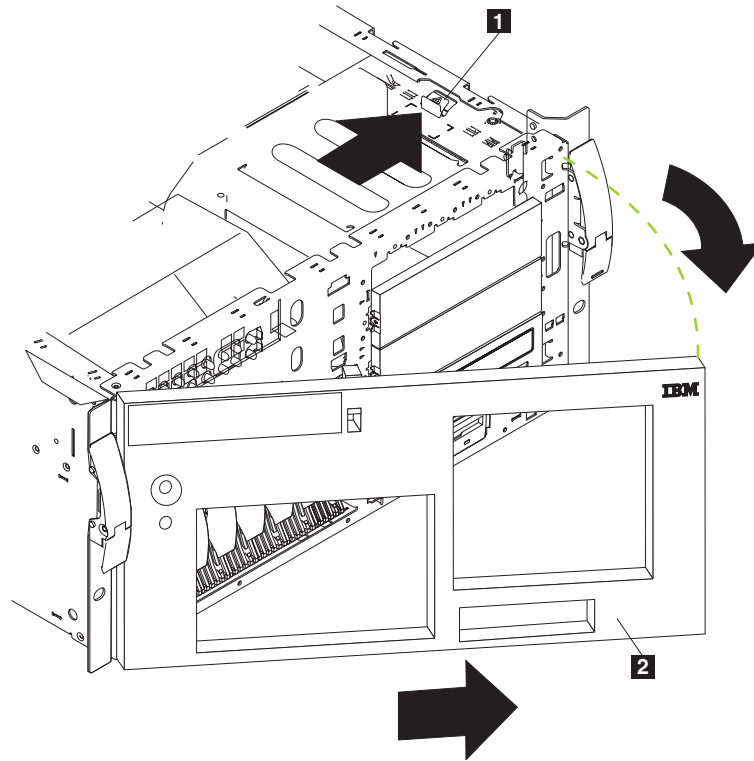


Figure 34. Removing the bezel of the Model 25T with the rack-mount conversion feature

- 1** Bezel-release lever
- 2** Bezel

1. Remove the cover and locate the bezel-release lever.
2. Press the bezel-release lever to the unlocked position as indicated on the lever.
3. Pull the right side of the bezel away from the chassis; then, slide the bezel to the right to disengage the tabs.
4. Remove the bezel from the engine and store the bezel in a safe place.

Active PCI assembly

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the cover (see “Removing the cover” on page 93).
5. Remove all adapters and spacers (see “Adapters” on page 105).
6. Disconnect the card cable from the system board.
7. Press the two tabs (see Figure 35 on page 98 or Figure 36 on page 99) on the card and remove it from the chassis.

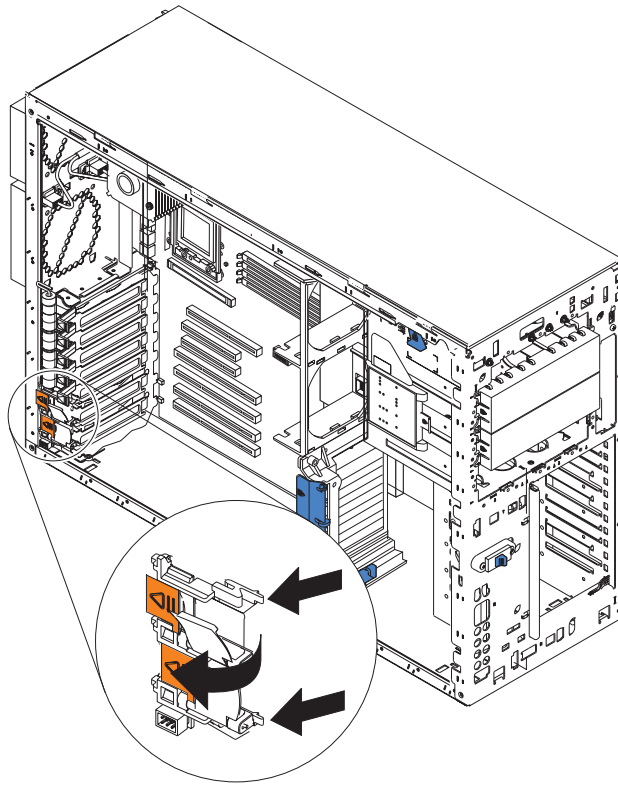


Figure 35. Removing the Active PCI card (Model 25T)

Note: It might be easier to remove this component if the engine is placed on its side.

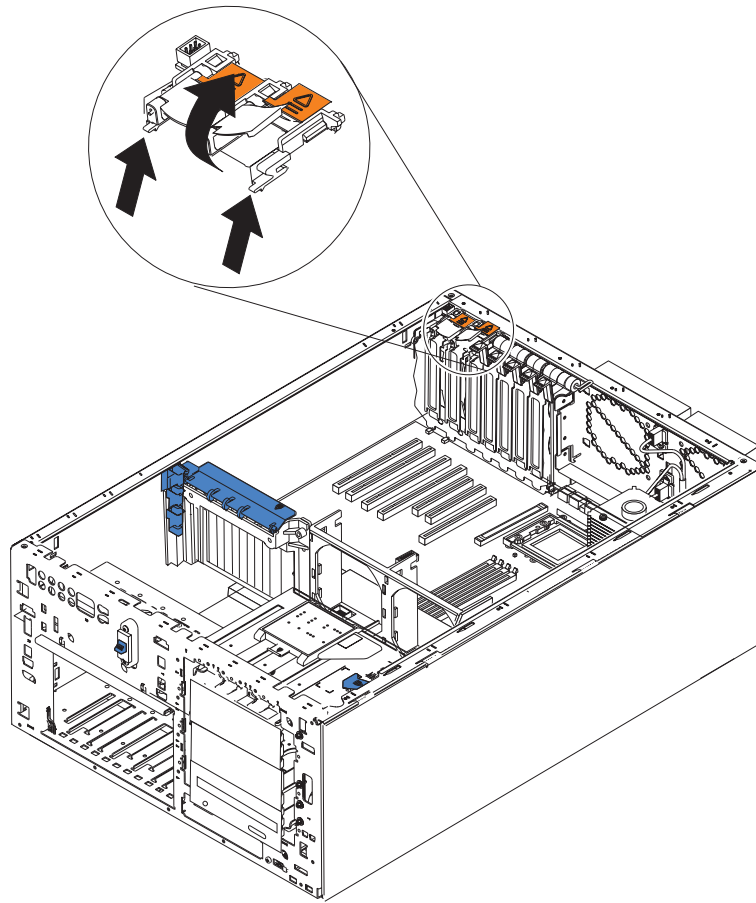


Figure 36. Removing the Active PCI card (Model 25T with the rack-mount conversion feature)

8. To replace the Active PCI card, line up the two tabs with the notches on the chassis and snap the assembly into place; then, connect the cable to the system board.

Adapters

You can install up to six PCI adapters in the available expansion slots on the system board of the NAS 200 according to the rules or tables provided in “Adapter placement” on page 217.

Figure 37 shows the location of the PCI expansion slots on the system board.

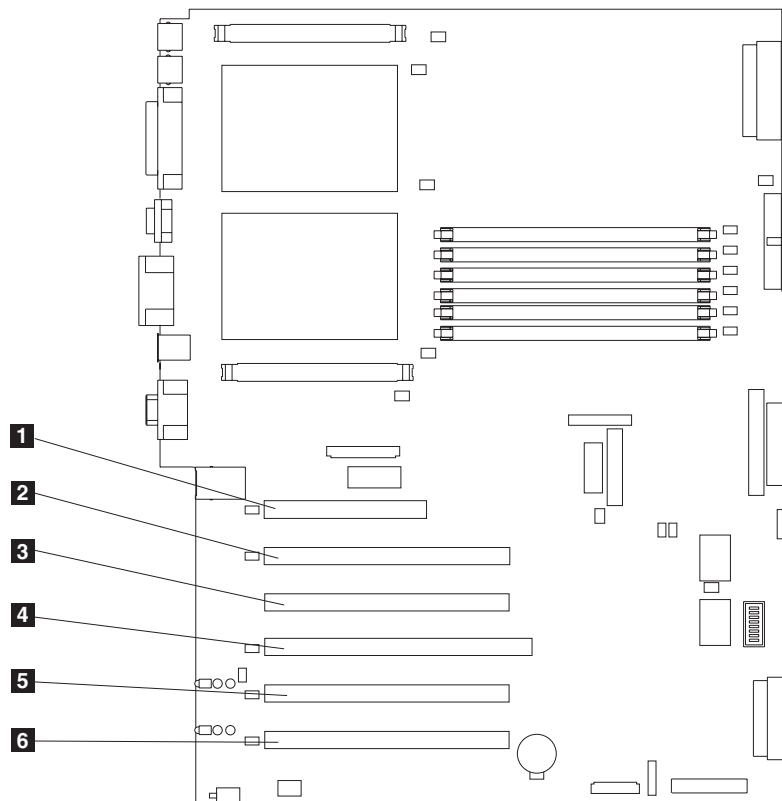


Figure 37. Location of the PCI expansion slots

- 1** PCI slot 1 32-bit 5.0 V (J32)
- 2** PCI slot 2 64-bit 3.3 V (J36)
- 3** PCI slot 3 64-bit 3.3 V (J38)
- 4** PCI slot 4 64-bit 3.3 V (J41)
- 5** PCI slot 5 64-bit 3 V (J43)
- 6** PCI slot 6 64-bit 3 V (J45)

There is a complete list of adapter rules, combinations, and placement locations in Appendix A, “Communication adapters” on page 217.

Adapter-support bracket

When working with some options, you must first remove the adapter-support bracket to access certain components or connectors on the system board.

Note: The center-fan bracket is attached to the adapter-support bracket. Both brackets are removed and installed together as a single unit.

Complete the following steps to remove the adapter-support bracket:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine and disconnect all power cords and external cables; then, remove the cover (see “Removing the cover” on page 93).
3. See Figure 38 or Figure 39 on page 102 and slide the air-baffle assembly out of the guides; then, remove it from the engine.

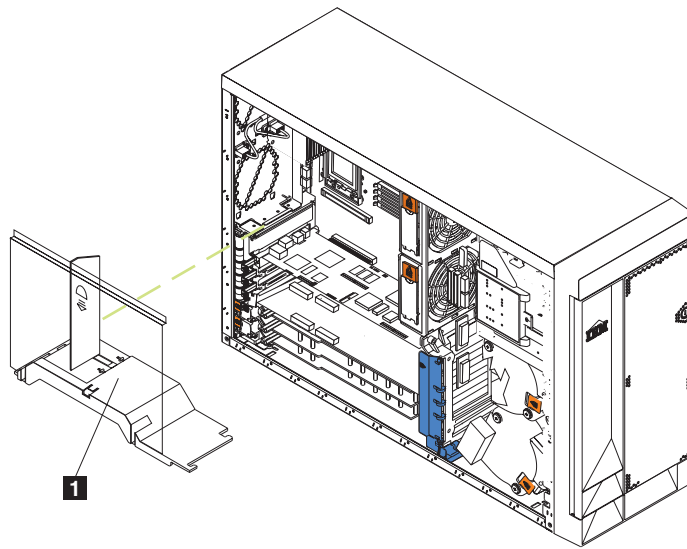


Figure 38. Removing the air-baffle assembly (Model 25T)

1 Air-baffle assembly

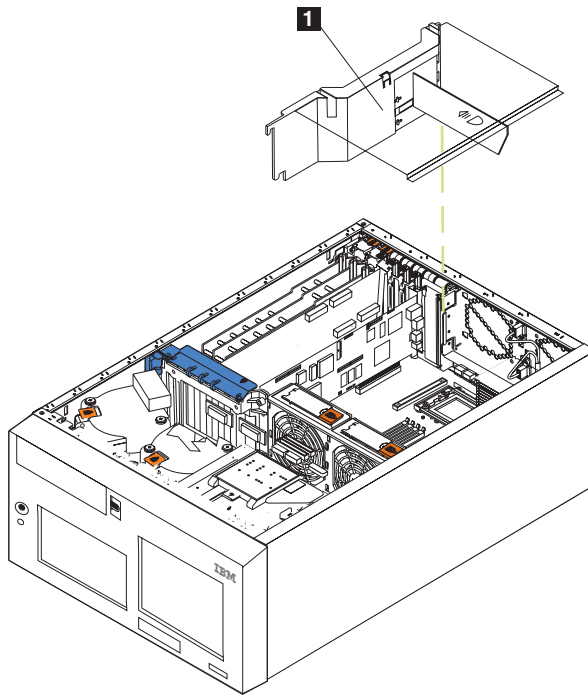


Figure 39. Removing the air-baffle assembly (Model 25T with the rack-mount conversion feature)

1 Air-baffle assembly

4. Disconnect any cables that are connected to the full-length adapters.
5. Lift the adapter-retention clip on top of the adapter-support bracket and the adapter-retention latch from each full-length adapter; then, remove the full-length adapters. (See Figure 42 on page 105 and Figure 43 on page 106 for the location of the adapter-retention clip.)
6. Lift and remove the plastic dividers from PCI-X slots 5 and 6 by lifting the ends of the dividers out of the adapter support bracket and tilting the dividers up and out of the engine.
7. Disconnect the end of the cable that is attached to the center-fans connector (J18). See Figure 12 on page 78 for the location of the center-fans connector. To disconnect this cable:
 - a. Press the small tab on the flat part of the cable connector facing away from the memory modules.
 - b. While pressing the tab, disconnect the cable.
8. Remove the adapter-support bracket (see Figure 40 on page 103 or Figure 41 on page 104).

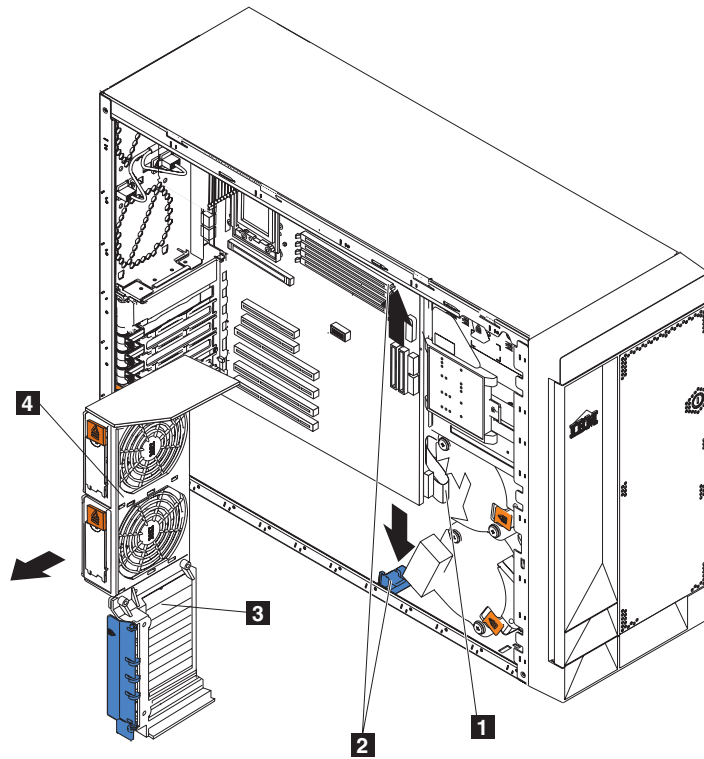


Figure 40. Removing the adapter-support bracket (Model 25T)

- 1** SCSI cable
- 2** Adapter-support bracket latches
- 3** Adapter-support bracket
- 4** Center-fan bracket

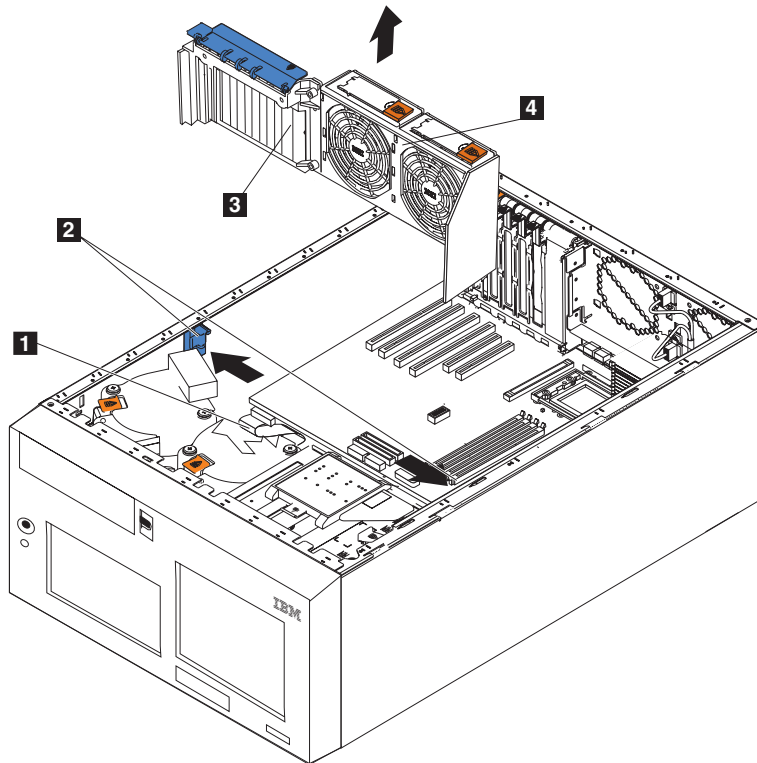


Figure 41. Removing the adapter-support bracket (Model 25T with the rack-mount conversion feature)

- 1** SCSI cable
- 2** Adapter-support bracket latches
- 3** Adapter-support bracket
- 4** Center-fan bracket

- a. Press the release tab on each adapter-support bracket latch. There are two latches, one at each end of the adapter-support bracket.
- b. Slide the adapter-support bracket out of the guides; then, remove it from the engine.

Note: To reinstall the adapter-support bracket and other components that you removed or disconnected, reverse the preceding steps. Remember to reroute the cables that you disconnected and reconnect the center-fan cable to connector J18 on the system board.

9. Continue with the option installation or removal procedure.

Adapters

Figure 42 and Figure 43 on page 106 show how to install a PCI adapter.

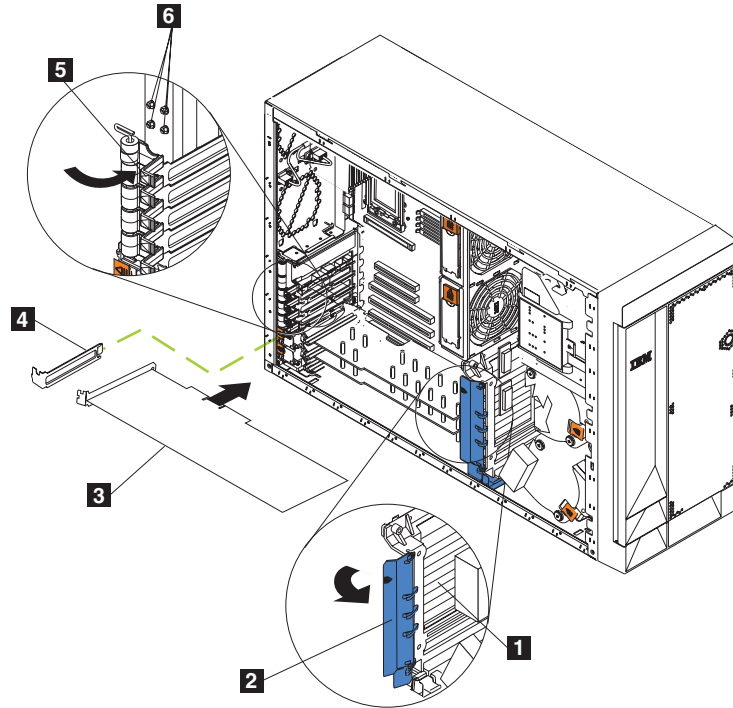


Figure 42. Installing an adapter (Model 25T)

- 1** Adapter-support bracket
- 2** Adapter-retention clip
- 3** Adapter
- 4** Expansion-slot cover
- 5** Adapter-retention latch
- 6** Backup expansion-slot screws

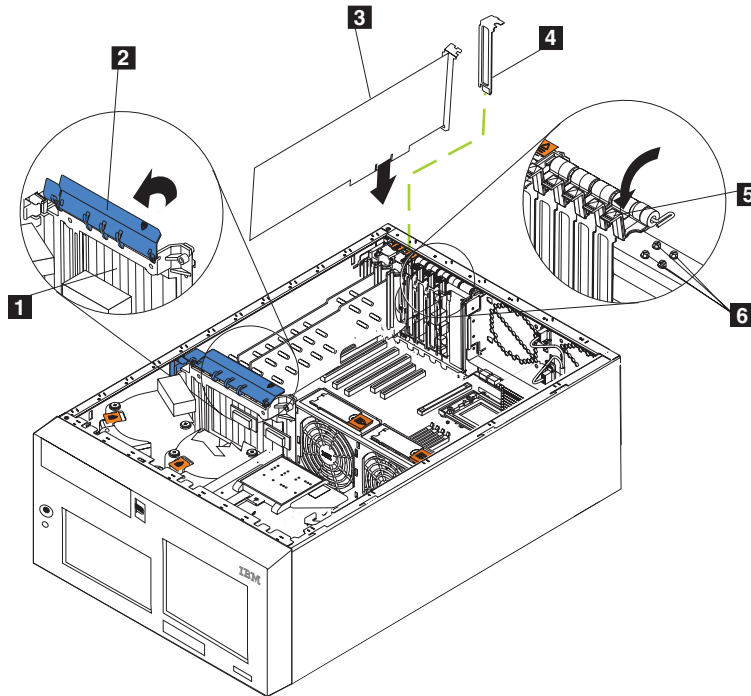


Figure 43. Installing an adapter (Model 25T with the rack-mount conversion feature)

- | | |
|---|------------------------------|
| 1 | Adapter-support bracket |
| 2 | Adapter-retention clip |
| 3 | Adapter |
| 4 | Expansion-slot cover |
| 5 | Adapter-retention latch |
| 6 | Backup expansion-slot screws |

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

Note: You can replace a ServeRAID-5i controller only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements. Install the ServeRAID-5i controller using the 3-U bracket that comes with the controller.

Follow these steps to install a PCI or PCI-X adapter:

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices. Disconnect all external cables and power cords; then, remove the cover. See “Removing the cover” on page 93 for details.
3. Determine which expansion slot you will use for the adapter using either the rules explained in “Adapter placement rules” on page 219 or the plug combination charts in Appendix A, “Communication adapters” on page 217. Be sure to check the instructions that come with the adapter for any requirements or restrictions.

4. If you are installing an adapter in PCI slot 1 or PCI-X slots 2 through 4, lift the tab on the expansion-slot cover. Continue with the next step.

If you are installing an adapter in PCI-X slot 5 or 6, slide the orange adapter-retention-latch release toward the rear of the engine and hold it there while you lift the black adapter-retention latch to the unlocked (open) position, as shown in Figure 44 and Figure 45 on page 108

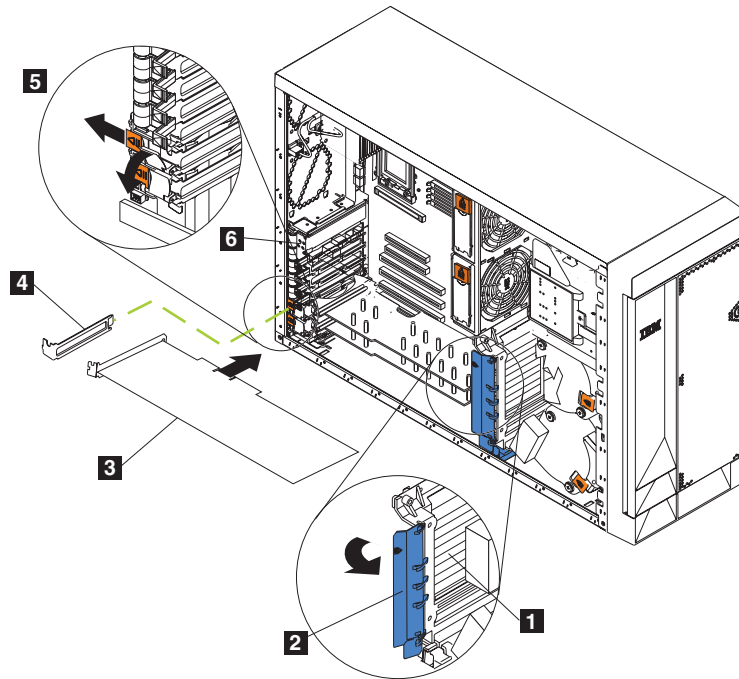


Figure 44. Installing an adapter into slots 5 or 6 (Model 25T)

- | | |
|----------|---|
| 1 | Adapter-support bracket |
| 2 | Adapter-retention clip |
| 3 | Adapter |
| 4 | Expansion-slot cover |
| 5 | Adapter-retention latch |
| 6 | Screws for securing adapters in slots 1-4 |

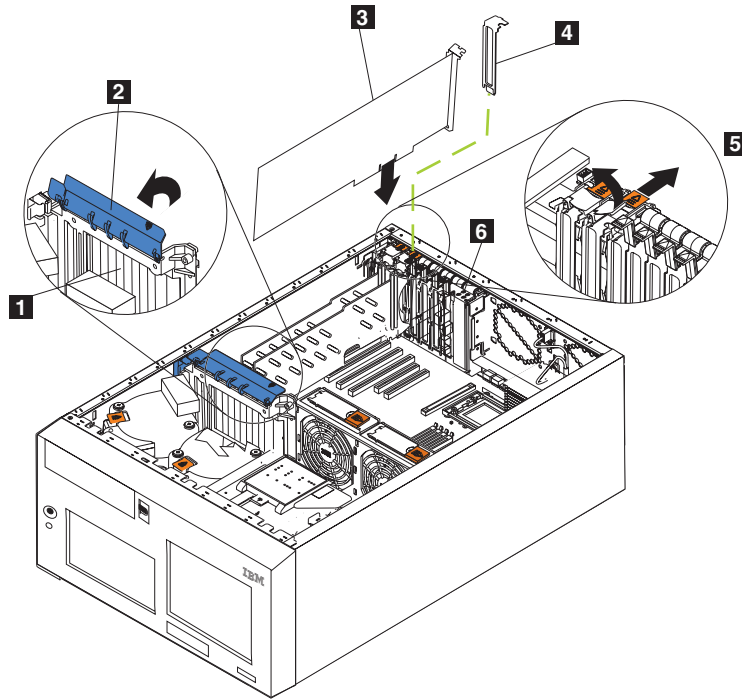


Figure 45. Installing an adapter into slots 5 or 6 (Model 25T with the rack-mount conversion feature)

- 1** Adapter-support bracket
- 2** Adapter-retention clip
- 3** Adapter
- 4** Expansion-slot cover
- 5** Adapter-retention latch

Attention: Expansion-slot covers must be installed on all empty slots. This maintains the electronic emissions characteristics of the system and ensures correct cooling of system components.

5. Remove the expansion-slot cover:
 - a. Push down the arrow on the adapter-retention-bracket release tab and the tab below, and pull to remove the bracket.
 - b. Slide the expansion-slot cover out of the appliance. Store it in a safe place for future use.
6. If you are installing a full-length adapter, lift the adapter-retention clip on the adapter-support bracket. Otherwise, continue with the next step.
7. Refer to the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.

Attention: Avoid touching the components and gold-edge connectors on the adapter.

8. Grasp the adapter by the metal bracket or adapter guide end and remove the adapter from the static-protective package.
9. Place the adapter, component-side up, on a flat, static-protective surface.

Cabling a ServeRAID controller: The IBM ServeRAID controller in your engine controls the internal hot-swap hard disk drives. A ServeRAID controller can, for example, enable you to configure the internal hot-swap hard disk drives into disk arrays. Figure 47 on page 112 and Figure 48 on page 113 show the cabling for internal hot-swap hard disk drives. You can also cable a ServeRAID controller to external hard disk drives. See your ServeRAID controller option documentation for complete instructions for installing a ServeRAID controller in your engine and for additional information about ServeRAID controllers.

Notes:

1. This cabling example does not apply to the ServeRAID-5i controller, which uses the integrated SCSI controller with RAID capabilities on the system board.
2. The ServeRAID-5i controller can be installed only in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements.
3. Connections made to external SCSI devices will be asynchronous.

If you are connecting the controller to any internal SCSI backplane or device, you will need to purchase additional SCSI cables. Contact your IBM marketing representative or authorized reseller for additional information about the number and types of cables that your configuration requires.

Your engine comes with one SCSI cable that can only be used with the integrated SCSI controller with RAID capabilities that is on the system board. One end of this SCSI cable is attached to the connector on the SCSI backplane, and the other end is attached to the SCSI channel A connector on the system board. The SCSI channel B connector on the system board is available for use, but the engine does not come with a cable attached to it.

The following procedure describes the cable routing that is necessary when you install a ServeRAID controller other than the ServeRAID-5i.

Notes:

1. See the documentation that comes with your controller for any cabling instructions.
2. Cable identifiers are printed on the cables that come with your engine and options. Use these identifiers to connect the cables to the correct connectors. For example, the hard disk drive cables are labeled "HDD option."

Cabling the ServeRAID-4Mx or -4H controllers: Complete the following steps to cable the ServeRAID-4Mx or -4H controllers:

1. Determine the number of SCSI channels that you want to use on the ServeRAID controller.
2. Review the information in "Before you begin" on page 73.
3. Shut down the engine (see "Powering on and shutting down the appliance" on page 11) and disconnect all power cords and external cables; then, remove the cover (see "Removing the cover" on page 93).
4. Remove the adapter-support bracket (see "Adapter-support bracket" on page 101).
5. Disconnect internal cables as necessary, remove the air-baffle assembly, and remove the adapter-support bracket from the engine. For complete details, see "Adapter-support bracket" on page 101.

6. Disconnect the internal SCSI cable from SCSI connector A (J44) or B (J51) on the system board. See Figure 12 on page 78 for the location of the SCSI connectors.

Note: The SCSI cables that came with your engine can be used only with the integrated SCSI controller with RAID capabilities. To select and order the correct cables for use with your RAID controller, contact your IBM marketing representative or authorized reseller.

7. Reinstall the adapter-support bracket in the engine (see “Adapter-support bracket” on page 101).

Important: To ensure correct cooling and engine operation, you must keep the air-baffle cover closed.

Note: You must reinstall the air-baffle assembly when you reinstall the adapter-support bracket. Make sure that no cable is under the adapter-support bracket or interferes with the center fans (connector J18).

8. Reinstall the plastic dividers between the PCI-X adapter slots.
9. Reinstall the adapters that you removed. If you have not yet installed the ServeRAID controller, install it now.

See “Adapters” on page 105 for instructions for installing an adapter; then, return to this step.

10. Replace the SCSI cable on the SCSI backplane with the SCSI cable for your new ServeRAID controller. The SCSI cable being replaced was one of the cables that was disconnected from the system board in step 6.
11. Route the free end of the SCSI cable from the SCSI backplane through the adapter-support bracket opening and toward the ServeRAID controller (see Figure 47 on page 112).
12. Attach the free end of the SCSI cable to the selected internal SCSI channel connector on the ServeRAID controller. Make sure that the other end of the SCSI cable is attached to the connector on the SCSI backplane.

Attention: When you route the SCSI cable, do not block the ventilated space around any of the fans.

Figure 47 on page 112 shows how to route one SCSI cable to the ServeRAID controller.

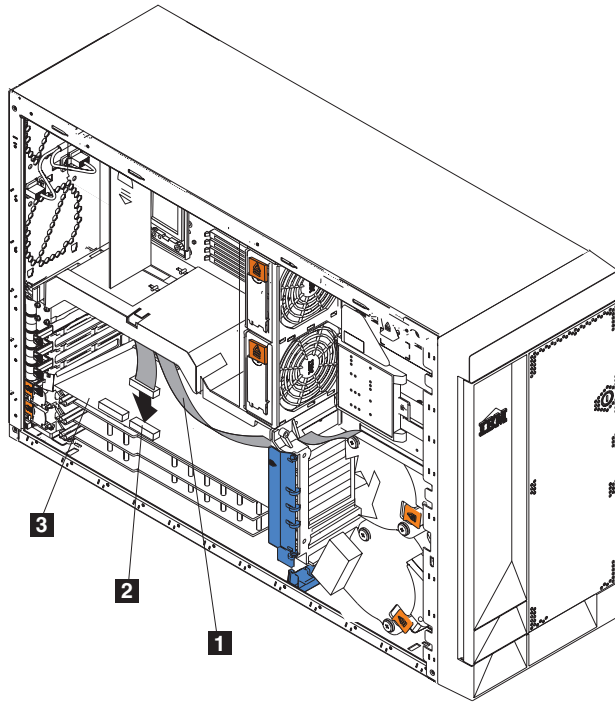


Figure 47. Routing one SCSI cable from backplane to the ServeRAID controller

- 1** SCSI cable
- 2** Internal channel 1
- 3** ServeRAID controller

13. If you are connecting the adapter to a second SCSI backplane on the engine, repeat steps 10 through 12 for the second backplane, and then continue with step 14. Otherwise, continue with step 14.
Figure 48 on page 113 shows how to route two SCSI cables from backplanes to the ServeRAID controller (in PCI slot 3 in Figure 48 on page 113).

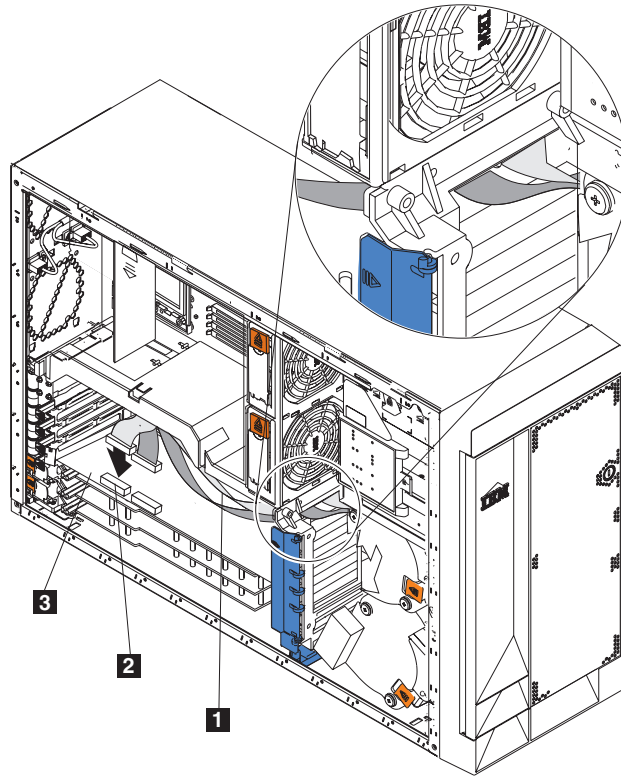


Figure 48. Routing two SCSI cables from backplanes to the ServeRAID controller

- 1** SCSI cable
- 2** Internal channel 2
- 3** ServeRAID controller

Note: If you plan to attach external SCSI devices, you must order additional SCSI cables. To select and order the correct cables for use with external devices, contact your IBM marketing representative or authorized reseller.

14. If you have other options to install or remove, do so now; otherwise, go to “Installing the cover” on page 198.

Cabling the ServeRAID-5i controller:

Note: The ServeRAID-5i controller can be installed only in the factory. It is always in PCI-X slot 4. Slot 4 is the only PCI-X slot that supports the ServeRAID-5i controller requirements.

Battery

There are at least two batteries in the Model 25T that might need replacing, depending on the options installed: the engine battery and the ServeRAID controller battery.

Engine battery replacement

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following safety guidelines.



CAUTION:

<2-16> When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

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

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

Note: For translated versions of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which is on the publications CD that was shipped with your appliance.

Note: In the U.S., call 1 800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a correct manner. To order replacement batteries, call 1 800-772-2227 within the United States.

Before you begin:

- Read “Before you begin” on page 73.
- Follow any special handling and installation instructions supplied with the replacement battery.
- Attach a monitor and keyboard.

Note: After you replace the battery, you must reconfigure your appliance and reset the system date and time.

To replace the battery:

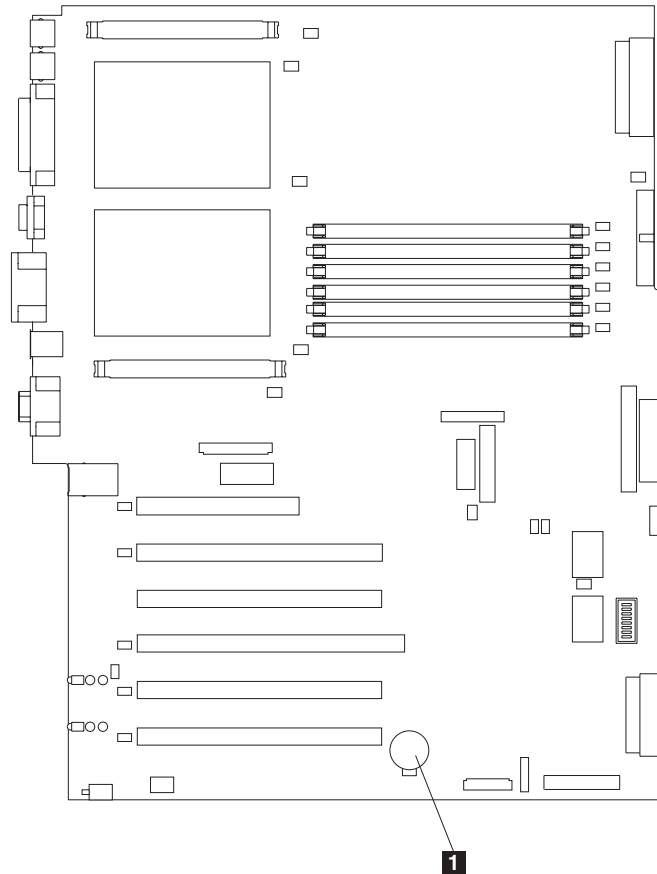
1. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices, and disconnect all external cables and power cords.
2. Remove the cover (see “Removing the cover” on page 93).
3. Lift the adapter-retention clip on top of the adapter-support bracket (see “Adapter-support bracket” on page 101).

4. Remove all of the full-length adapters and plastic dividers (see “Adapters” on page 105).

Attention: Note the location of the adapters. You must replace each adapter in the same slot from which it was removed.

Note: You do not need to unplug the internal adapter cables.

5. Locate the battery (connector BH1) on the system board using Figure 49.



1 Battery

Figure 49. Replacing the battery

6. Remove the plastic cover on the system board.
7. Remove the battery:
 - a. Use one finger to press the top of the battery clip away from the battery until the battery releases upward from the socket as shown in Figure 50 on page 116.
 - b. Lift and remove the battery from the socket.

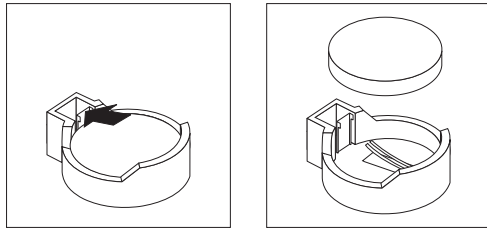


Figure 50. Releasing the battery

8. Insert the new battery:

Note: Ensure that the polarity of the battery is correct. The positive (+) side must face up.

- a. Tilt the battery so that you can insert it into the socket on the side opposite the battery clip.
- b. Press the battery down into the socket until it clicks under the battery clip, as shown in Figure 51.

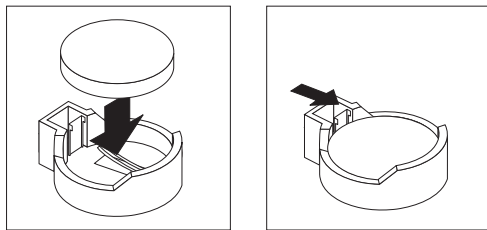


Figure 51. Inserting the new battery

9. Reinstall the adapters and plastic dividers in the same slots from where they were removed, and reconnect any internal cables that were disconnected (see “Adapters” on page 105).
10. Replace the adapter-support bracket (see “Adapter-support bracket” on page 101).

Note: You must reinstall the air-baffle assembly when you reinstall the adapter-support bracket. Make sure that no cable is under the adapter-support bracket or interferes with the center fans.

Important: To ensure correct cooling and engine operation, you must keep the air-baffle cover closed.

11. Reinstall the engine cover, and connect the power cords and external cables.

Note: Wait approximately 20 seconds after you plug the power cords of your appliance into electrical outlets for the power button to become active.

12. Power on the appliance.
13. Start the Configuration/Setup Utility program and set configuration parameters:
 - Set the system date and time
 - Set the power-on password
 - Reconfigure your appliance

IBM ServeRAID-5i Ultra320 SCSI Controller battery replacement

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following safety guidelines.



CAUTION:

<2-16> When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

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

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

Note: For translated versions of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which is on the publications CD that was shipped with your appliance.

Note: In the U.S., call 1 800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a correct manner. To order replacement batteries, call 1 800-772-2227 within the United States.

Before you begin:

- Read “Before you begin” on page 73.
- Follow any special handling and installation instructions supplied with the replacement battery.

To replace the battery in the IBM ServeRAID-5i Ultra320 SCSI Controller:

1. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices, and disconnect all external cables and power cords.
2. Remove the cover (see “Removing the cover” on page 93).
3. Lift the adapter-retention clip on top of the adapter-support bracket (see “Adapter-support bracket” on page 101).
4. Remove the IBM ServeRAID-5i Ultra320 SCSI Controller from slot 4 (see “Adapters” on page 105).

Attention: Note the location of the controller. You must replace it in the same slot from which it was removed.

Note: You do not need to unplug the internal adapter cables.

5. Locate the battery on the IBM ServeRAID-5i Ultra320 SCSI Controller.
6. Replace the battery:
 - a. Place the controller battery-side down on a nonconductive, static-protected surface.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.
 - b. Using a small, flat-blade screwdriver, remove the screw securing the battery pack.
 - c. Gently press up on the tab and remove the battery from the controller.

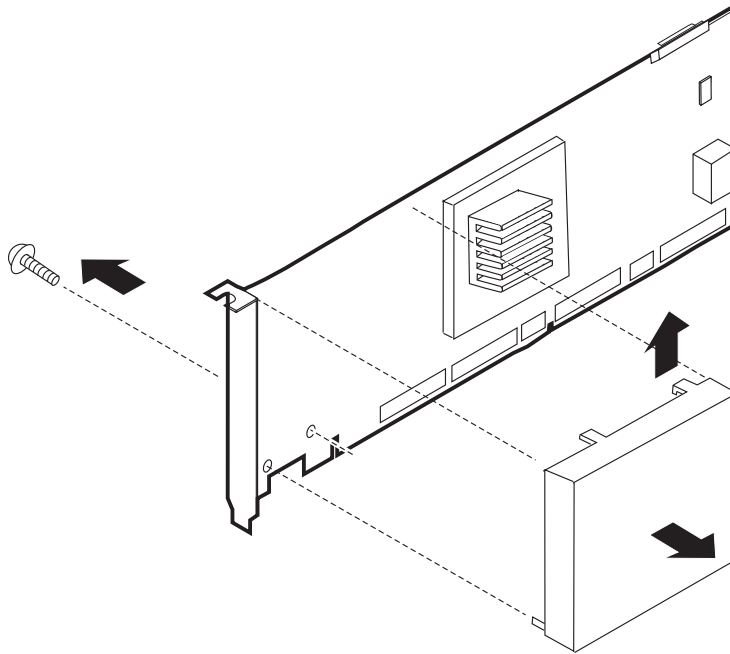


Figure 52. Replacing the battery of the IBM ServeRAID-5i Ultra320 SCSI Controller

- d. Disconnect the battery from the controller by removing the white connector from the tan connector located on the controller.
- e. Reverse steps 6a through 6d to replace the battery.
7. Reinstall the adapter in slot 4 (see “Adapters” on page 105).
8. Close the adapter-retention clip.
9. Reinstall the engine cover, and connect the power cords and external cables.

Note: Wait approximately 20 seconds after you plug the power cords of your appliance into electrical outlets for the power button to become active.
10. Power on the appliance.

Attention: When asked whether you want to use the RAID configuration from the RAID card or from the drives, select to use the configuration on the drives.

IBM ServeRAID-4Mx Ultra160 SCSI Controller battery replacement

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must

adhere to the following safety guidelines.



CAUTION:

<2-16> When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

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

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

Note: For translated versions of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which is on the publications CD that was shipped with your appliance.

Note: In the U.S., call 1 800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a correct manner. To order replacement batteries, call 1 800-772-2227 within the United States.

Before you begin:

- Read “Before you begin” on page 73.
- Follow any special handling and installation instructions supplied with the replacement battery.

To replace the battery in the IBM ServeRAID-4Mx Ultra160 SCSI Controller:

1. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices, and disconnect all external cables and power cords.
2. Remove the cover (see “Removing the cover” on page 93).
3. Lift the adapter-retention clip on top of the adapter-support bracket (see “Adapter-support bracket” on page 101).
4. Disconnect any SCSI cables connected to the internal or external channels of the IBM ServeRAID-4Mx Ultra160 SCSI Controller, noting where each cable is connected.
5. Remove the IBM ServeRAID-4Mx Ultra160 SCSI Controller from the PCI slot (see “Adapters” on page 105).

Attention: Note the location of the controller. You must replace it in the same slot from which it was removed.

6. Locate the battery on the IBM ServeRAID-4Mx Ultra160 SCSI Controller.

IBM ServeRAID-4H Ultra160 SCSI Controller battery replacement

IBM has designed this product with your safety in mind. The lithium battery must be handled correctly to avoid possible danger. If you replace the battery, you must adhere to the following safety guidelines.



CAUTION:

<2-16> When replacing the lithium battery, use only IBM Part Number 33F8354 or an equivalent type battery recommended by the manufacturer. If your system has a module containing a lithium battery, replace it only with the same module type made by the same manufacturer. The battery contains lithium and can explode if not properly used, handled, or disposed of.

Do not:

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

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

Note: For translated versions of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which is on the publications CD that was shipped with your appliance.

Note: In the U.S., call 1 800-IBM-4333 for information about battery disposal.

If you replace the original lithium battery with a heavy-metal battery or a battery with heavy-metal components, be aware of the following environmental consideration. Batteries and accumulators that contain heavy metals must not be disposed of with normal domestic waste. They will be taken back free of charge by the manufacturer, distributor, or representative, to be recycled or disposed of in a correct manner. To order replacement batteries, call 1 800-772-2227 within the United States.

Before you begin:

- Read “Before you begin” on page 73.
- Follow any special handling and installation instructions supplied with the replacement battery.

To replace the battery in the IBM ServeRAID-4H Ultra160 SCSI Controller:

1. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices, and disconnect all external cables and power cords.
2. Remove the cover (see “Removing the cover” on page 93).
3. Lift the adapter-retention clip on top of the adapter-support bracket (see “Adapter-support bracket” on page 101).
4. Disconnect any SCSI cables connected to the internal or external channels of the IBM ServeRAID-4H Ultra160 SCSI Controller, noting where each cable is connected.
5. Remove the IBM ServeRAID-4H Ultra160 SCSI Controller from PCI slot 4 (see “Adapters” on page 105).
6. Locate the battery on the IBM ServeRAID-4H Ultra160 SCSI Controller.

7. Replace the battery:
 - a. Place the controller battery-side up on a nonconductive, static-protected surface.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.
 - b. Using a small, Phillips-head screwdriver, remove the eight screws securing the daughter card with the battery to the main card.

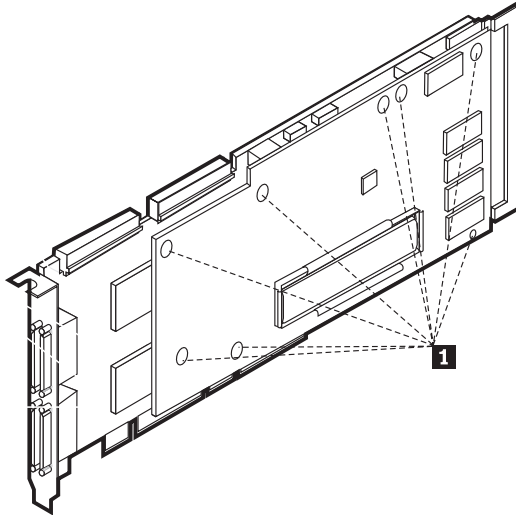


Figure 54. Replacing the battery of the IBM ServeRAID-4H Ultra160 SCSI Controller

- 1** Screws securing the daughter card
- c. Gently lift the daughter card from the main controller.
- d. Remove the battery from the daughter card by pressing the plastic tabs.
- e. Disconnect the battery from the controller by removing the white connector from the tan connector labeled “BATTERY” on the main card.
- f. Reverse steps 7a through 7e to replace the battery.
8. Reinstall the adapter in the slot 4 (see “Adapters” on page 105).
9. Close the adapter-retention clip.
10. Reconnect any internal and external SCSI cables that you removed in step 4 on page 121.
11. Reinstall the engine cover, and connect the power cords and external cables.

Note: Wait approximately 20 seconds after you plug the power cords of your appliance into electrical outlets for the power button to become active.

12. Power on the appliance.

Attention: When asked whether you want to use the RAID configuration from the RAID card or from the drives, select to use the configuration on the drives.

CD-ROM drive

Note: The appliance’s electromagnetic interference (EMI) integrity and cooling are both protected by having the non-hot-swap drive bays covered or occupied.

When you install a drive, save the filler panel from the bay in case you later remove the drive and do not replace it with another.

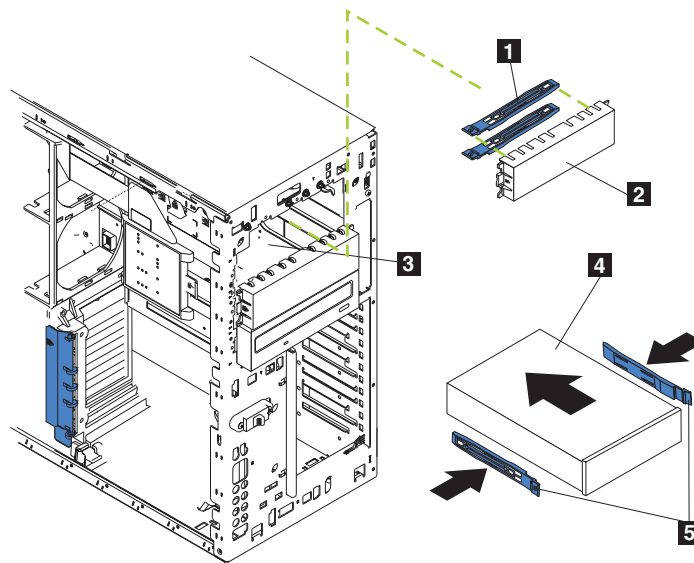


Figure 55. Replacing a CD-ROM drive (Model 25T)

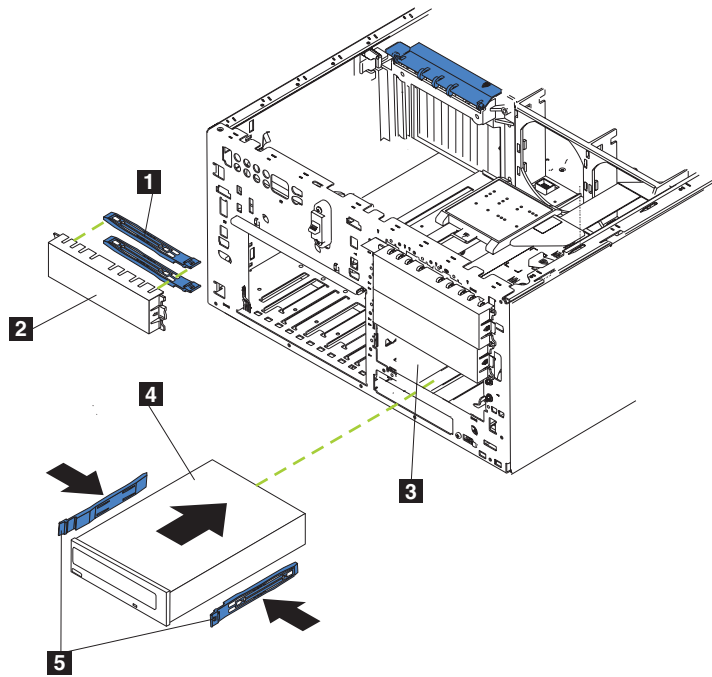


Figure 56. Replacing a CD-ROM drive (Model 25T with the rack-mount conversion feature)

- 1** Blue slide rails
- 2** Filler panel
- 3** Non-hot-swap bay
- 4** Non-hot-swap drive
- 5** Slide rails

To replace a CD-ROM drive:

1. Review the safety precautions in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices and then remove the cover, door, and bezel (see “Removing the cover” on page 93 and “Removing the bezel” on page 96 for details).
3. Unplug the power and data cables attached to the rear of the drive (the power cable is labeled P6).
4. Remove the CD-ROM drive by pressing on the blue tabs on side of the drive and pulling the drive out of the bay.
5. Observe the following safety precaution:



CAUTION:

<2-8> When laser products (such as CD-ROMs, fiber optic devices, or transmitters) are installed, note the following:

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



DANGER

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

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

Note: For translations of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.

6. Set the jumpers to the slave setting according to the documentation that comes with the drive.
7. Align the rails on the drive with the guide rails in the drive bay.
8. Push the drive into the bay until it clicks into place.

9. Connect a power and data cables to the back of the drive. Both cables are included with the engine. The data cable is labeled *CD*, while the power cable is labeled *P6*. The connectors are keyed and can be inserted only one way.
10. If you have other options to install or remove, do so now; otherwise, replace the cover, door, and bezel (see “Removing the cover” on page 93 and “Removing the bezel” on page 96 for details).
11. If you are replacing an IDE drive, load the system image on the hard disk drive (see Appendix B, “Using the Recovery and Supplementary CDs” on page 227).

DASD backplane assembly

To remove the DASD backplane assembly:

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices and disconnect all external cables and power cord.
3. Remove the cover and bezel (see “Removing the cover” on page 93 and “Removing the bezel” on page 96).
4. Pull out the hot-swap hard disk drives just far enough to disengage the DASD backplane assembly. Do **not** pull the drives all the way out.
5. Remove the two front fans (see “Hot-swap fan” on page 132).
6. Disconnect and remove the adapters and spacers (see “Adapters” on page 105).
7. Remove the two center fans (see “Hot-swap fan” on page 132).
8. Remove the plastic baffle (see Figure 81 on page 151 and Figure 82 on page 151).
9. Disconnect the DASD cables from the DASD backplane.

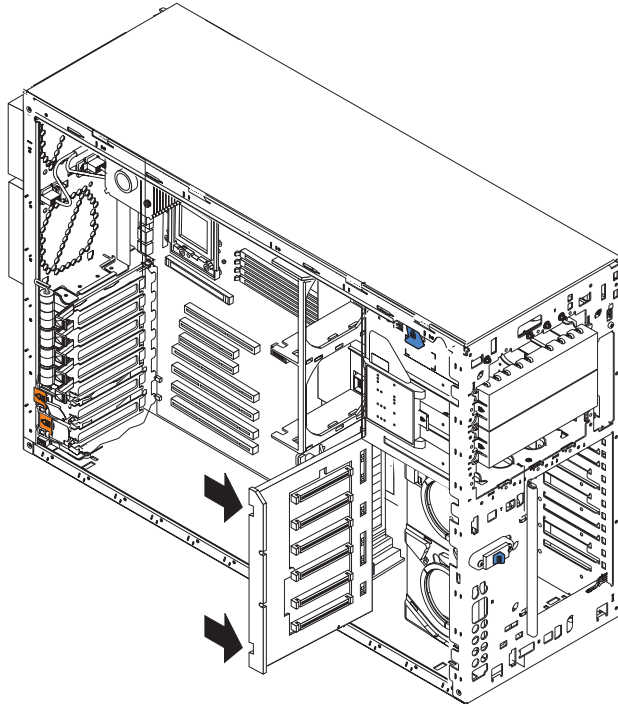


Figure 57. Removing the DASD backplane (Model 25T)

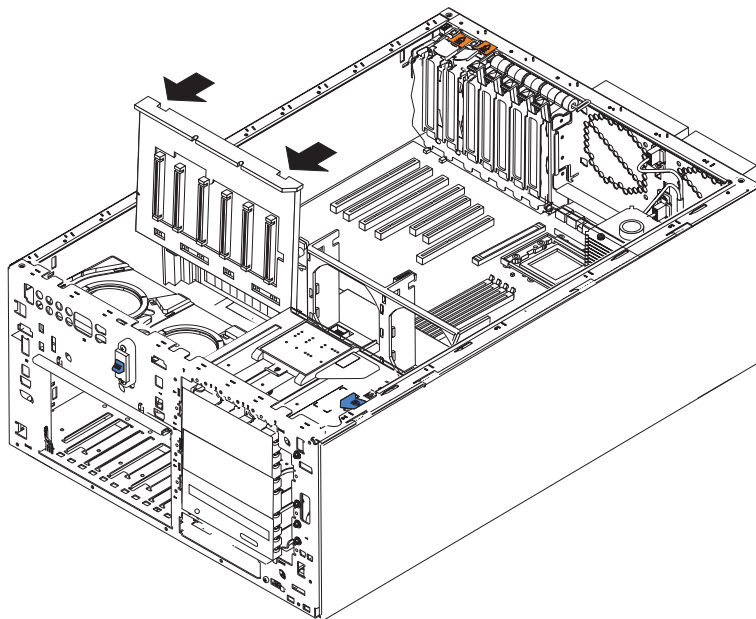


Figure 58. Removing the DASD backplane (Model 25T with the rack-mount conversion feature)

10. Press the release latches in the direction of the system board and pull the backplane out of the engine.
11. To replace the DASD backplane, reverse the previous steps, making sure to place the backplane assembly over the two guide pins on the chassis floor.

12. Replace the cover and bezel (see “Removing the cover” on page 93 and “Removing the bezel” on page 96).

Diagnostics panel card

To remove the diagnostics panel card:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the cover (see “Removing the cover” on page 93).
5. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
6. Remove the two central fans (see “Hot-swap fan” on page 132).
7. Remove the plastic baffle (see Figure 81 on page 151 and Figure 82 on page 151).
8. Remove the adapter-support bracket (see “Adapter-support bracket” on page 101).
9. Disconnect the diagnostics panel card cable from the system board (J23) by pinching the tabs on the ends of the cable together and removing the cable.
10. Slide the CD-ROM drive out enough to allow access to the cable (see “CD-ROM drive” on page 122).
11. If it is installed, slide the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit out enough to allow access to the cable (see “Removing the 3-Pack Expansion” on page 147).
12. Grasp the tab on the diagnostics panel card and gently pull up and to the right until the card assembly releases.

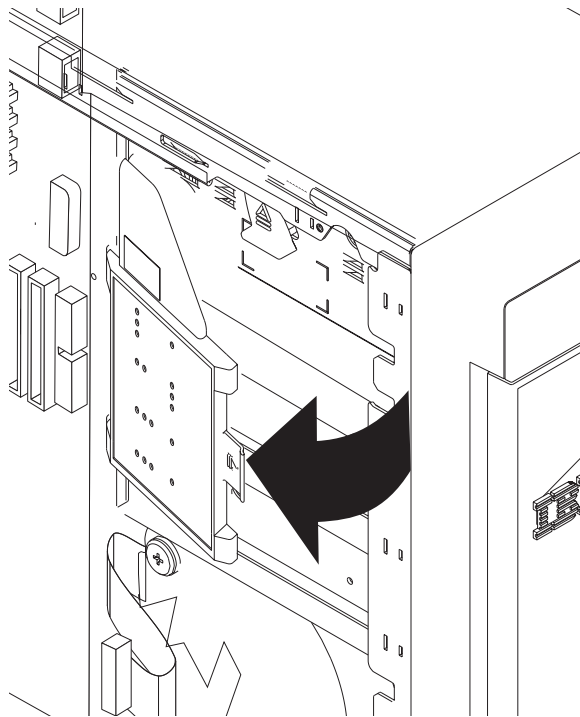


Figure 59. Removing the diagnostics panel card (Model 25T)

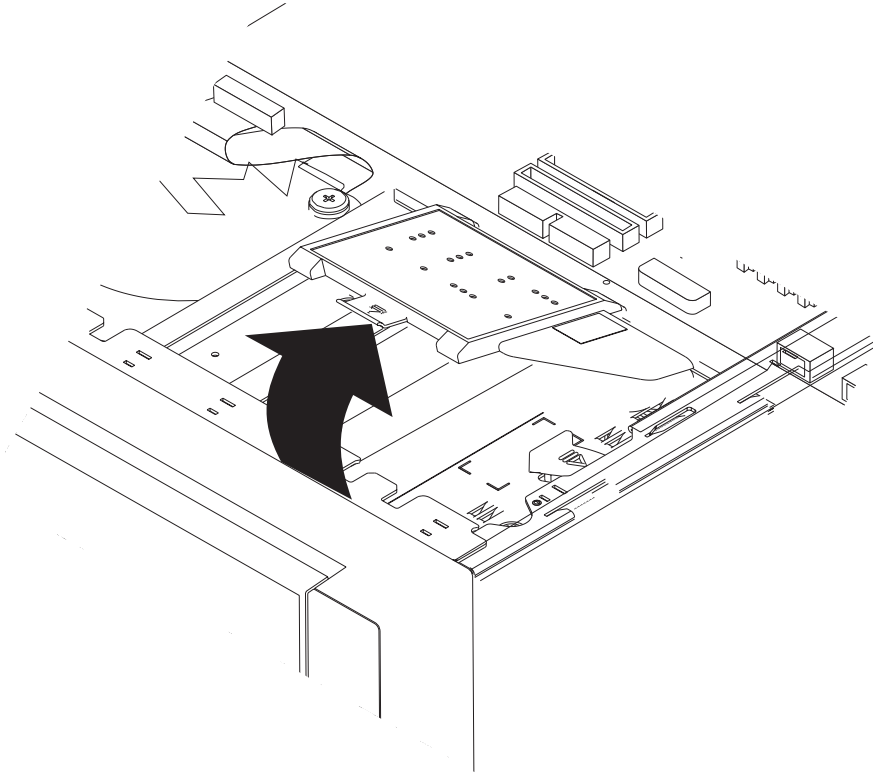


Figure 60. Removing the diagnostics panel card (Model 25T with the rack-mount conversion feature)

13. To replace the diagnostics panel card, line up the two notches on the left and snap the assembly into place; then, connect the cable to the system board.
14. Reverse the steps to reconnect the items that were disconnected.
15. Replace the cover (see “Installing the cover” on page 198).

Diskette drive

Complete the following steps to remove the diskette drive.

1. Review the information in “Before you begin” on page 73.
2. Turn off the engine and all attached devices.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the cover (see “Removing the cover” on page 93).
5. Remove the front bezel (see “Removing the bezel” on page 96).
6. Press in on the two blue diskette drive release tabs until the drive is released from the chassis.

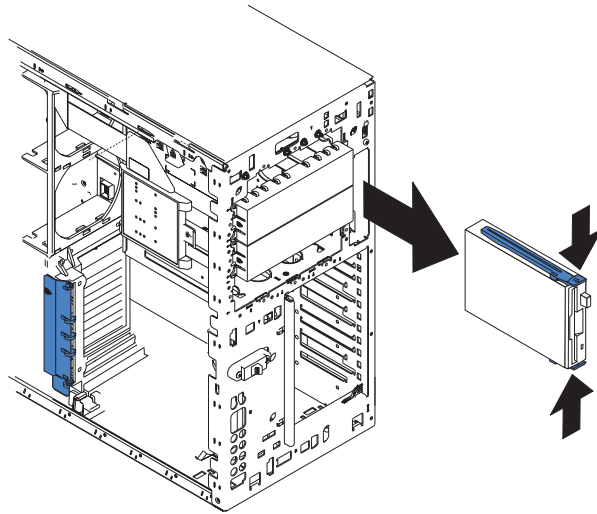


Figure 61. Removing the diskette drive (Model 25T)

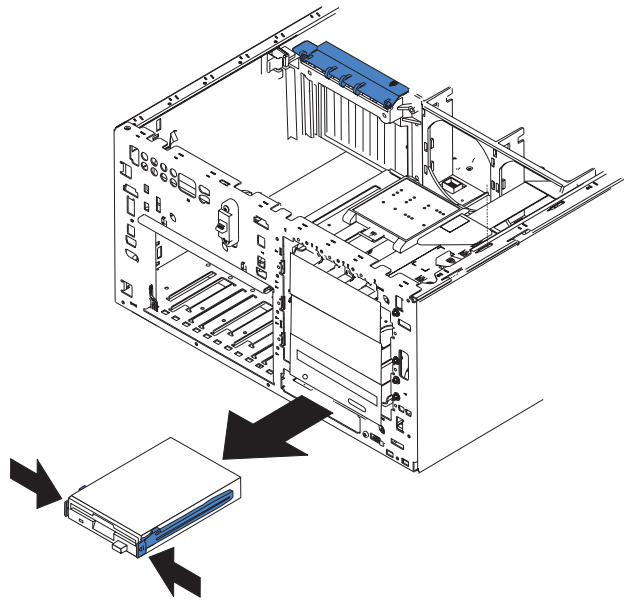


Figure 62. Removing the diskette drive (Model 25T with the rack-mount conversion feature)

7. Carefully pull the drive away from the chassis until the cables at the rear of the drive are accessible.
8. Remove the two cables from the back of the drive and pull the drive out.
9. To replace the diskette drive, reverse the previous steps.

Note: If you are replacing the drive, prepare the new drive by completing the following procedure:

- a. Remove the side rails from the drive by gently pulling them away from the drive until they detach.
- b. Insert one pin of the rail into the notch near the rear of the drive.
- c. Pushing the rail gently toward the rear of the drive, insert the other pin into the notch near the front of the drive.

- d. Press in on the metal strip in the rail to secure the rail to the drive.

Front-fan housing

To remove the front-fan housing:

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripherals, and disconnect the power cords and external cables.
3. Remove the cover (see “Removing the cover” on page 93).
4. Remove the bezel (see “Removing the bezel” on page 96).
5. Remove the two front fans (see “Hot-swap fan” on page 132).
6. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
7. Remove the two center fans (see “Hot-swap fan” on page 132).
8. Remove the plastic baffle (see Figure 81 on page 151 or Figure 82 on page 151).
9. Remove the adapter-support bracket (see Figure 40 on page 103 or Figure 41 on page 104).
10. Remove the DASD backplane (see “DASD backplane assembly” on page 125).
11. Disconnect the fan cable from the system board:
 - a. Press the small tab on the flat part of the cable connector facing the inside of the chassis.
 - b. While pressing the tab, disconnect the cable.
12. Press in the tabs (**1**) with the tip of a flat-blade screwdriver until the housing releases and tilts up (**2**); then, pull the housing out of the two notches on the front of the chassis and lift (**3**) the housing out of the engine.

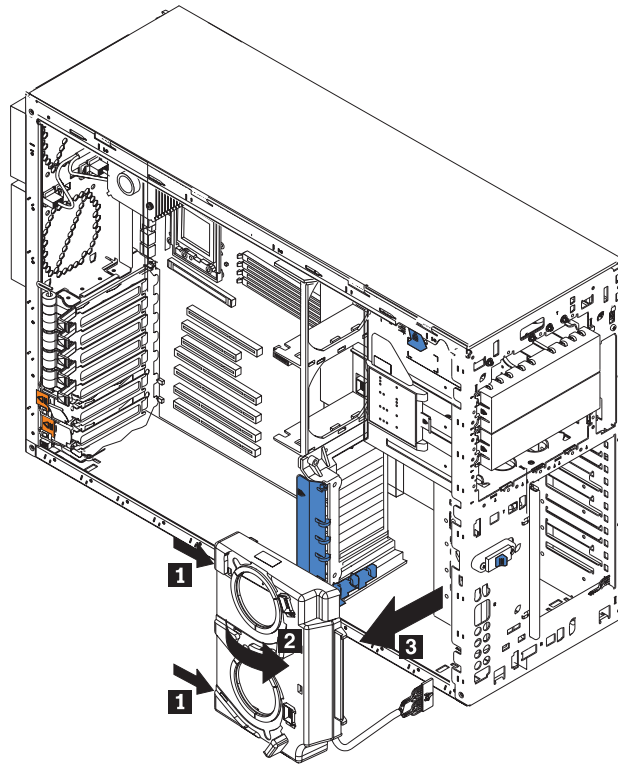


Figure 63. Removing the front fan housing (Model 25T)

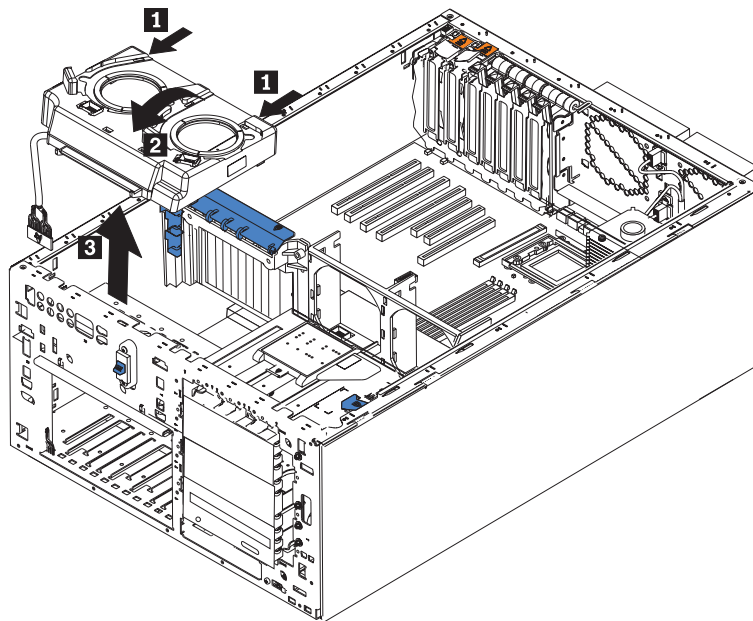


Figure 64. Removing the front fan housing (Model 25T with the rack-mount conversion feature)

13. To replace the blower housing, reverse the previous steps, making sure that the two tabs are inserted into the notches on the front of the chassis.

Hot-swap fan

Each engine comes with six hot-swap fans (two front fans in connector J50, two center fans in connector J18, and two rear fans in connector J25). The two largest fans (in connector J50) are also known as blowers. You do not need shut down the engine to replace a hot-swap fan. Figure 65 and Figure 66 show the numbering scheme for identifying the fans.

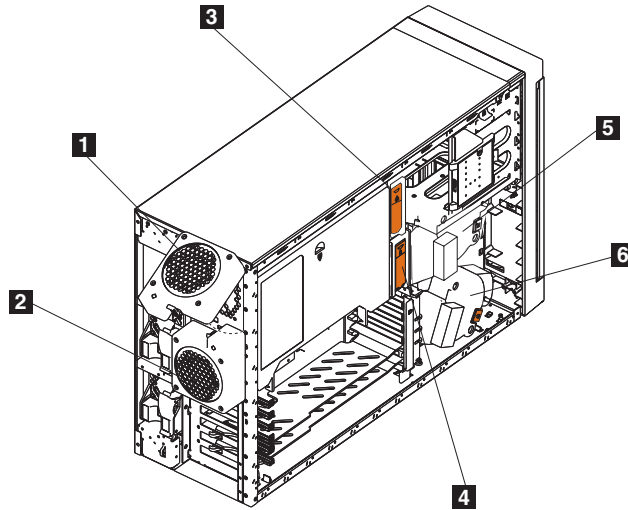


Figure 65. Fan identification (Model 25T)

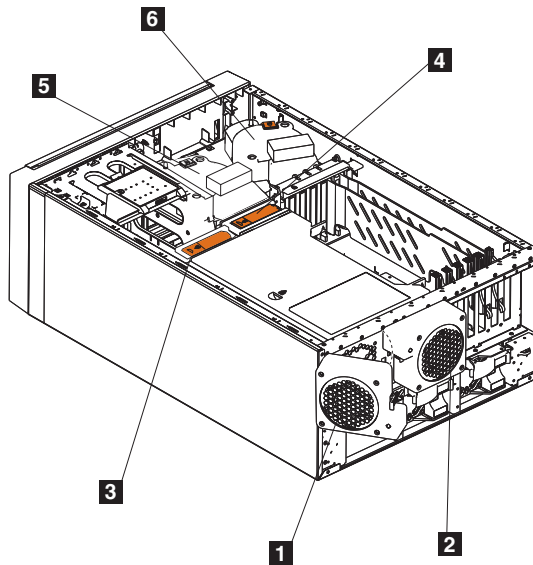


Figure 66. Fan identification (Model 25T with the rack-mount conversion feature)

1	Fan 1
2	Fan 2
3	Fan 3
4	Fan 4
5	Fan 5
6	Fan 6

Attention: To help ensure correct cooling, if a fan fails, replace it within 48 hours.

Figure 67 and Figure 68 show how to replace hot-swap fans.

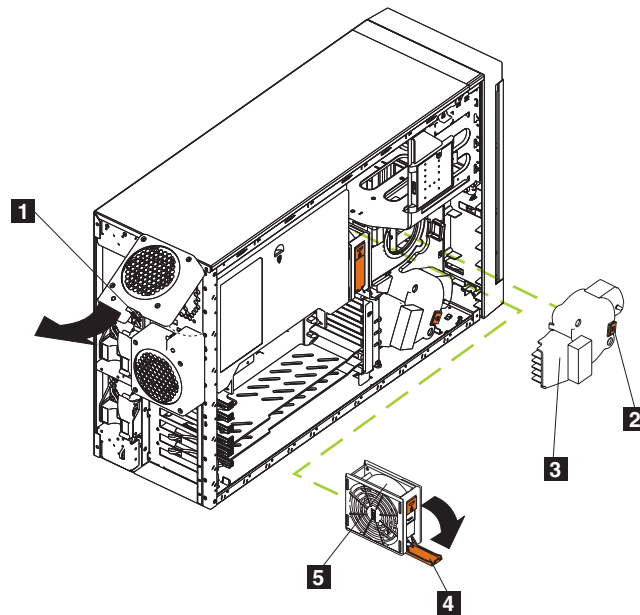


Figure 67. Replacing a hot-swap fan (Model 25T)

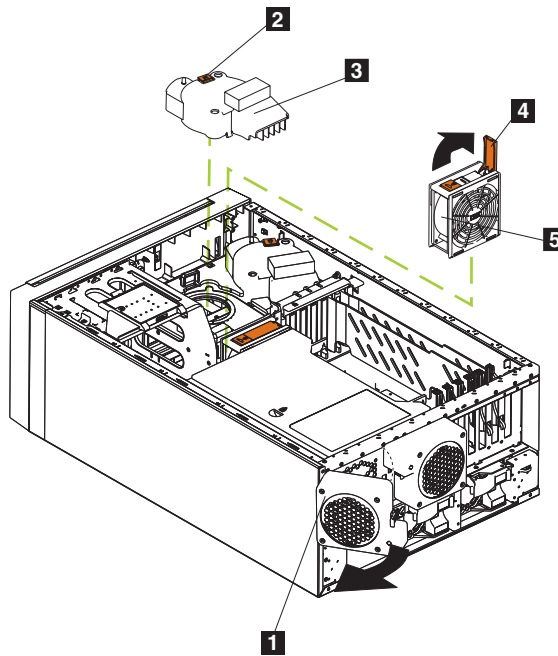


Figure 68. Replacing a hot-swap fan (Model 25T with the rack-mount conversion feature)

- 1** Fan release latch for rear fans (1 and 2)
- 2** Fan assembly latch for front fans (5 and 6)
- 3** Hot-swap fan assembly
- 4** Release lever for the center fans (3 and 4)
- 5** Hot-swap fan

Determine which fan to replace by checking the LEDs on the fans. The front fans, center fans, and rear fans are installed differently from each other. This section contains separate instructions for each group of fans.

Replacing a front fan

Complete the following steps to replace front fan 5 or 6 in connector J50:

1. Review the information in “Before you begin” on page 73.
2. Remove the cover (see “Removing the cover” on page 93).
Attention: To ensure correct system cooling, do not remove the cover for more than 30 minutes during this procedure.
3. Press the orange fan-release latch in the direction indicated by the arrow.
4. Pull the fan out of the engine.
5. Align the two tabs on the replacement fan with the notches in the fan housing and press the fan into the corresponding connector. Press the front edge of the fan to engage the latch fully and secure the fan.
6. Verify that the FAN LED on the diagnostic LED panel is not on. If the FAN LED is on, reseal the fan.
7. Reinstall the cover (see “Installing the cover” on page 198).

Replacing a center fan

Complete the following steps to replace center fan 3 or 4 in connector J18:

1. Review the information in “Before you begin” on page 73.
2. Remove the cover (see “Removing the cover” on page 93).
Attention: To ensure correct system cooling, do not remove the engine cover for more than 30 minutes during this procedure.
3. Press the orange fan-release latch in the direction indicated by the arrow; the latch arm springs up.
4. Pull the fan out of the engine.
5. Press the orange fan-release latch in the direction indicated by the arrow and open the latch; then, slide the replacement fan into the engine. Press the latch arm to snap it into place and secure the fan.

Note: When you slide the fan into the engine, make sure that the orange fan-release latch is at the top.
6. Verify that the FAN LED on the diagnostics LED panel is not on. If the FAN LED is on, reseal the fan.
7. Reinstall the cover (see “Installing the cover” on page 198).

Replacing a rear fan

Complete the following step to replace rear fan 1 or 2 in connector J25:

1. Review the information in “Before you begin” on page 73.
2. Press and pull out on the orange fan-release latch on the rear fan bracket; then, lift the fan away and out of the hinge cutouts.
3. Touch an unpainted metal part of the engine for at least 2 seconds; then, slide the replacement fan into the engine. (Make sure that the fan fits correctly into the hinge cutouts on the rear of the engine.)
4. When you have the fan correctly seated, push on the fan-release latch until it clicks into place.
5. Verify that the FAN LED on the diagnostics LED panel is not on. If the FAN LED is on, reseal the fan.

Hot-swap hard disk drives

Your appliance contains hardware that lets you continue to operate your system while a hard disk drive is removed or installed. These hard disk drives are known as *hot-swappable* or *hot-swap* hard disk drives.

Each hot-swap hard drive that you plan to install must have a hot-swap hard drive tray attached. The hard drive must have a single connector attachment (SCA) connector. Hot-swap hard drive trays come with the hot-swap drives.

- Your appliance supports up to six slim 25-mm (1-in.) hot-swap hard drives in the hot-swap bays.
- The hot-swap hard drive bays connect to a SCSI *backplane*. This backplane is the printed circuit board behind the bay.
- The backplane controls the SCSI IDs for the hot-swap hard drives.

Installing a hard disk drive

Attention:

- To maintain correct system cooling, do not operate the appliance for more than 2 minutes without either a hard disk drive or a filler panel installed in each drive bay. Therefore, if you are replacing a defective hot-swap drive, either leave the defective drive in place or put in a filler panel until you have a replacement drive.
- When you handle electrostatic discharge-sensitive devices (ESDs), take precautions to avoid damage from static electricity. For details about handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

To install a hot-swap hard disk drive in a drive bay:

1. Remove the filler panel from one of the empty hot-swap drive bays by inserting your finger in the depression on the filler panel and pulling it away from the appliance. Save the filler panel in case you need it in the future.
2. Install the hot-swap hard disk drive in the drive bay:
 - a. Ensure that the tray handle is open (that is, perpendicular to the hard disk drive).
 - b. Align the rails on the hard disk drive assembly with the guide rails in the drive bay.
 - c. Gently push the hard disk drive assembly into the drive bay until it connects to the backplane.
 - d. Push the tray handle toward the closed position until it locks the hard disk drive in place.

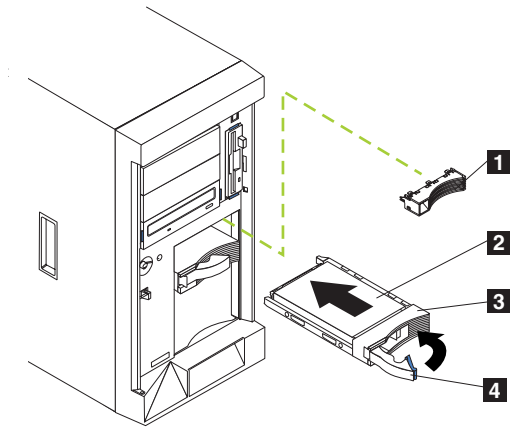


Figure 69. Installing a hard disk drive (Model 25T)

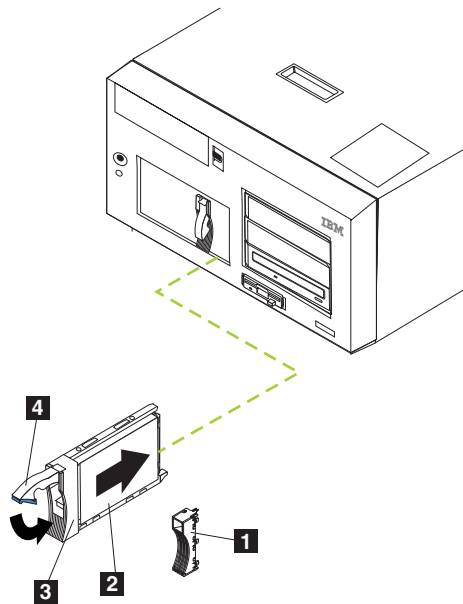


Figure 70. Installing a hard disk drive (Model 25T with the rack-mount conversion feature)

- 1** Filler panel
- 2** Hard disk drive
- 3** Drive tray
- 4** Drive-tray handle (in open position)

3. Locate the filler piece on the inside of the filler panel.
4. Pull up on the small latch inside the filler panel to release the filler piece.
5. Tilt the filler piece up from the filler panel; then remove it from the tray.
6. Insert the filler piece into the empty space that is left in the drive bay.

7. Check the hard-disk-drive status indicators to verify that the hard disk drives are operating correctly. The Hard-disk-drive status LED is immediately to the right of the hard disk drive.
 - When the green LED flashes rapidly (three flashes per second), the controller is identifying the hard disk drive.
 - When the green LED flashes slowly (one flash per second), the hard disk drive is being rebuilt.
 - When the amber LED is on, the hard disk drive has failed.
8. Refer to the *IBM TotalStorage NAS 200 User's Reference* for information about using the ServeRAID utility to configure the hot-swap drive.

Replacing a hot-swap hard disk drive

You do not have to shut down (see “Powering on and shutting down the appliance” on page 11) the appliance to remove or install the hot-swap hard disk drives.

Attention:

- If you partially or completely remove a good drive instead of a defective one, you can lose valuable data. Before you remove a hot-swap hard drive, check the Hard-disk-drive status LED on the front of the drive. If the LED is amber, the drive is defective.

This situation is especially relevant because this appliance has a RAID adapter installed. The RAID adapter can rebuild the data that you need, provided that certain conditions are met.
- Before you remove a hot-swap hard drive that is not defective, back up all important data.
- While different drive sizes are supported in the Model 25T, Model EXP, and the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, it is recommended that all drives are the same size if they are in the same set of drive bays. The drive storage capacity of the smallest drive in a defined RAID array is used as the storage capacity for all other drives in the array.

See “Installing a hard disk drive” on page 135 while you perform the steps in this procedure.

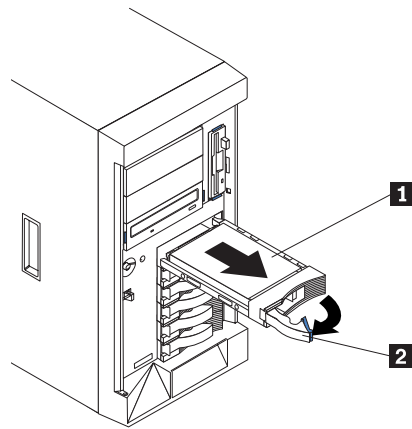


Figure 71. Removing a hard-disk drive in a hot-swap drive bay in the Model 25T

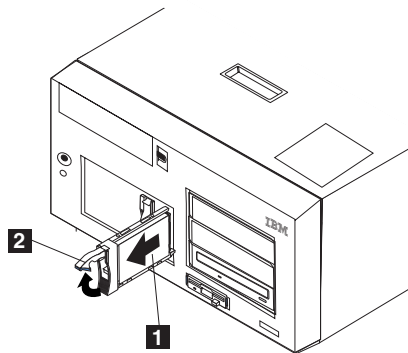


Figure 72. Removing a hard-disk drive in a hot-swap drive bay in the Model 25T with the rack-mount conversion feature

- 1** Hard disk drive
- 2** Drive tray handle (in open position)

To replace a drive in a hot-swap drive bay:

1. Before you begin, read the documentation that comes with your hard drive.
2. If your appliance is a Model 25T, open the appliance door (see “Removing the cover” on page 93, “Removing the bezel” on page 96, and “Removing the door” on page 95).

Attention: To maintain correct system cooling, do not operate the appliance for more than two minutes without either a hard drive or a filler panel installed for each drive bay.

3. Locate the defective drive by checking for an amber hard-drive-status LED on the front of the drive.
4. Remove the defective hot-swap hard disk drive:
 - a. Pull the drive tray handle to the open position (perpendicular to the hard drive) to disengage the hard disk drive connector from the backplane at the back of the drive bay.
 - b. Wait approximately 30 seconds to allow the hard disk drive to spin down.
 - c. Pull the hot-swap hard disk drive assembly from the hot-swap drive bay.

5. Install the replacement hot-swap hard disk drive in the hot-swap drive bay (see Figure 73 and Figure 74):

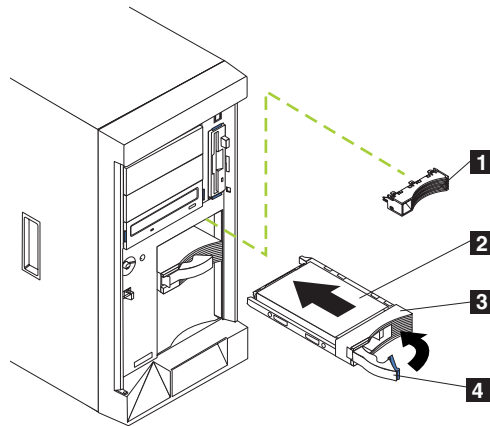


Figure 73. Replacing a hard disk drive in a hot-swap drive bay (Model 25T)

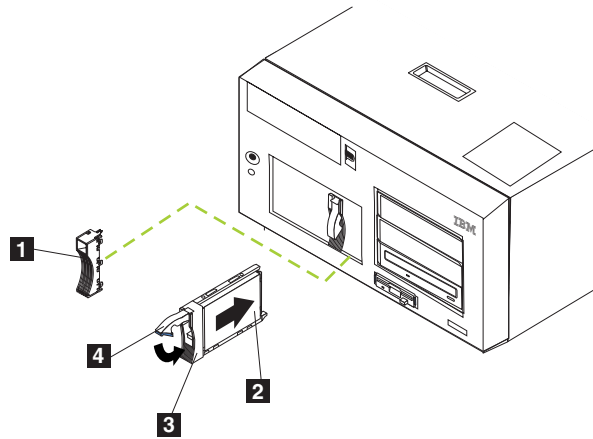


Figure 74. Replacing a hard disk drive in a hot-swap drive bay (Model 25T with the rack-mount conversion feature)

- 1 Slim filler panel
- 2 Hard disk drive
- 3 Drive tray
- 4 Drive tray handle (in open position)

- a. Ensure that the tray handle is open (that is, perpendicular to the hard disk drive).
- b. Align the rails on the hard disk drive assembly with the guide rails in the drive bay.
- c. Gently push the hard disk drive assembly into the drive bay until the hard disk drive connects to the backplane.
- d. Push the tray handle toward the closed position until it locks the hard disk drive in place.

6. Check the Hard-disk-drive status LED to verify that the hard disk drive is installed correctly. The Hard-disk-drive status LED is located to the immediate right of the hard disk drive.
 - When the amber LED is on, the drive has failed.
 - When the amber LED flashes slowly (one flash per second), the hard disk drive is being rebuilt.
 - When the amber LED flashes rapidly (three flashes per second), the controller is identifying the hard disk drive.
7. If your appliance is a Model 25T, close the appliance door.

IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit

This section provides instructions for installing and removing the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit (*3-Pack Expansion*) option in the Model 25T. The 3-Pack Expansion replaces two non-hot-swap drive bays with three SCSI hot-swap hard disk drive bays in the Model 25T or Model 25T with the rack-mount conversion feature. The 3-Pack Expansion supports Ultra160 hard disk drives.

Installing the 3-Pack Expansion

The kit includes the following parts. You will not need all the parts for this installation:

- One LVD, SCSI backplane
- One long, LVD, SCSI cable
- One short, LVD, SCSI cable
- One SCSI device cage
- Three, drive filler panels
- Miscellaneous mounting-hardware kit
- *IBM Safety Information* booklet

To install the 3-Pack Expansion:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine and disconnect the power cords and external cables.
3. Remove the cover of the Model 25T or Model 25T with the rack-mount conversion feature (refer to “Removing the cover” on page 93).
4. Remove the door and bezel of the Model 25T or Model 25T with the rack-mount conversion feature (refer to “Removing the door” on page 95 and “Removing the bezel” on page 96).
5. If necessary, remove the air-baffle assembly, adapter-support bracket, adapters, and plastic dividers. See “Adapter-support bracket” on page 101 and “Adapters” on page 105 for additional information.

Attention: The server electromagnetic interference (EMI) integrity and cooling are both protected by having the front bays covered or occupied. When you install the 3-Pack Expansion, save the filler panels from the bay, in case you later remove the 3-Pack Expansion and do not replace it with another device.

6. Remove the two filler panels from the empty drive bays above the CD-ROM drive on the front of the Model 25T or Model 25T with the rack-mount conversion feature. Save the filler panels for future use.
7. Remove the custom metal slide rails and screws that are inside the 5.25-inch removable-media drive bays. Store the slide rails and screws for future use.

8. Align the 3-Pack Expansion with the empty removable media bay opening, adjacent to the standard hot-swap hard disk drive backplane.
9. Insert the cage into the Model 25T or Model 25T with the rack-mount conversion feature. To simplify cabling, do not secure the 3-Pack Expansion with the screws.

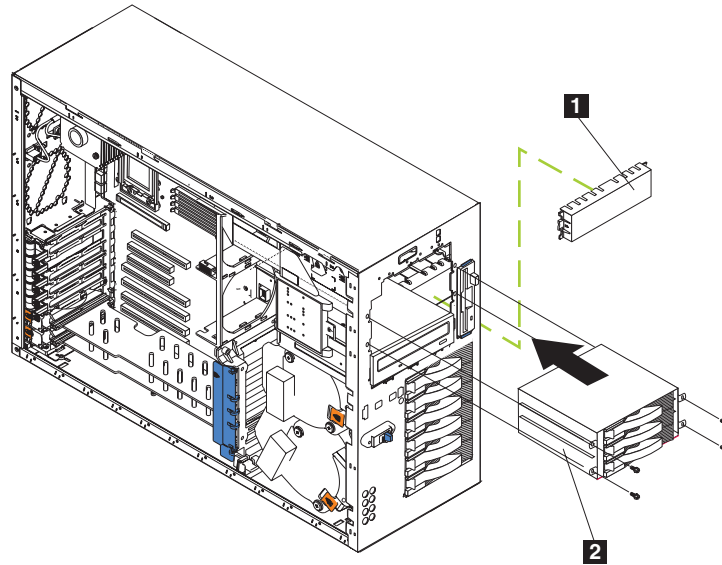


Figure 75. Inserting the cage (Model 25T)

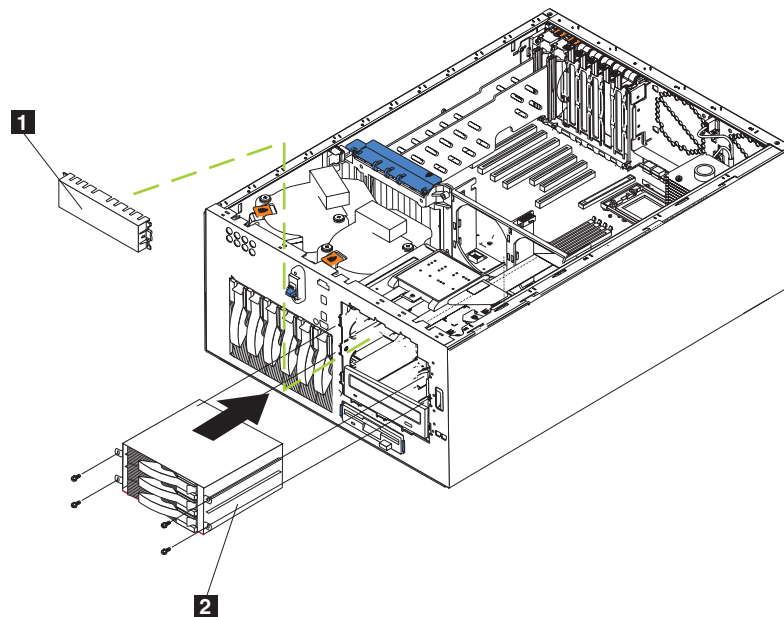


Figure 76. Inserting the cage (Model 25T with the rack-mount conversion feature)

- 1** Filler panel
- 2** 3-Pack Expansion

10. Cable the 3-Pack Expansion:

a. Connect the SCSI cable:

- If you are attaching the 3-Pack Expansion using a ServeRAID-5i controller:
 - 1) Locate the short SCSI cable that comes with this kit (part number 59P4200).
 - 2) Connect one end of the cable to the SCSI cable connector on the new 3-Pack Expansion SCSI backplane, which is shown in Figure 77. (This shows the rear connectors on the 3-Pack Expansion SCSI backplane, as viewed from the rear of the engine.)

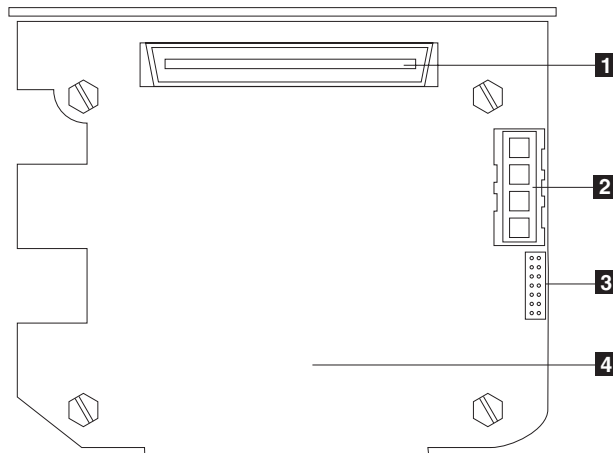


Figure 77. 3-Pack Expansion SCSI backplane

- | | |
|----------|----------------------------------|
| 1 | SCSI cable connector |
| 2 | SCSI power connector |
| 3 | I ² C cable connector |
| 4 | SCSI backplane |

Note: The SCSI cables that come with this kit can only be used with the integrated SCSI controller with RAID capabilities. If a RAID controller other than the ServeRAID-5i is installed, you must use SCSI cables that are compatible with that controller. To select and order the correct cables for use with your RAID controller, contact your IBM marketing representative or authorized reseller.

- 3) Connect the other end of the cable to SCSI connector J51 on the system board.
 - 4) If provided, secure the cable ends with the retention clips on the SCSI connectors.
- If you are attaching the 3-Pack Expansion using a ServeRAID-4Mx controller:
 - 1) Locate the long SCSI cable included with the engine or with the 3-Pack Expansion kit (part number 37L0349).
 - 2) Connect one end of the cable to the SCSI cable connector on the new 3-Pack Expansion SCSI backplane, which is shown in Figure 77. (This shows the rear connectors on the 3-Pack Expansion SCSI backplane, as viewed from the rear of the engine.)

- 3) Connect the other end of the cable to the SCSI connector on internal channel 2 on the primary ServeRAID-4Mx controller. (See Figure 48 on page 113 for an illustration showing how to route the cable).
 - 4) If provided, secure the cable ends with the retention clips on the SCSI connectors.
- If you are attaching the 3-Pack Expansion using a ServeRAID-4H controller:
 - 1) Locate the long SCSI cable included with the engine or with the 3-Pack Expansion kit (part number 37L0349).
 - 2) Connect one end of the cable to the SCSI cable connector on the new 3-Pack Expansion SCSI backplane, which is shown in Figure 77 on page 142. (This shows the rear connectors on the 3-Pack Expansion SCSI backplane, as viewed from the rear of the engine.)
 - 3) Connect the other end of the cable to the SCSI connector on internal channel 2 on top of the ServeRAID-4H controller. (See Figure 48 on page 113 for an illustration showing how to route the cable).
 - 4) If provided, secure the cable ends with the retention clips on the SCSI connectors.
 - b. Connect the I²C cable:
 - 1) Locate the I²C cable that comes with this kit.

Note: Both I²C cable connectors are the same, so this cable can be connected in either direction.
 - a) Connect one of the I²C cable connectors to the SCSI backplane (see Figure 78 on page 144 for the connector location on the SCSI backplane).

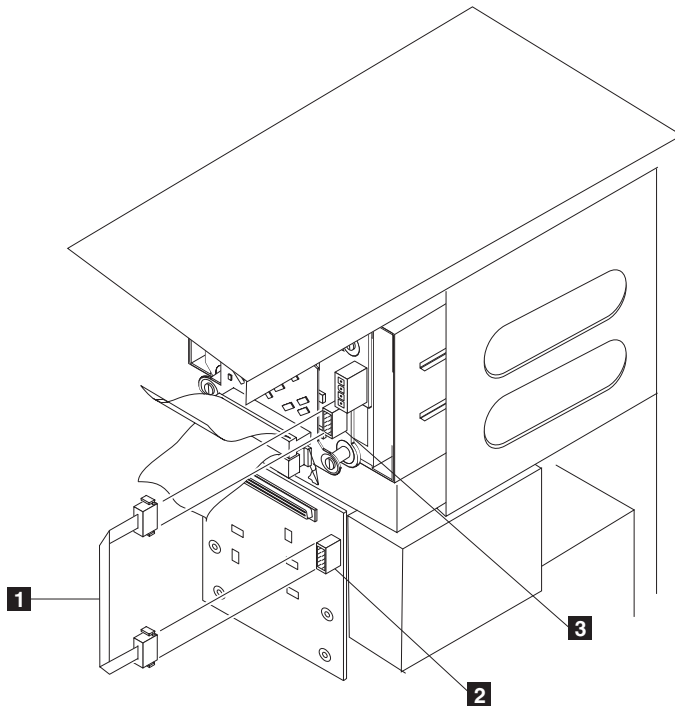


Figure 78. Attaching the gray I²C cable

- 1** Gray I²C cable
- 2** Connector location on the SCSI backplane
- 3** Connector location on the 3-Pack Expansion backplane

- b) Connect the other I²C cable connector to the new 3-Pack Expansion SCSI backplane (see Figure 78 for the connector location on the 3-Pack Expansion backplane).
- c. Connect the power-supply cable:
 - 1) Locate the white power-supply power cable labeled “HDD2” located in a group of cables attached to the Model 25T or Model 25T with the rack-mount conversion feature.
 - 2) Connect this cable to the SCSI power cable connector on the new 3-Pack Expansion backplane (see Figure 77 on page 142 for the location of the connector).

11. Slide the 3-Pack Expansion into the engine until it stops, and secure the option to the engine using the four screws provided (see Figure 79 or Figure 80).

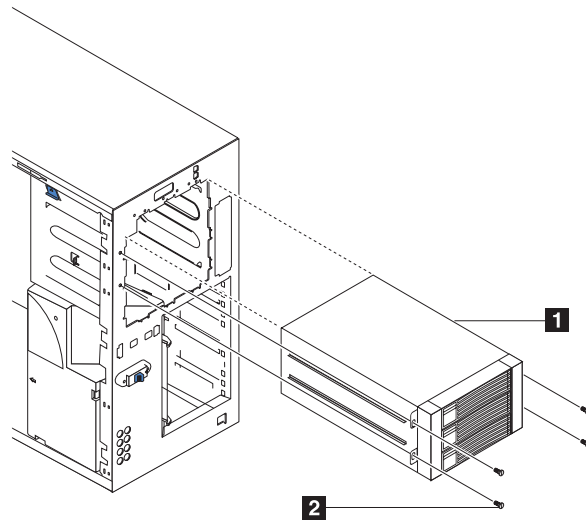


Figure 79. Attaching the 3-Pack Expansion (Model 25T)

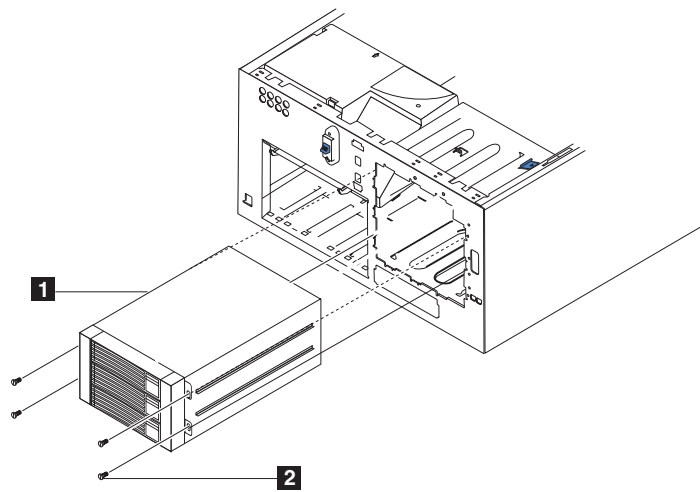


Figure 80. Attaching the 3-Pack Expansion (Model 25T with the rack-mount conversion feature)

- 1** 3-Pack Expansion
- 2** Screws

12. If you removed the air-baffle assembly, adapters, plastic dividers, and adapter-support bracket in step 5 on page 140, reinstall them (see “Adapter-support bracket” on page 101 and “Adapters” on page 105).

Note: You must reinstall the air-baffle assembly when you reinstall the adapter-support bracket. Make sure that no cable is under the adapter-support bracket or interferes with the center fans (connector J18).

13. Install the hot-swap hard disk drives in the 3-Pack Expansion (see “Installing a hard disk drive” on page 135).

Note: If three drives are installed, they will each provide the drive storage of the smallest drive. For example, if you install one 73.4-GB hard disk drive and two 36.4-GB hard disk drives, then each of the three drives provides 36.4-GB of memory.

- a. Remove the filler panel from the drive bay of the expansion unit.
 - b. Open the drive handle so that it is perpendicular to the front of the drive.
 - c. Slide the drive into the drive bay with the handle on the left side.
 - d. When the drive handle begins to close, lock the drive in place by pressing the handle until it clicks.
 - e. Repeat steps 1) - 4) for the other two drives.
14. If you have other options to install or remove, do so now; otherwise go to “Installing the cover” on page 198.

Removing the 3-Pack Expansion

To remove the 3-Pack Expansion:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine and disconnect the power cords and external cables.
3. Remove the cover of the Model 25T or Model 25T with the rack-mount conversion feature (refer to “Removing the cover” on page 93).
4. Remove the door and bezel of the Model 25T or Model 25T with the rack-mount conversion feature (refer to “Removing the door” on page 95 and “Removing the bezel” on page 96).
5. Remove the four screws securing the 3-Pack Expansion to the chassis (see Figure 79 on page 145 for the location of the screws).
6. Disconnect the SCSI cable from the backplane of the 3-Pack Expansion.
7. Disconnect the gray I²C cable from the backplane of the 3-Pack Expansion.
8. Disconnect the white power cable from the backplane of the 3-Pack Expansion.
9. Release the CD-ROM drive by pushing both tabs in on the sides.
10. Carefully remove the 3-Pack Expansion from the engine.

Note: When removing the 3-Pack Expansion, the CD-ROM will also begin to slide out with it. Ensure that the CD-ROM drive does not fall.

11. Approximately 3/4 of the distance out of the engine, the 3-Pack Expansion will release from the CD-ROM drive.
12. Remove the 3-Pack Expansion.
13. To replace the 3-Pack Expansion, reverse these steps or see “Installing the 3-Pack Expansion” on page 140.

Note: You must have either the 3-Pack Expansion or the filler panels in place to maintain correct system cooling.

Memory modules

Adding memory to your engine increases performance. You can increase the amount of memory in your engine by installing memory-module options. When you install memory, you must install a pair of matched dual inline memory modules (DIMMs).

Notes:

1. The system board contains 6 DIMM connectors and supports two-way memory interleaving.
2. The DIMM options available for your engine are 2 x 256 MB, and 2 x 1 GB. Your engine supports a minimum of 512 MB and a maximum of 4.5 GB (or 6 GB if you replace both standard 256-MB DIMMs with a pair of 1 GB DIMMs) of system memory.
3. The amount of usable memory will be reduced depending on the system configuration. A certain amount of memory must be reserved for system resources. The BIOS will display the total amount of installed memory and the amount of configured memory.
4. Your engine comes standard with two 256-MB DIMMs, (for a total of 512-MB of memory) installed in the DIMM 5 and DIMM 6 memory connectors (J14 and J15, respectively). When you install additional DIMMs, be sure to install them in pairs, with the next pair in DIMM connectors 3 and 4 (J11 and J12), and the final pair in DIMM connectors 1 and 2 (J7 and J9).
5. Each DIMM in a single pair must be the same size, speed, type, and technology. You can mix compatible DIMMs from various manufacturers.
6. Each DIMM pair does not have to contain DIMMs of the same size, speed, type, and technology as the other DIMM pairs.
7. Install only 133 MHz, 2.5 V, 184-pin, double-data-rate (DDR), PC2100, registered synchronous dynamic random-access memory (SDRAM) with error correcting code (ECC) DIMMs. These DIMMs must be compatible with the latest PC2100 SDRAM Registered DIMM specification.
8. Your engine supports Chipkill™ memory.
9. You do not need to save new configuration information when installing or removing DIMMs. The only exception is if you replace a faulty DIMM that was marked as **Disabled** in the **Memory Settings** menu. In this case, you need to re-enable that memory row in the Configuration/Setup Utility or reload the default memory settings.

Memory modules must be added, installed, or replaced two modules at a time.

Before installing the memory modules:

- Become familiar with the safety and handling guidelines specified under “Handling electrostatic discharge-sensitive devices” on page 252.
- The blue color on components and labels inside your NAS 200 identifies touch points where a component can be gripped, a latch moved, and so on. The only exception to this is the power supplies, which are orange.
- Before you begin installing components, read the safety information found in “Safety notices” on page 243.
- Install the DIMMs in the order shown in Table 33 on page 149.

Table 33. DIMM installation sequence

Pair	DIMM connectors	Diagnostic reference
First	6 and 5 (J15, J14)	Bank 3
Second	4 and 3 (J12, J11)	Bank 2
Third	2 and 1 (J9, J7)	Bank 1

To install a memory module:

1. Review the documentation that comes with your DIMM.

Attention: When you handle devices sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.



DANGER

<1–5> Electrical current from power, telephone and communication cables is hazardous.

To avoid a shock hazard:

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

To Connect	To Disconnect
<ul style="list-style-type: none">a. Turn everything OFF.b. First, attach all cables to devices.c. Attach signal cables to connectors.d. Attach power cords to outlet.e. Turn device ON.	<ul style="list-style-type: none">a. Turn everything OFF.b. First, remove power cords from outlet.c. Remove signal cables from connectors.d. Remove all cables from devices.



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.

Note: For translated versions of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which is on the publications CD that was shipped with your appliance.

2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices, and disconnect all external cables and power cords.
3. Remove the cover (see “Removing the cover” on page 93).

4. Open the cover on the air-baffle assembly as shown in Figure 81 and Figure 82.

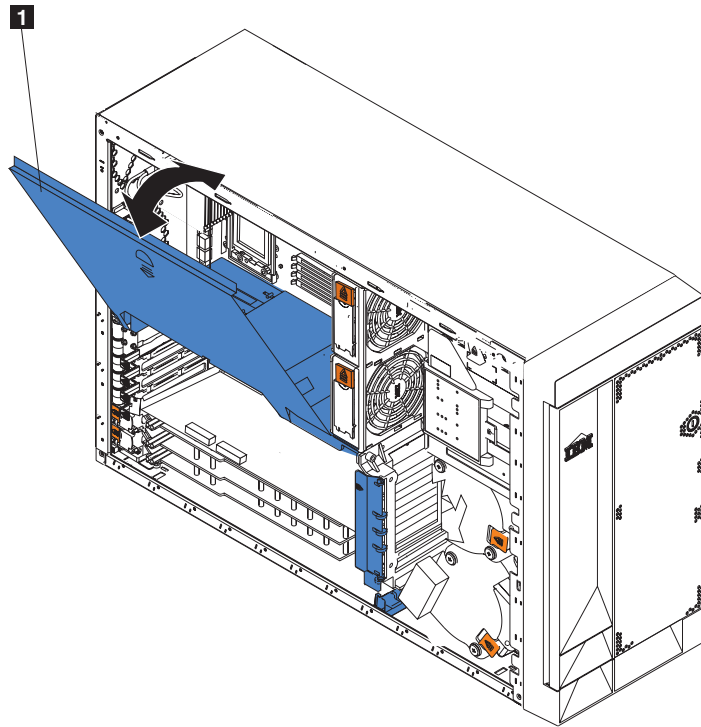


Figure 81. Opening the air-baffle assembly cover (Model 25T)

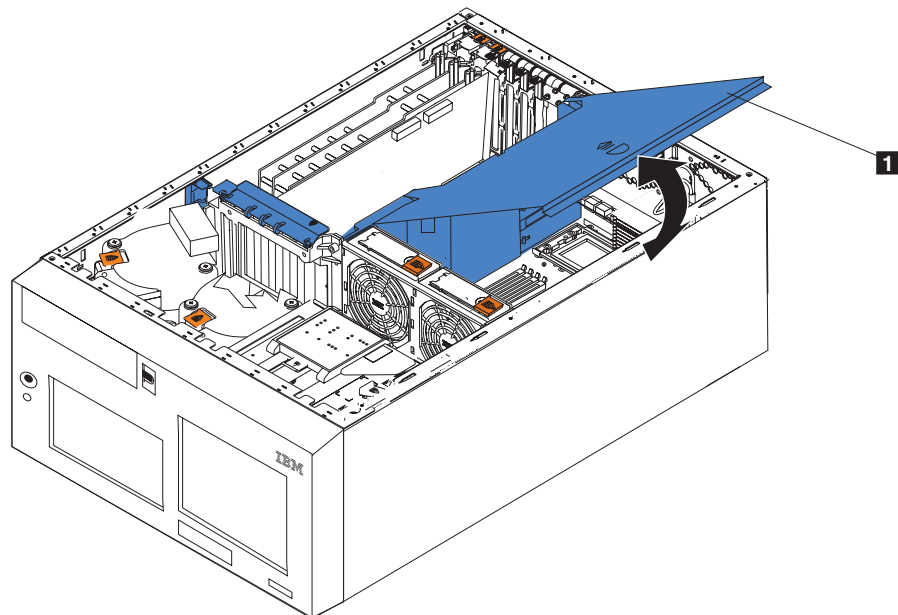


Figure 82. Opening the air-baffle assembly cover (Model 25T with the rack-mount conversion feature)

- 1 Air-baffle assembly cover

Note: It is not necessary to remove the air-baffle assembly to perform this procedure.

5. Locate the DIMM connectors on the system board. Determine the slots into which you will be adding or replacing the DIMMs (see Table 33 on page 149 for the correct installation sequence).
6. If you are replacing a DIMM, open the retaining clips and remove the defective DIMM by pulling it firmly out of the connector.
7. Touch the static-protective package containing the new DIMM to any unpainted metal surface on the appliance, and remove the DIMM from the package. This discharges any static electricity from the package and from your body.
8. Ensure that the DIMM retaining clips are in the open position.

Note: Handle the retaining clips gently to avoid breaking them or damaging the DIMM connectors.

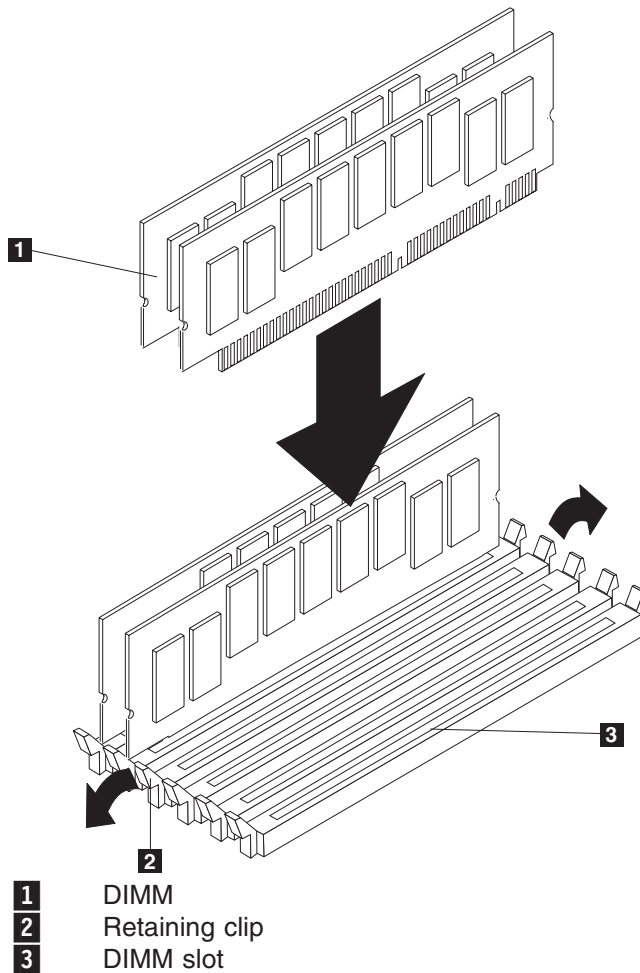


Figure 83. DIMM slots and retaining clips

9. Turn the DIMM so that the pins align correctly with the connector. Note the notches in the DIMM edge that key the DIMM to the connector.
10. Insert the DIMM into the connector by pressing on one end of the DIMM and then on the other end of the DIMM. Be sure to press straight into the connector. Be sure that the retaining clips snap into the closed position.

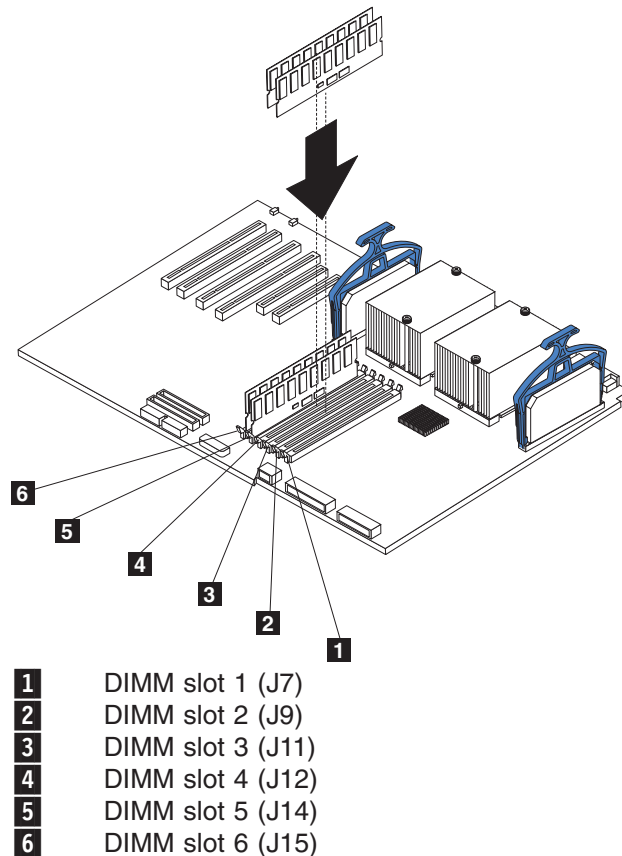


Figure 84. Installing a DIMM

11. Make sure that the retaining clips are in the closed position. If a gap exists between the DIMM and the retaining clips, the DIMM has not been correctly seated. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.
12. Repeat steps 7 on page 152 through 11 for the remaining DIMM.
13. Close the cover on the air-baffle assembly.
14. Replace the cover (see “Installing the cover” on page 198).
15. Reconnect any power cords and external cables.

Microprocessor

The standard Model 25T has one microprocessor installed on the system board. If two microprocessors are installed, then use these instructions to **replace** a microprocessor.

Attention: To avoid damage and ensure correct appliance operation when you install a microprocessor, use microprocessors that have the same cache size and type, and clock speed. Microprocessor internal clock frequencies and external clock frequencies must be identical.

Important: A boot processor must always be installed in socket U13 of the system board. See Figure 11 on page 77 for the location of the boot processor.

Notes:

1. To order an additional microprocessor, contact your IBM marketing representative or authorized reseller.
2. When you install a microprocessor in socket U9, you must also install the voltage regulator module (VRM) that comes with the microprocessor, in VRM connector J1.
3. The microprocessor sockets in this engine contain built-in termination for the microprocessor bus; therefore, terminator cards are not required for empty microprocessor sockets. However, for airflow, an empty microprocessor socket must contain a microprocessor baffle.
4. The microprocessor speeds are automatically set for this engine; therefore, you do not need to set any microprocessor frequency-selection jumpers or switches.

To install a microprocessor:

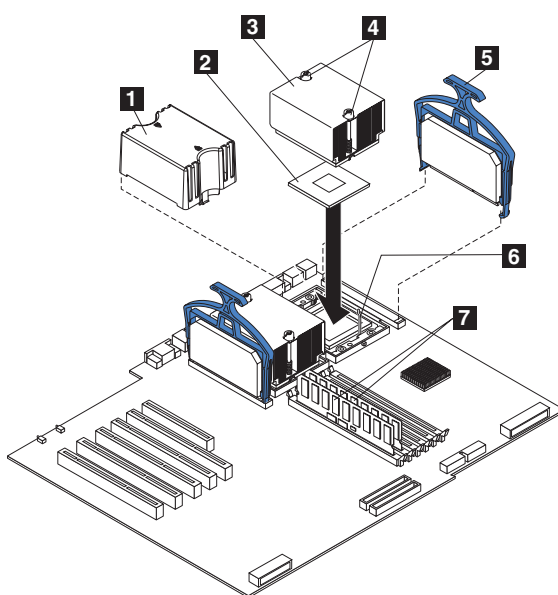


Figure 85. Installing an additional microprocessor

- | | |
|----------|------------------------------|
| 1 | Microprocessor baffle |
| 2 | Microprocessor 2 |
| 3 | Heat sink 2 |
| 4 | Captive screws |
| 5 | VRM 2 |
| 6 | Microprocessor release lever |
| 7 | DIMM slots |

Attention: When you handle devices that are sensitive to electrostatic discharge, take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices. Disconnect all external cables and power cords. Remove the cover (see “Removing the cover” on page 93 for details).

3. Open the cover on the air-baffle assembly. See Figure 81 on page 151 and Figure 82 on page 151 for an illustration.

Note: It is not necessary to remove the air-baffle assembly for this procedure.

4. Locate the second microprocessor socket (connector U27) on the system board.
5. Remove the microprocessor baffle from the microprocessor socket.
6. If the second microprocessor socket is covered with protective film, peel and remove the film.
7. Install the VRM included in the microprocessor kit.

Attention: Use of other VRMs might cause your appliance to overheat.

- a. Center the VRM over the VRM connector. Ensure that the VRM is oriented and aligned correctly.
 - b. Carefully but firmly push down the VRM clip handle to seat the VRM in the connector.
 - c. Ensure that the VRM snaps into the connector on both sides.
8. Install the microprocessor:
 - a. Touch the static-protective package containing the new microprocessor to any **unpainted** metal surface on the appliance; then remove the microprocessor from the package.
 - b. Pull out and lift up on the microprocessor-release lever to unlock the microprocessor socket.
 - c. Center the microprocessor over the microprocessor connector aligning the gold alignment arrow on the corner of the microprocessor with the cut-out arrow on the connector. See Figure 86.

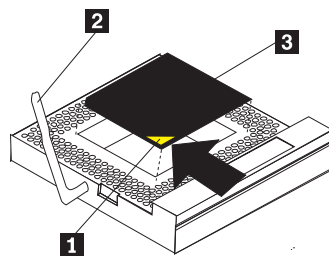


Figure 86. Aligning the microprocessor

- | | |
|----------|------------------------------|
| 1 | Alignment arrow |
| 2 | Microprocessor release lever |
| 3 | Microprocessor |

- d. Carefully place the microprocessor into the connector.

Attention: Do not use excessive force when pressing the microprocessor into the socket.
 - e. Carefully close the microprocessor release lever to secure the microprocessor in the socket.
9. Install the heat sink on the microprocessor:
 - a. Remove the protective film from the bottom of the heat sink.

Notes:

- 1) Do not set down the heat sink after you remove the protective film.

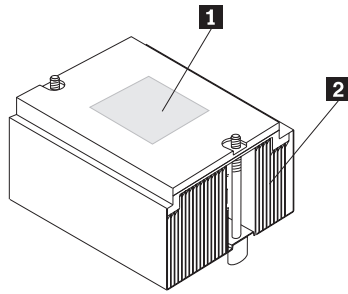


Figure 87. Microprocessor heat sink

- 1** Thermal grease
- 2** Heat sink

- 2) Do not touch the thermal grease on the bottom of the heat sink. Touching the thermal grease will contaminate it. If the thermal grease on the microprocessor or heat sink becomes contaminated, see “Thermal grease” on page 157.
 - b. Align and place the heat sink on top of the microprocessor (grease side down) in the retention bracket. Press firmly on the heat sink.
 - c. Secure the heat sink to the microprocessor by tightening the captive screws. Alternate between the two captive screws in the heat sink while tightening them.

Attention: Alternate the tightening of the two captive screws to prevent damage to the microprocessor. Ensure that the screws are completely tightened (until they stop); otherwise, damage to the microprocessor will occur.
10. Close the cover on the air-baffle assembly.
11. If you have other options to install or remove, do so now; otherwise, go to “Installing the cover” on page 198.
12. Reconnect the power cords and external cables.

Removing the microprocessor

Complete the following steps to remove a microprocessor.

1. Review the information in “Before you begin” on page 73.
2. Turn off the engine and disconnect all power cords and external cables; then, remove the cover (see “Removing the cover” on page 93).
3. Open the cover on the air-baffle assembly. (see Figure 81 on page 151 and Figure 82 on page 151).

Note: It might be easier to turn the engine on its side and remove the air baffle to access the microprocessors.

4. Identify the microprocessor to be removed.
5. Remove the heat sink:
 - a. Loosen one captive screw fully; then, loosen the other captive screw.

Attention: Loosening one screw fully before loosening the other screw will help to break the thermal bond that adheres the heat sink to the microprocessor.
 - b. Pull the heat sink off of the microprocessor.
6. Open the microprocessor release lever.

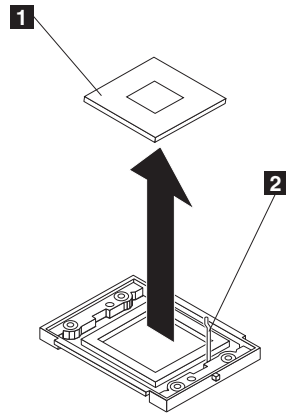


Figure 88. Removing the microprocessor

- 1** Microprocessor
- 2** Microprocessor release lever

7. Pull the microprocessor out of the socket.

To install a microprocessor, see “Microprocessor” on page 153.

Thermal grease

This section contains information about removing and replacing the thermal grease between the heat sink and the microprocessor. The thermal grease must be replaced any time the heat sink has been removed from the top of the microprocessor and is going to be reused, or when debris is found in the grease.

Complete the following steps to replace damaged or contaminated thermal grease on the microprocessor and heat sink.

1. Review the information in “Before you begin” on page 73.
2. Place the heat sink on a clean work surface.
3. Remove the cleaning pad from its package and unfold it completely.
4. Use the cleaning pad to wipe the thermal grease from the bottom of the heat sink.

Note: Be sure that all of the thermal grease is removed.

5. Use a clean area of the cleaning pad to wipe the thermal grease from the microprocessor; then, dispose of the cleaning pad after all of the thermal grease is removed.

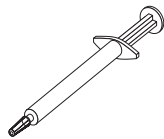


Figure 89. Thermal grease syringe

6. Use the thermal grease syringe to place 16 uniformly spaced dots of 0.01ML each on the top of the microprocessor.

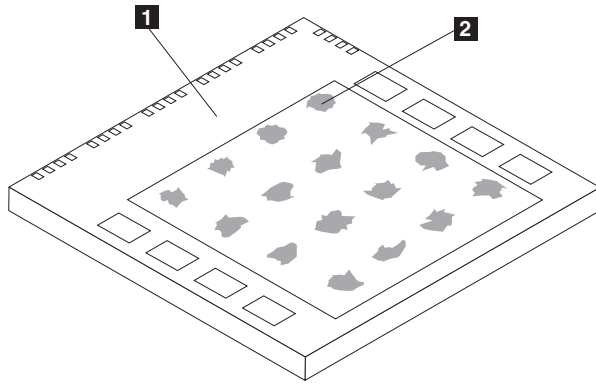


Figure 90. Applying the thermal grease to the microprocessor

- 1** Microprocessor
- 2** 0.01 ml of thermal grease

Note: 0.01 ml is one tick mark on the syringe. If the grease is applied correctly, approximately half (0.22 ml) of the grease will remain in the syringe.

7. Install the heat sink onto the microprocessor as described in “Microprocessor” on page 153.

Operator information panel

The procedure for replacing the operator information panel is different for a Model 25T and a Model 25T with the rack-mount conversion feature.

To remove the operator information panel of a Model 25T, perform the following steps:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine and any attached devices.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the cover (see “Removing the cover” on page 93).
5. Remove the front bezel (see “Removing the bezel” on page 96).
6. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
7. Remove the two central fans (see “Hot-swap fan” on page 132).
8. Remove the plastic baffle (see Figure 81 on page 151).
9. Remove the adapter-support bracket (see “Adapter-support bracket” on page 101).
10. Disconnect the operator information panel cable from the system board (see Figure 12 on page 78 for the location of the connector).
11. Slide the CD-ROM drive out enough to allow access to the cable (see “CD-ROM drive” on page 122).
12. If it is installed, slide the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit out enough to allow access to the cable (see “Removing the 3-Pack Expansion” on page 147).
13. From inside the engine, push the tab **1** on the panel **2**, making sure to press the tab near the chassis; the panel will disengage from the chassis.

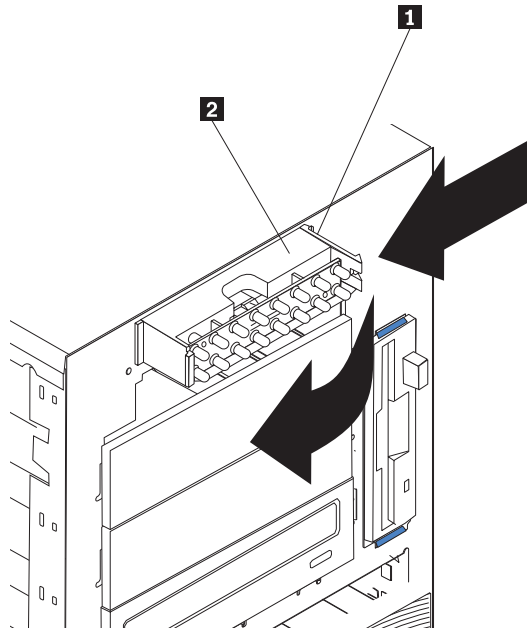


Figure 91. Disengaging the operator information panel

- 1** Tabs
- 2** Operator information panel

14. Remove the panel, carefully threading the cable past the other components and through the opening in the chassis.

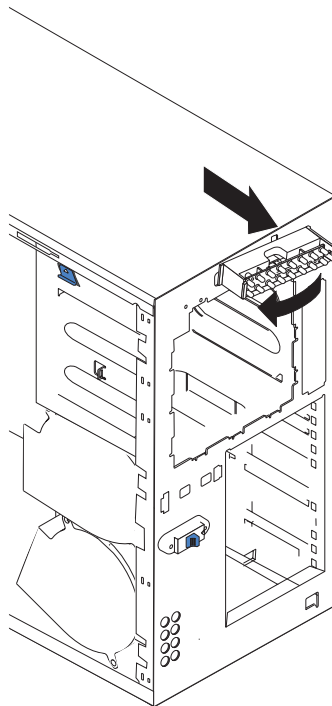


Figure 92. Removing the operator information panel (Model 25T)

Note: If the cable has been secured in the cable clamps, gently pull it out of the clamps before pulling the cable through the opening in the chassis.

15. To install the operator information panel, reverse the previous steps.

Notes:

- a. Thread the cable through the opening in the chassis and extend it into the engine before attaching the operator information panel.
- b. Secure the cable in the cable clamps along the inside of the chassis.
- c. Fit the left tab (in the rack configuration, this is the top tab) into the lip on the chassis, and then press on the right tab (in the rack configuration, this is the bottom tab) until it snaps into place.

To remove the operator information panel of a Model 25T with the rack-mount conversion feature, perform the following steps:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine and any attached devices.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the cover (see “Removing the cover” on page 93).
5. Remove the front bezel (see “Removing the bezel” on page 96).
6. Remove the two front fans (see “Hot-swap fan” on page 132).
7. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
8. Remove the two central fans (see “Hot-swap fan” on page 132).
9. Remove the adapter-support bracket (see “Adapter-support bracket” on page 101).
10. Slide the CD-ROM drive out enough to allow access to the cable (see “CD-ROM drive” on page 122).
11. If it is installed, slide the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit out enough to allow access to the cable (see “Removing the 3-Pack Expansion” on page 147).
12. Remove the DASD backplane (see “DASD backplane assembly” on page 125).
13. Remove the front-fan housing (see “Front-fan housing” on page 130).
14. Disconnect the operator information panel cable from the system board (see Figure 12 on page 78) for the location of the connector.
15. From outside the engine, push the two tabs on the panel as shown in Figure 93 on page 161, making sure to press the tab near the chassis; the panel will disengage from the chassis.

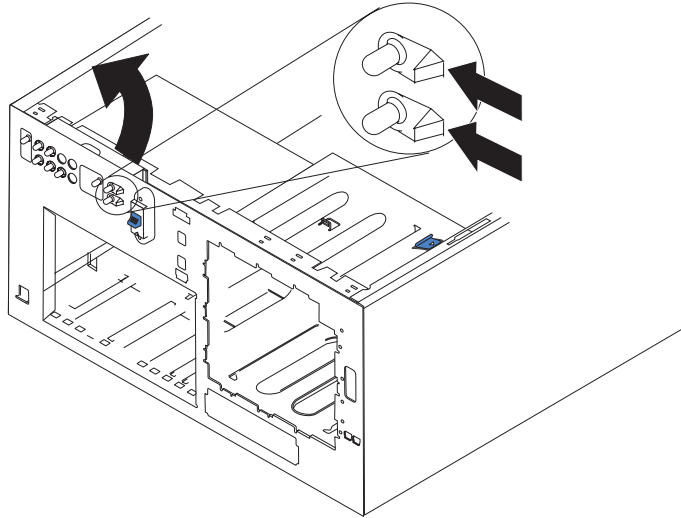


Figure 93. Removing the operator information panel (Model 25T with the rack-mount conversion feature)

16. Remove the panel, carefully threading the cable past the other components and through the opening in the chassis.

Note: If the cable has been secured in the cable clamps, gently pull it out of the clamps before pulling the cable through the opening in the chassis.

17. To install the operator information panel, reverse the previous steps.

Notes:

- a. Thread the cable through the opening in the chassis and extend it into the engine before attaching the operator information panel.
- b. Secure the cable in the cable clamps along the inside of the chassis.
- c. Fit the left tab (in the rack configuration, this is the top tab) into the lip on the chassis, and then press on the right tab (in the rack configuration, this is the bottom tab) until it snaps into place.

Power-button shield

A plastic power-button shield is included to prevent accidentally powering off the engine. The power-button shield is in a bag that is taped to the front of the engine. To install the power-button shield:

1. Remove the power-button shield from the plastic bag.
2. Locate the white power button on the front of the engine.
3. Align the two prongs on the power-button shield with the channels next to the power button.
4. Inserting the prongs into the channels, snap the power-button shield to the bezel.
5. To remove the power-button shield, gently pry it from the bezel.

Power-reset card

The procedure for removing and replacing the power-reset card is different for the Model 25T and the Model 25T with the rack-mount conversion feature.

Complete the following steps to remove the power reset card in the Model 25T:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the bezel (see “Removing the bezel” on page 96).
5. Remove the cover (see “Removing the cover” on page 93).
6. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
7. Remove the two central fans (see “Hot-swap fan” on page 132).
8. Remove the plastic baffle (see Figure 81 on page 151 and Figure 82 on page 151).
9. Disconnect the power-reset card cable from the system board (J47).
10. Press the tab on the front of the power-reset card and lift it out from inside the chassis.

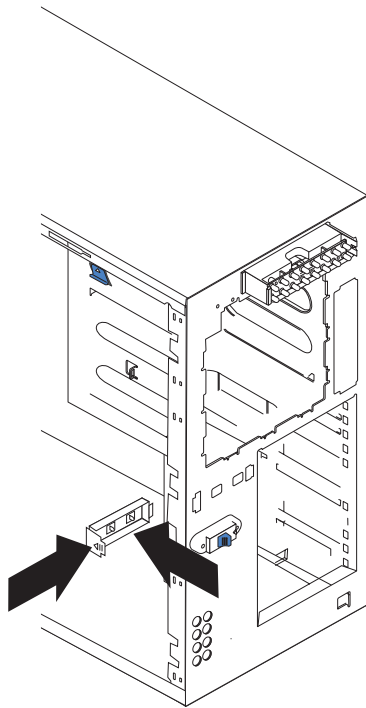


Figure 94. Removing the power-reset card (Model 25T)

11. To replace the power reset card, reverse the previous steps, threading the cable carefully.

Note: It might be necessary to remove the DASD backplane assembly to thread the cable.

Complete the following steps to remove the power reset card in the Model 25T with the rack-mount conversion feature:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the engine.
3. Disconnect all external cables and power cords from the back of the engine.
4. Remove the bezel (see “Removing the bezel” on page 96).

5. Remove the cover (see “Removing the cover” on page 93).
6. Remove the front fans (see “Hot-swap fan” on page 132).
7. Disconnect and remove adapters and spacers (see “Adapters” on page 105).
8. Remove the two central fans (see “Hot-swap fan” on page 132).
9. Remove the plastic baffle (see Figure 81 on page 151 and Figure 82 on page 151).
10. Remove the adapter-support bracket (see “Adapter-support bracket” on page 101).
11. Remove the DASD backplane (see “DASD backplane assembly” on page 125).
12. Remove the front-fan housing (see “Front-fan housing” on page 130).
13. Disconnect the power-reset card cable from the system board (J47) (see Figure 12 on page 78 for the location of the connector).
14. Press the tab on the front of the power-reset card and lift it out from inside the chassis.

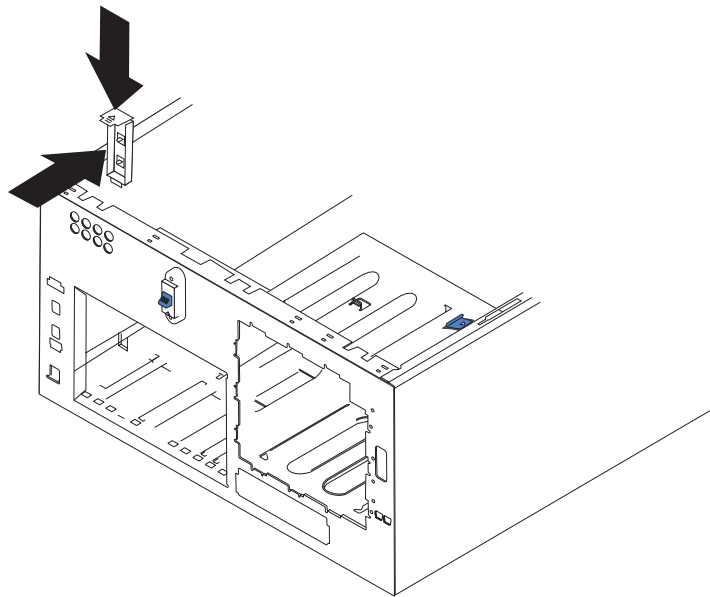


Figure 95. Removing the power-reset card (Model 25T with the rack-mount conversion feature)

15. To replace the power reset card, reverse the previous steps, threading the cable carefully.

Power supply

Your appliance has two hot-swap power supplies, installed in bays 1 and 2. The second power supply provides redundancy. Each power supply has two status indicators. See Figure 96 on page 164 and Figure 97 on page 165 for information about the status indicators and power supply bay locations for the appliance.

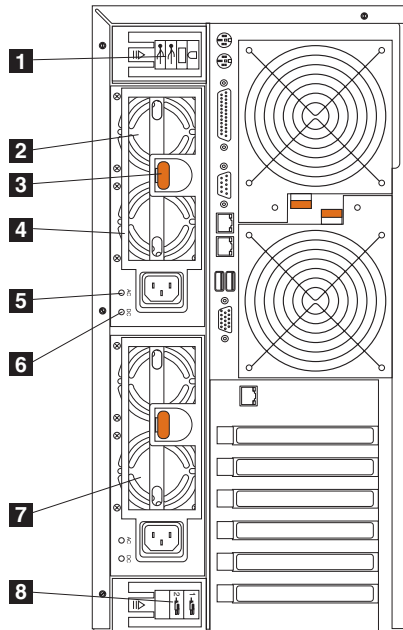


Figure 96. Replacing a hot-swap power supply (Model 25T)

- 1 I/O cable-restraint bracket** - This bracket manages the cables to the I/O connectors.
- 2 Hot-swap power supply 2** - LED PS2 on the system board diagnostics panel refers to this power supply. See Figure 15 on page 82 for more information about the diagnostics panel.
- 3 Release latch** - This release latch is used to release power supply 2.
- 4 Handle** - This handle is used to pull out power supply 2 when the release latch is activated.
- 5 AC power LED** - This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 6 DC power LED** - This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 7 Hot-swap power supply 1** - LED PS1 on the system board diagnostics panel refers to this power supply. See Figure 15 on page 82 for more information about the diagnostics panel.
- 8 Power cord restraint bracket** - This bracket is used to manage the power cords.

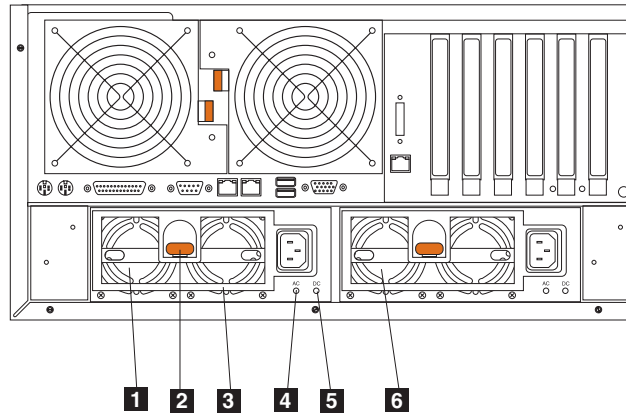


Figure 97. Replacing a hot-swap power supply (Model 25T with the rack-mount conversion feature)

- 1** **Hot-swap power supply 2** - LED PS2 on the system board diagnostics panel refers to this power supply. See Figure 15 on page 82 for more information about the diagnostics panel.
- 2** **Release latch** - This release latch is used to release power supply 2.
- 3** **Handle** - This handle is used to pull out power supply 2 when the release latch is activated.
- 4** **AC power LED** - This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 5** **DC power LED** - This LED provides status information about the power supply. During normal operation, both the AC and DC Power LEDs are on.
- 6** **Hot-swap power supply 1** - LED PS1 on the system board diagnostics panel refers to this power supply. See Figure 15 on page 82 for more information about the diagnostics panel.



DANGER

<1-2> Do not try to open the covers of the power supply module.



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

Notes:

1. If you have functioning redundancy, you do not need to switch off the power to the appliance to install hot-swap power supplies.

NAS 200 provides power redundancy and hot-swappability.

2. When replacing a power supply, do not remove the power supply until you are ready to install its replacement.

Attention: If you remove a power supply while the appliance is running and you do not have functioning power redundancy, your appliance will abruptly cease to function.

To replace a hot-swap power supply:

1. Review the information in “Before you begin” on page 73.
2. The LEDs on the power supplies indicate whether a power supply has failed.
 - a. If a power supply has failed, go to step 5 on page 167.
 - b. Otherwise, continue with step 3.
3. Remove the engine covers (see “Removing the cover” on page 93).
4. Determine which power supply has failed by checking the LEDs on the diagnostics panel on the system board.
 - If the Nonredundant LED is on, you do not have redundancy: **shut down the appliance** (see “Powering on and shutting down the appliance” on page 11) and peripheral devices.

Note: The Information LED on the operator information panel on the front of the appliance also will be on. See “Engine controls and indicators” on page 7 for the location and contents of the operator information panel.

- If the Nonredundant LED is not on, you have redundancy and do not need to shut down the appliance.

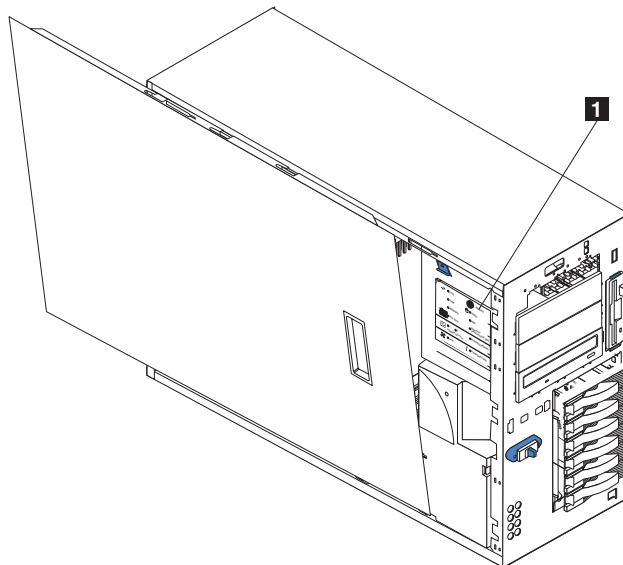


Figure 98. Location of the diagnostics panel (Model 25T)

1 Diagnostics panel

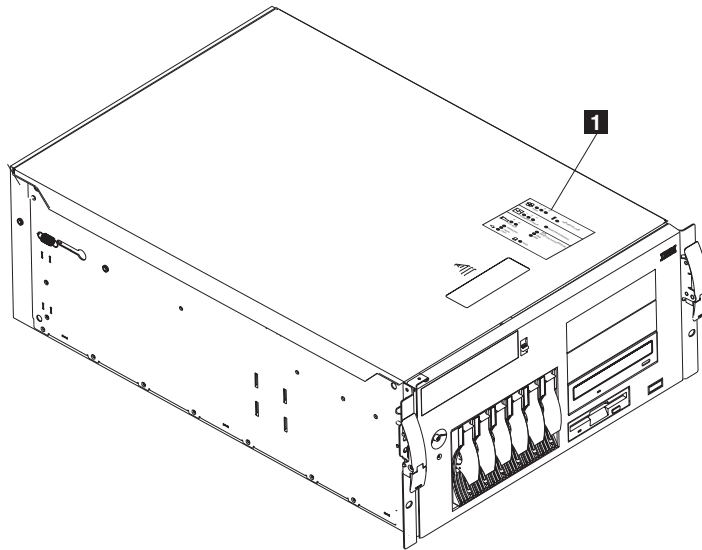


Figure 99. Location of the diagnostics panel (Model 25T with the rack-mount conversion feature)

1 Diagnostics panel



CAUTION:
The following label indicates a hot surface nearby.



Note: For translations of this safety notice, refer to *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.

5. Remove the defective power supply:
 - a. Unplug the defective power supply.
 - b. Press the orange release lever and pull the power-supply handle. This disconnects the power supply from the power-supply backplane.

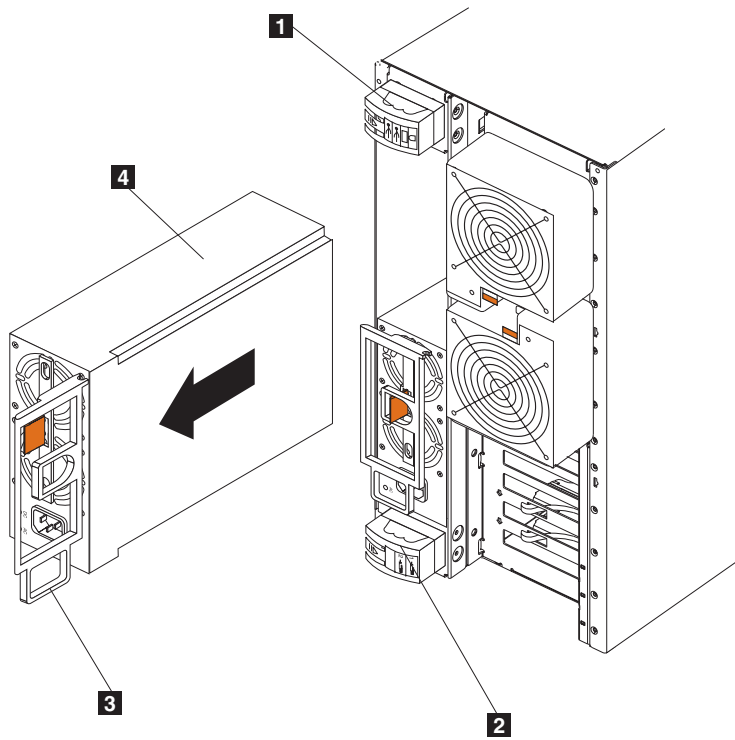


Figure 100. Removing a hot-swap power supply (Model 25T)

- 1** I/O cable-restraint bracket
- 2** Power-cord-restraint bracket
- 3** Power-supply handle (in the open position)
- 4** Power supply

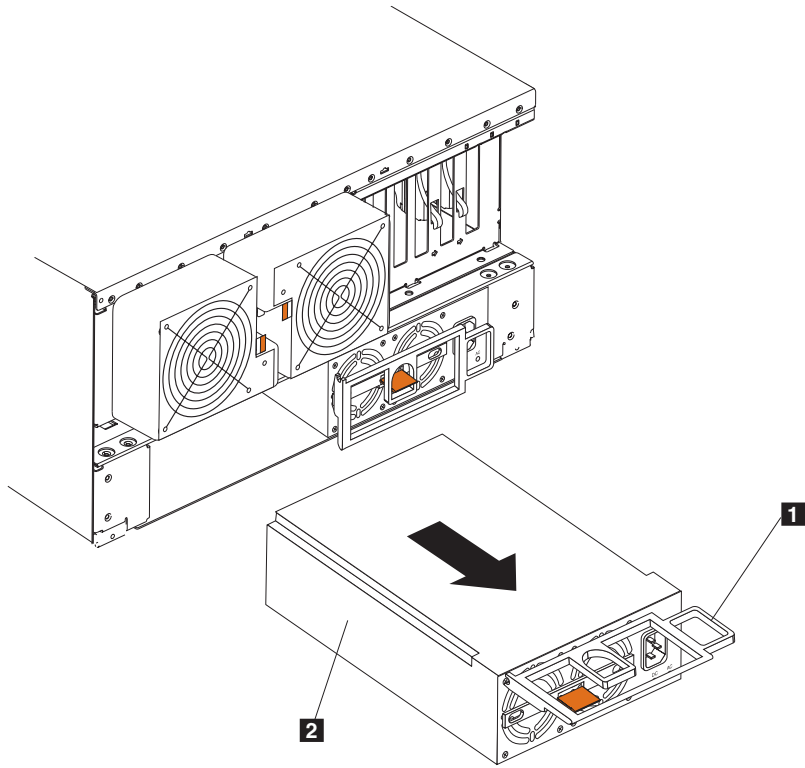


Figure 101. Removing a hot-swap power supply (Model 25T with the rack-mount conversion feature)

- 1** I/O cable-restraint bracket
- 2** Power-cord-restraint bracket
- 3** Power-supply handle (in the open position)
- 4** Power supply

c. Gently slide out the power supply.

6. Install the replacement power supply in the bay:
 - a. Place the handle on the power supply in the open position (that is, perpendicular to the power supply) and slide the power supply into the chassis.
 - b. Gently push the power supply into the bay until it connects to the power supply backplane.

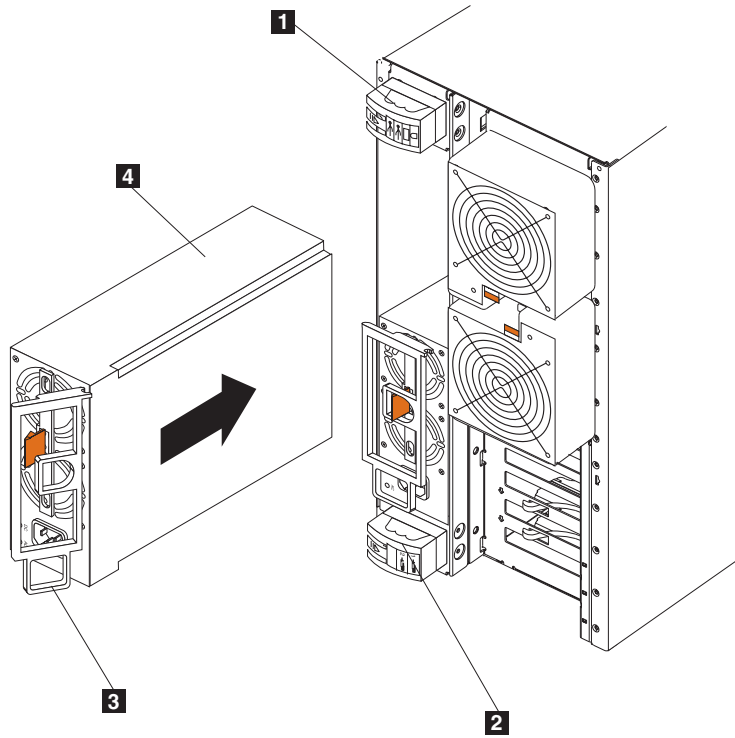


Figure 102. Installing a hot-swap power supply (Model 25T)

- | | |
|----------|---|
| 1 | I/O cable-restraint bracket |
| 2 | Power cord restraint bracket |
| 3 | Power-supply handle (in the half-open position) |
| 4 | Power supply |

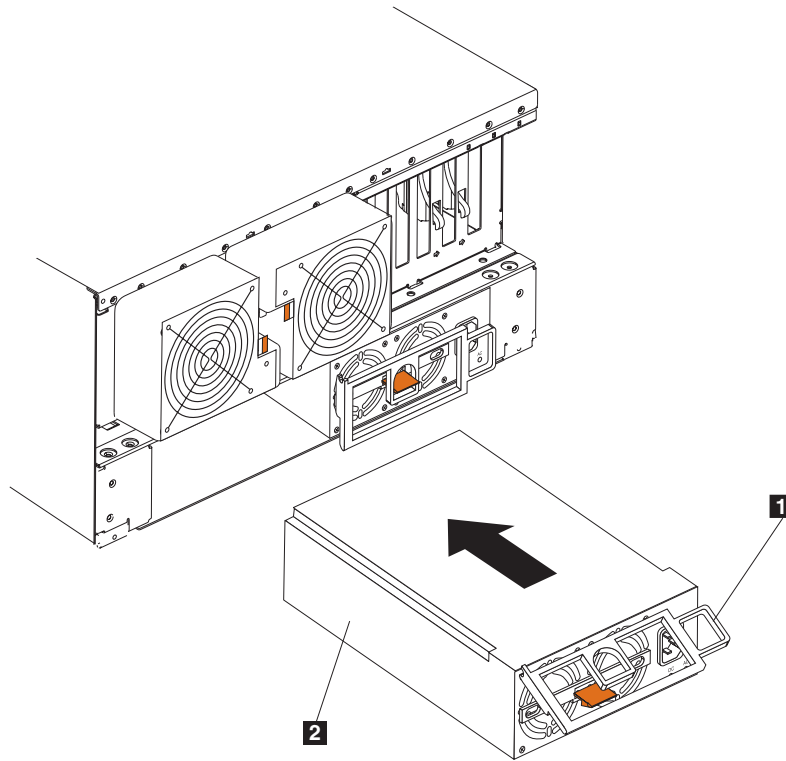


Figure 103. Installing a hot-swap power supply (Model 25T with the rack-mount conversion feature)

- 1** I/O cable-restraint bracket
- 2** Power cord restraint bracket
- 3** Power-supply handle (in the half-open position)
- 4** Power supply

- c. Close the handle to seat the power supply in the bay.
7. Plug the power cord for the power supply you just installed into the power-cord connector.
8. Open the cable-restraint housing by pulling down the top end of the cable-restraint housing.
9. Route the power cord through the cable-restraint bracket.
10. Plug the power cord into a grounded electrical outlet.
11. Verify that the DC Power LED and AC Power LED on the power supply are on, indicating that the power supply is operating correctly.

Remote Supervisor Adapter

The optional Remote Supervisor Adapter provides remote system management for the Model 25T or Model 25T with the rack-mount conversion feature hardware and operating system, independent of the status of the hardware.

A Remote Supervisor Adapter that is connected to the ASM Interconnect bus is used as an Ethernet gateway for the ASM Interconnect bus, enabling all ASM information generated by the Model 25T or Model 25T with the rack-mount conversion feature attached to the ASM Interconnect bus to be forwarded to other systems on your Ethernet network.

Installing the adapter

To install the Remote Supervisor Adapter:

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the NAS 200 and attached devices.
3. If the Model 25T with the rack-mount conversion feature is in a rack, pull it out from the rack.
4. Remove the cover (see “Removing the cover” on page 93).
5. Open the blue adapter-retention clip.
6. Open the adapter-retention latch on slot 1.
7. Slide the expansion-slot cover from PCI slot 1 (see Figure 104 and Figure 105 on page 173). Store it in a safe place.

Attention: Expansion-slot covers must be installed in all vacant slots. This provision maintains the electronic emission characteristics of the engine and ensures cooling of engine components.

8. Remove the adapter from the static-protective package. Avoid touching the components and gold-edge connectors on the adapter.
9. Install the adapter:
 - a. Carefully grasp the adapter by its top edge or upper corners, and align it with expansion slot 1.

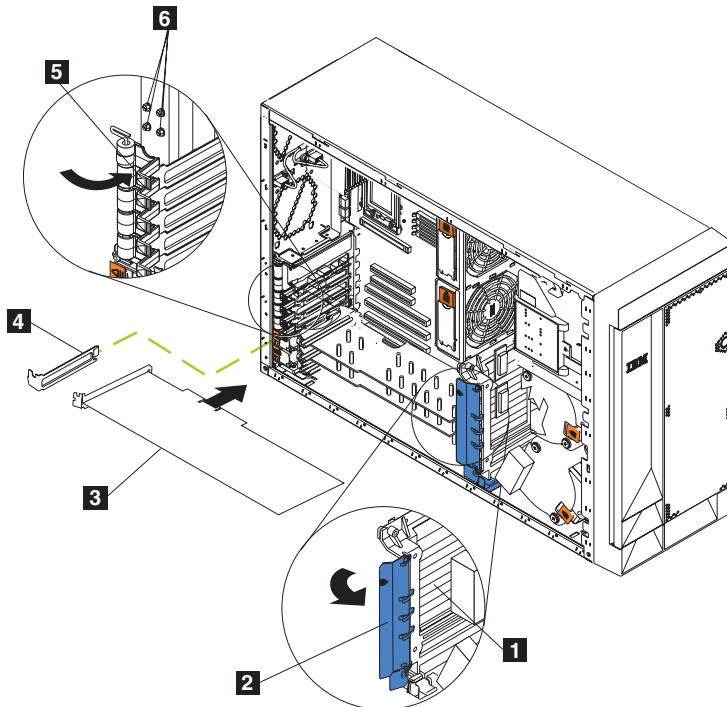


Figure 104. Installing a Remote Supervisor Adapter (Model 25T)

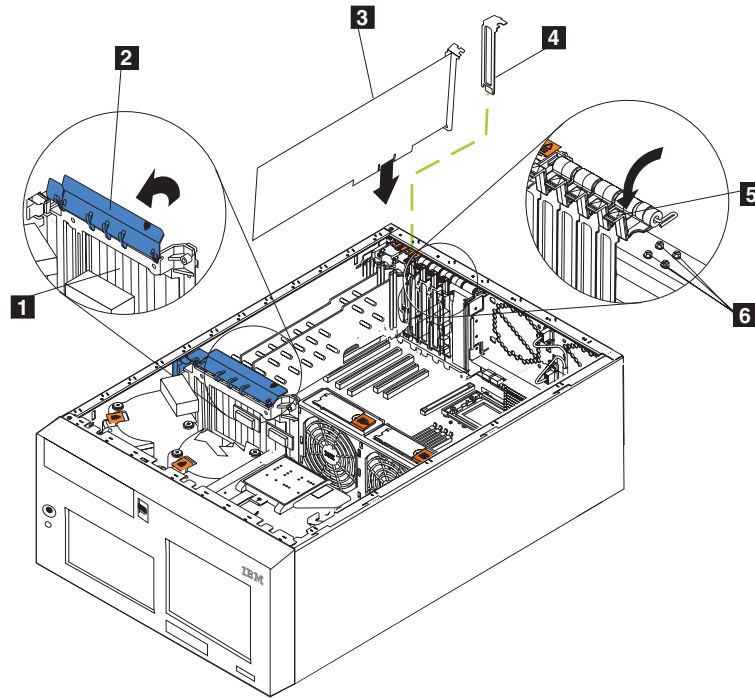


Figure 105. Installing a Remote Supervisor Adapter (Model 25T with the rack-mount conversion feature)

- 1 Adapter-support bracket
 - 2 Adapter-retention clip
 - 3 Adapter
 - 4 Expansion-slot cover
 - 5 Adapter-retention latch
 - 6 Backup expansion-slot screws
- b. Press the adapter **firmly** into the PCI slot.

Attention: When you install the adapter in the engine, be sure it is completely and correctly seated in the connector before you power on the engine. Incorrect insertion might cause damage to the system board or the adapter.
 - c. Secure the adapter with a screw: insert one of the backup expansion-slot screws (see Figure 104 on page 172 and Figure 105 for the location of the screws) through the top of the adapter bracket into the screw hole to secure the adapter.
 - d. Lower the adapter-retention latch over the top corner of the adapter.
 - e. Close the blue adapter-retention clip.
10. Connect the 20-pin ribbon cable:
 - a. Connect one end of the 20-pin ribbon cable to the system-management connector on the adapter. The 20-pin, ribbon-cable connector ends are keyed for correct installation.

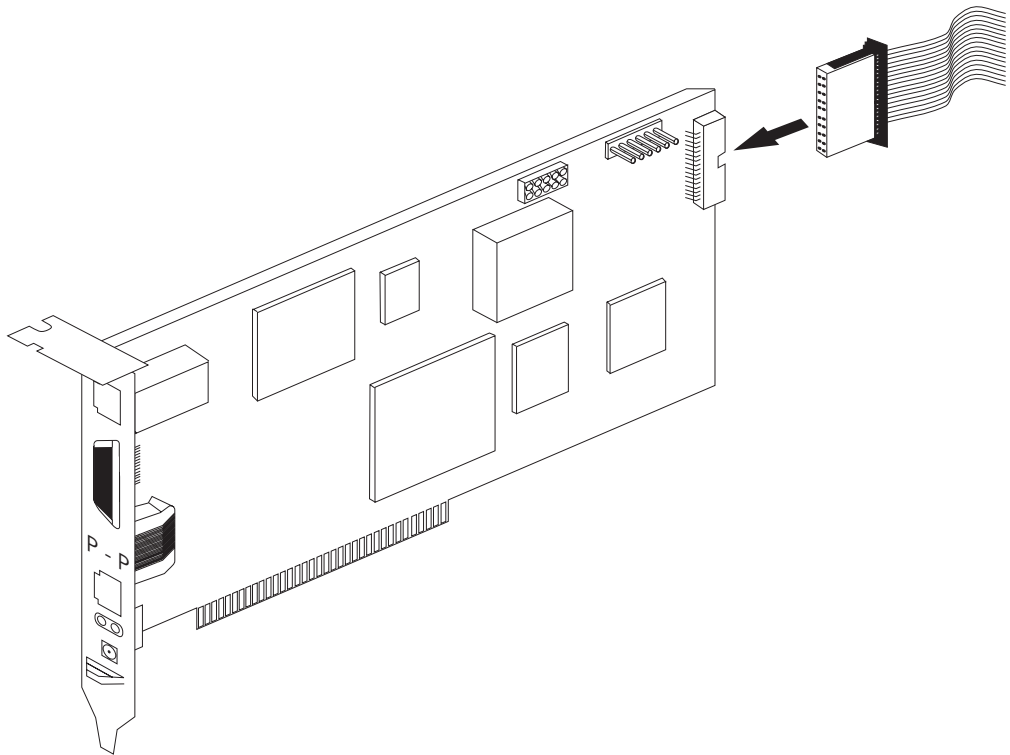


Figure 106. Connecting the 20-pin ribbon cable to the Remote Supervisor Adapter

- b. Connect the other end of the cable to the system-management connector (J27) on the system board. Item **1** in Figure 107 on page 175 shows the location of the system-management connector on the system board.

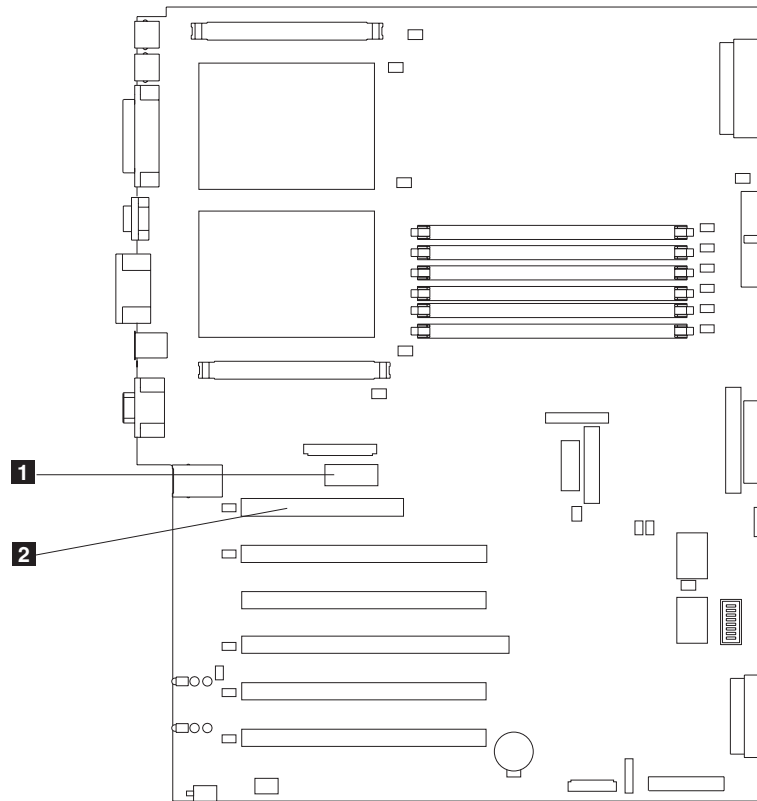


Figure 107. Remote Supervisor Adapter connectors on the system board

- 1** System-management connector (J27)
- 2** PCI slot 1

11. Replace the cover.
12. If the appliance was in a rack, return it to the rack.
13. Connect the external cables and power cords.
14. Continue with “Connecting the LAN and serial port cables”.

Connecting the LAN and serial port cables

The appliance is managed remotely through either a LAN using the Ethernet port or a serial port. If the connection to the Remote Supervisor Adapter is a LAN connection, continue with “Cabling the Ethernet LAN port”. If the connection is a serial port, continue with “Cabling the serial port” on page 176.

Cabling the Ethernet LAN port: To attach the Ethernet cables:

Attention: To avoid damage to the Ethernet connector on the Remote Supervisor Adapter, do not plug the ASM Interconnect module into the Ethernet (RJ-45) port.

1. Connect one end of a Category 3 or Category 5 Ethernet cable to the Ethernet port on the Remote Supervisor Adapter. Connect the other end of the Ethernet cable to your network.

2. Check the Ethernet LEDs. The location of the LEDs is shown in Figure 108.

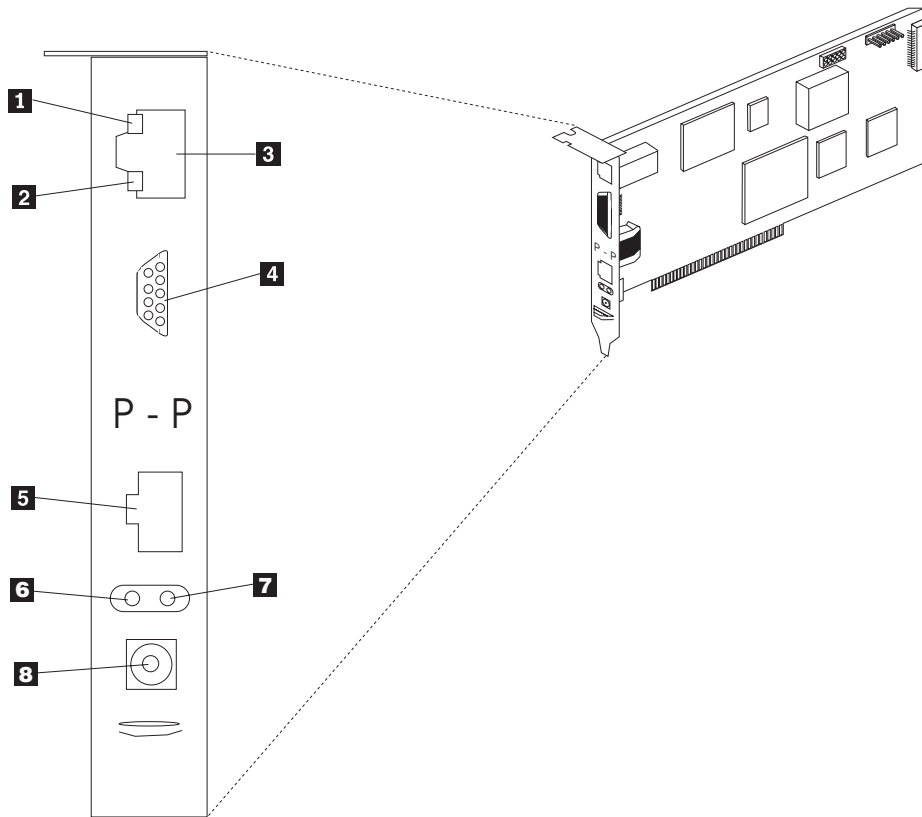


Figure 108. Ethernet LEDs and external ports on the Remote Supervisor Adapter

- 1** Ethernet link LED - The green Ethernet link LED is on when the Ethernet cable is connected correctly.
- 2** Ethernet activity LED - The green Ethernet activity LED is flashing when there is Ethernet activity.
- 3** Ethernet port
- 4** Serial port
- 5** ASM interconnect port
- 6** Error LED (amber)
- 7** Power LED (green)
- 8** External power-supply connector

Cabling the serial port: To connect to the serial port, connect a modem or null-modem cable to the serial port on the Remote Supervisor Adapter.

Connecting the ASM Interconnect module to the NAS 200

The ASM Interconnect module connects the Remote Supervisor Adapter to the ASM interconnect network. This module is included with the Remote Supervisor Adapter option.

To connect the ASM Interconnect module to the Remote Supervisor Adapter:

1. Connect the ASM Interconnect module **2** to the Remote Supervisor Adapter ASM Interconnect port **1**. This port is labeled *P - P* (for *peer-to-peer*) on the back panel of the adapter. Figure 109 and Figure 110 on page 178 show the Remote Supervisor Adapter installed in the Model 25T.

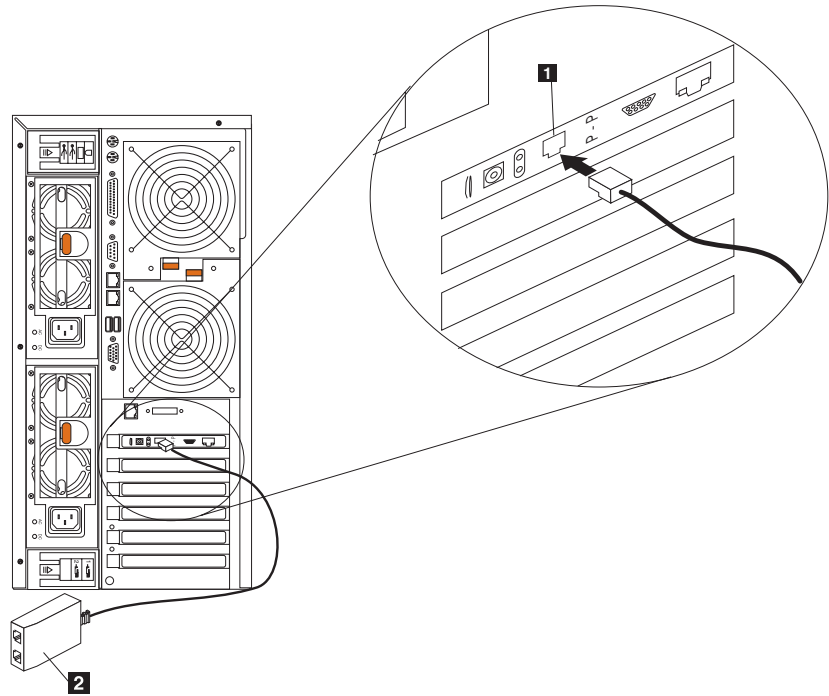


Figure 109. Connecting the ASM interconnect module to the Remote Supervisor Adapter (Model 25T)

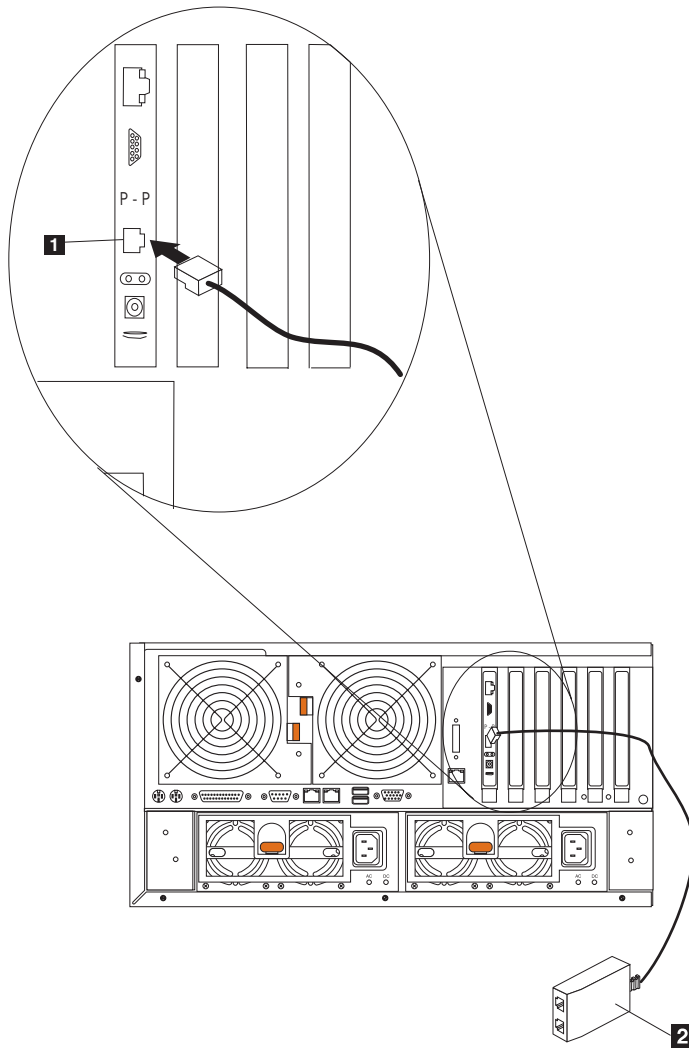


Figure 110. Connecting the ASM interconnect module to the Remote Supervisor Adapter (Model 25T with the rack-mount conversion feature)

- 1** ASM interconnect port
 - 2** ASM interconnect module
2. Connect one or two Category 3 or Category 5 Ethernet cables to the other end of the ASM Interconnect module.

For full management capability, you can install a Remote Supervisor Adapter in both engines. In the following example, an Ethernet cable connects the administrator's system to the Remote Supervisor Adapter that is installed in a NAS 200. In this case, the NAS 200 uses the LAN connection to forward system management data generated by the other engines in the ASM interconnect network to the remote system-management administrator.

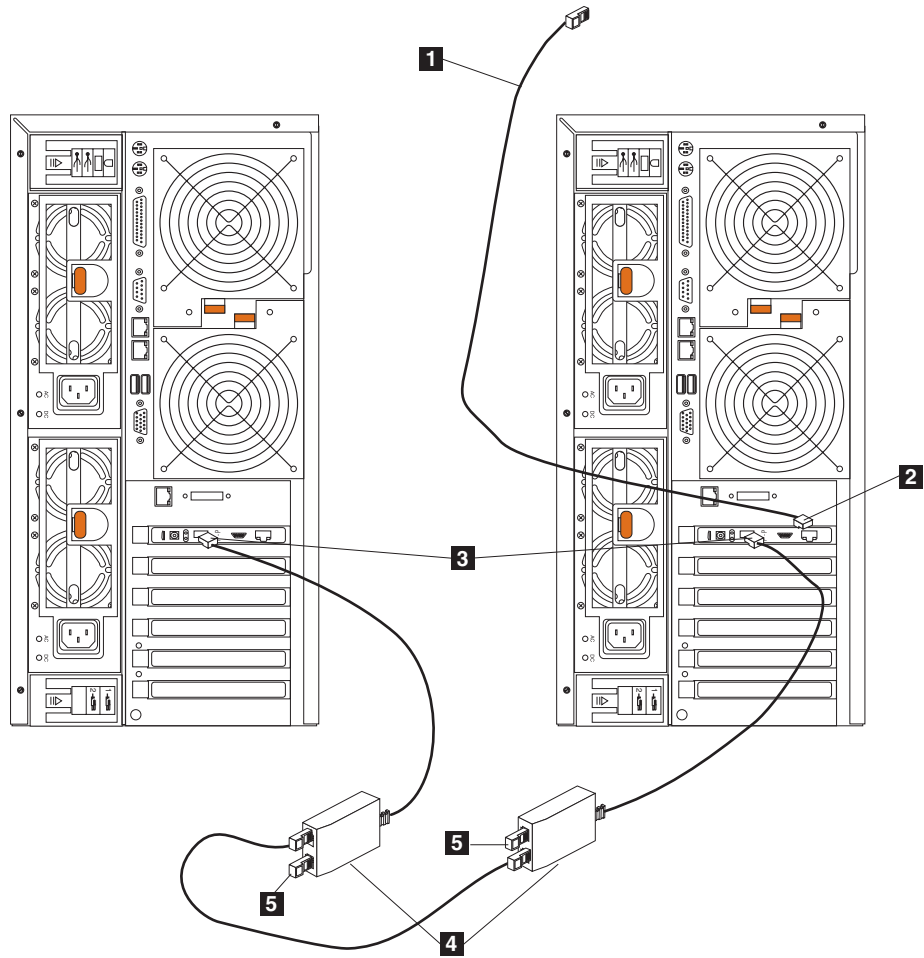


Figure 111. Connecting two Model 25Ts using two Remote Supervisor Adapters

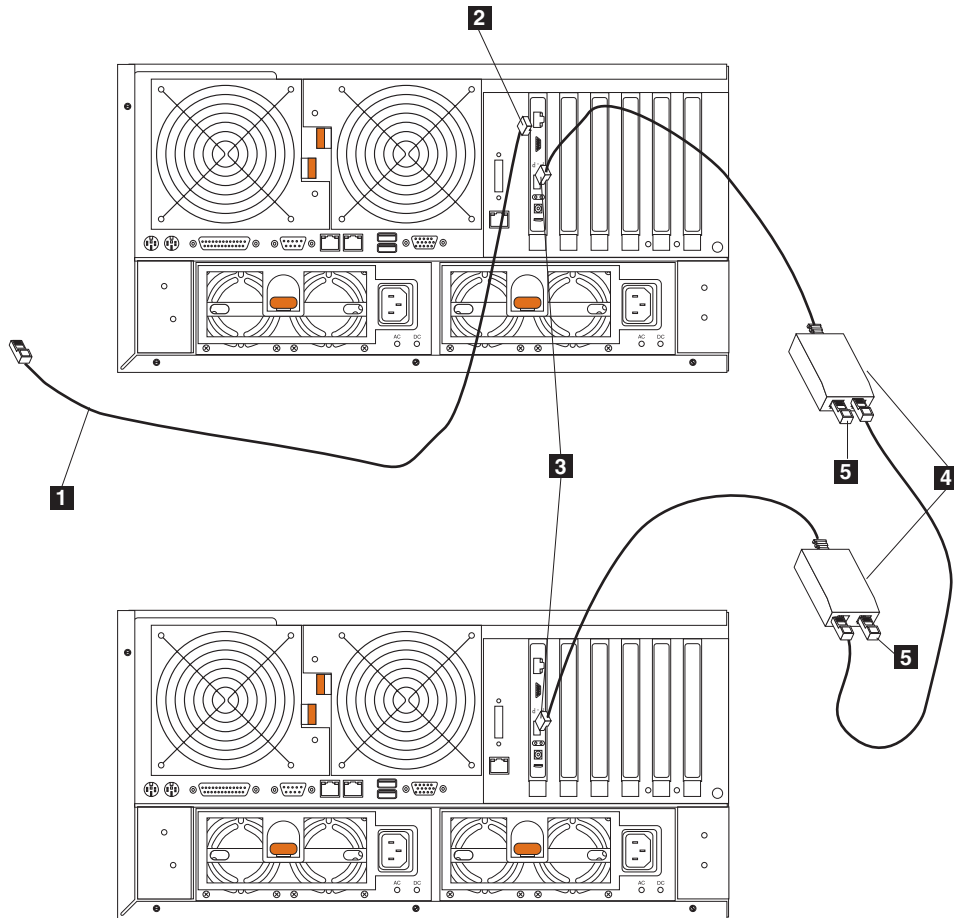


Figure 112. Connecting two Model 25T with the rack-mount conversion features using two Remote Supervisor Adapters

- 1** Ethernet connection to the remote-system-management administrator's system
- 2** Ethernet port on the Remote Supervisor Adapter in right engine
- 3** Peer-to-peer connection on the Remote Supervisor Adapter
- 4** ASM interconnect modules
- 5** Terminator plugs

Attention: When you handle devices sensitive to static electricity, take precautions to avoid damage from static electricity. For details about handling static-sensitive devices, see "Handling electrostatic discharge-sensitive devices" on page 252.

ServeRAID controller

This section contains instructions for replacing any of the ServeRAID controllers, and installing the ServeRAID-4Mx and -4H. The ServeRAID-5i controller can only be installed at the factory.

ServeRAID-4H controller

The ServeRAID-4H controller has four independent SCSI channel connectors: channel 1, channel 2, channel 3, and channel 4. Each of these SCSI channels supports up to 15 physical devices. External channel 1 cannot be used, but

channels 2, 3, and 4 allow you to connect up to three 5194-EXP Storage Expansion Units or two 5194-EXP Storage Expansion Units and an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit.

Note: The battery-backup cache protects the data being stored in the ServeRAID cache memory during a power outage or failure when using the write-back mode.

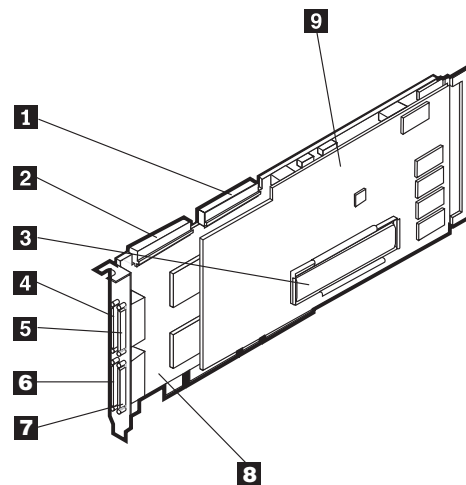


Figure 113. ServeRAID-4H controller

- | | |
|---|----------------------|
| 1 | Internal channel 2 |
| 2 | Internal channel 1 |
| 3 | Battery backup cache |
| 4 | External channel 1 |
| 5 | External channel 2 |
| 6 | External channel 3 |
| 7 | External channel 4 |
| 8 | Base card |
| 9 | Daughter card |

In the ServeRAID-4H controller, an internal SCSI device is attached to channel 1. This means you cannot attach an external SCSI device to channel 1. If the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit option is installed, then you cannot attach an external SCSI device to external channel 2.

Replacing the ServeRAID-4H controller: During the installation, you might need a small, flat-blade and a small, Phillips-head screwdriver.

Note: If you are replacing a ServeRAID-4H controller with a ServeRAID-4Mx controller, you will need two ServeRAID-4Mx controllers to provide the same number of SCSI channels as the ServeRAID-4H.

To replace an existing ServeRAID controller with the ServeRAID-4H controller:

1. Review the *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance. Disconnect all power cords and network cables from the appliance.

3. Remove the engine cover (see “Removing the cover” on page 93).
4. The ServeRAID-4H is always installed in slot 4, and the ServeRAID-4H must be the only ServeRAID controller in the engine. Be sure to check the instructions included with the adapter for any additional requirements or restrictions.
5. Remove the old ServeRAID controller from slot 4:
 - a. If you are replacing a ServeRAID-4Mx or ServeRAID-4H controller, disconnect any cables from the ServeRAID controller in slot 4.
 - b. If the ServeRAID controller that you are replacing is a ServeRAID-5i, remove the cables connected from SCSI connectors J44 and J51 on the system board to the DASD backplane and optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, respectively.
 - c. Remove the retaining screw from the top of the adapter near the expansion slot.
 - d. Remove the old adapter using Figure 114 and Figure 115 on page 183 as reference.

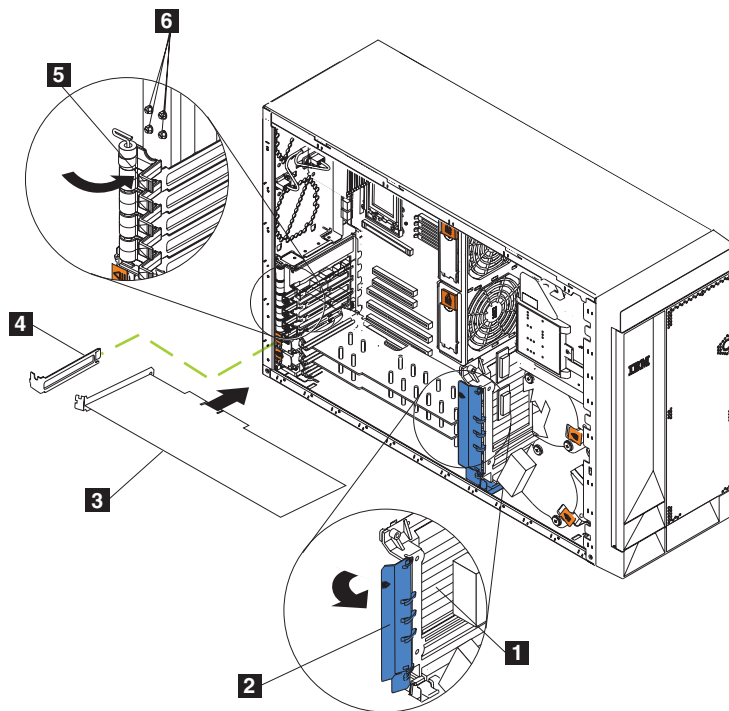


Figure 114. Replacing a ServeRAID controller (Model 25T)

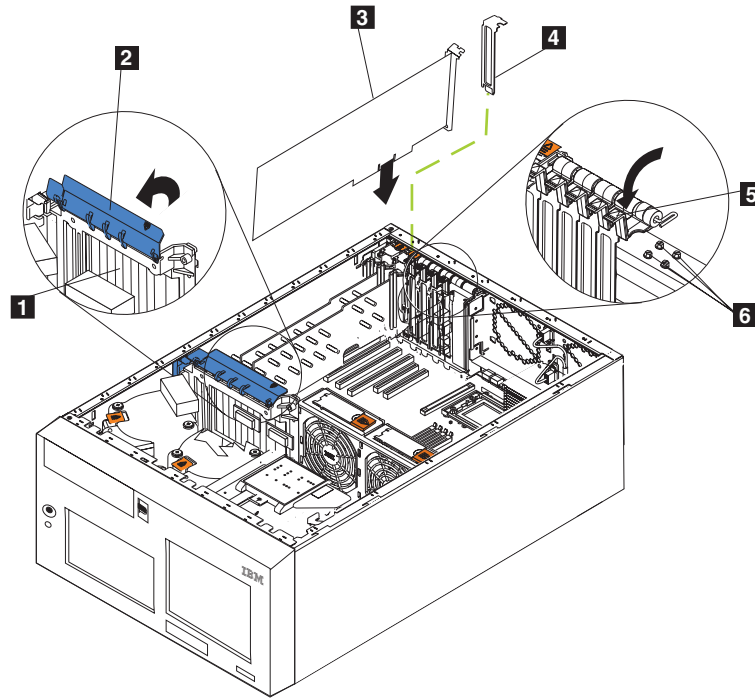


Figure 115. Replacing a ServeRAID controller (Model 25T with the rack-mount conversion feature)

- 1** Adapter-support bracket
- 2** Adapter-retention clip
- 3** Adapter
- 4** Expansion-slot cover
- 5** Adapter-retention latch
- 6** Backup expansion-slot screws

- e. Open the adapter-retention clip.
- f. Open the adapter-retention latch covering the controller in slot 4.
- g. Carefully pull the ServeRAID controller from the PCI slot.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

- 6. If you are replacing a defective daughter card on the ServeRAID-4H controller:
 - a. Remove and retain the eight screws that secure the daughter card to the base card.
 - b. Remove the daughter card.
 - c. Touch the static-protective package containing the daughter card to an unpainted metal expansion-slot cover on the appliance. This discharges any static electricity from the package and from your body.

- d. Remove the daughter card from the static-protective package, holding the card by the edges. Do not touch any exposed components or gold-edge connections on the card.
- e. Carefully attach the replacement daughter card to the base card using the eight screws removed in step 6a on page 183.
7. Touch the static-protective package containing the ServeRAID controller to an unpainted metal expansion-slot cover on the appliance. This discharges any static electricity from the package and from your body.
8. Remove the controller from the static-protective package, holding the controller by the edges. Do not touch any exposed components or gold-edge connections on the controller.
9. For the procedure to install the controller, refer to “Adapters” on page 105, then return here to cable the controller.
10. Connect one end of the 68-pin SCSI cable (part number 37L0349) to internal channel 1 on the new controller.

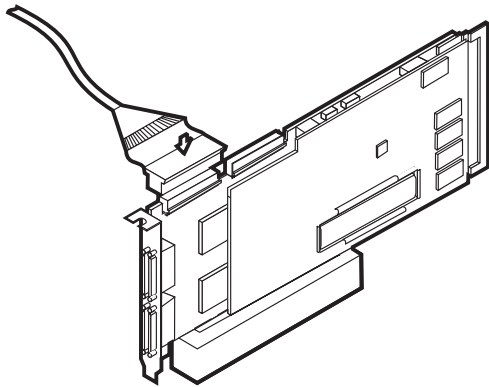


Figure 116. Connecting a SCSI cable to internal channel 1 on the ServeRAID-4H controller

11. Route the cable through the adapter-support bracket (see Figure 47 on page 112) and connect the other end of the SCSI cable to the hard disk drive SCSI connector (J9) on the engine's DASD backplane. See Figure 117 on page 185 or Figure 118 on page 185 for the location of the backplane.

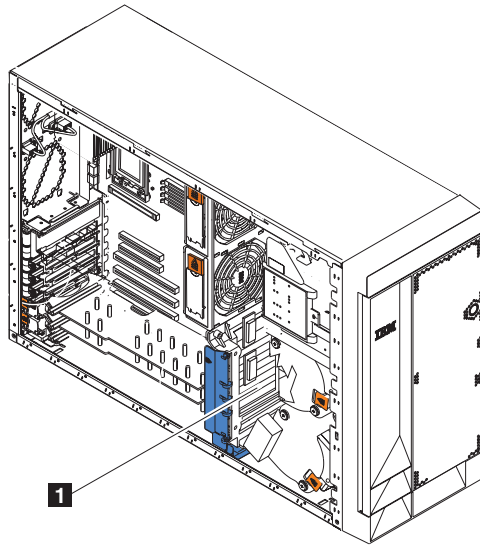


Figure 117. Location of the engine's DASD backplane (Model 25T)

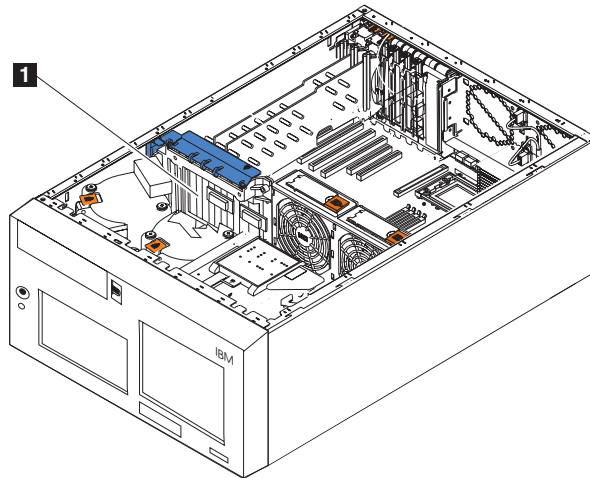


Figure 118. Location of the engine's DASD backplane (Model 25T with the rack-mount conversion feature)

1 DASD backplane

12. If you have an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed:
 - a. Attach one end of a SCSI cable (part number 37L0349) to internal channel 2 on the ServeRAID-4H controller.
 - b. Route the cable through the adapter-support bracket (see Figure 47 on page 112) and connect the other end of the SCSI cable to the SCSI connector on the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit backplane.
 - c. If not already connected, connect the unconnected end of the SCSI cable (part number 31P6078) to the system-board connector J51. This cable is attached to the SCSI port at the rear of the engine.

13. If you have hard disk drives to install, install them now.

Note: The ServeRAID controllers use SCSI ID 7.

14. Install the engine cover (see “Replacing the cover, door, and bezel” on page 198).

15. Reconnect the power cords and external cables (see “Connecting external devices” on page 194).

ServeRAID-5i controller

The ServeRAID-5i controller has two independent SCSI channels. One channel controls the six hot-swap drive bays in the engine. The other channel can control either the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit if installed, or the 5194-EXP Storage Expansion Unit. The external SCSI device can be controlled only if the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit is not installed and the SCSI port in the rear of the machine is connected to J51 on the system board.

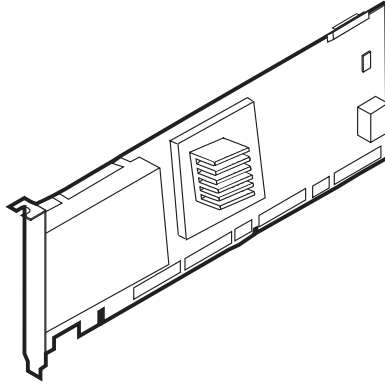


Figure 119. ServeRAID-5i controller

You can attach an external device only to the SCSI connection on the rear of the engine.

Replacing the ServeRAID-5i controller: During the installation, you might need a small, flat-blade and a small, Phillips-head screwdriver.

To replace the ServeRAID-5i controller:

1. Review the *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance. Disconnect all power cords and network cables from the appliance.
3. Remove the engine cover (see “Removing the cover” on page 93).
4. The ServeRAID-5i can only be installed in slot 4. Be sure to check the instructions included with the adapter for any requirements or restrictions.
5. Remove the defective ServeRAID-5i controller from slot 4:
 - a. Remove the retaining screw from the top of the adapter near the expansion slot.
 - b. Remove the defective ServeRAID-5i controller using Figure 114 on page 182 and Figure 115 on page 183 as a reference.
 - c. Open the adapter-retention clip.
 - d. Open the adapter-retention latch covering the controller in slot 4.
 - e. Carefully pull the ServeRAID controller from the PCI slot.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

6. Touch the static-protective package containing the ServeRAID controller to an unpainted metal expansion-slot cover on the appliance. This discharges any static electricity from the package and from your body.
7. Remove the controller from the static-protective package, holding the controller by the edges. Do not touch any exposed components or gold-edge connections on the controller.
8. For the procedure to install the controller, refer to “Adapters” on page 105.
9. If you have hard disk drives to install, install them now.

Note: The ServeRAID controllers use SCSI ID 7.

10. Install the engine cover (see “Replacing the cover, door, and bezel” on page 198).
11. Reconnect the power cords and external cables (see “Connecting external devices” on page 194).

ServeRAID-4Mx controller

The ServeRAID-4Mx controller has two independent SCSI channel connectors: channel 1 and channel 2. Each of these channels supports up to 15 physical devices. Channel 2 is the only available channel when one ServeRAID-4Mx controller is the only RAID controller installed and there is no optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed. If the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit is installed, no external channels are available if there is only one ServeRAID-4Mx controller in the engine. Both channels can be used externally to attach 5194-EXP Storage Expansion Units if there is another ServeRAID-5i or -4Mx controller installed and the other controller is used to control the drives inside the engine (and optionally the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit). See Table 34 on page 203 for the number of possible external attachments.

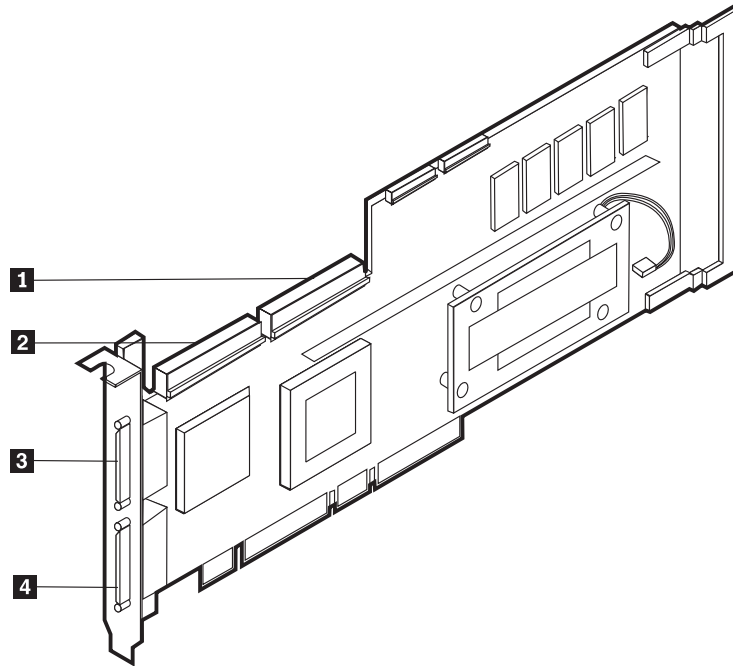


Figure 120. ServeRAID-4Mx controller

- | | |
|----------|--------------------|
| 1 | Internal channel 1 |
| 2 | Internal channel 2 |
| 3 | External channel 2 |
| 4 | External channel 1 |

Replacing the ServeRAID-4Mx controller: During the installation, you might need a small, flat-blade and a small, Phillips-head screwdriver.

To replace the ServeRAID-4Mx controller:

1. Review the *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance. Disconnect all power cords and network cables from the appliance.
3. Remove the engine cover (see “Removing the cover” on page 93).
4. Determine whether you will be replacing the controller in slot 3 or 4.
5. Remove the defective ServeRAID controller from the appropriate slot:
 - a. If you are replacing a ServeRAID-4Mx or ServeRAID-4H controller, disconnect any cables from the ServeRAID controller.
 - b. If the ServeRAID controller that you are replacing is a ServeRAID-5i, remove the cables connected from SCSI connectors J44 and J51 on the system board to the DASD backplane and optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, respectively.
 - c. Remove the retaining screw from the top of the adapter near the expansion slot.
 - d. Remove the adapter using Figure 114 on page 182 and Figure 115 on page 183 as a reference.
 - e. Open the adapter-retention clip.
 - f. Open the adapter-retention latch covering the controller.
 - g. Carefully pull the ServeRAID controller from the PCI slot.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

6. Touch the static-protective package containing the new ServeRAID controller to an unpainted metal expansion-slot cover on the appliance. This discharges any static electricity from the package and from your body.
7. Remove the controller from the static-protective package, holding the controller by the edges. Do not touch any exposed components or gold-edge connections on the controller.
8. For the procedure to install the controller, refer to “Adapters” on page 105, then return here to cable the controller.
9. If the controller is the primary controller (in slot 4 and is the only controller, or in slot 3 with an additional ServeRAID-4Mx in slot number 4):
 - a. Connect one end of the 68-pin SCSI cable (part number 37L0349) to internal channel 1 on the new controller.
 - b. If necessary, route the cable through the adapter-support bracket (see Figure 47 on page 112) and connect the other end of the SCSI cable to the hard disk drive SCSI connector (J9) on the engine’s DASD backplane.

- c. If you have an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed:
 - 1) Attach one end of a SCSI cable (part number 37L0349) to internal channel 2 on the ServeRAID-4Mx controller.
 - 2) If necessary, route the cable through the adapter-support bracket (see Figure 48 on page 113) and connect the other end of the SCSI cable to the SCSI connector on the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit backplane.
10. If the controller is a secondary controller (in slot 4 with an additional ServeRAID-4Mx in slot 3), no internal cabling is required.
11. If you have hard disk drives to install, install them now.

Note: The ServeRAID controllers use SCSI ID 7.

12. Install the engine cover (see “Replacing the cover, door, and bezel” on page 198).
13. Reconnect the power cords and external cables (see “Connecting external devices” on page 194).

Installing a ServeRAID-4Mx controller: During the installation, you might need a small, flat-blade and a small, Phillips-head screwdriver.

To install a new ServeRAID-4Mx controller:

1. Review the *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance. Disconnect all power cords and network cables from the appliance.
3. Remove the engine cover (see “Removing the cover” on page 93).
4. Determine whether you will be installing the controller in slot 3 or 4:
 - If there is already a ServeRAID-5i controller installed in slot 4, then you will install the ServeRAID-4Mx into slot 3. Continue with step 6 on page 193.
 - If there is already a ServeRAID-4Mx in slot 4, then you will install the ServeRAID-4Mx into **slot 4**. Continue with step 5.
 - If this is the first ServeRAID controller installed into this engine, then it will be installed in slot 4. Continue with step 6 on page 193.
5. Move the ServeRAID-4Mx controller from slot 4 to slot 3:
 - a. Remove the retaining screw from the top of the adapter near the expansion slot.
 - b. Remove the adapter using Figure 114 on page 182 and Figure 115 on page 183 as a reference.
 - c. Open the adapter-retention clip.
 - d. Open the adapter-retention latch covering the controller.
 - e. Carefully pull the ServeRAID-4Mx controller from the slot 4.
 - f. Carefully insert the ServeRAID-4Mx controller in slot 3.
 - g. Secure the adapter in slot 3 using the same screw that secured it in slot 4.
 - h. Close the adapter-retention latch over slot 3. Continue with step 6 on page 193.

Attention: When you handle devices that are sensitive to electrostatic discharge (ESDs), take precautions to avoid damage from static electricity. For details on handling these devices, refer to “Handling electrostatic discharge-sensitive devices” on page 252.

6. Touch the static-protective package containing the new ServeRAID-4Mx controller to an unpainted metal expansion-slot cover on the appliance. This discharges any static electricity from the package and from your body.
 7. Remove the controller from the static-protective package, holding the controller by the edges. Do not touch any exposed components or gold-edge connections on the controller.
 8. For the procedure to install the controller, refer to “Adapters” on page 105, then return here to cable the controller.
 9. If you moved the ServeRAID-4Mx controller from slot 4 to slot 3, then no additional internal cabling is required. Continue with step 11.
 10. If the controller is the primary controller (in slot 4 and is the only controller):
 - a. Connect one end of the 68-pin long SCSI cable (part number 37L0349) to internal channel 1 on the new controller.
 - b. Route the cable through the adapter-support bracket (see Figure 47 on page 112) and connect the other end of the SCSI cable to the hard disk drive SCSI connector (J9) on the engine’s DASD backplane.
 - c. If you have an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed:
 - 1) Attach one end of a SCSI cable (part number 37L0349) to internal channel 2 on the ServeRAID-4Mx controller.
 - 2) Route the cable through the adapter-support bracket (see Figure 48 on page 113) and connect the other end of the SCSI cable to the SCSI connector on the IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit backplane.
 11. If you have hard disk drives to install, install them now.
- Note:** The ServeRAID controllers use SCSI ID 7.
12. Install the engine cover (see “Replacing the cover, door, and bezel” on page 198).
 13. Reconnect the power cords and external cables (see “Connecting external devices” on page 194).

Connecting external devices

The ServeRAID-5i and the ServeRAID-4Mx each support one external connection if it is the only installed controller and there is no optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed. For the number of external connections available with combinations of controllers, see Table 34 on page 203.

Attaching external SCSI devices to a ServeRAID-4H controller: To attach SCSI devices to an external channel connector on the ServeRAID-4H controller:

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to an external channel connector (channel 2, 3, or 4 if there is no IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, channel 3 or 4 if there is a IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed) on the ServeRAID controller. (See Figure 113 on page 181 for the channel connector locations.)

Note: Do not connect a SCSI cable to external channel connector 1.

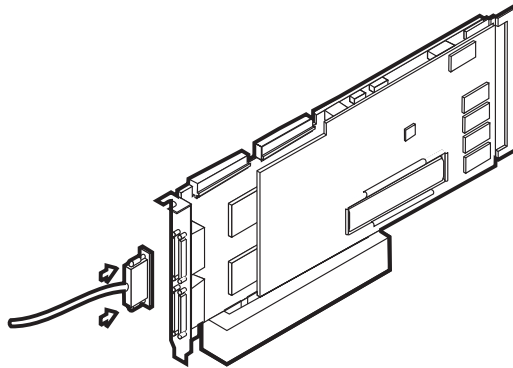


Figure 121. Connecting a ServeRAID-4H controller external channel connector

2. Connect the other end of the SCSI cable to the external SCSI device.
3. Continue with “Updating BIOS and firmware” on page 195.

Attaching external SCSI devices to a ServeRAID-4Mx controller: To attach SCSI devices to an external channel connector on the ServeRAID-4Mx controller:

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to an external channel connector (channel 2 if there is no IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, channel 1 or 2 on a second ServeRAID-4Mx if there is a IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed) on the primary or secondary ServeRAID controller. (See Figure 120 on page 189 for the channel connector locations.)

Note: Do not connect a SCSI cable to external channel connector 1.

2. Connect the other end of the SCSI cable to the external SCSI device.
3. Continue with “Updating BIOS and firmware” on page 195.

Attaching external SCSI devices to a ServeRAID-5i controller: To attach SCSI devices to an external channel connector on the ServeRAID-5i controller:

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to the appropriate SCSI connector (the connector on the rear of the engine if there is no IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, channel 1 or 2 on a second ServeRAID-4Mx if there is a IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed) on the primary or secondary ServeRAID controller.
2. Connect the other end of the SCSI cable to the external SCSI device.
3. Continue with “Updating BIOS and firmware”.

Updating BIOS and firmware

Before configuring the ServeRAID controller, you must have the latest BIOS and firmware installed on your appliance. To update the BIOS and firmware:

1. Attach a keyboard, mouse, and monitor to the engine.
2. Get the latest ServeRAID BIOS from www.ibm.com/storage/support/. Follow the instructions for creating diskettes.
3. Boot the diskettes as directed and follow the on-screen instructions.
4. Remove the diskette.
5. Reboot the appliance.

Configuring the ServeRAID Controller

To configure a ServeRAID Controller:

1. After you reboot the appliance in step 5 of “Updating BIOS and firmware”, a ServeRAID BIOS message may appear. If the BIOS detects a mismatch in the configuration, it shows a status of Fail and prompts you to press a function key to continue. Press **F10** to continue without changing the configuration.
2. When prompted to start the Mini-Configuration Program, press **Ctrl+I**.
3. Select **Advanced functions**.
4. Select **Copy the configuration from drives to the controller**.
5. Confirm the action by typing **y**. Wait until prompted to Press any key to continue.
6. From the **Advanced functions** menu, select **Configure BIOS settings**.
7. Select **Bypass read/verify operations** and ensure that it says Yes. If it says No, then press **Enter** to change the option to Yes.
8. Select **Save configuration to the ServeRAID controller**.
9. Select **Exit**; then, select **Exit** again. This will terminate the Mini-Configuration program.
10. Press **Ctrl+Alt+Del** to reboot the appliance.

System board

To remove the system board:

1. Review the safety precautions listed in *IBM TotalStorage Network Attached Storage Translated Safety Notices*, which can be found on the Documentation CD that was shipped with your appliance.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices and disconnect all external cables and power cords.

Note: When replacing the system board, you must either update the system with the latest firmware or restore the pre-existing firmware that the customer provides on a diskette or CD image.

3. Lay the engine so that the cover is facing up.
4. Remove the cover and bezel (see “Removing the cover” on page 93 and “Removing the bezel” on page 96).
5. Remove all adapters and spacers (see “Adapters” on page 105).
6. Remove the two central fans (see “Hot-swap fan” on page 132).
7. Remove the plastic baffle.
8. Remove the adapter-support bracket (see “Adapter-support bracket” on page 101).
9. Disconnect all cables from the system board.

Note: Place all disconnected cables carefully to the side so that they do not come in contact with the center of the system board.

10. Remove all microprocessors and VRMs and set them aside on the static-protected surface for reinstallation (see “Removing the microprocessor” on page 156).
11. Remove the DIMMs and set them aside on a static-protected surface for reinstallation (see “Memory modules” on page 148).

Note: When you set the DIMMs aside, be sure to keep track of the slots they belong to; DIMMs must be installed in pairs of the same size, speed, type, and technology.

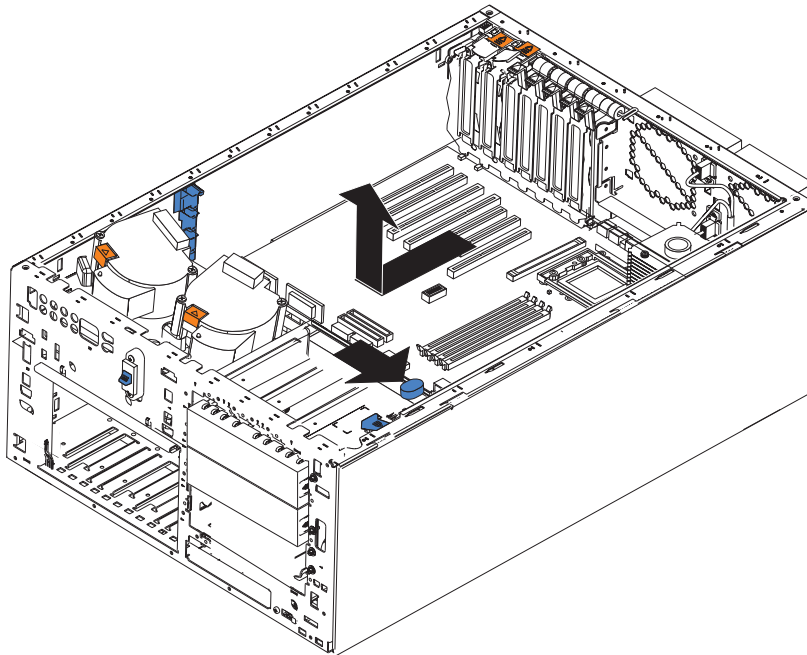


Figure 122. Removing the system board

12. Push the system-board release latch toward the side of the system board where the DIMM slots are located to release the board.

Note: The board will not be released until the latch is pushed to be approximately parallel with the DIMM slots.

13. Carefully lift out the system board.
14. Lay the replacement system board on the engine floor with the release lever in the open position.
15. Slide the lever toward the side of the system board with the adapter slots until the system board is secure.
16. Reverse steps 5 on page 196 through 11 on page 196 to replace the removed components.

Note: When replacing the components in the engine, be sure to route all cables so that they are not exposed to undue pressure.

17. Replace the cover (see “Replacing the cover, door, and bezel” on page 198) and external cables.

Replacing the cover, door, and bezel

Installing the cover

Model 25T:

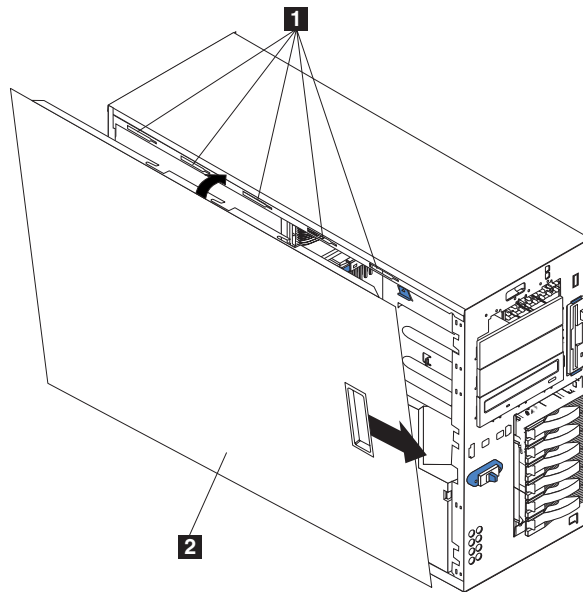


Figure 123. Replace the Model 25T cover

- 1** Slots
- 2** Left-side cover

To replace the appliance left-side cover:

1. Verify that all cables, adapters, and other components are installed and seated correctly, and that there are no loose tools in the engine.
2. Place the bottom lip of the cover over the bottom edge of the engine chassis.
3. Rotate the cover to a vertical position, inserting the tabs at the top of the cover into the matching slots in the engine chassis.
4. Slide the cover until it clicks into place.
5. Reconnect any cables to the back of the engine.
6. Plug the power cords into a grounded electrical outlet.

Model 25T with the rack-mount conversion feature:

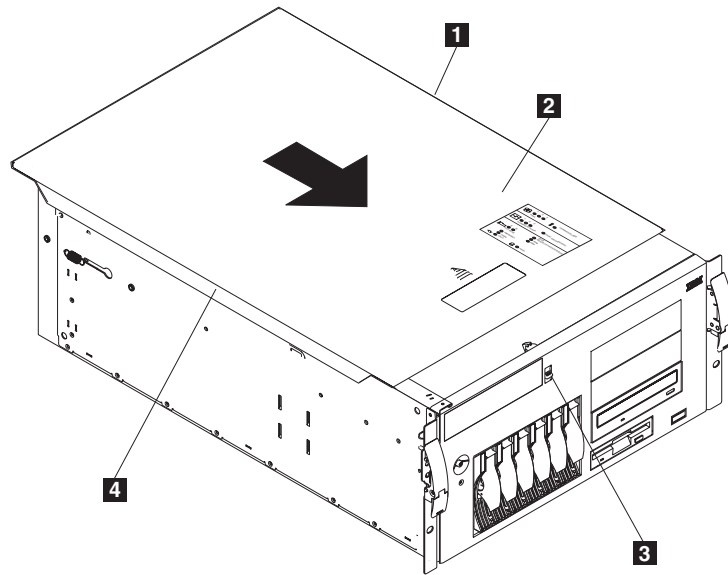


Figure 124. Replacing the Model 25T with the rack-mount conversion feature cover

- | | |
|----------|---------------------|
| 1 | Flange |
| 2 | Cover |
| 3 | Cover-release latch |
| 4 | Flange |

To replace the appliance top cover:

1. Verify that all cables, adapters, and other components are installed and seated correctly, and that there are no loose tools in the engine.
2. Place the cover-release latch in the open (up) position.
3. Place the lip of the left side of the cover over the top-left edge of the engine chassis.
4. Rotate the cover to a horizontal position, inserting the tabs at the right side of the cover in the matching slots in the engine chassis.
5. Slide the cover forward until it locks in place.
6. Reconnect any cables to the back of the engine.
7. Plug the power cords into a grounded electrical outlet.

Installing the door

To install the appliance door on the Model 25T:

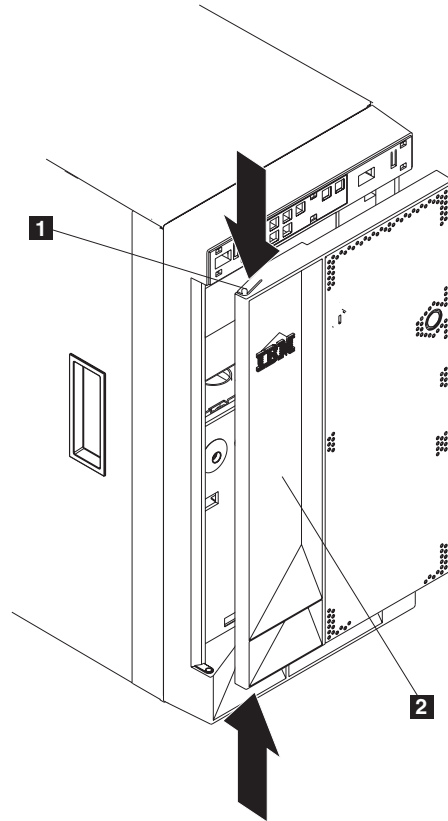


Figure 125. Installing the door

- 1** Flange
- 2** Door

1. Review the information in “Before you begin” on page 73.
2. Set the door on the bottom hinge.
3. Press the flange on the top downward while pressing the top of the door toward the appliance, until the flange connects with the top hinge. Then, release the flange.
4. Close and lock the engine door.

Attention: Be sure to maintain a clearance of at least 100 mm (4 in.) at the front and rear of the appliance to allow for air circulation.

Installing the bezel

Model 25T:

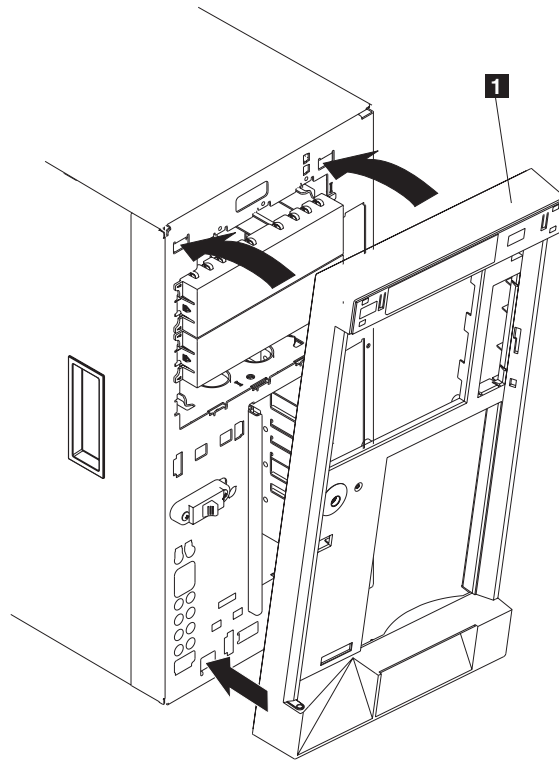


Figure 126. Replacing the Model 25T bezel

1 Bezel

To replace the bezel:

1. Review the information in “Before you begin” on page 73.
2. Place the tabs at the bottom edge of the bezel in the slots at the bottom front of the engine.
3. Press the top of the bezel toward the engine until it clicks into place.

Model 25T with the rack-mount conversion feature:

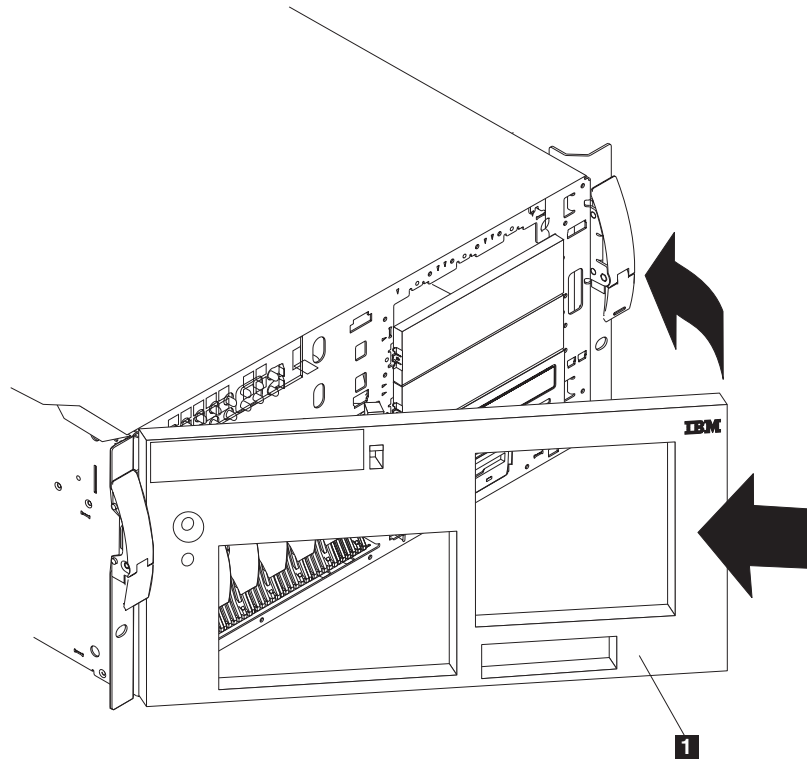


Figure 127. Replacing the Model 25T with the rack-mount conversion feature bezel

1 Bezel

To replace the bezel:

1. Review the information in “Before you begin” on page 73.
2. Place the two tabs on the bottom of the bezel in the matching holes on the engine chassis.
3. Press the top of the bezel toward the engine until the bezel clicks into place.

5194-EXP storage unit

You can attach up to three 5194-EXP storage units to the Model 25T and Model 25T with the rack-mount conversion feature, depending on the options installed. Use Table 34 to determine how many 5194-EXP storage units you can attach.

Table 34. Number of supported 5194-EXP storage units

ServeRAID controller combination	Number of 5194-EXP storage units supported without the optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit	Number of 5194-EXP storage units supported with the optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit
One IBM ServeRAID-5i Ultra320 SCSI Controller only	1	0
One IBM ServeRAID-4Mx Ultra160 SCSI Controller only	1	0
One IBM ServeRAID-4H Ultra160 SCSI Controller only	3	2
One IBM ServeRAID-5i Ultra320 SCSI Controller and one IBM ServeRAID-4Mx Ultra160 SCSI Controller	3	2
Two IBM ServeRAID-4Mx Ultra160 SCSI Controllers	3	2

For detailed installation and cabling instructions for the 5194-EXP storage unit, refer to the *IBM TotalStorage NAS 200 Storage Unit Model EXP Installation and User's Guide*.

IBM ServeRAID-4H Ultra160 SCSI Controller

To attach 5194-EXP storage units using a IBM ServeRAID-4H Ultra160 SCSI Controller:

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to the appropriate external channel connector on the IBM ServeRAID-4H Ultra160 SCSI Controller.

Important: For the ServeRAID-4H, channel 1 is reserved for internal hard disk drives. Connect the first 5194-EXP storage unit to channel 2, the second to channel 3, and the third to channel 4. If there is an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, then channel 2 is reserved for it. If there is an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, connect the first 5194-EXP storage unit to channel 3, the second to channel 4.

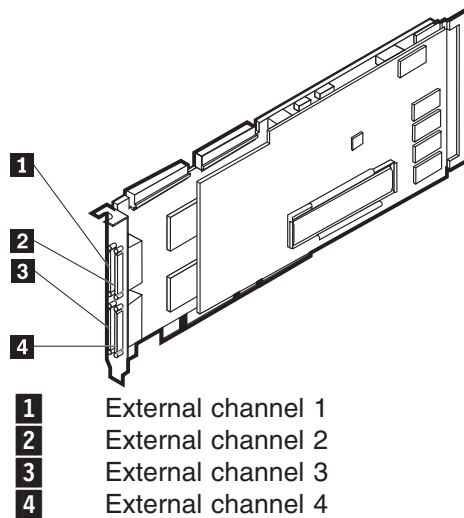


Figure 128. External channels of the ServeRAID-4H controller

2. Connect the other end of the SCSI cable to the 5194-EXP storage unit.

IBM ServeRAID-4Mx Ultra160 SCSI Controller

To attach 5194-EXP storage units using the IBM ServeRAID-4Mx Ultra160 SCSI Controller:

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to external channel 2 of the IBM ServeRAID-4Mx Ultra160 SCSI Controller.

Important: Channel 1 is reserved for internal hard disk drives. Connect the 5194-EXP storage unit to external channel 2 of the ServeRAID-4Mx controller. If there is an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, then channel 2 is reserved for it. If there is an IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit, there must be another ServeRAID-5i or -4Mx controller installed to attach a 5194-EXP storage unit.

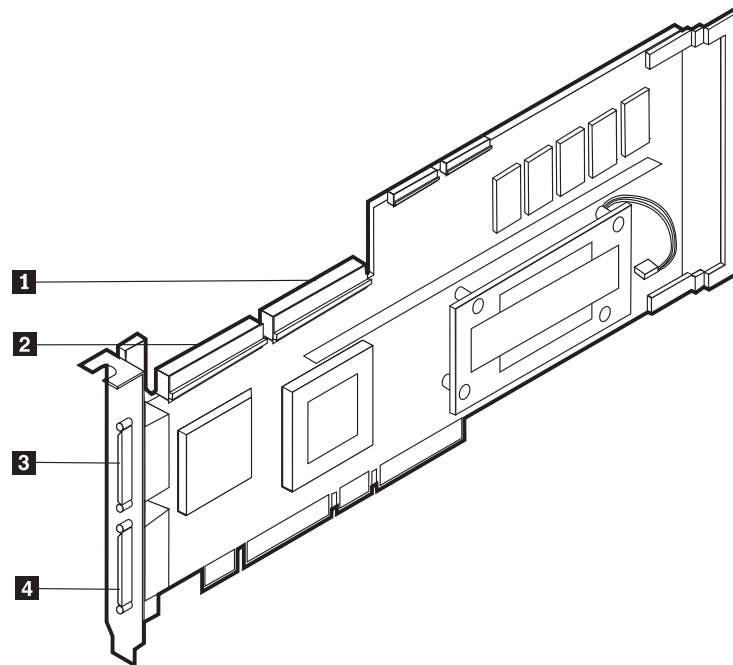


Figure 129. Internal and external channels of the ServeRAID-4Mx controller

1	Internal channel 1
2	Internal channel 2
3	External channel 2
4	External channel 1

2. Connect the other end of the SCSI cable to the 5194-EXP storage unit.

IBM ServeRAID-5i Ultra320 SCSI Controller

To attach 5194-EXP storage units using the IBM ServeRAID-5i Ultra320 SCSI Controller:

Important: Connect the 5194-EXP storage unit to the SCSI port on the rear of the engine. If there is an optional IBM Netfinity 3-Pack Ultra320 Hot-Swap Expansion Kit installed, there must be another ServeRAID-4Mx controller installed to attach a 5194-EXP storage unit.

1. Connect one end of a 68-pin very-high-density connector interface (VHDCI) SCSI cable to the SCSI connector on the rear of the engine.
2. Connect the other end to the 5194-EXP storage unit.

Chapter 6. Configuring the appliance

The following configuration programs are provided with your appliance:

Note: Using these utilities requires the attachment of a monitor, keyboard, and mouse prior to powering on the appliance.

- **Configuration/Setup Utility**

The Configuration/Setup Utility is part of the basic input/output system (*BIOS*) that comes with each appliance. Use this program to configure serial- and parallel-port assignments, change interrupt request (IRQ) settings, change the drive startup sequence, set the date and time, and set passwords. See “Using the Configuration/Setup Utility program” for more information.

- **SCSISelect Utility**

Use this program to configure the devices attached to the integrated SCSI controller. See “Using the SCSISelect Utility program” on page 213 for more information.

- **ServeRAID programs**

The ServeRAID programs come with the appliance. You must use the ServeRAID Configuration program to define and configure your disk-array subsystem. This program is on a CD that is included with the appliance.

Using the Configuration/Setup Utility program

This section provides the instructions needed to start the Configuration/Setup Utility program and descriptions of the menu choices available.

Starting the Configuration/Setup Utility program

To start the Configuration/Setup Utility program:

1. Power ON the appliance and watch the display screen.
2. When the message Press F1 for Configuration/Setup appears, press **F1**.

Note: If you have set both levels of passwords (user and administrator), you must enter the administrator password to access the full Configuration/Setup menu.

3. Follow the instructions that appear on the screen.

The BIOS has set default values for all configuration settings. You should only change settings when instructed to do so by service. You can restore the default settings by selecting the *Load Defaults* selection toward the bottom of the Configuration/Setup Utility menu.

Choices available from the Configuration/Setup main menu

From the Configuration/Setup Utility main menu, you can select settings that you want to change. The Configuration/Setup Utility main menu is similar to the one shown in Figure 130.

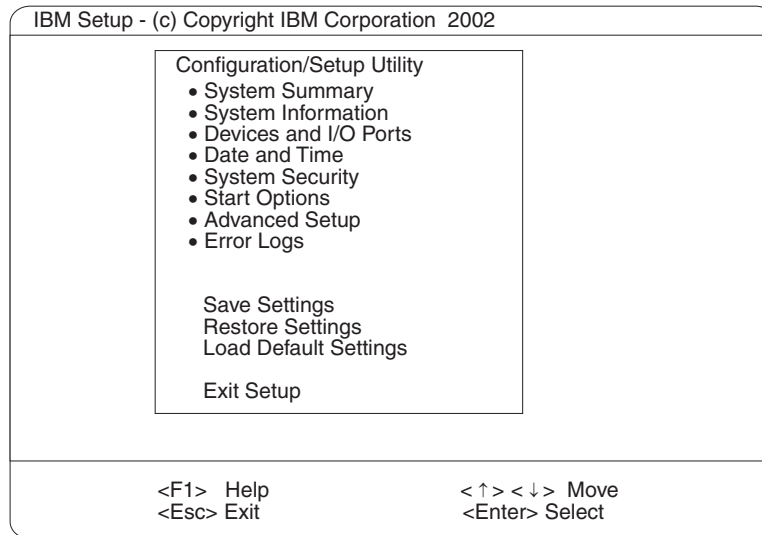


Figure 130. Configuration/Setup Utility main menu

Notes:

1. You can press F1 to display Help information for a selected menu item.
2. The choices on some menus might differ slightly, depending on the BIOS version in your server.

Selections available from the main menu are as follows:

System Summary

Select System Summary to display configuration information. This information includes the type and speed of the microprocessors and the amount of memory installed.

Changes that you make to configuration settings appear on this summary panel. You cannot edit the fields.

This choice appears on both the full and limited Configuration/Setup Utility menus.

System Information

Select System Information to display information about each appliance. Changes that you make on other menus might appear on this summary screen. You cannot edit any fields. The System Information choice appears only on the full Configuration/Setup Utility main menu.

- **System Card Data**

Select System Card Data to view vital product data (VPD) for some appliance components.

- **Product Data**

Select Product Data to view system information, such as the machine type and model, the appliance serial number, and the revision level or issue date of the BIOS stored in the flash electronically erasable programmable ROM (EEPROM).

Devices and I/O Ports

Select Devices and I/O Ports to view or change the assignments for devices and input/output ports. This choice appears only on the full Configuration/Setup Utility main menu.

Date and Time

Select Date and Time to set the system date and time, and to change the system time sent to the Configuration/Setup Utility (service processor) when the server is started. This choice appears only on the full Configuration/Setup Utility main menu.

The system time is in a 24-hour format: hour:minute:second.

You can set a time delta to be added or subtracted from the system time that is sent to the service processor (Configuration/Setup Utility) each time the server is started. Use the number keys to enter the hours and minutes, and + or – to add or subtract from the system time. If you want the system-clock time to be the same as the Configuration/Setup Utility clock time, leave the value set at its default of 0.

System Security

Select System Security to set passwords or a system owner's name. This choice appears only on the full Configuration/Setup Utility main menu.

You can implement two levels of password protection:

- **Power-on Password**

Select Power-on Password to set or change a power-on password. See "Using passwords" on page 212 for more information.

- **Administrator Password**

Select Administrator Password to set or change an administrator password.

Attention: If an administrator password is set and then forgotten, it **cannot** be overridden or removed. You must replace the system board.

The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords, and allow a power-on password to be changed by the user.

See "Using passwords" on page 212 for more information.

- **System Owner's Name**

Select System Owner's Name to specify a system owner's name, which will display during POST. You can remove or change the name only from the System Security menu. You can use any combination of up to 16 characters for the system owner's name.

Start Options

Select Start Options to view or change the start options. This selection appears only on the full Configuration/Setup Utility main menu. Start options take effect when you start your appliance.

You can select keyboard operating characteristics, such as the keyboard speed. You also can specify whether the keyboard number lock starts on or off. You also can enable the appliance to run without a diskette drive, monitor, or keyboard.

The appliance uses a startup sequence to determine the device from which the operating system loads. For example, you can define a startup sequence that checks for a startable diskette in the diskette drive, checks the hard disk drive in bay 1, and then checks a network adapter.

You also can select which PCI SCSI adapter is given boot precedence. The first drive that is attached to the selected adapter will be assigned drive number 80L and the operating system will start from that drive. The default for boot precedence is Disabled. The range of choices depends upon the number of PCI SCSI adapters installed in the appliance.

You can enable a virus-detection test that checks for changes in the master boot record at startup. You also can choose to run POST in the enhanced mode or the quick mode.

Advanced Setup

Select Advanced Setup to change values for advanced hardware features, such as cache control, and PCI configuration. This selection appears only on the full Configuration/Setup Utility main menu.

A warning message appears above the selections on this menu to alert you that the system might malfunction if these options are configured incorrectly. Follow the instructions on the screen carefully.

- **Processor Serial Number Access**

Select Processor Serial Number Access to identify if the microprocessor serial number in the microprocessor is readable.

- **Core Chipset Control**

Select Core Chipset Control to modify settings that control features of the core chip set on the system board.

- **Cache Control**

Select Cache Control to enable or disable the microprocessor cache. In addition, you can define the microprocessor cache type as write-back (WB) or write-through (WT). Selecting write-back mode will provide the maximum system performance.

- **PCI Slot/Device Information**

Select PCI Slot/Device Information to view and identify system resources used by PCI devices. PCI devices automatically communicate with the appliance configuration information. This usually results in automatic configuration of a PCI device.

Attention: You must use the menu selections to save custom settings for the PCI Slot/Device Information choice. The save, restore and load default settings on the main menu of the Configuration/Setup Utility do not save the PCI Slot/Device Information settings.

After making changes, select:

- **Save and exit the PCI Utility** to save the changes and return to the Advanced Setup choice.
- **Exit the PCI Utility without saving changes** to ignore the changes, restore the previous settings, and return to the Advanced Setup menu.

PCI Device Control allows you to enable or disable the integrated SCSI, video, and Ethernet controllers. You can also enable or disable PCI slots from this menu.

- The default setting is Enable for all the controllers and PCI slots. If you select Disable, the system will not configure the disabled device and the operating system will not see the device. (This is equivalent to unplugging the device.)
- If the on-board SCSI controller is disabled and no other controller and mass storage device are installed, operating system startup cannot occur.
- If the video controller is disabled and no video adapter is installed, the appliance will have no video capability. However, switching the appliance off and on three times results in a default startup that enables video again.

- **Memory Settings**

Select Memory Settings to manually disable or enable a bank of memory. If a memory error is detected during POST or memory configuration, the appliance can automatically disable the failing memory bank and continue operating with reduced memory capacity. If this occurs, you must manually enable the memory bank after the problem is corrected.

1. Select **Memory Settings** from the Advanced Setup menu.
2. Use the arrow keys to highlight the bank that you want to enable.
3. Use the arrow keys to select **Enable**.

System Service Processor Settings

Select this to view the interrupt-request setting (IRQ) used by the Configuration/Setup Utility (system service processor). You can then use the arrow keys to select a new IRQ setting for the Configuration/Setup Utility.

Error Logs

Select Event/Error Logs to view or clear error logs.

- Select **Clear error logs** to clear the error or event log.
- Select **POST Error Log** to view the three most recent error codes and messages that the system generated during POST.
- Select **System Event/Error Log** to view the system event/error log. The system event/error log contains all the system error and warning messages that the system has generated. You can use the arrow keys to move between pages in the system event/error log.

Save Settings

Select Save Settings to save your customized settings.

Restore Settings

Select Restore Settings to delete your changes and restore the previous settings.

Load Default Settings

Select Load Default Settings to cancel your changes and restore the factory settings.

Exit Setup

If you have made any changes, the program will prompt you to save the changes or exit without saving the changes.

Using passwords

System Security appears only on the full Configuration/Setup Utility menu. You can implement two levels of protection: power-on password and administrator password.

Power-on password

After you set a power-on password, you can enable the unattended-start mode. This locks the keyboard and mouse but allows the system to start the operating system. The keyboard and mouse remain locked until you enter the correct password.

You can use any combination of up to seven characters (A – Z, a – z, and 0 – 9) for your power-on password. Keep a record of your password in a secure place. If you forget the power-on password, you can regain access to the appliance through one of the following methods:

- If an administrator password is set, enter the administrator password at the power-on prompt. Start the Configuration/Setup Utility program and change the power-on password.
- Change the position of the password override switch as described in “Setting the password override switch”.
- Remove the battery and then install the battery.

Setting the password override switch:

Note: As shown in Figure 14 on page 80, switch 8 is the one at the top of the switch block (SW1).

To set the password override switch:

1. Review the information in “Before you begin” on page 73.
2. Shut down (see “Powering on and shutting down the appliance” on page 11) the appliance and peripheral devices and disconnect all external cables and power cords; then, remove the cover. See “Removing the cover” on page 93.
3. Change the setting of the password override switch (switch 8 on switch block 1 on the system board) to ON.
4. Install the appliance cover (see “Installing the cover” on page 198) and connect all external cables and power cords.

Note: You can now start the Configuration/Setup utility program and change the power-on password. If you want the appliance to ask for a password when you switch it on, set the password override switch back to the OFF position.

Administrator password

Select this to set an administrator password. The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords, and allow a power-on password to be changed by the user.

Attention: If an administrator password is set and then forgotten, it **cannot** be overridden or removed. You must replace the system board.

Table 35 provides a summary of the password features.

Table 35. Power-on and administrator password features

Type of password	Description
Power-on password only	<ul style="list-style-type: none">• Enter the password to complete the system startup.• All choices are available on the Configuration/Setup Utility main menu.
Administrator password only	<ul style="list-style-type: none">• No password is required to start the system.• Enter the password to access the Configuration/Setup Utility program.• All choices are available on the Configuration/Setup Utility main menu.
Administrator <i>and</i> power-on password	<ul style="list-style-type: none">• You can enter either password to complete the system startup.• The administrator password provides access to all choices on the Configuration/Setup Utility main menu. You can set, change, or delete both the administrator and power-on passwords, and allow a power-on password to be changed by the user.• The power-on password provides access to a limited set of choices on the Configuration/Setup Utility main menu. This limited access might include changing or deleting the power-on password.

Bypassing an unknown power-on password

When a power-on password is set, POST does not complete until you enter the password. If you forget the power-on password, you can regain access to the appliance through any of the following methods:

- Enter the administrator password at the power-on prompt, if an administrator password has been set.
- Start the Configuration/Setup Utility program and change the power-on password.
- Change switch 8 of switch block 1 (SW1) on the system board to the opposite position to bypass the power-on password check. You can then start the Configuration/Setup Utility program and change the power-on password.

Using the SCSISelect Utility program

SCSISelect is a built-in, menu-driven configuration utility program that you can use to:

- View the default SCSI IDs
- Locate and correct configuration conflicts
- Perform a low-level format on a SCSI hard disk drive

The following sections provide the instructions needed to start the SCSISelect Utility and descriptions of the menu choices available.

Starting the SCSISelect Utility program

To start the SCSISelect Utility program:

1. Power ON the appliance.
2. When the <<< Press <CTRL><A> for SCSISelect Utility! >>> prompt appears, press **Ctrl+A**.

Note: If an administrator password has been set, a prompt appears asking you to enter the password to start the SCSISelect Utility program.

3. When prompted, select either **channel A** (internal) or **channel B** (external).

4. Use the arrow keys to select a choice from the menu.
 - Press **Esc** to return to the previous menu.
 - Press **F5** to switch between color and monochrome modes (if your monitor permits).
5. Follow the instructions on the panel to change the settings of the selected items; then, press **Enter**.

Choices available from the SCSISelect menu

The following selections appear on the SCSISelect Utility menu:

- **Configure/View Host Adapter Settings**

Select this to view or change the SCSI controller settings. To reset the SCSI controller to its default values, press **F6**; then, follow the instructions that appear on the panel.

You can view or change the following controller settings:

- **Host Adapter SCSI ID**

Select this to view the SCSI controller ID, which is normally 7.

- **SCSI Parity Checking**

Select this to view the assigned value of *Enabled*.

- **Host Adapter SCSI Termination**

Select this to view the assigned value of *Automatic*.

- **Boot Device Options**

Select this to configure startable device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.

- **SCSI Device Configuration**

Select this to configure SCSI device parameters. Before you can make updates, you must know the ID of the device whose parameters you want to configure.

Note: The Maximum Sync Transfer Rate represents the transfer rate for Ultra SCSI devices.

- The transfer rate for Ultra3 SCSI LVD devices is 160.0
- The transfer rate for Ultra2 SCSI LVD devices is 80.0
- The transfer rate for Fast SCSI devices is 20.0

- **Advanced Configuration Options**

Select this to view or change the settings for advanced configuration options. These options include enabling support for large hard disk drives and support for drives with UltraSCSI speeds.

- **SCSI Disk Utilities**

Select this to view the SCSI IDs that are assigned to each device or to format a SCSI device.

To use the utility program, select a drive from the list. Read the information on the panels carefully before making a selection.

Note: If you press **Ctrl+A** before the selected drives are ready, restart the appliance and watch the SCSISelect messages as each drive starts. After the drive that you want to view or format starts up, press **Ctrl+A**.

- **Format Disk**

Attention: The Low-Level Format program erases *all* data and programs.

Select this to perform a low-level format on a hard disk drive. Depending on the hard disk drive capacity, the Low-Level Format program could take up to 2 hours.

Use the Low-Level Format program:

- When you are installing software that requires a low-level format
- When you get recurring messages from the diagnostic tests directing you to run the Low-Level Format program on the hard disk drive
- As a last resort before replacing a failing hard disk drive

Note: If your appliance has a ServeRAID controller installed, refer to the RAID adapter documentation for instructions for performing low-level formats on hard disk drives attached to the adapter.

To start the Low-Level Format program:

1. If the hard disk drive is working, make a backup copy of all the files and programs on the hard disk drive. (See your operating system information for instructions.)
2. Select **Format Disk**; then, follow the instructions on the panel.

Note: Hard disks normally contain more tracks than their stated capacity (to allow for defective tracks). A message is displayed if the defect limit is reached. If this happens, have the system serviced.

Appendix A. Communication adapters

This appendix shows the placement of the PCI adapters.

Adapter placement

Note: You can install up to two of any type of network adapter up to a combined total of four network adapters.

The following figures illustrate the connector ends of the adapters. Use these illustrations for identification as necessary.

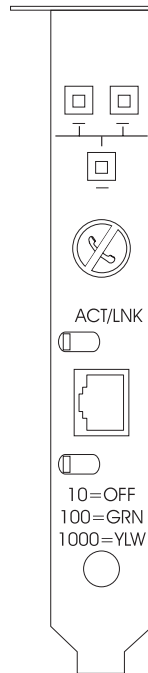


Figure 131.
PRO/1000 XT Server
Adapter by Intel

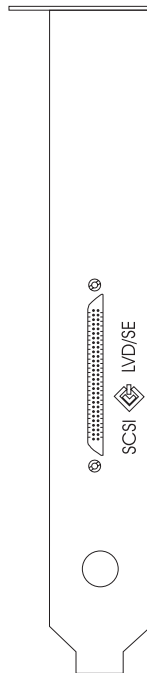


Figure 132. IBM PCI
Ultra160 SCSI
adapter (LVD/SE)

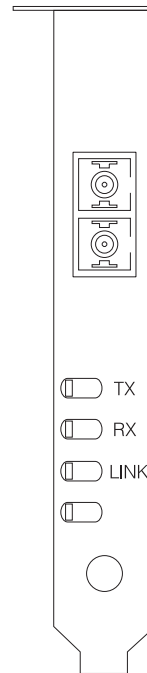


Figure 133. IBM
Gigabit Ethernet SX
Server Adapter

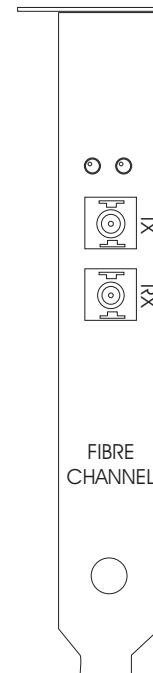


Figure 134. Qlogic
2340 1-port Fibre
Channel adapter

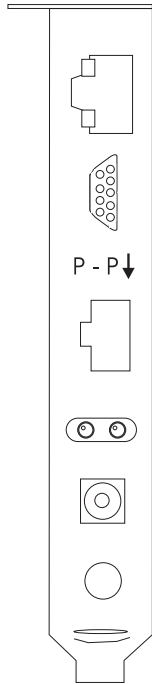


Figure 135. Remote Supervisor Adapter

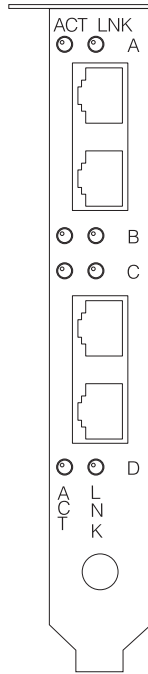


Figure 136. Alacritech 100x4 Quad-Port Server Accelerated Adapter

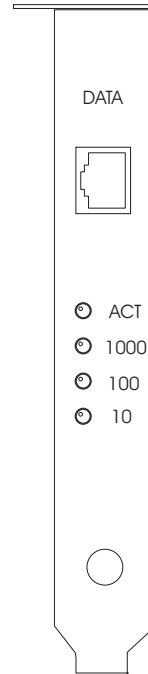


Figure 137. Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter

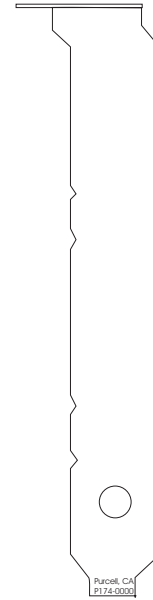


Figure 138. IBM ServeRAID-5i Ultra320 SCSI Controller (no visible channels)

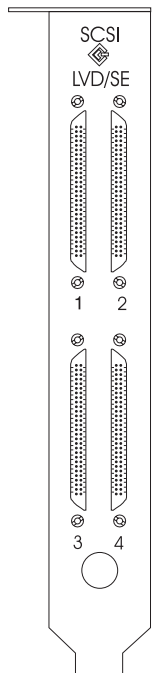


Figure 139. IBM ServeRAID-4H Ultra160 SCSI Controller

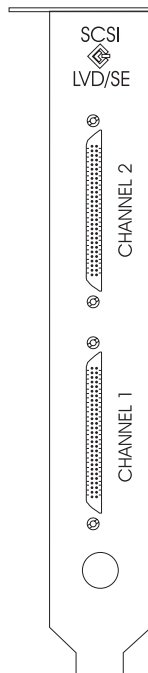


Figure 140. IBM ServeRAID-4Mx Ultra160 SCSI Controller

Adapter placement rules

Adapter placement rules guide which adapter to install in a PCI slot. These rules consist of *priority* and *slot location*. Priority is the sequence in which you install the adapters. Determining the slot location requires eliminating already filled slots and placing the adapter into the first available slot according to its possible Slot locations. The priority and slot locations are shown in Table 36. To determine the location of the slots:

1. Arrange the adapters in order, one having the highest priority, using the Priority column in Table 36. Refer to the illustrations earlier in this appendix for help identifying the adapters.
2. Place the highest priority adapter into the first available slot location listed in the slot location column of Table 36.
3. Repeat step 2 until all adapters are installed.

Example 1: If you are installing a single IBM Gigabit Ethernet SX Server Adapter in the NAS 200, that adapter should be installed in slot 2.

Example 2: If you are installing five adapters—one IBM ServeRAID-4Mx Ultra160 SCSI Controller, two IBM Gigabit Ethernet SX Server Adapters, one IBM PCI Ultra160 SCSI adapter (LVD/SE), and one Alacritech 100x4 Quad-Port Server Accelerated Adapter— they should be installed in the following slots:

- Slot 1 — Empty
- Slot 2 — IBM Gigabit Ethernet SX Server Adapter
- Slot 3 — IBM Gigabit Ethernet SX Server Adapter
- Slot 4 — IBM ServeRAID-4Mx Ultra160 SCSI Controller
- Slot 5 — IBM PCI Ultra160 SCSI adapter (LVD/SE)
- Slot 6 — Alacritech 100x4 Quad-Port Server Accelerated Adapter

Table 36. Adapter installation rules for the Model 25T

Priority	Adapter	Slot location	Maximum quantity
1	IBM ServeRAID-5i Ultra320 SCSI Controller	4	1
2	IBM ServeRAID-4H Ultra160 SCSI Controller	4	1
3	IBM ServeRAID-4Mx Ultra160 SCSI Controller	4, 3	2
4	Remote Supervisor Adapter	1	1
5	Qlogic 2340 1-port Fibre Channel adapter	5	1
6	IBM PCI Ultra160 SCSI adapter (LVD/SE)	5	1
7	Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter	2, 3, 6, 5	2

Table 36. Adapter installation rules for the Model 25T (continued)

Priority	Adapter	Slot location	Maximum quantity
8	IBM Gigabit Ethernet SX Server Adapter	2, 3, 6, 5	2
9	PRO/1000 XT Server Adapter by Intel	2, 3, 6, 5	2
10	Alacritech 100x4 Quad-Port Server Accelerated Adapter	2, 3, 6, 5	2

There is also a complete list of adapter combinations and placement locations in the following charts.

Adapter placement charts

These sections explain where to install the PCI adapters according to your configuration.

The following abbreviations for adapter names are used in the tables:

Tape	Either an IBM PCI Ultra160 SCSI adapter (LVD/SE) or Qlogic 2340 1-port Fibre Channel adapter used for tape backup.
RSA	Remote Supervisor Adapter
EN4	Alacritech 100x4 Quad-Port Server Accelerated Adapter
5Si	IBM ServeRAID-5i Ultra320 SCSI Controller
S4H	IBM ServeRAID-4H Ultra160 SCSI Controller
S4M	IBM ServeRAID-4Mx Ultra160 SCSI Controller
SR1	Either a 4H, a 4Mx or a 5i. SR2 denotes either a 4Mx or a 5i, but not a 4H adapter. See 2.
SR2	Either a 4Mx or a 5i, but not a 4H adapter. See 2.
GB	IBM Gigabit Ethernet SX Server Adapter
CEN	PRO/1000 XT Server Adapter by Intel
CENA	Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter

Notes:

1. The IBM ServeRAID-5i Ultra320 SCSI Controller is only available when it is ordered and installed in the engine from the factory.
2. An engine can be ordered with a single ServeRAID adapter (5i, 4Mx, or 4H) or two ServeRAID adapters (in which case, one must be a 4Mx and the other either a second 4Mx or a 5i). If a IBM ServeRAID-4H Ultra160 SCSI Controller adapter is installed, it must be the only ServeRAID adapter installed. In the placement charts, SR2 denotes either a 4Mx or a 5i, but not a 4H adapter. Similarly, SR1 denotes either a 4H, a 4Mx or a 5i.
3. The Remote Supervisor Adapter is the only adapter that is supported in slot 1. For this reason, the Remote Supervisor Adapter can be added to any of the combinations in the placement charts that do not already list a Remote Supervisor Adapter .
4. An engine can be ordered with a maximum of one adapter for tape backup (either a Qlogic 2340 1-port Fibre Channel adapter or a IBM PCI Ultra160 SCSI adapter (LVD/SE)). In the placement charts, *Tape* refers to the tape backup adapter. If there is a tape backup adapter, it is always installed in slot 5.
5. The maximum number of Ethernet adapters in each engine is four.
6. Each NAS 200 engine must be ordered with at least one of the following ServeRAID controllers:
 - IBM ServeRAID-5i Ultra320 SCSI Controller
 - IBM ServeRAID-4Mx Ultra160 SCSI Controller
 - IBM ServeRAID-4H Ultra160 SCSI Controller

Each engine can also support two ServeRAID controllers in these combinations:

- 1 IBM ServeRAID-5i Ultra320 SCSI Controller and 1 IBM ServeRAID-4Mx Ultra160 SCSI Controller
- 2 IBM ServeRAID-4Mx Ultra160 SCSI Controller

No options

Table 37 shows the placement of a single ServeRAID adapter with no additional options. Table 38 shows the placement of dual ServeRAID adapters with no additional options.

Table 37. Single ServeRAID adapter Options (SR1) — No options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
				S5i		
				S4H		
				S4M		

Table 38. Dual ServeRAID adapter Options (SR2) — No options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
			S4M	S5i		
			S4M	S4M		

RSA only options

Table 39 shows the adapter placement of a SAN connection with only an RSA option.

Table 39. NAS 200 with SAN: RSA only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
RSA	RSA			SR1		
RSA	RSA		S4M	SR2		

Tape only options

Table 40 shows the adapter placement of a SAN connection with only a tape backup option.

Table 40. NAS 200 with SAN: Tape only options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
LVD	RSA			SR1	LVD	
LVD	RSA		S4M	SR2	LVD	
FC	RSA			SR1	FC	
FC	RSA		S4M	SR2	FC	

Network only options

These tables show the adapter placement of a SAN connection with only network connection options.

- Table 41 on page 223 shows placement of single ServeRAID adapters with network options
- Table 42 on page 224 shows placement of dual ServeRAID adapters with network options

Table 41. Single ServeRAID adapters with network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CENA	RSA	CENA		SR1		
GB	RSA	GB		SR1		
CEN	RSA	CEN		SR1		
EN4	RSA	EN4		SR1		
CENA, CENA	RSA	CENA	CENA	SR1		
CENA, GB	RSA	CENA	GB	SR1		
GB, GB	RSA	GB	GB	SR1		
CEN, CEN	RSA	CEN	CEN	SR1		
CEN, CENA	RSA	CENA	CEN	SR1		
CEN, GB	RSA	GB	CEN	SR1		
EN4, EN4	RSA	EN4	EN4	SR1		
EN4, CEN	RSA	CEN	EN4	SR1		
EN4, CENA	RSA	CENA	EN4	SR1		
EN4, GB	RSA	GB	EN4	SR1		
EN4, EN4, CEN	RSA	CEN	EN4	SR1		EN4
EN4, EN4, CENA	RSA	CENA	EN4	SR1		EN4
EN4, EN4, GB	RSA	GB	EN4	SR1		EN4
EN4, CEN, CEN	RSA	CEN	CEN	SR1		EN4
EN4, CEN, CENA	RSA	CENA	CEN	SR1		EN4
EN4, CEN, GB	RSA	GB	CEN	SR1		EN4
EN4, CENA, CENA	RSA	CENA	CENA	SR1		EN4
EN4, CENA, GB	RSA	CENA	GB	SR1		EN4
EN4, GB, GB	RSA	GB	GB	SR1		EN4
CEN, CEN, CENA	RSA	CENA	CEN	SR1		CEN
CEN, CEN, GB	RSA	GB	CEN	SR1		CEN
CEN, CENA, CENA	RSA	CENA	CENA	SR1		CEN
CEN, CENA, GB	RSA	CENA	GB	SR1		CEN
CEN, GB, GB	RSA	GB	GB	SR1		CEN
CENA, CENA, GB	RSA	CENA	CENA	SR1		GB
CENA, GB, GB	RSA	CENA	GB	SR1		GB
EN4, EN4, CEN, CENA	RSA	CENA	CEN	SR1	EN4	EN4
EN4, EN4, CEN, GB	RSA	GB	CEN	SR1	EN4	EN4
EN4, EN4, CEN, CEN	RSA	CEN	CEN	SR1	EN4	EN4
EN4, EN4, CENA, CENA	RSA	CENA	CENA	SR1	EN4	EN4
EN4, EN4, CENA, GB	RSA	CENA	GB	SR1	EN4	EN4
EN4, EN4, GB, GB	RSA	GB	GB	SR1	EN4	EN4
EN4, CEN, CEN, CENA	RSA	CENA	CEN	SR1	EN4	CEN
EN4, CEN, CEN, GB	RSA	GB	CEN	SR1	EN4	CEN
EN4, CEN, CENA, CENA	RSA	CENA	CENA	SR1	EN4	CEN

Table 41. Single ServeRAID adapters with network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
EN4, CEN, CENA, GB	RSA	CENA	GB	SR1	EN4	CEN
EN4, CEN, GB, GB	RSA	GB	GB	SR1	EN4	CEN
EN4, CENA, CENA, GB	RSA	CENA	CENA	SR1	EN4	GB
EN4, CENA, GB, GB	RSA	CENA	GB	SR1	EN4	GB
CEN, CEN, CENA, CENA	RSA	CENA	CENA	SR1	CEN	CEN
CEN, CEN, CENA, GB	RSA	CENA	GB	SR1	CEN	CEN
CEN, CEN, GB, GB	RSA	GB	GB	SR1	CEN	CEN
CEN, CENA, CENA, GB	RSA	CENA	CENA	SR1	CEN	GB
CEN, CENA, GB, GB	RSA	CENA	GB	SR1	CEN	GB
CENA, CENA, GB, GB	RSA	CENA	CENA	SR1	GB	GB

Table 42. Dual ServeRAID adapters with network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CENA	RSA	CENA	S4M	SR2		
GB	RSA	GB	S4M	SR2		
CEN	RSA	CEN	S4M	SR2		
EN4	RSA	EN4	S4M	SR2		
CENA, CENA	RSA	CENA	S4M	SR2		CENA
CENA, GB	RSA	CENA	S4M	SR2		GB
GB, GB	RSA	GB	S4M	SR2		GB
CEN, CEN	RSA	CEN	S4M	SR2		CEN
CEN, CENA	RSA	CENA	S4M	SR2		CEN
CEN, GB	RSA	GB	S4M	SR2		CEN
EN4, EN4	RSA	EN4	S4M	SR2		EN4
EN4, CEN	RSA	CEN	S4M	SR2		EN4
EN4, CENA	RSA	CENA	S4M	SR2		EN4
EN4, GB	RSA	GB	S4M	SR2		EN4
EN4, EN4, CEN	RSA	CEN	S4M	SR2	EN4	EN4
EN4, EN4, CENA	RSA	CENA	S4M	SR2	EN4	EN4
EN4, EN4, GB	RSA	GB	S4M	SR2	EN4	EN4
EN4, CEN, CEN	RSA	CEN	S4M	SR2	EN4	CEN
EN4, CEN, CENA	RSA	CENA	S4M	SR2	EN4	CEN
EN4, CEN, GB	RSA	GB	S4M	SR2	EN4	CEN
EN4, CENA, CENA	RSA	CENA	S4M	SR2	EN4	CENA
EN4, CENA, GB	RSA	CENA	S4M	SR2	EN4	GB
EN4, GB, GB	RSA	GB	S4M	SR2	EN4	GB
CEN, CEN, CENA	RSA	CENA	S4M	SR2	CEN	CEN
CEN, CEN, GB	RSA	GB	S4M	SR2	CEN	CEN
CEN, CENA, CENA	RSA	CENA	S4M	SR2	CEN	CENA

Table 42. Dual ServeRAID adapters with network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
CEN, CENA, GB	RSA	CENA	S4M	SR2	CEN	GB
CEN, GB, GB	RSA	GB	S4M	SR2	CEN	GB
CENA, CENA, GB	RSA	CENA	S4M	SR2	GB	CENA
CENA, GB, GB	RSA	CENA	S4M	SR2	GB	GB

Tape and network options

These tables show the adapter placement of a SAN connection with tape and network connection options.

- Table 43 shows placement of single ServeRAID adapters with tape and network options
- Table 44 on page 226 shows placement of dual ServeRAID adapters with tape and network options

Table 43. Single ServeRAID adapters with tape and network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CENA	RSA	CENA		SR1	Tape	
Tape, GB	RSA			SR1	Tape	
Tape, CEN	RSA	CEN		SR1	Tape	
Tape, EN4	RSA	EN4		SR1	Tape	
Tape, CENA, CENA	RSA	CENA	CENA	SR1	Tape	
Tape, CENA, GB	RSA	CENA	GB	SR1	Tape	
Tape, GB, GB	RSA	GB	GB	SR1	Tape	
Tape, CEN, CEN	RSA	CEN	CEN	SR1	Tape	
Tape, CEN, CENA	RSA	CENA	CEN	SR1	Tape	
Tape, CEN, GB	RSA	GB	CEN	SR1	Tape	
Tape, EN4, EN4	RSA	EN4	EN4	SR1	Tape	
Tape, EN4, CEN	RSA	CEN	EN4	SR1	Tape	
Tape, EN4, CENA	RSA	CENA	EN4	SR1	Tape	
Tape, EN4, GB	RSA	GB	EN4	SR1	Tape	
Tape, EN4, EN4, CEN	RSA	CEN	EN4	SR1	Tape	EN4
Tape, EN4, EN4, CENA	RSA	CENA	EN4	SR1	Tape	EN4
Tape, EN4, EN4, GB	RSA	GB	EN4	SR1	Tape	EN4
Tape, EN4, CEN, CEN	RSA	CEN	CEN	SR1	Tape	EN4
Tape, EN4, CEN, CENA	RSA	CENA	CEN	SR1	Tape	EN4
Tape, EN4, CEN, GB	RSA	GB	CEN	SR1	Tape	EN4
Tape, EN4, CENA, CENA	RSA	CENA	CENA	SR1	Tape	EN4
Tape, EN4, CENA, GB	RSA	CENA	GB	SR1	Tape	EN4
Tape, EN4, GB, GB	RSA	GB	GB	SR1	Tape	EN4
Tape, CEN, CEN, CENA	RSA	CENA	CEN	SR1	Tape	CEN
Tape, CEN, CEN, GB	RSA	GB	CEN	SR1	Tape	CEN

Table 43. Single ServeRAID adapters with tape and network options (continued)

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CEN, CENA, CENA	RSA	CENA	CENA	SR1	Tape	CEN
Tape, CEN, CENA, GB	RSA	CENA	GB	SR1	Tape	CEN
Tape, CEN, GB, GB	RSA	GB	GB	SR1	Tape	CEN
Tape, CENA, CENA, GB	RSA	CENA	CENA	SR1	Tape	GB
Tape, CENA, GB, GB	RSA	CENA	GB	SR1	Tape	GB

Table 44. Dual ServeRAID adapters with tape and network options

Configuration	PCI Slot-1 (32-bit)	PCI Slot-2 (64-bit)	PCI Slot-3 (64-bit)	PCI Slot-4 (64-bit)	PCI Slot-5 (64-bit)	PCI Slot-6 (64-bit)
Tape, CENA	RSA	CENA	S4M	SR2	Tape	
Tape, GB	RSA	GB	S4M	SR2	Tape	
Tape, CEN	RSA	CEN	S4M	SR2	Tape	
Tape, EN4	RSA	EN4	S4M	SR2	Tape	
Tape, CENA, CENA	RSA	CENA	S4M	SR2	Tape	CENA
Tape, CENA, GB	RSA	CENA	S4M	SR2	Tape	GB
Tape, GB, GB	RSA	GB	S4M	SR2	Tape	GB
Tape, CEN, CEN	RSA	CEN	S4M	SR2	Tape	CEN
Tape, CEN, CENA	RSA	CENA	S4M	SR2	Tape	CEN
Tape, CEN, GB	RSA	GB	S4M	SR2	Tape	CEN
Tape, EN4, EN4	RSA	EN4	S4M	SR2	Tape	EN4
Tape, EN4, CEN	RSA	CEN	S4M	SR2	Tape	EN4
Tape, EN4, CENA	RSA	CENA	S4M	SR2	Tape	EN4
Tape, EN4, GB	RSA	GB	S4M	SR2	Tape	EN4

Appendix B. Using the Recovery and Supplementary CDs

Attention: Changing the preloaded software configuration of this product, including applying or installing unauthorized service packs or updates to preinstalled software, or installing additional software products that are not included in either the preloaded image or on the Supplementary CD, may not be supported and could cause unpredictable results. For updated compatibility information, see <http://www.storage.ibm.com/support>

To correct problems with a preloaded software component, back up your user and system data. Then use the Recovery CD Set to restore the preloaded software image.

This chapter describes the applications included on the Supplementary and Recovery CDs, and how and when you should use them.

As an alternative to using the Recovery CD Set, you can use the restore portion of the disaster recovery solution provided by Persistent Storage Manager (PSM) to recover the NAS 200, if you have met the requirements (including creating a PSM backup image and PSM recovery diskette). The restore function allows you to restore the NAS 200 to its state at the time of the PSM backup, in one step, without having to revert to the original (factory) configuration, which would require you to subsequently reconfigure clustering and other components. See the *IBM TotalStorage NAS 200 User's Reference* to determine whether you have met the requirements. If so, you can use the PSM recovery method. If you have not met the requirements for using the PSM recovery method or if the PSM recovery fails, then you must use the Recovery CD Set as described in this appendix.

Using the Recovery Enablement Diskette and Recovery CD

The Recovery CD Set contains the preload image for this appliance and is used to recover the preloaded image on the NAS 200. You must start the NAS 200 using the Recovery Enablement Diskette before you can boot from Recovery CD 1.

CAUTION:

The NAS 200 does not have a monitor, keyboard, or mouse attached to it under normal operating conditions. Because of this, you can not interact with the preload-image restore process using a monitor. Starting Recovery CD 1 will, without visually prompting the user, automatically destroy all data on the system drive. Use the Recovery Enablement Diskette and Recovery CD Set only when it is absolutely necessary to restore the preloaded system image.

To recover the preloaded image on the NAS 200, perform the following steps. Note that the recovery process invalidates persistent images and leaves them in a state that is inconsistent with their pre-recovery state. So, if you plan to use the Recovery CD Set, it is recommended that you first delete all persistent images to ensure a clean reload of the system software.

1. Attach a keyboard and display to the engine.
2. Insert the Recovery Enablement Diskette into the diskette drive of the NAS 200 and restart the engine. When the Recovery Enablement Diskette has completed loading and modifying your engine startup sequence, the engine will begin a continuous beep. Do not continue with this procedure until the engine begins the beep.

Important

The Recovery Enablement Diskette enables the NAS 200 to start from the CD-ROM drive. You will not be able to restore the preload image from the Recovery CD Set without first restarting the appliance using the Recovery Enablement Diskette.

3. Remove the Recovery Enablement Diskette from the diskette drive of the appliance.
4. Place Recovery CD 1 in the CD-ROM drive of the NAS 200 and restart the engine.
5. If you installed additional processor memory on the NAS 200, the BIOS configuration program will appear. Click **Continue** on the first panel, click **Continue** again, click **Exit Setup**, and finally, click **Yes, save and exit Setup**.
6. The recovery process will begin automatically. Follow the instructions provided by the image restoration software, and the original manufacturing preload will be restored. During the restoration of the preload, you will be prompted to insert the other recovery CDs into the CD-ROM drive. When the preload image is restored, the NAS 200 restarts automatically.
7. If you installed additional processor memory, the BIOS configuration program will now appear a second time. Click **Continue** on the first panel, click **Continue** again, click **Exit Setup**, and finally, click **Yes, save and exit Setup**. You may now detach the keyboard and display from the NAS 200 and allow the recovery process to complete automatically.

Important

- After the NAS 200 restarts, a series of configuration and system preparation programs that finish configuring the engine run automatically. These programs must finish running before you use any included applications (such as the IBM Advanced Appliance Configuration Utility or the Terminal Services Client) to connect to or configure the NAS 200. Do not connect to or configure the appliance for at least 15 minutes after system restart. This notice applies only to the first time the NAS 200 is started after using the Recovery CD Set.
- Logical Disk 0 will be configured to have a 6-GB NTFS boot partition. Any other previously configured logical disk drives, as well as the remainder of Logical Disk 0 (which, on the original hard disk drive of the NAS 200, contains the Maintenance partition, but for a replacement hard disk drive would not contain any other partitions), will be unchanged.

8. Reinstall all software updates you had installed on the appliance. Or, if the Recovery CD Set you used in this procedure is a newer version than the one you received with the NAS 200, reinstall only those software updates that are newer than those on the Recovery CD Set.

Using the Supplementary CD

The Supplementary CD contains documentation and copies of key software applications that are preinstalled on the NAS 200. Table 45 on page 229 includes the names of the directories found on the Supplementary CD and a description of the contents of the directory.

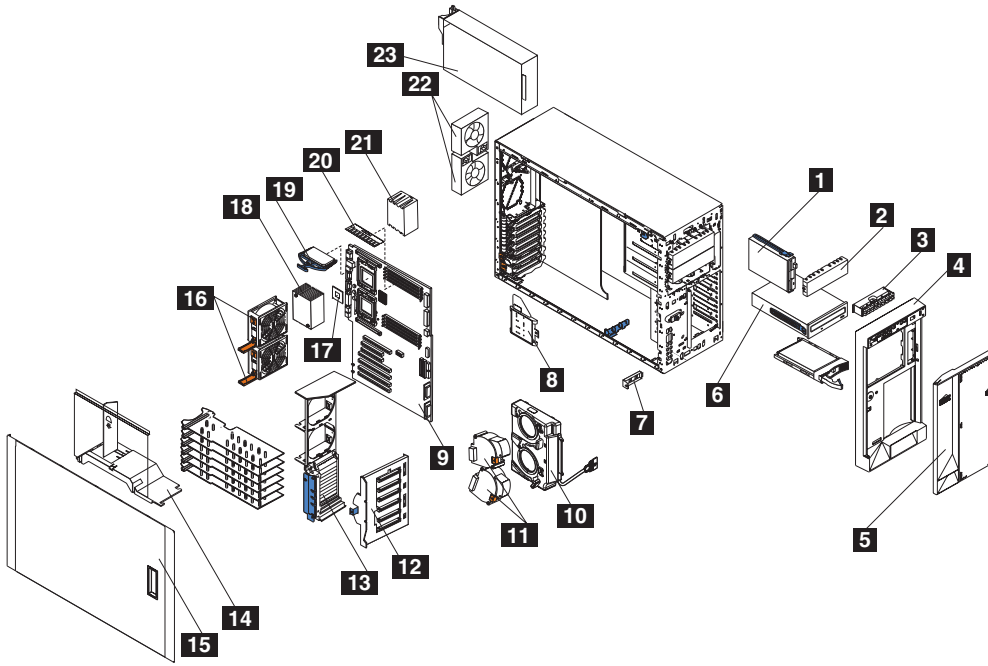
Table 45. Supplementary CD directories

Directory name	Contents
IBM Advanced Appliance Configuration	<p>IBM Advanced Appliance Configuration console and agent installation files. The IBM Advanced Appliance Configuration agent is preinstalled as a Windows Powered service on the NAS 200. To install the Advanced Appliance Configuration console (on another network-attached workstation running Windows 98, Windows NT, or Windows 2000), run <code>lpsetup.exe</code> (if you have Supplementary CD Version 1.5) from the <code>x:\IBM Advanced Appliance Configuration</code> directory, where <code>x</code> is the drive letter assigned to your workstation's CD-ROM drive.</p> <p>Note: When the installation completes, it will leave behind a temporary directory named <code>iaacu</code> on the workstation, under the directory specified by the <code>TEMP</code> environment variable (usually <code>c:\temp</code>; you can determine the value of the <code>TEMP</code> variable by typing <code>set temp</code> from a DOS command prompt). You should remove this directory (using Windows Explorer) after the installation has completed.</p>
DiskImages	<p>A diskette image for the Recovery Enablement Diskette. To create the Recovery Enablement Diskette, run <code>RecovDsk.bat</code> and insert a HD 1.44 floppy diskette into drive A when prompted. Be sure to read the <code>readme!.txt</code> file located in this directory for last minute and model-specific updates.</p>
I386	<p>Windows Powered installation files. You may be prompted to insert your Windows Powered CD-ROM if you add device drivers, OS features, and so on. If so, insert the Supplementary CD and specify path <code>x:\i386</code>, where <code>x</code> is the drive letter assigned to your CD-ROM drive.</p>
W2KSP2	<p>Windows Powered Service Pack 2, which is preloaded on the Model 25T or Model 25T with the rack-mount conversion feature. You should reapply Service Pack 2 if you add any device drivers, OS features, and so on. Run the executable <code>w2ksp2.exe</code> and follow the instructions provided.</p>
Services for UNIX	<p>SFU 2.2 installation files, zipped into a self-extracting executable, <code>sfu22.exe</code>. If you add features that are not preloaded, you will be prompted for these installation files. You will need to extract the installation files onto the hard disk drive of the Model 25T or Model 25T with the rack-mount conversion feature. It is recommended that you use the maintenance drive (D drive) as the destination, but you can use the system drive (C drive). On whatever drive you choose, make sure that you have at least 250 MB of free space, create a temporary directory on the drive, and then issue the following command from the Services for UNIX directory on the Supplementary CD: <code>sfu22 path</code>, where <code>path</code> is the drive letter and path of the temporary directory you created. When you are prompted by the Services for UNIX installation to provide the path of the installation files, specify the same path you specified in extracting the files from the CD.</p>
Terminal Services Client	<p>The stand-alone Win32 Terminal Services Client application. The appliance supports Web-based terminal services, so this is an optional installation. To install the Terminal Services Client, run <code>setup.exe</code> from the <code>Disk1</code> subdirectory.</p>
readme.txt	<p>A text file that describes the contents of the Supplementary CD.</p>

Appendix C. Parts listings

The following pages contains exploded views and parts lists of the IBM TotalStorage NAS Appliance Model 25T or Model 25T with the rack-mount conversion feature.

Assembly 1: Model 25T Appliance



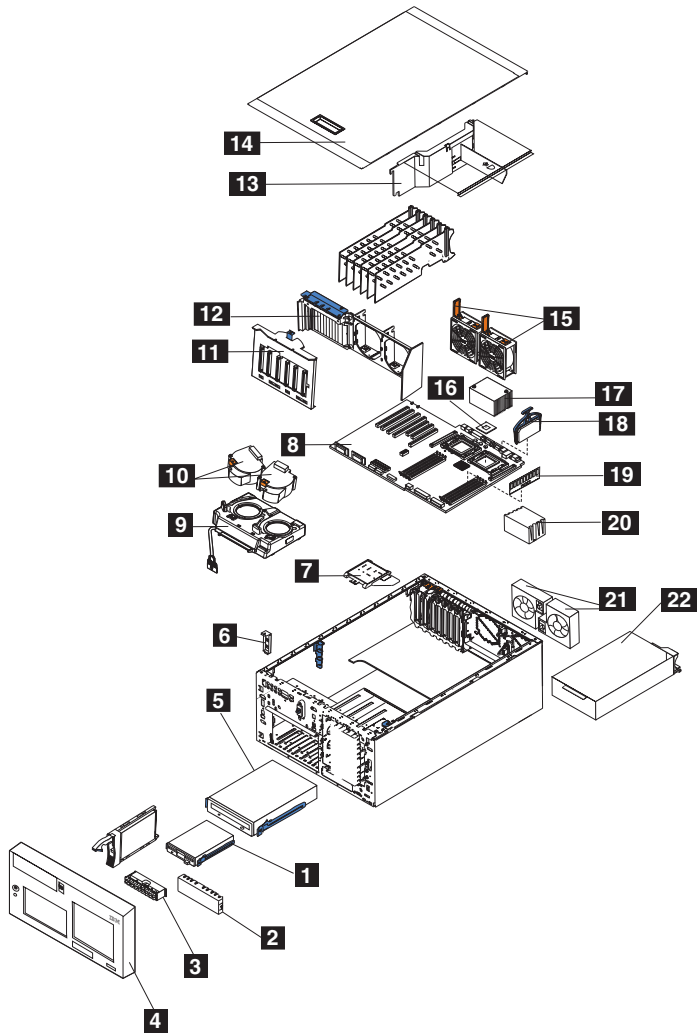
Assembly 1: (continued)

Asm-Index	Part Number	Units	Description
1-	38P7559	1	Model 25T Appliance
-1	76H4091	1	• • floppy drive, 1.44 MB
-2	00N6407	1	• • 5.25 in. media blank bezel
-3	59P5808	1	• • Operator information panel
-4	38P7623	1	• • bezel assembly
-5	24P0615	1	• • door assembly
-6	33P3203	1	• • CD-ROM, 48X
-6	33P3207	1	• • CD-ROM, 48X (alternate part)
-7	25P3306	1	• • power reset card
-8	21P9728	1	• • Diagnostics panel card
-9	48P9045	1	• • system board assembly
-10	00N6409	1	• • front fan housing
-11	09N7499	1	• • fan assembly
-12	33P2961	1	• • DASD backplane with carrier assembly
-13	59P4159	1	• • Guide, fan/card assembly
-14	59P4160	1	• • baffle
-15	21P9660	1	• • cover
-16	09N9474	2	• • fan assembly, 92 mm
-17	24P3525	1	• • microprocessor, 2.4-0K-L3
-18	25P6309	2	• • heat sink
-19	49P2021	1	• • voltage regulator module, 9.05
-20		1	• • memory
-	09N4306	2	• • • 256 MB 133 MHz ECC SDRAM RDIMM memory
-	09N4305	2	• • • 512 MB 133 MHz ECC SDRAM RDIMM memory
-		2	• • • 1 GB 133 MHz ECC SDRAM RDIMM memory
-21	24P1284	1	• • microprocessor blank cover
-22	21P9707	2	• • fan, rear, hot-swap
-23	36L8819	2	• • power supply, 250 Watt
-		1	• • hard disk drives
-	06P5759	1	• • • 36.4 GB 10K-5 Ultra 160 SCSI Hot-Swap SL hard disk drive
-	19K0615	1	• • • 36.4 GB 10K-4 Ultra 160 SCSI Hot-Swap SL hard disk drive (alternate part)
-	06P5760	1	• • • 73.4 GB 10K-5 Ultra 160 SCSI Hot-Swap SL hard disk drive (alternate part)
-	49P2025	1	• • power cage assembly
-		1	• • adapters
-	06P2215	1	• • • IBM PCI Ultra160 SCSI adapter (LVD/SE)
-	09N7292	1	• • • Qlogic 2340 1-port Fibre Channel adapter
-		1	• • • Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter
-	06P3709	1	• • • IBM Gigabit Ethernet SX Server Adapter
-	38P7829	1	• • • Alacritech 100x4 Quad-Port Server Accelerated Adapter
-	22P6801	1	• • • PRO/1000 XT Server Adapter by Intel
-		1	• • • Remote Supervisor Adapter
-	24P2589	1	• • • IBM ServeRAID-4Mx Ultra160 SCSI Controller
-	06P5736	1	• • • IBM ServeRAID-4Mx Ultra160 SCSI Controller
-		1	• • • IBM ServeRAID-5i Ultra320 SCSI Controller
-			• • • IBM ServeRAID-4H Ultra160 SCSI Controller
-	37L6892	1	• • • Base card assembly
-	37L6902	1	• • • Daughter card assembly
-	19K0561	1	• • • Daughter card assembly (Japan)
-	37L6903	1	• • • Battery
-	00N9561	1	• • • Battery (Japan)
-	19K0577	1	• • • ServeRAID support CD
-	19K0578	1	• • • ServeRAID support CD (Japan)
-			• • • IBM ServeRAID-4Mx Ultra160 SCSI controller

Assembly 1: (continued)

Asm-Index	Part Number	Units	Description
-	24P2589	1	• • • Card assembly
-	06P5739	1	• • • Card assembly (Japan)
-	37L6903	1	• • • Battery
-	00N9561	1	• • • Battery (Japan)
-	19K6131	1	• • • ServeRAID support CD
-	24P2925	1	• • • ServeRAID support CD (Japan)
-	00N6412	2	• • DASD slide
-	00N6413	2	• • diskette drive slide
-	33F8354	1	• • system board battery 3.0 volt (8590)
-	31P6027	1	• • thermal grease kit
-	37L6063	1	• • cable, blower
-	21P9681	1	• • cable, rear fan
-	21P9684	1	• • cable, fan
-	59P4201	1	• • cable, SCSI 15.71 in.
-	59P4199	1	• • cable, SCSI 10 in.
-	21P9685	1	• • cable, switch CD
-	24P5069	1	• • cable, floppy disk drive
-	24P5085	1	• • cable, IDE CD-ROM drive
-	06P6245	1	• • hot-swap hard disk drive filler blank
-	00N6393	1	• key lock assembly
-	32P0579	4	• foot, screw-in
-	21P9561	1	• chassis, mechanical shell
-		1	• Netfinity 3-Pack Ultra160 Hot-Swap Expansion Kit

Assembly 2: Model 25T with the rack-mount conversion feature Appliance



Assembly 2: (continued)

Asm- Index	Part Number	Units	Description
2-	38P7560	1	Model 25T with the rack-mount conversion feature Appliance
-1	76H4091	1	• floppy drive, 1.44 MB
-2	00N6407	1	• 5.25 in. media blank bezel
-3	59P5808	1	• Operator information panel
-4	38P7623	1	• bezel assembly
-5	33P3203	1	• CD-ROM, 48X
-5	33P3207	1	• CD-ROM, 48X (alternate part)
-6	25P3306	1	• power reset card
-7	21P9728	1	• Diagnostics panel card
-8	48P9045	1	• system board assembly
-9	00N6409	1	• front fan housing
-10	09N7499	1	• fan assembly
-11	33P2961	1	• DASD backplane with carrier assembly
-12	59P4159	1	• Guide, fan/card assembly
-13	59P4160	1	• baffle
-14	21P9660	1	• cover
-15	09N9474	2	• fan assembly, 92 mm
-16	37L3570	1	• microprocessor, 2.4-0K-L3
-17	25P6309	2	• heat sink
-18	49P2021	1	• voltage regulator module, 9.05
-19		1	• memory
-	09N4306	2	• • 256 MB 133 MHz ECC SDRAM RDIMM memory
-		2	• • 512 MB 133 MHz ECC SDRAM RDIMM memory
-		2	• • 1 GB 133 MHz ECC SDRAM RDIMM memory
-20		1	• microprocessor blank cover
-21	21P9707	2	• fan, rear, hot-swap
-22	36L8819	2	• power supply, 250 Watt
-		1	• hard disk drives
-	06P5759	1	• • 36.4 GB 10K-5 Ultra 160 SCSI Hot-Swap SL hard disk drive
-	19K0615	1	• • 36.4 GB 10K-4 Ultra 160 SCSI Hot-Swap SL hard disk drive (alternate part)
-	06P5760	1	• • 73.4 GB 10K-5 Ultra 160 SCSI Hot-Swap SL hard disk drive (alternate part)
-	06P6245	1	• hot-swap hard disk drive filler blank
-	49P2025	1	• power cage assembly
-		1	• adapters
-	06P2215	1	• • IBM PCI Ultra160 SCSI adapter (LVD/SE)
-	09N7292	1	• • Qlogic 2340 1-port Fibre Channel adapter
-		1	• • Alacritech 1000x1 Single-Port Server and Storage Accelerated adapter
-	06P3709	1	• • IBM Gigabit Ethernet SX Server Adapter
-	38P7829	1	• • Alacritech 100x4 Quad-Port Server Accelerated Adapter
-	22P6801	1	• • PRO/1000 XT Server Adapter by Intel
-		1	• • Remote Supervisor Adapter
-		1	• • IBM ServeRAID-4Mx Ultra160 SCSI Controller
-	24P2589	1	• • • Card assembly
-	06P5739	1	• • • Card assembly (Japan)
-	37L6903	1	• • • Battery
-	00N9561	1	• • • Battery (Japan)
-	19K6131	1	• • • ServeRAID support CD
-	24P2925	1	• • • ServeRAID support CD (Japan)
-	06P5736	1	• • IBM ServeRAID-4Mx Ultra160 SCSI Controller
-		1	• • IBM ServeRAID-5i Ultra320 SCSI Controller
-		1	• • IBM ServeRAID-4H Ultra160 SCSI Controller
-	37L6892	1	• • • Base card assembly
-	37L6902	1	• • • Daughter card assembly

Assembly 2: (continued)

Asm-Index	Part Number	Units	Description
-	19K0561	1	• • • Daughter card assembly (Japan)
-	37L6903	1	• • • Battery
-	00N9561	1	• • • Battery (Japan)
-	19K0577	1	• • • ServeRAID support CD
-	19K0578	1	• • • ServeRAID support CD (Japan)
-	00N6412	2	• DASD slide
-	00N6413	2	• diskette drive slide
-	33F8354	1	• system board battery 3.0 volt (8590)
-	31P6027	1	• thermal grease kit
-	37L6063	1	• cable, blower
-	21P9681	1	• cable, rear fan
-	21P9684	1	• cable, fan
-	59P4201	1	• cable, SCSI 15.71 in.
-	59P4199	1	• cable, SCSI 10 in.
-	21P9685	1	• cable, switch CD
-	24P5069	1	• cable, floppy disk drive
-	24P5085	1	• cable, IDE CD-ROM drive
-	00N6417	1	• rack kit
-	00N6419	1	• miscellaneous rack parts kit
-	00N6429	2	• rack bracket assemblies
-	21P9562	1	• chassis mechanical shell

Appendix D. 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 Richtlinie 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.

中华人民共和国“A类”警告声明

声明

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

Taiwan electrical emission statement

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

Japanese Voluntary Control Council for Interference (VCCI) statement

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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 elektrische apparatuur op een veilige manier moet bekabelen en aansluiten



Danger: Avant de procéder à l'installation 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 instalar 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 što 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 priključivanje 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 apparatuur.



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 équipements 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 Veröffentlichung beschreibt die Sicherheitsvorkehrungen für das Verkabeln 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: Mielőtt megkezdi a berendezés üzembe helyezését, olvassa el a *Caution: Safety Information–Read This First*, SD21-0030 könyvecskében leírt biztonsági információkat. Ez a könyv leírja, milyen biztonsági intézkedéseket kell megtenni az elektromos berendezés huzalozásakor illetve csatlakoztatásakor.



Pericolo: prima di iniziare l'installazione di questo prodotto, leggere le informazioni relative 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 først*, 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 установить этот продукт, прочтите Инструкцию по технике безопасности в документе "Внимание: Инструкция по технике безопасности -- Прочсть в первую очередь", SD21-0030. В этой брошюре описаны безопасные способы каблирования и подключения электрического оборудования.



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



Pozor: Preden začnete 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: Säkerhetsföreskrifter – Läs detta först*, SD21-0030. Där beskrivs hur du på ett säkert sätt 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 Electronics 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

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).

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

A

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.

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

attach. To make a device a part of a network logically. Contrast with *connect*.

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

ATTN. See *attention*.

B

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

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

BIOS. See *Basic Input/Output System*.

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

bps. See *bits per second*.

buffer. See *buffer storage*.

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, a serial and a parallel device, or between devices having different transfer rates. (2) In word processing, a temporary storage in which text is held for processing or communication (T).

bus. See *data bus*.

C

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

carrier sense multiple access with collision detection (CSMA/CD). A class of medium access procedures that allows multiple stations to access the medium at will, without explicit prior coordination, and avoids contention by way of carrier sense and deference. Contention is resolved by way of collision detection and transmission.

CIFS. See *Common Internet File System*.

cluster. (1) A station that consists of a control unit (a *cluster controller*) and the terminals attached to it. (2) A group of APPN nodes that have the same network ID and the same topology database. A cluster is a subset of a network identifier (NETID) subnetwork. See also *high-availability cluster multiprocessing (HACMP)* and *network identifier (NETID)*.

collision avoidance. In carrier sense multiple access with collision avoidance (CSMA/CA), the process of sending a jam signal and waiting for a variable time before transmitting data. The process is designed 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.

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

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*.

D

DASD. See *direct access storage device*.

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

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 subsystem continues to run. The disk-unit subsystem reconstructs the data after the disk unit in the subsystem is repaired or replaced. See also *RAID*.

DHCP. See *Dynamic Host Configuration Protocol*.

DIMM. See *dual inline memory module*.

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 performs the transfer of data between itself and the system's memory directly.

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 in an appliance into which you insert a hard-disk-drive module. The bays are in storage units that can be located in a different 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.

E

EIA. See *Electronic Industries Association*.

EISA. See *Extended Industry Standard Architecture*.

electromagnetic compatibility (EMC). The design and test of products to meet legal and corporate specifications dealing with the emissions and susceptibility to frequencies in the radio spectrum. Electromagnetic compatibility is the ability of various electronic equipment to operate correctly in the intended electromagnetic environment.

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.

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

EMC. See *electromagnetic compatibility*.

engine. The unit that contains the processors that respond to requests for data from clients. The operating software for the IBM TotalStorage appliance resides in the engine.

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). Contrast with *failure*.

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 manages 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.

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 Industry Standard Architecture (EISA). The PC bus standard that extends the AT bus (ISA bus) to 32 bits and provides support for bus master. 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

fabric. A complex network using hubs, switches and gateways. For example, Fibre Channel uses a fabric to connect devices. A fabric can be as simple as a single cable connecting two devices.

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 in which the primary database server or application server switches to a backup system due to the failure of the primary server.

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*.

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

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

flash memory. A type of non-volatile storage device that must be erased in fixed blocks rather than single bytes.

FRU. See *field-replaceable unit*.

FTP. See *File Transfer Protocol*.

G

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

H

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.

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 client, a server, or both. (2) In Fibre Channel technology, 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.

I

IETF. See *Internet Engineering Task Force*.

iLUN. See *iSCSI client logical-unit number*.

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.

interrupt request (IRQ). An input found on a processor that causes it to suspend normal instruction execution temporarily and to start executing an interrupt handler routine.

IP. See *Internet Protocol*.

IRQ. See *interrupt request*.

iSCSI client logical-unit number (iLUN). A unique number that is assigned to each virtual logical unit number (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.

L

LAN. See *local area network*.

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

logical drive. A unit of virtual storage that is made available to the network through virtual logical unit numbers (VLUNs) and iSCSI client logical-unit number (iLUNs). It consists of one or more physical disks that are combined using RAID 0, 1, 1E, 5, or 5E technology.

logical unit. A type of network-accessible unit that enables users to gain access to network resources and communicate with each other.

logical unit number (LUN). An identifier used on a SCSI bus to distinguish among up to eight devices (logical units) with the same SCSI ID.

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

LUN. See *logical unit number*.

M

management information base (MIB). Simple Network Management Protocol (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 equals 1 000 000 hertz.

MES. See *miscellaneous equipment specification*.

MHz. See *megahertz*.

MIB. See *management information base*.

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

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. A type of IP address, which identifies a group of interfaces and permits all of the systems that are in that group to receive the same packet of information.

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 - 100 microns that will allow a large number of modes to propagate.

N

N. See *newton*.

NAS. See *network-attached storage*.

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

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 unit of force required to impart an acceleration of one meter per second per second to a mass of one kilogram (1 m/s^2).

NFS. See *Network File System*.

NIS. See *network information services*.

O

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

P

path. In a network, a route between two nodes.

path group. A collection of equivalent paths. Storage devices may have one - n path groups.

PCI. See *Peripheral Component Interconnect*.

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 industry standard architecture (ISA) or extended industry standard architecture (EISA) bus. ISA and EISA boards 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, TruImage data views of any or all system and data volumes residing on network-attached storage. All persistent images survive system 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.

port. See *socket*.

protocol. The meaning of, and the sequencing rules for, requests and responses used for managing a network, transferring data, and synchronizing the states of network components.

PSM. See *Persistent Storage Manager*.

R

RAID. See *redundant array of independent disks*.

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 (DASD)*.

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 also *device parity protection*.

router. An attaching device that connects two LAN segments at the reference-model network layer. The LAN segments may use similar or different architectures.

S

SAN. See *storage area network*.

SCSI. See *small computer system interface*.

server. In a network, a node that provides facilities to other stations; examples of servers are a file server, a printer server, and a mail server.

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

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-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*.

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

SNMP. See *Simple Network Management Protocol*.

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

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

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

storage device. A logical unit number (LUN) that terminates a collection of ports on the storage network.

storage network. An arrangement that provides shared access to a set of logical unit numbers (LUNs) across one - *n* storage client networks.

storage port. An engine's connection point to a storage client network. A storage port is a member of a single fabric. See also *engine*.

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

STP. See *shielded twisted pair*.

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.

T

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, such as 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*.

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

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 concept permits resegmentation of the LAN without requiring physical rearrangement.

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

VLAN. See *virtual local area network*.

VLUN. See *virtual logical unit number*.

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

W

Windows Internet Naming Service (WINS). A Microsoft 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*.

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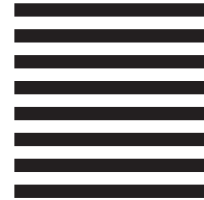
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