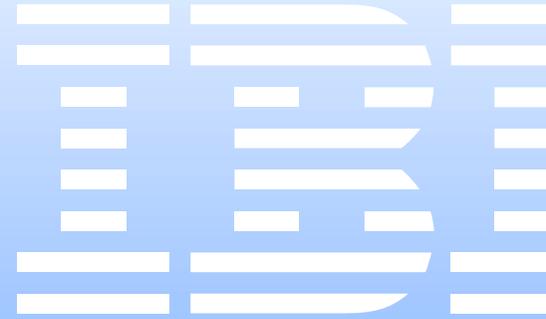


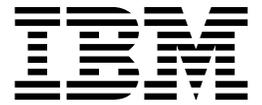


Netfinity 7600 – Type 8665

Models 1RY, 2RY



Hardware Maintenance Manual



Netfinity 7600 – Type 8665

Models 1RY, 2RY

Note

Before using this information and the product it supports, be sure to read the general information under "Notices" on page 280.

Second Edition (September 2000)

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Netfinity 7600 – Type 8665

Sept 2000

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About this manual

This manual contains diagnostic information, a Symptom-to-FRU index, service information, error codes, error messages, and configuration information for the Netfinity 7600 – Type 8665.

Important: This manual is intended for trained servicers who are familiar with IBM PC Server products.

Important safety information

Be sure to read all caution and danger statements in this book 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。

注意及危险声明 (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.

Online support

Use the World Wide Web (WWW) to download Diagnostic, BIOS Flash, and Device Driver files.

File download address is:

<http://www.us.pc.ibm.com/files.html>

IBM online addresses

The HMM manuals online address is:

<http://www.us.pc.ibm.com/cdt/hmm.html>

The IBM PC Company Support Page is:

<http://www.us.pc.ibm.com/support/index.html>

The IBM PC Company Home Page is:

<http://www.pc.ibm.com>

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General checkout

The server diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of the server: The system board, Ethernet controller, video controller, RAM, keyboard, mouse (pointing device), diskette drive, serial ports, hard drives, and parallel port. You can also use them to test some external devices. See “Diagnostic programs and error messages” on page 24.

Also, if you cannot determine whether a problem is caused by the hardware or by the software, you can run the diagnostic programs to confirm that the hardware is working properly.

When you run the diagnostic programs, a single problem might cause several error messages. When this occurs, work to correct the cause of the first error message. After the cause of the first error message is corrected, the other error messages might not occur the next time you run the test.

A failed system might be part of a shared DASD cluster (two or more systems sharing the same external storage device(s)). Prior to running diagnostics, verify that the failing system is not part of a shared DASD cluster.

A system might be part of a cluster if:

- The customer identifies the system as part of a cluster.
- One or more external storage units are attached to the system and at least one of the attached storage units is additionally attached to another system or unidentifiable source.
- One or more systems are located near the failing system.

If the failing system is suspected to be part of a shared DASD cluster, all diagnostic tests can be run except diagnostic tests which test the storage unit (DASD residing in the storage unit) or the storage adapter attached to the storage unit.

Notes:

1. For systems that are part of a shared DASD cluster, run one test at a time in looped mode. Do not run all tests in looped mode, as this could enable the DASD diagnostic tests.
2. If multiple error codes are displayed, diagnose the first error code displayed.
3. If the computer hangs with a POST error, go to the “Chapter . Symptom-to-FRU index,” on page 215.
4. If the computer hangs and no error is displayed, go to “Undetermined problems” on page 241.
5. Power supply problems, see “Chapter . Symptom-to-FRU index,” on page 215.
6. Safety information, see “Safety information” on page 249.
7. For intermittent problems, check the error log; see “POST error messages” on page 12.

1. IS THE SYSTEM PART OF A CLUSTER?

YES. Schedule maintenance with the customer. Shut down all systems related to the cluster. Run storage test.

NO. Go to step 2.

2. THE SYSTEM IS NOT PART OF A CLUSTER.

- Power-off the computer and all external devices.
- Check all cables and power cords.
- Set all display controls to the middle position.
- Power-on all external devices.
- Power-on the computer.
- Record any POST error messages displayed on the screen. If an error is displayed, look up the first error in the “POST error codes” on page 226.
- Check the information LED panel System Error LED; if on, see “Diagnostic panel LEDs” on page 218.
- Check the System Error Log. If an error was recorded by the system, see “Chapter . Symptom-to-FRU index,” on page 215.
- Start the Diagnostic Programs. See “Diagnostic programs and error messages” on page 24.
- Check for the following responses:
 - a. One beep.
 - b. Readable instructions or the Main Menu.

3. DID YOU RECEIVE BOTH OF THE CORRECT RESPONSES?

NO. Find the failure symptom in “Chapter . Symptom-to-FRU index,” on page 215.

YES. Run the Diagnostic Programs. If necessary, refer to “Diagnostic programs and error messages” on page 24.

If you receive an error, go to “Chapter . Symptom-to-FRU index,” on page 215.

If the diagnostics completed successfully and you still suspect a problem, see “Undetermined problems” on page 241.

General information

The IBM® Netfinity® 7600 server is a high-performance server with the capability of microprocessor upgrade to a symmetric multiprocessing (SMP) server. It is ideally suited for networking environments that require superior microprocessor performance, efficient memory management, flexibility, and large amounts of reliable data storage.

Performance, ease of use, reliability, and expansion capabilities were key considerations during the design of the server. These design features make it possible for you to customize the system hardware to meet your needs today, while providing flexible expansion capabilities for the future.

The IBM Netfinity 7600 server comes with a three-year limited warranty and 90-Day IBM Start Up Support. If you have access to the World Wide Web, you can obtain up-to-date information about the server model and other IBM server products at the following World Wide Web address: <http://www.ibm.com/pc/us/netfinity/>

Features and specifications

The following provides a summary of the features and specifications for the Netfinity 7600 server.

- **Microprocessor:**
 - Intel® Pentium®III Xeon™
 - 32 KB of level-1 cache
 - 1 MB of Level-2 cache (min.)
 - Expandable to four microprocessors
- **Memory:**
 - Maximum: 16GB
 - Type: ECC, SDRAM, Registered DIMMs
 - Slots: 4-way interleaved, 16 slots
- **Drives standard:**
 - Diskette: 1.44 MB
 - CD-ROM: 40X IDE
- **Expansion bays:**
 - Hot-swap: 10 slim high or 7 half high
 - Non-hot-swap: Two 5.25-inch
- **PCI expansion slots:**
 - Four 33 MHz 64-bit
 - Two 66 MHz 64-bit
- **Hot-swap power supplies:**

250 W (115-230 V ac)

 - Minimum: Three
 - Maximum: Four
- **Redundant cooling:**
 - Four hot-swap fan assemblies
- **Video:**

- S3 video controller
- Compatible with SVGA and VGA
- 4 MB video memory
- **Size**
 - Height: 356 mm (14 in.)
 - Depth: 650 mm (25.6 in.)
 - Width: 440 mm (17.3 in.)
 - Weight: 34.4 kg (76 lb.) to 61 kg (134 lb.) depending upon configuration
- **Integrated functions:**
 - Netfinity Advanced System Management processor
 - Dual Ultra-2 (LVD) SCSI controller, one external port, one internal port
 - One 10BASE-T/100BASE-TX AMD Ethernet controller
 - Three serial ports (one reserved for system management)
 - Two RS 485 ports
 - One parallel port
 - Two universal serial bus ports
 - Keyboard port
 - Mouse port
 - Video port
- **RAID technology**
 - IBM ServeRAID controller (three channels)
- **Acoustical noise emissions:**
 - Sound power, idling: 6.3 bel maximum
 - Sound power, operating: 6.3 bel maximum
 - Sound pressure, operating: 48 dBa maximum
- **Environment:**
 - Air temperature:
 - Server on: 10° to 35° C (50° to 95° F). Altitude: 0 to 914 m (3000 ft.)
 - Server on: 10° to 32° C (50° to 89.6° F). Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)
 - Server off: 10° to 43° C (50° to 110° F). Maximum altitude: 2133 m (7000 ft.)
 - Humidity:
 - Server on: 8% to 80%
 - Server off: 8% to 80%
- **Heat output:**

Approximate heat output in British Thermal Units (BTU) per hour

 - Minimum configuration: 1023.9 BTU
 - Maximum configuration: 2764.6 BTU
- **Electrical input:**
 - Sine-wave input (50-60 Hz) required
 - Input voltage low range:
 - Minimum: 90 V ac
 - Maximum: 137 V ac
 - Input voltage high range:
 - Minimum: 180 V ac
 - Maximum: 265 V ac
 - Input kilovolt-amperes (kVA) approximately:

- Minimum: 0.08 kVA
- Maximum: 0.52 kVA

Server features

The unique design of the server takes advantage of advancements in symmetric multiprocessing (SMP), data storage, and memory protection. The server combines:

- Impressive performance using an innovative approach to SMP

The server supports up to four Pentium III Xeon microprocessors. The server comes with one microprocessor installed; you can install additional microprocessors to enhance performance and provide SMP capability.

- Integrated disk-array subsystem

Although many operating systems provide software fault tolerance through mirroring, IBM provides hardware fault tolerance through the redundant array of independent disks (RAID) controller. The IBM ServeRAID™ controller is a standard feature. It provides three channels and supports RAID levels 0, 1, 1E, 5, and 5E.

- Large data-storage and hot-swap capabilities

All models of the server support up to 10 slim-high or 7 half high hot-swap hard disk drives. This *hot-swap* feature enables you to remove and replace hard disk drives without turning off the server.

- Hot-plug PCI adapter capabilities

The server has four *hot-plug* slots for PCI adapters. With operating system support, you can replace failing hot-plug PCI adapters without turning off the server. If the *hot-add* feature is supported by the operating system and the PCI adapter, you can also add PCI adapters in these slots without turning off the server.

- Redundant cooling and power capabilities

The redundant cooling and hot-swap capabilities of the fans in the server enable continued operation if one of the fans fails, because you can replace a failing fan without turning off the server.

The server comes standard with three 250-watt power supplies, which support redundancy for a typical configuration. You can install one additional power supply.

- Large system memory

The memory bus in the server supports up to 16 GB of system memory. The memory controller provides error correcting code (ECC) support for up to 16 industry-standard, 3.3 V, 168-pin, 8-byte, registered, dual inline memory modules (DIMMs). The memory controller also provides Chipkill™ memory protection. Chipkill memory protection is a technology that protects the system from component failure on a DIMM.

- System-management capabilities

The server comes with a Netfinity Advanced System Management Processor. This processor, in conjunction with the Netfinity Manager software provided on the ServerGuide CDs, enables you to manage the functions of the server locally and remotely. The Netfinity Advanced System Management Processor also provides system monitoring, event recording, and dial-out alert capability.

Note: The Netfinity Advanced System Management Processor is sometimes referred to as the service processor.

Refer to “Chapter . Netfinity Manager,” on page 95 for more information.

- Integrated network environment support

The server comes with an Ethernet controller. This Ethernet controller has an interface for connecting to 10-Mbps or 100-Mbps networks. The server automatically selects between 10BASE-T and 100BASE-TX. The controller provides full-duplex (FDX) capability, which enables simultaneous transmission and reception of data on the Ethernet local area network (LAN).

- Redundant network-interface card

The addition of an optional, redundant network interface card (NIC) provides a failover capability to a redundant Ethernet connection. If a problem occurs with the primary Ethernet connection, all Ethernet traffic associated with this primary connection is automatically switched to the redundant NIC. This switching occurs without data loss and without user intervention.

- IBM ServerGuide CDs

The ServerGuide CDs included with the Netfinity server provide programs to help you set up the server and install the network operating system (NOS). The ServerGuide program detects the hardware options that are installed, and provides the correct configuration program and device drivers. In addition, the ServerGuide CDs include a variety of application programs for the server.

Reliability, availability, and serviceability

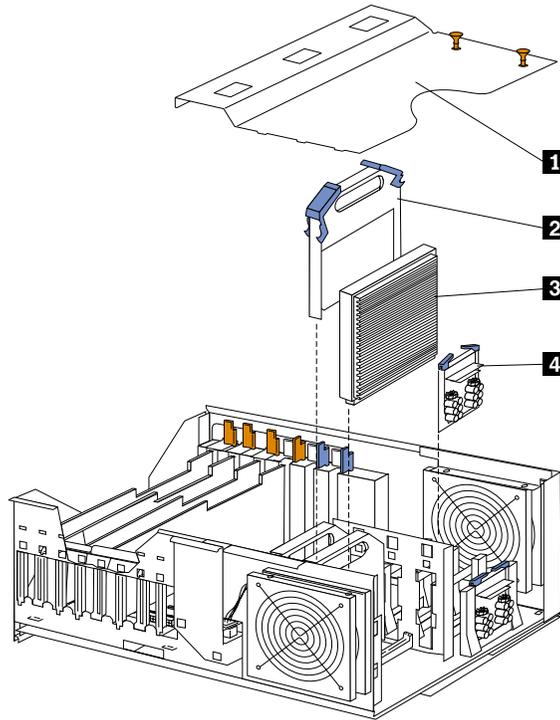
Three of the most important features in server design are reliability, availability, and serviceability (RAS). These factors help to ensure the integrity of the data stored on the server; that the server is available when you want to use it; and that should a failure occur, you can easily diagnose and repair the failure with minimal inconvenience.

The following is an abbreviated list of the RAS features that the server supports.

- Menu-driven setup, system configuration, RAID configuration, and diagnostic programs
- Power-on self-test (POST)
- Integrated
- Predictive Failure Analysis™ alerts
- Remote system problem-determination support
- Power and temperature monitoring
- Power-supply redundancy monitoring
- Fault-resistant startup
- Hot-swap drive bays
- Support for hot-plug PCI adapters
- Error codes and messages
- System error logging
- Upgradable BIOS, diagnostics, and code
- Automatic restart after a power failure
- Parity checking on the SCSI bus and the PCI bus
- Error correcting code (ECC) memory
- Chipkill™ memory protection
- Redundant hot-swap power supplies and fans
- Redundant Ethernet capabilities (with optional adapter)
- Vital Product Data (VPD) on processors, processor board, I/O board, power supplies, hard disk backplane, power backplane and VRMs.
- Information and diagnostic LED panels

Controls and indicators

The following illustration shows the controls and indicators on the server.

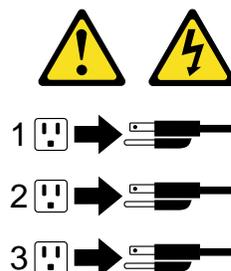


- 1** **Hard-disk drive status light:** Each of the hot-swap drives has a status light. When this amber light is on continuously, the drive has failed. When the light flashes slowly (one flash per second), the drive is being rebuilt. When the light flashes rapidly (three flashes per second) the controller is identifying the drive.
- 2** **Hard-disk activity light:** Each of the hot-swap drives has a hard-disk activity light. When this green light is flashing, the drive is being accessed.
- 3** **CD-ROM eject/load button:** Press this button to eject or retract the CD-ROM tray.
- 4** **CD-ROM drive in-use light:** When this light is on, the CD-ROM drive is being accessed.
- 5** **Diskette-eject button:** Press this button to eject a diskette from the drive.
- 6** **Diskette drive in-use light:** When this light is on, the diskette drive is being accessed.
- 7** **Reset button:** Press this button to reset the server and run the power-on self-test (POST).
- 8** **Power control button:** Press this button to manually turn on or off the server.



CAUTION:

The power control button on the device and/or 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.



You can start the server in several ways:

- You can turn on the server by pressing the Power Control button on the front of the server.
Note: After you plug the power cords of your server into electrical outlets, wait 20 seconds before pressing the Power Control button. During this time the system-management processor is initializing and the Power Control button does not respond.
- If the server is turned on, a power failure occurs, and unattended- start mode is enabled in the Configuration/Setup utility program, the server will start automatically when power is restored.
- If AC power is present, the server is off, and the wake-up feature is enabled in the Configuration/Setup utility program, the wake-up feature will turn on the server at the set time.
- If AC power is present, the server is off, and ring signal detect is enabled in the Configuration/Setup utility program, you can turn on the server by telephone input.
- The Netfinity Advanced System Management Processor also can turn on the server.

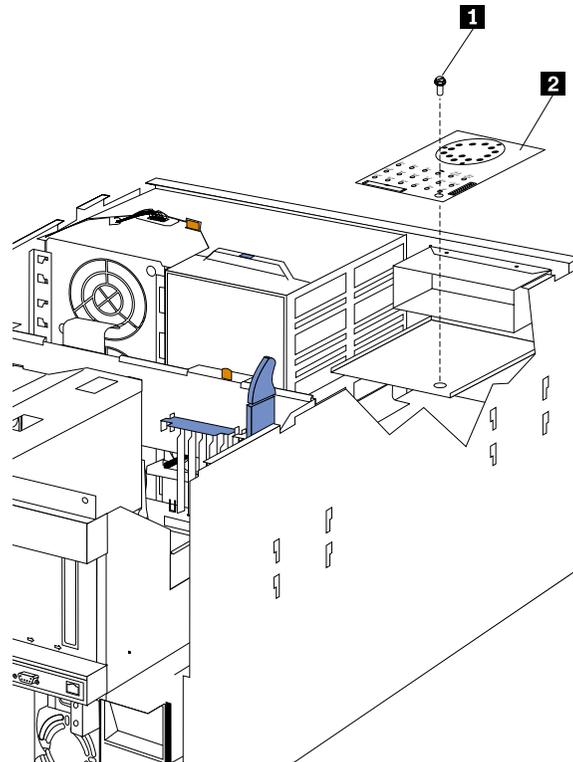
You can turn off the server in several ways:

- You can turn off the server by pressing the Power Control button on the front of the server. Pressing the Power Control button starts an orderly shutdown of the operating system, if this feature is supported by your operating system, and places the server in standby mode.
Note: After turning off the server, wait at least 5 seconds before pressing the Power Control button to power the server on again.
- You can press and hold the Power Control button for more than 4 seconds to cause an immediate shutdown of the server and place the server in standby mode. You can use this feature if the operating system stalls.
- You can disconnect the server power cords from the electrical outlets to shut off all power to the server.
Note: Wait about 15 seconds after disconnecting the power cords for your system to stop running. Watch for the System Power light on the operator information panel to stop blinking.

- 9** **Information LED panel:** The lights on this panel give status information for the server. See “Information LED panel”.

Information LED panel

The following illustration shows the status lights on the Information LED panel.



- 1** **System power light:** When this green light is on, power is present in the server. When this light flashes, the server is in standby mode (the system power supply is turned off and ac current is present). When this light is off, the power subsystem, the ac power, or a light has failed.
- Attention:** If the system power light is off, it does not mean there is no electrical current present in the server. The light might be burned out. To remove all electrical current from the server, you must unplug the server power cords from the electrical outlets or from the uninterruptible power device.
- 2** **POST-complete light:** This green light is on when the power-on self-test (POST) completes without any errors.
- 3** **Hard disk drive activity light:** This green light flickers when there is activity on a hard disk drive.
- 4** **Information light:** When this amber light is on, the server power supplies are nonredundant or some other noncritical event has occurred. The event is recorded in the Event log. See “Choices available from the Configuration/Setup main menu” on page 44. A light on the diagnostic panel may also be on; see “Diagnostic panel LEDs” on page 28.
- 5** **System error light:** This amber light is on when a system error occurs. A light on the diagnostics LED panel will also be on to further isolate the error. (For more information, see “Diagnostic panel LEDs” on page 28.)

- 6 Ethernet transmit/receive activity light:** When this green light is on, there is activity between the server from the network.
- 7 Ethernet-link status light:** When this green light is on, there is an active connection on the Ethernet port.
- 8 Ethernet speed 100 Mbps:** When this green light is on, the Ethernet speed is 100 Mbps. When the light is off, the Ethernet speed is 10 Mbps.
- 9 Processor activity lights:** One or more of these green lights are on when there is microprocessor activity. The number of lights that are on indicates the number of microprocessors with activity.

Diagnostics

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This section provides basic troubleshooting information to help you resolve some common problems that might occur with the server.

If you cannot locate and correct the problem using the information in this section, refer to “Chapter . Symptom-to-FRU index,” on page 215 for more information.

Diagnostic tools overview

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

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

The power-on self-test (POST) generates beep codes and messages to indicate successful test completion or the detection of a problem. See “POST” on page 12 for more information.

- **Diagnostic programs and error messages**

The server diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of the server. See “Diagnostic programs and error messages” on page 24 for more information.

- **Light path diagnostics**

Your server has light-emitting diodes (LEDs) to help you identify problems with server components. These LEDs are part of the light-path diagnostics that are built into the server. By following the *path of lights*, you can quickly identify the type of system error that occurred. See “Light path diagnostics” on page 27 for more information.

- **Error symptoms**

These charts list problem symptoms, along with suggested steps to correct the problems. See the “Diagnosing errors” on page 34 for more information.

POST

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

If POST finishes without detecting any problems, a single beep sounds, the first screen of the operating system or application program appears, and the System POST Complete (OK) light is illuminated on the operator information panel.

If POST detects a problem, more than one beep sounds and an error message appears on the screen. See “POST beep codes” and “POST error messages” 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.

POST beep codes

POST generates beep codes to indicate successful completion or the detection of a problem.

- One beep indicates the successful completion of POST.
- More than one beep indicates that POST detected a problem. For more information, see “Beep symptoms” on page 215.

POST error messages

POST error messages occur during startup when POST finds a problem with the hardware or detects a change in the hardware configuration. For a list of POST errors, see “POST error codes” on page 226.

Event/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 Netfinity Advanced System Management Processor.

To view the contents of the error logs, start the Configuration/Setup Utility program; then, select **Event/Error Logs** from the main menu.

Small computer system interface messages

If you receive a SCSI error message, see “SCSI error codes” on page 236.

Note: If the server does not have a hard disk drive, ignore any message that indicates that the BIOS is not installed.

You will get these messages only when running the SCSISelect Utility.

Solving ServeRAID problems

This section describes the ServeRAID text and numeric messages that might appear during startup. This section also includes some basic information about rebuilding a defunct drive.

In addition to the information provided in this section, you might want to use the ServeRAID IPSSSEND program to help isolate ServeRAID problems.

ServeRAID controller messages

This section lists the ServeRAID messages that might appear during system startup.

The ServeRAID controllers provide a Device Event Log that collects statistics on the number and types of events that occur on a selected physical drive. After correcting a problem with the array, clear the log so that you can identify any subsequent errors quickly. For information about clearing the event log, see "eraseevent" on page 170.

All physical drives contain unique identifiers, such as the drive serial number and manufacturer. During configuration, the ServeRAID controller stores this information.

ServeRAID startup messages

During power-on self-test (POST), the ServeRAID controller compares the stored configuration information to the configuration that is actually present. If a discrepancy exists, one or more status messages appear after POST completes, but before the operating system loads.

Notes:

1. When the ServeRAID controller requires your input, a list of function keys will appear below the message.
2. Where the Action information tells you to start the IBM ServeRAID configuration program, insert the *IBM ServeRAID Support CD* into the CD-ROM drive; then, restart the server. The Action column also provides general information about the message.
3. Where *SID* or *ch* appears in these messages, *sid* is the SCSI ID for the device, and *ch* is the channel to which the device is attached.
4. Where *m* or *n* appears in these messages, a number will appear in the actual message.

Following are messages associated with the ServeRAID subsystem in alphabetical order.

A new drive was installed.

Explanation: When the ServeRAID controller detects a new drive that is not part of the current configuration, the following message appears:

x new ready drives found
where *x* is the number of ready drives found.

Action: This is an information message. No action is required.

Auto rearrange.

Explanation: Auto rearrange is enabled or disabled.

Action: This is an information message. No action is required.

Battery-Backup Write Cache Not Responding

Explanation: BIOS code detected a bad or failed battery-backup write cache.

Action: Press **F9** to remove the battery-backup write cache from the configuration, or press **F10** to exit without change.

Battery-Backup Write Cache Replacement

Explanation: The ServeRAID controller detects that the battery-backup write cache is defective.

Action: Press **F8** if you replaced the battery-backup write cache, or press **F10** if you have not replaced the battery-backup write cache.

Configured drives are missing.

Explanation: When the ServeRAID controller detects that a previously configured drive is missing, the following message appears:

x online drives not responding

where x is the number of drives not responding. Example of a possible message: Online Drive on Channel 3 SCSI ID 3 is not responding.

Action: Press one of the following keys:

F2 – Detailed description. Press this key for a detailed description of the problem, such as the example message above.

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.

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. 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.

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:

1. All cables are connected properly to the backplane and to the physical drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. Try rebuilding the drive if you have not already done so. See “Rebuilding a defunct drive” on page 22 for more information.

After you perform these steps, if the physical drive does not function properly, replace the drive.

F10 – Continue booting without changing the configuration. Press this key to continue without change to the configuration.

Configured drives are not in the configured location.

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:

x online drive has been rearranged

where x is the number of drives that have been rearranged. Examples of possible messages are: Online Drive on Channel 3 SCSI ID 4 moved to Channel 3 SCSI ID 3

Online Drive on Channel 3 SCSI ID 3 moved to Channel 3 SCSI ID 4

Action: Press one of the following keys: **F2** – Detailed description. Press this key for a detailed description of the problem, such as the example messages above. **F4** – Retry. Press this key after correcting a problem. For example, press **F4** after you move the physical drive to its previously assigned location. **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.

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:

1. All cables are connected properly to the backplane and to the physical drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See “Rebuilding a defunct drive” on page 22 for more information.

After you perform these steps, if the physical drive does not function properly, replace the drive. **F6** – Change the configuration and accept the rearrangement. Press this key to modify the configuration to match the current drive location. 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. **F10** – Continue startup without changing the configuration. Press this key to continue without change to the configuration.

Controller is not responding to commands. No logical drives are installed.

Explanation: The ServeRAID controller is not operational.

Action: Run the *IBM ServeRAID Support CD* and reseal the adapter. If the problem persists, replace the adapter.

Error: Cannot disable this controller BIOS.

Explanation: The ServeRAID controller was unable to prevent an extra copy of its BIOS code from being stored on the server. This condition occurs when the server contains multiple ServeRAID controllers.

Action: This is an information message. No action is required.

Installation stopped.

Explanation: The server cannot access the ServeRAID controller.

Action: This is a follow-on message to a preceding message. Follow the Action instructions for the preceding message to resolve the problem.

New controller installed in a configured server or drives are imported.

Explanation: When the ServeRAID controller detects that the identifiers of the drives do not match the controller configuration information, the following message appears: *x* online drive(s) found with mismatch configuration
Examples of possible messages: Configuration mismatch Channel 1 SCSI ID 0 with Host ID Configuration mismatch Channel 2 SCSI ID 0 with Host ID

Action: Press one of the following keys: **F2** – Detailed description. Press this key for a detailed description of the problem, such as the example messages above. **F4** – Retry. Press this key after correcting the problem. For example, press F4 after you move the physical drive to its previously assigned location, or after you install the original physical drives back in the server. **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. **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:

1. All cables are connected properly to the backplane or processor or I/O board, and to the physical drive. Also, ensure that all cables inside the server are connected properly.
2. The hot-swap drive trays are seated properly in the drive bay.
3. If you have not already attempted to rebuild the drive, try rebuilding it. See “Rebuilding a defunct drive” on page 22 for more information.

After you perform these steps, if the physical drive does not function properly, replace the drive. **F7** – Import configuration information from drive. Press this key to restart the server. Press this key 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. 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. 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:

1. Restart the server and press Ctrl+I to enter the Mini-Configuration program (see “Using the ServeRAID Mini-Configuration program” on page 165).
2. Select **Advanced Functions**.
3. Select **Copy the Configuration from Drives to the Controller** and follow the instructions on the screen.

Recoverable configuration error.

Explanation: The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.

Action:

1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu.
2. Select **Advanced Functions** from the Main Menu.
3. Select **Copy the Configuration from Drives to the Controller**.

Unrecoverable configuration error.

Explanation: The configuration data stored in NVRAM does not match the configuration data stored in the EEPROM.

Action:

1. Press Ctrl+I to access the ServeRAID Mini-Configuration menu.
2. Select **Advanced Functions** from the Main Menu.
3. Select **Restore to the Factory Default Settings**.

WARNING: n logical drives are critical; n logical drives are offline.

Explanation: One or more physical drives have failed.

Action: Replace the defunct drives as soon as possible to prevent data loss.

Your server has an error due to a Blocked Logical Drive.

Explanation: One or more logical drives are blocked. A blocked logical drive cannot be accessed.

Action: Press **F4** to unblock the logical drive, or press **F5** to continue without unblocking.

ServeRAID ISPR, BCS, and ECS POST error codes

After the ServeRAID POST completes, register information appears on the screen in hexadecimal format, as follows:

Hardware: ISPR=aaaa BCS=bb ECS=cc

ISPR displays the four-digit Interrupt Status Report Register code, BCS displays the Basic Configuration Status Register code, and ECS displays the Extended Configuration Status Register code.

For example:

Controller 1 Slot 5, Status:Not responding properly - Error Code=0B0
 Controller 2 Slot 4, Logical Drive=0, Other=0, Firmware=2.88.10, Status=0k
 Controller 3 Slot 3, Logical Drive=0, Other=0, Firmware=3.60.13, Status=0k
 Controller 4 Slot 2, Logical Drive=1, Other=1, Firmware=1.00.09, Status=0k

If no errors occur:

ISPR (*aaaa*) = EF10

BCS (*bb*) = 0F or 09

ECS (*cc*) = 00

If an error occurs, refer to: “ServeRAID POST (ISPR) error codes” on page 232 for the ISPR error codes and “Basic and Extended Configuration Status Register Codes” for the BCS and ECS error codes.

Basic and Extended Configuration Status Register Codes:

BCS	ECS	Explanation and possible recovery action
Code not in table	Code not in table	Explanation: The ServeRAID controller is not functioning properly. Action: Replace the adapter or the I/O board with integrated controller.
00	01	Explanation: Invalid flash configuration. Action: Start the <i>IBM ServeRAID Support CD</i> and follow the instructions that appear on the screen.
00	02	Explanation: Invalid NVRAM configuration. Action: Start the <i>IBM ServeRAID Support CD</i> and follow the instructions that appear on the screen.
00	03	Explanation: Invalid flash and NVRAM configuration. Action: Start the <i>IBM ServeRAID Support CD</i> and follow the instructions that appear on the screen.
01	08	Explanation: No configuration was found in drives, or online/rebuild drives are not responding. Action: Press F4, F5, F7, or F10.
01	18	Explanation: No configuration was found in drives, or online/rebuild and hot-spare/standby hot-spare drives are not responding. Action: Press F4, F5, F7, or F10.
01	28	Explanation: No configuration was found in drives, or online/rebuild and ready/standby drives are not responding. Action: Press F4, F5, F7, or F10.
01	38	Explanation: No configuration was found in drives, or online/rebuild, hot-spare/standby hot-spare, and ready/standby drives are not responding. Action: Press F4, F5, F7, or F10.
01	48	Explanation: No configuration was found in drives, or online/rebuild drives are not responding and unidentified drives were found. Action: Press F4, F5, F7, or F10.

BCS	ECS	Explanation and possible recovery action
01	58	<p>Explanation: No configuration was found in drives, or online/rebuild and hot-spare/standby hot-spare drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
01	68	<p>Explanation: No configuration was found in drives, or online/rebuild and ready/standby drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
01	78	<p>Explanation: No configuration was found in drives, or online/rebuild, hot-spare/standby hot-spare, and ready/standby drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	88	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	98	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild and hot spare/standby hot-spare drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	A8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild and ready/standby drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	B8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild, hot-spare/standby hot-spare, and ready/standby drives are not responding.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	C8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	D8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild and hot-spare/standby hot-spare drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	E8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild and ready/standby drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>
03	F8	<p>Explanation: A drive was imported from another system and it has valid configuration, and online/rebuild, hot-spare/standby hot-spare, and ready/standby drives are not responding and unidentified drives were found.</p> <p>Action: Press F4, F5, F7, or F10.</p>

BCS	ECS	Explanation and possible recovery action
07	08	Explanation: Online/rebuild drives are not responding. Action: Press F4, F5, or F10.
07	0C	Explanation: Online/rebuild drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	18	Explanation: Online/rebuild and hot-spare/standby hot-spare drives are not responding. Action: Press F4, F5, or F10.
07	1C	Explanation: Online/rebuild and hot spare/standby hot-spare drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	28	Explanation: Online/rebuild and ready/standby drives are not responding. Action: Press F4, F5, or F10.
07	2C	Explanation: Online/rebuild and ready/standby drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	38	Explanation: Online/rebuild, ready/standby, and hot-spare/standby hot-spare drives are not responding. Action: Press F4, F5, or F10.
07	3C	Explanation: Online/rebuild, ready/standby, and hot-spare/standby hot-spare drives are not responding, and a drive was found at the incorrect SCSI ID. Action: Press F4, F5, F6, or F10.
07	48	Explanation: Online/rebuild drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	4C	Explanation: Online/rebuild drives are not responding, and a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
07	58	Explanation: Online/rebuild and hot spare/standby hot-spare drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	5C	Explanation: Online/rebuild and hot spare/standby hot-spare drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
07	68	Explanation: Online/rebuild and ready/standby drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.

BCS	ECS	Explanation and possible recovery action
07	6C	Explanation: Online/rebuild and ready/standby drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
07	78	Explanation: Online/rebuild, ready/standby, and hot-spare/standby hot-spare drives are not responding, and unidentified drives were found. Action: Press F4, F5, or F10.
07	7C	Explanation: Online/rebuild, ready/standby, and hot-spare/standby hot-spare drives are not responding, a drive was found at the incorrect SCSI ID, and unidentified drives were found. Action: Press F4, F5, F6, or F10.
09	00	Explanation: No error occurred. Action: No action is required.
09	10	Explanation: Hot-spare/standby hot-spare drives are not responding. Action: Press F4, F5, or F10.
09	20	Explanation: Ready/standby drives are not responding. Action: Press F4, F5, or F10.
09	30	Explanation: Hot-spare/standby hot-spare and ready/standby drives are not responding. Action: Press F4, F5, or F10.
0F	00	Explanation: No error occurred. Action: No action is required.
0F	10	Explanation: Hot-spare/standby hot-spare drives are not responding. Action: Press F4, F5, or F10.
0F	20	Explanation: Ready/standby drives are not responding. Action: Press F4, F5, or F10.
0F	30	Explanation: Hot-spare/standby hot-spare and ready/standby drives are not responding. Action: Press F4, F5, or F10.

Rebuilding a defunct drive

A physical drive is defunct when there is a loss of communication between the controller and the physical drive. This can be caused by any of the following:

- An improperly connected cable, physical drive, or controller
- A loss of power to a drive
- A defective cable, backplane, physical drive or controller

In each case, the communication problem needs to be resolved, and then a rebuild operation is required to reconstruct the data for the device in its disk array. The ServeRAID controllers can reconstruct RAID level-1 and RAID level-5 logical drives, but they cannot reconstruct data stored in RAID level-0 logical drives.

To prevent data-integrity problems, the ServeRAID controllers sets the RAID level-0 logical drives to blocked during a rebuild operation. After the rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. Remember, however, that the logical drive might contain damaged data.

Steps for recovering from defunct drives

If the defunct drives are part of an array, do the following:

- If more than one physical drive in an array is defunct, replace DDD drives and restore from backup.
- If a rebuild operation is in progress, wait until the rebuild is complete.
- If a rebuild is not in progress and only one physical drive in the array is defunct, replace the drive.

Rebuilding a hot-swap drive

A hot-swap rebuild refers to a rebuild operation that is started by the ServeRAID controller when it detects that a drive that is part of a RAID-I or RAID-J array and in the defunct state has been removed and reinserted on the SCSI backplane. The reinsertion of the physical drive, whether it is the same drive or a new drive, will trigger the ServeRAID controller to start the rebuild operation. During the rebuild operation, the drive being rebuilt is in the rebuild state, and the logical drive remains critical until the rebuild operation has been successfully completed.

On IBM servers, when a hot-spare drive is available, the rebuild operation will begin automatically without the requirement to replace the failed drive.

To start a hot-swap rebuild, do the following:

1. Without removing the drive completely, gently remove the physical drive from the server, using the handle of the hot-swap tray. If necessary, refer to the documentation that comes with your server on removing a physical drive.
2. Wait 20 seconds to allow the physical drive to completely spin down.
Note: When power is removed from a hot-swap drive, the drive immediately parks the heads, locks the actuator in the "landing zone", and begins spinning down. However, the spinning down of the disk might require up to 20 seconds after power is removed. Do not move the drive while it is spinning down. Moving the drive while it is spinning down may damage the drive.
3. Gently replace into the server the physical drive that you removed. Make sure the drive is completely installed in the backplane connector.

Recovering from an incomplete format of a physical drive

During formatting of a physical drive, if the format process is stopped by a system reset, system shut down, power outage, or by some other means, the physical drive becomes inoperable.

To enable the physical drive to communicate with the ServeRAID controller again, do the following:

1. Note the channel of the ServeRAID controller to which the physical drive is connected.
2. Note the SCSI ID of the physical drive.

3. Use **ipssend format** to restart the format of the physical drive. The syntax is:
ipssend format controller channel sid

where:

- *controller* is the ServeRAID controller number (1–12)
- *channel* is the channel number for the device (1, 2, or 3)
- *sid* is the SCSI ID for the device (0–15)

After the **format** is complete, the ServeRAID controller will be able to recognize the drive again.

Recovering from a failure in a failover-environment

In a failover environment, when the ServeRAID device driver is unable to send a command to the primary controller and the primary controller does not respond to a reset command, the device driver attempts to failover to the secondary controller.

Note: Loose cables or defective physical drives will not cause a failover to occur.

Replacing a non-hot-plug controller in a failover pair

If a failed controller is not in a hot-plug PCI slot, do the following to replace it:

1. Shutdown the server.
2. Replace the failed controller.
3. Reconfigure the new controller.

Notes:

1. Be sure the firmware level of the new controller is the same as the controller you are replacing. Be sure to use the same controller name, partner name, and SCSI initiator ID for the controller you are replacing.
2. For detailed instructions, refer to the Hardware Maintenance Manual for the ServeRAID controller being serviced.

If the failed controller is in a hot-plug slot, refer to the documentation that comes with the server for instructions for replacing the controller.

Diagnostic programs and error messages

The server diagnostic programs are stored in upgradable read-only memory (ROM) on the system board. These programs are the primary method of testing the major components of the server.

Diagnostic error messages indicate that a problem exists; they are not intended to be used to identify a failing part. Troubleshooting and servicing of complex problems that are indicated by error messages should be performed by trained service personnel.

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

The following sections contain the error codes that might appear in the detailed test log and summary log when running the diagnostic programs.

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 that 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.

Text messages

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 be one of the following:

Passed This result occurs when the diagnostic test completes without any errors.

Failed This result occurs when the diagnostic test discovers an error.

User Aborted

This result occurs when you stop the diagnostic test before it is complete.

Not Applicable

This result occurs when you specify a diagnostic test for a device that is not present.

Aborted This result occurs when the test could not proceed because of the system configuration.

Warning This result occurs when a possible problem is reported during the diagnostic test, such as when a device that is to be tested is not installed.

Test Specific String

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

Starting the diagnostic programs

You can press F1 while running the diagnostic programs to obtain Help information. You also can press F1 from within a help screen to obtain online documentation from which you can select different categories. To exit Help and return to where you left off, press Esc.

To start the diagnostic programs:

1. Turn on the server and watch the screen.

Note: To run the diagnostic programs, you must start the server 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.

2. When the message **F2 for Diagnostics** appears, press **F2**.
3. Type in the appropriate password when prompted; then, press **Enter**.
4. Select either **Extended** or **Basic** from the top of the screen.
5. When the **Diagnostic Programs** screen appears, select the test you want to run from the list that appears; then, follow the instructions on the screen.

Notes:

- a.If the server stops during testing and you cannot continue, restart the server and try running the diagnostic programs again. If the problem persists, flash server with the latest diagnostics code and run the test again.
- b.The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server.
- c.If you run the diagnostic programs with no mouse attached to the server, you will not be able to navigate between test categories using the **Next Cat** and **Prev Cat** buttons. All other functions provided by mouse-selectable buttons are also available using the function keys.
- d.You can run the USB interface test and the USB external loopback test only if there are no USB devices attached.
- e.You can view server 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 screen.

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

If the hardware checks out OK but the problem persists during normal server operations, a software error might be the cause. If you suspect a software problem, refer to the information that comes with the software package.

Viewing the test log

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

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

To view the test log:

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

The system maintains the test-log data while the server is powered on. When you turn off the power to the server, the test log is cleared.

Diagnostic error message tables

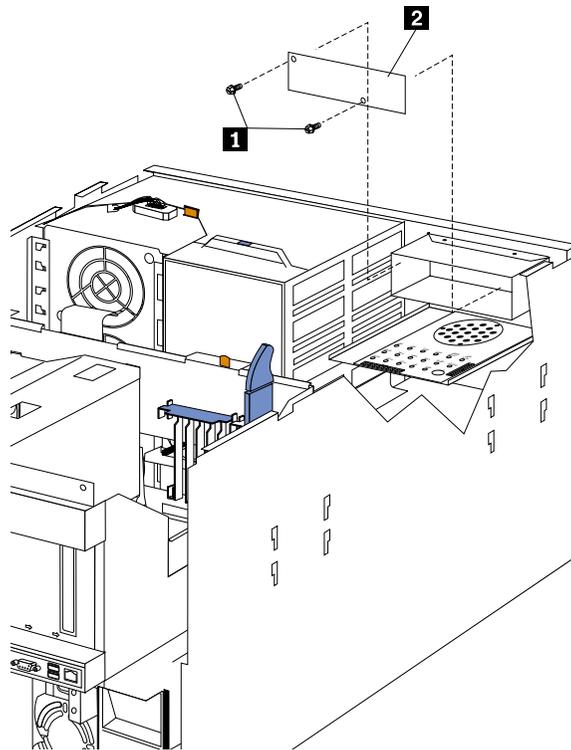
For descriptions of the error messages that might appear when you run the diagnostic programs, see “Diagnostic error codes” on page 220. If diagnostic error messages appear that are not listed in those tables, make sure that the server has the latest levels of BIOS, Advanced System Management Processor, ServeRAID, and diagnostics microcode installed.

Light path diagnostics

The server has LEDs to help you identify problems with some server components. These LEDs are part of the light path diagnostics built into the server. By following the *path of lights* you can quickly identify the type of system error that occurred.

Power supply LEDs

The AC and DC power LEDs on the power supply provide status information about the power supply. See “Installing a hot-swap power supply” on page 76 for the location of these LEDs. See “Power checkout” on page 31 for more information on power problems.



- 1** AC power light
- 2** DC power light

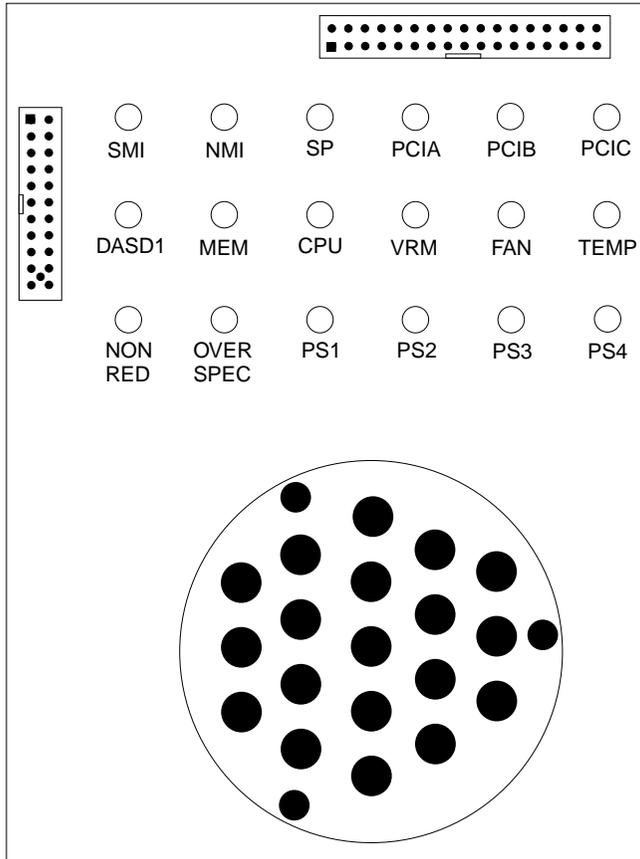
The following table describes the AC and DC power LEDs.

AC power LED	DC power LED	Description and action
On	On	The power supply is on and operating correctly.

AC power LED	DC power LED	Description and action
On	Off	<p>There is a dc power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. The server is not turned on (the power LED is blinking on the front of the server). Action: Press the power-control button to start the server. 2. The power supply has failed. Action: Replace the power supply.
Off	Off	<p>There is an ac power problem.</p> <p>Possible causes:</p> <ol style="list-style-type: none"> 1. There is no ac power to the power supply. Actions: Verify that: <ul style="list-style-type: none"> • The electrical cord is properly connected to the server. • The electrical outlet functions properly. 2. The power supply has failed. Action: Replace the power supply.

Diagnostic panel LEDs

The following illustration shows the LEDs on the diagnostics panel inside the server. See Table 1 on page 30 for information on identifying problems using these LEDs.



Light path diagnostics

You can use the light path diagnostics built into the server to quickly identify the type of system error that occurred. Your server is designed so that LEDs remain illuminated when the server shuts down, as long as the power supplies are operating properly. This feature helps you to isolate the problem if an error causes the server to shut down.

If the system error LED (on the information LED panel) is not lit and no diagnostics panel LEDs are lit, it means that the light path diagnostics have not detected a system error.

If the system error LED (on the information LED panel) is lit, it means that a system error was detected. Check to see which of the LEDs on the diagnostics panel inside the server are lit and refer to the following table:

Table 1. Light path diagnostics.

LED	Cause	Action
None	The system error log is 75% or more full; a PFA alert was logged; or a failure occurred on the I2C bus.	Check the system error log and correct any problems. See "Choices available from the Configuration/Setup main menu" on page 44 for information about clearing the error log. Disconnecting the server from all power sources for at least 20 seconds will turn off the system error LED.
SMI	A systems management event occurred.	Restart the server.
NMI	A nonmaskable interrupt occurred. The PCIA, PCIB, or PCIC LED will probably also be on.	<ol style="list-style-type: none"> 1. If the PCIA, PCIB, or PCIC LED is not on, restart the server. <p>If the problem persists, try to determine the failing adapter by removing one adapter at a time and restarting the server after each adapter is removed.</p>
SP	The service processor has failed.	<ol style="list-style-type: none"> 1. Run service processor diagnostics. 2. Replace Legacy I/O board.
PCIA	An error occurred on PCI bus A. An adapter in PCI slot 1 or 2, or the processor board caused the error.	<ol style="list-style-type: none"> 1. Check the error log for additional information. 2. If you cannot correct the problem from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus A (PCI slots 1-2) and restarting the server after each adapter is removed.
PCIB	An error occurred on PCI bus B. An adapter in PCI slot 3, 4, 5, or 6 or the processor board caused the error.	<ol style="list-style-type: none"> 1. Check the error log for additional information. 2. If you cannot correct the problem from the information in the error log, try to determine the failing adapter by removing one adapter at a time from PCI bus B (PCI slots 3-6) and restarting the server after each adapter is removed.
PCIC	An error occurred on PCI bus C. An error on the processor or I/O board caused the problem.	Check the error log for additional information. If the error log indicates a problem with the integrated SCSI controller, the Ethernet controller or video controller, see "Starting the diagnostic programs" on page 25.
DASD	A hot-swap hard disk drive has failed on SCSI channel B.	<ol style="list-style-type: none"> 1. If the TEMP LED is also on, take the actions listed for that LED. 2. If the amber status LED on one of the hot-swap hard disk drives is on, replace the drive.
MEM	A memory error occurred.	<ol style="list-style-type: none"> 1. Check the DIMM error LEDs on the memory board. 2. Replace the DIMM indicated by the lit DIMM error LEDs.
CPU	One of the microprocessors has failed or a microprocessor is installed in the wrong connector.	<ol style="list-style-type: none"> 1. Check the microprocessor error LEDs on the memory board. If a microprocessor error LED is on for a microprocessor connector that has a terminator card installed instead of a microprocessor, the microprocessors are not installed in the correct order. See "Installing a microprocessor kit" on page 73 for information about the correct order for installing microprocessors and VRMs. Otherwise, continue with the next step. 2. Turn off the server, reseat the microprocessor indicated by the lit microprocessor error LED, and restart the server. 3. If the problem persists, replace the microprocessor.
VRM	One of the voltage regulator modules on the processor board has failed.	<ol style="list-style-type: none"> 1. Check the VRM error LEDs on the processor board. 2. Turn off the server, reseat the VRM indicated by the lit VRM error LED, and restart the server. 3. If the problem persists, replace the VRM.
FAN	One of the fan assemblies has failed or is operating too slowly. Note: A failing fan can also cause the TEMP and DASD LEDs to be on.	The LED on the failing fan assembly will be lit. Replace the fan assembly.
TEMP	The system temperature has exceeded the maximum rating.	<ol style="list-style-type: none"> 1. Check to see if a fan has failed. If it has, replace the fan. 2. Make sure the room temperature is not too high. (See "Features and specifications" on page 3.) <p>If the problem persists, see "Temperature checkout" on page 31.</p>
NON RED	Server drawing too much power to operate in a redundant power mode.	System can continue to operate in a nonredundant power mode. To operate in a redundant mode, add a power supply or remove most recently installed options.
OVER SPEC	The server is drawing more power than the power supplies are rated for.	Either add a power supply or remove a device from the server.
PS1	The first power supply has failed.	Replace the first power supply.
PS2	The second power supply has failed.	Replace the second power supply.
PS3	The third power supply has failed.	Replace the third power supply.

Table 1. Light path diagnostics.

LED	Cause	Action
PS4	The fourth power supply has failed.	Replace the fourth power supply.

Power checkout

Power problems can be difficult to troubleshoot. For instance, a short circuit can exist anywhere on any of the power distribution busses. 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. Power off the system and disconnect the AC cord(s).
2. Check for loose cables in the power subsystem. Also check for short circuits, for instance 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 system is at minimum configuration required for power on (see "Minimum operating requirements" on page 225).
4. Reconnect the AC cord and power on the system. If the system powers up successfully, replace adapters and devices one at a time until the problem is isolated. If system does not power up from minimal configuration, replace FRUs of 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 power up (see page 225). For specific problems, see "Power error messages" on page 237.

Temperature checkout

Proper cooling of the system is important for proper operation and system reliability. For a typical Netfinity server, you should make sure:

- 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 inches) of ventilated space at the sides of the server and 100 mm (4 inches) at the rear of the server
- The top cover is removed for no longer than 30 minutes while the server is operating
- The processor housing cover covering the processor and memory area is removed for no longer than ten minutes while the server is operating
- A removed hot-swap drive is replaced within two 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 "Features and specifications" on page 3.

For more information on specific temperature error messages, see "Temperature error messages" on page 236.

Recovering BIOS

If the BIOS code in the server has become corrupted, such as from a power failure during a flash update, you can recover the BIOS using the recovery boot block and a BIOS flash diskette.

Note: You can obtain a BIOS flash diskette from one of the following sources:

- Use the ServerGuide program to make a BIOS flash diskette.
- Download a BIOS flash diskette from the World Wide Web. Go to <http://www.pc.ibm.com/support/>, select IBM Server Support, and make the selections for the server.

The flash memory of the server consists of a primary page and a backup page. The J56 jumper controls which page is used to start the server. If the BIOS in the primary page is corrupted, you can use the backup page to start the server; then boot the BIOS Flash Diskette to restore the BIOS to the primary page.

To recover the BIOS:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords; then, remove the cover.
2. Locate jumper J56 on the processor board (see "Processor board jumpers" on page 57).
3. Move J56 to pins 1 and 2 to enable secondary boot block page.
4. Insert the BIOS flash diskette into the diskette drive.
5. Restart the server.
6. The system begins the power-on self-test (POST). Select 1 – Update POST/BIOS from the menu that contains various flash (update) options.
7. When you are asked if you would like to move the current POST/BIOS image to the backup ROM location, type N.
Attention: Typing Y will copy the corrupted BIOS into the secondary page.
8. When you are asked if you would like to save the current code to a diskette, select N.
9. You will be asked to choose which language you wish to use. Select your language (0-7) and press **Enter** to accept your choice. You will be prompted to remove the diskette and press **Enter** to restart the system. Remove the flash diskette from the diskette drive.
Attention: Do not press **Enter** to reboot the system at this time.
10. Power-off the server.
11. Move jumper J56 back to pins 2 and 3 to return to normal startup mode.
12. Restart the server. The system should start up normally.

Replacing the battery

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 instructions.

CAUTION:

When replacing the 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.

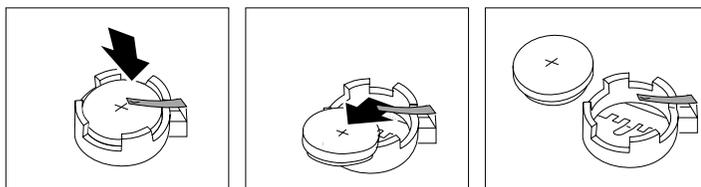
Note: In the U. S., call 1-800-IBM-4333 for information about battery disposal.

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 proper manner.

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

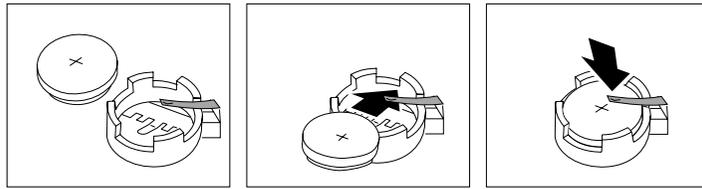
To replace the battery:

1. Read the information in “Before you begin” on page 60.
2. Follow any special handling and installation instructions supplied with the battery.
3. Turn off the server and all attached devices and disconnect all external cables and power cords (see “Safety information” on page 249); then remove the top cover.
4. Locate the battery on the processor board (see “Processor board component locations” on page 55).
5. Remove adapters as necessary so you can access the battery. (See “Working with adapters” on page 63.)
6. Lift and remove the plastic dividers by pressing the latches on the top ends of the dividers toward the dividers and lifting the dividers from the server.
7. Remove the battery:
 - a. Use one finger to lift the battery clip over the battery.
 - b. Use one finger to slightly slide the battery toward the rear of the server. The spring mechanism behind the battery will push it out toward you as you slide it forward.
 - c. Use your thumb and index finger to pull the battery from under the battery clip.
 - d. Ensure that the battery clip is touching the base of the battery socket by pressing gently on the clip.



8. Insert the new battery:

- a. Tilt the battery so that you can insert it into the front of the socket, under the battery clip.
- b. As you slide it under the battery clip, press the battery down into the socket.



9. Reinstall any adapters that you removed.
10. Insert the plastic dividers into the divider guides.
11. Reinstall the top cover.
Note: You must wait approximately 20 seconds after you plug the power cord of your server into an electrical outlet before the power control button becomes active.
12. Start the Configuration/Setup Utility program and set configuration parameters as needed. Refer to “Using the Configuration/Setup Utility program” on page 43.

Diagnosing errors

To find solutions to problems that have definite symptoms, see “Error symptoms” on page 225.

If you cannot find the problem there, go to “Starting the diagnostic programs” on page 25 to test the server.

If you have just added new software or a new option and the server is not working, do the following before using the error symptoms table:

- Remove the software or device that you just added.
- Run the diagnostic tests to determine if the server is running correctly.
- Reinstall the new software or new device.

Troubleshooting the Ethernet controller

This section provides troubleshooting information for problems that might occur with the 10/100 Mbps Ethernet controller.

Network connection problems

If the Ethernet controller cannot connect to the network, check the following:

- Make sure 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.

If you set the Ethernet controller to operate at 100 Mbps, you must use Category 5 cabling.

If you directly connect two workstations (without a hub), or if you are not using a hub with X ports, use a crossover cable.

Note: To determine whether a hub has an X port, check the port label. If the label contains an X, the hub has an X port.

- Determine if the hub supports auto-negotiation. If not, try configuring the integrated Ethernet controller manually to match the speed and duplex mode of the hub.
- Check the Ethernet controller lights on the operator information panel.

These lights indicate whether a problem exists with the connector, cable, or hub.

- The Ethernet Link Status light illuminates when the Ethernet controller receives a LINK pulse from the hub. If the light is off, there might be a defective connector or cable, or a problem with the hub.
- The Ethernet Transmit/Receive Activity light illuminates when the Ethernet controller sends or receives data over the Ethernet Network. If the Ethernet Transmit/Receive Activity light is off, make sure that the hub and network are operating and that the correct device drivers are loaded.
- The Ethernet Speed 100 Mbps light illuminates when the Ethernet controller LAN speed is 100 Mbps.
- Make sure that you are using the correct device drivers, supplied with the server.
- Check for operating system-specific causes for the problem.
- Make sure that the device drivers on the client and server are using the same protocol.
- Test the Ethernet controller.

How you test the Ethernet controller depends on which operating system you are using (see the Ethernet controller device driver README file).

Ethernet controller troubleshooting chart

You can use the following troubleshooting chart to find solutions to 10/100 Mbps Ethernet controller problems that have definite symptoms.

Table 2. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested Action
The server stops running when loading device drivers.	<p>The PCI BIOS interrupt settings are incorrect.</p> <p>Check the following:</p> <ul style="list-style-type: none"> • Determine if the interrupt (IRQ) setting assigned to the Ethernet controller is also assigned to another device in the Configuration/Setup Utility program. <p>Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet controller or the other device. For example, for NetWare Versions 3 and 4 it is recommended that disk controllers not share interrupts with LAN controllers.</p> <ul style="list-style-type: none"> • Make sure that you are using the most recent device driver available from the World Wide Web. • Run the network diagnostic program.

Table 2. Ethernet troubleshooting chart.

Ethernet controller problem	Suggested Action
Ethernet Link Status light does not light.	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that the hub is turned on. • Check all connections at the Ethernet controller and the hub. • Check the cable. A crossover cable is required unless the hub has an X designation. • Use another port on the hub. • If the hub does not support auto-negotiation, manually configure the Ethernet controller to match the hub. • If you manually configured the duplex mode, make sure that you also manually configure the speed. • Run diagnostics on the LEDs.
The Ethernet Transmit/Receive Activity light does not light.	<p>Check the following:</p> <p>Note: The Ethernet Transmit/Receive Activity LED illuminates only when data is sent to or by this Ethernet controller.</p> <ul style="list-style-type: none"> • Make sure that you have loaded the network device drivers. • The network might be idle. Try sending data from this workstation. • Run 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.	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that you are using Category 5 cabling when operating the server at 100 Mbps. • Make sure that the cables do not run close to noise-inducing sources like fluorescent lights.
The Ethernet controller stopped working when another adapter was added to the server.	<p>Check the following:</p> <ul style="list-style-type: none"> • Make sure that the cable is connected to the Ethernet controller. • Make sure that the PCI system BIOS is current. • Reseat the adapter. • Determine if the interrupt (IRQ) setting assigned to the Ethernet adapter is also assigned to another device in the Configuration/Setup Utility program. <p>Although interrupt sharing is allowed for PCI devices, some devices do not function well when they share an interrupt with a dissimilar PCI device. Try changing the IRQ assigned to the Ethernet adapter or the other device.</p>
The Ethernet controller stopped working without apparent cause.	<p>Check the following:</p> <ul style="list-style-type: none"> • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reinstall the device drivers. Refer to the operating-system documentation and to the ServerGuide information.

Ethernet controller messages

The integrated Ethernet controller might display messages from the following device drivers:

- Novell™ NetWare™ or IntraNetWare Server ODI
- NDIS Adapter for level 4.0 (Windows NT)
- SCO™ UNIX LLI

Novell NetWare or IntraNetWare server ODI driver messages

This section provides explanations of the error messages for the Novell NetWare or IntraNetWare server ODI driver, and suggested actions to resolve each problem.

Table 3. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

PCNTNW-NW-026	The MSM is unable to parse a required custom keyword. Explanation: The user entered an incorrect parameter keyword. Action: Reload the driver using the correct keyword.
PCNTNW-NW-054	The adapter did not respond to the initialization command. Explanation: The adapter did not respond when the driver tried to initialize it. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.
PCNTNW-NW-058	The adapter did not respond to the initialization command. Explanation: The interrupt request (IRQ) setting might not be valid or the EEPROM information might be incorrect. Action: Make sure the IRQ settings are correct in the Configuration/Setup Utility program. for information on setting the interrupt requests. If the IRQ settings are correct, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.
PCNTNW-NW-066	The cable might be disconnected from the adapter. Explanation: The cable might be disconnected from the server Ethernet port. Action: Verify that a cable is connected to the Ethernet port.
PCNTNW-NW-071	The matching virtual adapter could not be found. Explanation: You tried to load another instance of the driver with a different I/O address. This new adapter could not be found. Action: Verify that you installed an IBM Netfinity 10/100 Fault Tolerant Adapter and make sure that the adapter is seated correctly. If the adapter is seated correctly, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.
PCNTNW-NW-072	A resource tag is unavailable. Explanation: The driver tried to allocate some resources that were not available. Action: Add more memory, or free some memory resources in the server. Then, restart the server.
PCNTNW-NW-073	Unable to allocate memory Explanation: The driver failed to allocate the memory needed for normal operation. Action: Add more memory, or free some memory resources in the server. Then, restart the server.

Table 3. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

<p>PCNTNW-NW-074</p>	<p>The hardware interrupt cannot be set.</p> <p>Explanation: An attempt was made to initialize a given hardware interrupt. The attempt was not successful. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.</p> <p>If you have an Ethernet adapter installed, make sure that the adapter does not share an IRQ with any other device.</p>
<p>PCNTNW-NW-075</p>	<p>The Multiple Link Interface Driver (MLID) cannot be registered with the Link Support Layer (LSL).</p> <p>Explanation: An error occurred while the driver was trying to register with the LSL. Action: Check the version of the NetWare or IntraNetWare Operating System. Make sure that this driver is correct for the version of NetWare or IntraNetWare that you are using. Restart the server.</p>
<p>PCNTNW-NW-079</p>	<p>The Multiple Link Interface Driver (MLID) did not initialize MSMTx Free Count.</p> <p>Explanation: The MSMTx Free Count is not initialized correctly. Action: Restart the server. If the problem persists, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.</p>
<p>PCNTNW-NW-086</p>	<p>The driver parameter block is too small.</p> <p>Explanation: The driver parameter block is too small. Action: Restart the server. If the problem persists, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.</p>
<p>PCNTNW-NW-087</p>	<p>The media parameter block is too small.</p> <p>Explanation: The driver media parameter block is too small. Action: Restart the server. If the problem persists, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.</p>
<p>PCNTNW-NW-091</p>	<p>The hardware configuration conflicts.</p> <p>Explanation: You tried to load a new frame type for the existing controller. The hardware assumptions made in doing so are incorrect. This error can also occur if you try to specify a mode (such as, redundancy) that conflicts with another specified mode. Action: Make sure that your hardware configuration matches the software settings.</p>
<p>PCNTNW-NW-126</p>	<p>The group bit in the node address override was cleared.</p> <p>Explanation: The IEEE address has a group bit that indicates that an address belongs to a group of stations. This bit is used only as a destination address; it cannot be used as a source address. You tried to enter a source address with this bit set. The driver cleared the group bit of the source address. Action: None necessary, message is for information only.</p>
<p>PCNTNW-NW-127</p>	<p>The local bit in the node address override was set.</p> <p>Explanation: The local bit in the IEEE address format indicates that the addresses are being managed locally. If you use the node address override capabilities of this driver to enter a new address, the local bit must be set. You entered an address without the local bit set. The driver has set the local bit. Action: None necessary, message is for information only.</p>
<p>PCNTNW-NW-164</p>	<p>The device was not found.</p> <p>Explanation: The driver cannot find an Ethernet controller in the server. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.</p>

Table 3. Novell NetWare or IntraNetWare ODI driver messages for the Ethernet controller.

PCNTNW-NW-165	The device was not found at IOADDRESS. Explanation: The Ethernet controller cannot be found at the I/O address specified. Action: The Ethernet controller does not require a parameter for the I/O address. Remove the I/O address parameter.
PCNTNW-NW-167	PCI scan specified, device not found. Explanation: The driver cannot locate the Ethernet controller on the PCI bus. Action: Verify that the Ethernet controller is enabled. If the problem persists, go to “Starting the diagnostic programs” on page 25 to run the diagnostic programs.
PCNTNW-NW-180	The DMA parameter is not necessary for PCI device. Explanation: The Ethernet controller does not require a DMA setting. Action: None necessary, message is for information only.

NDIS 4.0 (Windows NT) driver messages

This section contains the error messages for the NDIS 4.0 drivers. The explanation and recommended action are included with each message.

Table 4. NDIS (Windows NT) driver messages for the Ethernet controller.

PermaNet™ Server:	No Secondary Adapter Found. Grouping Mode is disabled. Explanation: The failover option requires an adapter that is compatible with the device driver of the Ethernet controller on the system board. No such adapter was found. Action: Make sure the correct adapter is installed.
PermaNet Server:	Problem Occurs on the Primary Adapter. Switching over to the Secondary Adapter. Explanation: The system detected a problem with the primary Ethernet connection and has transferred all network traffic to the secondary Ethernet controller. Action: Identify the cause of the failure on the primary Ethernet connection. Restoring the operational state of the primary connection will cause the network traffic to automatically transfer to the primary Ethernet controller.
PermaNet Server:	Switching back to Primary Adapter. Explanation: The primary Ethernet connection is now operating correctly. Network traffic will automatically transfer to the primary Ethernet controller. Action: None needed, message is for information only.

UNIX messages

This section provides descriptions of the Ethernet error messages for the SCO UNIX LLI driver, and suggested actions to resolve each problem.

Table 5. UNIX LLI driver messages for the Ethernet controller.

pnt0-2	<p>PCI search specified, PCI device not found!</p> <p>Explanation: The driver cannot locate the Ethernet controller on the PCI bus. Action:</p> <ul style="list-style-type: none"> • Run the NETCONFIG program to search for another Ethernet controller • Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.
pnt0-6	<p>Cannot allocate memory for the adapter during an interrupt. Please check the Streams parameters.</p> <p>Explanation: On a SunSoft Solaris system, this message indicates that the system is out of Streams memory blocks. Action: Use the CRASH utility to increase the number of Streams memory blocks. Modify the interrupt request (IRQ) settings in the Configuration/Setup Utility program, or run the NETCONFIG program to match the hardware settings.</p>
pnt0-7	<p>Cannot allocate memory for the adapter during reset. Please check the Streams parameters.</p> <p>Explanation: The system is out of Streams memory blocks. Action: Use the CRASH utility to increase the number of Streams memory blocks.</p>
pnt0-11	<p>Device not found!</p> <p>Explanation: The driver cannot find an Ethernet controller. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.</p>
pnt0-12	<p>Device failed checksum test!</p> <p>Explanation: The driver cannot find an Ethernet controller. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.</p>
pnt0-13	<p>add_intr_handler failed! Interrupts already enabled.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action: Modify the hardware settings.</p>
pnt0-14	<p>Cannot locate hardware.</p> <p>Explanation: The SunSoft Solaris driver cannot find any Ethernet controller. Action: Verify that the Ethernet controller is enabled. If the Ethernet controller is enabled, run the diagnostic programs.</p>
pnt0-15	<p>No more devices to open.</p> <p>Explanation: The SunSoft Solaris driver cannot find any more Ethernet controllers. Action: Verify that additional IBM Netfinity 10/100 Fault Tolerant Adapters are present or replace the Ethernet adapter that fails to respond. If the problem persists, run the diagnostic programs.</p>
pnt0-17	<p>Device fault...Reset initiated!</p> <p>Explanation: The SunSoft Solaris driver has been reset due to a device fault. Action: Verify that additional IBM Netfinity 10/100 Fault Tolerant Adapters are present or replace the Ethernet adapter that fails to respond. If the problem persists, run the diagnostic programs.</p>
pnt0-19	<p>IRQ found for PCnet hardware does not match space.c (or pnt.conf)!</p> <p>Explanation: This is a warning message referring to the interrupt request (IRQ) that the SunSoft Solaris driver found in the system. Action: Ignore this message if you are sure that this is what you want to do. Otherwise, run the NETCONFIG program to match the hardware settings</p>

Table 5. UNIX LLI driver messages for the Ethernet controller.

pnt0-20	<p>add_intr_handler failed! Unknown interrupt type.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action:</p> <ul style="list-style-type: none"> • Modify the hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-21	<p>add_intr_handler failed! Out of range interrupt number.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action:</p> <ul style="list-style-type: none"> • Modify the hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-22	<p>add_intr_handler failed! Out of range IPL.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action: Modify the hardware settings. Run the NETCONFIG program to search for another Ethernet controller.</p>
pnt0-23	<p>add_intr_handler failed! Vector already occupied.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action: Modify the hardware settings.</p>
pnt0-24	<p>add_intr_handler failed! Vector already shared at different IPL.</p> <p>Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server. Action:</p> <ul style="list-style-type: none"> • Modify the hardware settings. • Run the NETCONFIG program to search for another Ethernet controller.
pnt0-26	<p>The DMA number is not necessary for PCI device.</p> <p>Explanation: The IBM Netfinity 10/100 Fault Tolerant Adapter does not require a DMA setting. Action: Edit the SPACE.C file to delete the DMA parameter.</p>
pnt0-29	<p>The IRQ number is already in use.</p> <p>Explanation: The specified I/O address is already in use. Action: Run the NETCONFIG program to modify the hardware settings.</p>
pnt0-31	<p>I/O address is not necessary for the PCI device.</p> <p>Explanation: The I/O address specified is not required. Action: Remove the assigned I/O address specified for the Ethernet controller.</p>

Configuring the server

The following configuration programs are provided with the server:

- **Configuration/Setup Utility**

This program is part of the *basic input/output system (BIOS)* code that comes with the server. You can 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**

With the built-in SCSISelect Utility program, you can configure the devices attached to the integrated SCSI controller. See “Using the SCSISelect utility program” on page 49 for more information.

- **ServeRAID programs**

The ServeRAID programs come with the optional ServeRAID adapters and with server models that have a ServeRAID adapter preinstalled. If the server has a ServeRAID adapter installed, you must use the ServeRAID Configuration program to define and configure the disk-array subsystem *before* you install the operating system. See “Chapter . Installing and configuring ServeRAID controllers,” on page 139 for more detailed information.

- **ServerGuide CDs**

The ServerGuide CDs include software setup and installation tools specifically designed for IBM Netfinity servers. You can use these CDs during the initial installation of the server to configure the server hardware and simplify the network operating system installation. The ServerGuide CDs also contain a collection of application programs, which you can install after the server is up and running.

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:

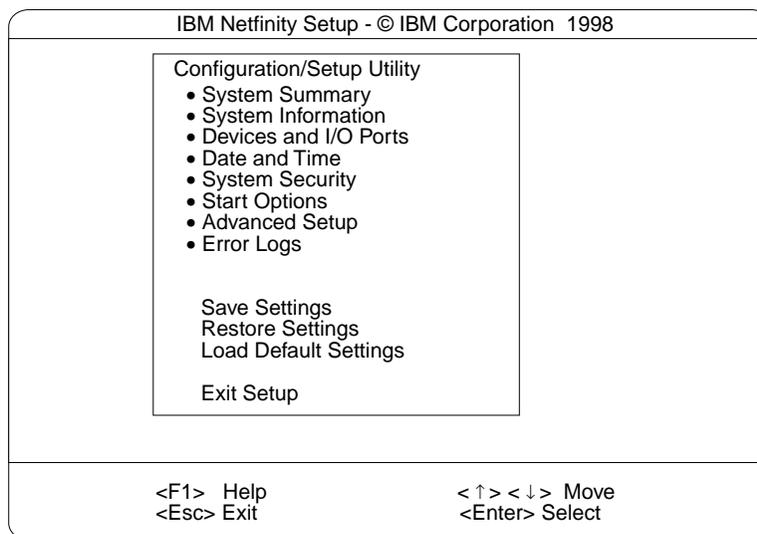
1. Turn on the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.

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.

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 following:



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 the server.

Descriptions of the choices available from the main menu are as follows:

- **System Summary**

Select this choice to display configuration information. This 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 screen. You cannot edit the fields.

This choice appears on both the full and limited Configuration/Setup Utility menus.

- **System Information**

Select this choice to display information about the server. 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.

- **Product Data**

Select this choice to view system information, such as the machine type and model, the server serial number, and the revision level or issue date of the BIOS stored in the flash electronically erasable programmable ROM (EEPROM).

- **System Card Data**

Select this choice to view vital product data (VPD) for some server components.

- **Devices and I/O Ports**

Select this choice 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 this choice to set the system date and time and to change the system time sent to the Advanced System Management Processor (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 (Advanced System Management Processor) 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 Advanced System Management Processor clock time, leave the value set at its default of 0.

- **System Security**

Select this choice 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 this choice to set or change a power-on password. See "Using passwords" on page 48 for more information.

- **Administrator Password**

Select this choice 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 I/O Legacy 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 48 for more information.

- **System Owner's Name**

Select this choice 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 this choice to view or change the start options. This choice appears only on the full Configuration/Setup Utility main menu. Start options take effect when you start the server.

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 server to run without a diskette drive, monitor, or keyboard.

The server 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, then 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 server.

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 this choice to change values for advanced hardware features, such as cache control, and PCI configuration. This choice appears only on the full Configuration/Setup Utility main menu.

A warning message appears above the choices 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 this choice to identify if the microprocessor serial number in the microprocessor is readable.

- **Core Chipset Control**

Select this choice to modify settings that control features of the core chip set.

Attention: Changes here must only be made by an IBM authorized service representative.

- **Cache Control**

Select this choice 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 this choice to view and identify system resources used by PCI devices. PCI devices automatically communicate with the server 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 choices 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 choice.

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 server will have no video capability. However, turning the server off and on three times without completing POST results in a default startup that enables video again.

- **Memory Settings**

Select this choice to manually disable or enable a bank of memory.

If a memory error is detected during POST or memory configuration, the server 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. Select **Memory Settings** from the Advanced Setup menu, use the arrow keys to highlight the bank that you want to enable; then, use the arrow keys to select **Enable**.

- **System Service Processor Settings**

Select this choice to enable or disable power supply redundancy monitoring.

- **Event/Error Logs**

Select this choice 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 this choice to save the customized settings.

- **Restore Settings**

Select this choice to delete the changes and restore the previous settings.

- **Load Default Settings**

Select this choice to cancel the 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

The **System Security** choice appears only on the full Configuration/Setup Utility menu. After you select this choice, 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 server 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 the power-on password. Keep a record of the password in a secure place. If you forget the power-on password, you can regain access to the server 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: 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 server through either 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. See “Power-on password”
- Change the position of the jumper on J48 to bypass the power-on password check. You can then start the Configuration/Setup Utility program and change the power-on password. See “Processor board component locations” on page 55 for the location of J48.

Administrator password

Select this choice 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 I/O Legacy board.

The following table provides a summary of the password features.

Table 6. Power-on and administrator password features.

Type of password	Results
Power-on password	<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	<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.

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

The following sections provide the instructions needed to start the SCSISelect Utility and descriptions of the menu choices available.

Note: If the server has a RAID adapter installed, use the configuration method supplied with the RAID adapter to view or change SCSI settings for RAID attached devices.

Starting the SCSISelect utility program

To start the SCSISelect utility program:

1. Turn on the server.
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 (external) or channel B (internal).
4. Use the arrow keys to select a choice from the menu.
 - Press Esc to return to the previous menu.
 - Press the F5 key to switch between color and monochrome modes (if the monitor permits).
5. Follow the instructions on the screen to change the settings of the selected items; then, press Enter.

Choices available from the SCSISelect menu

The following choices appear on the SCSISelect Utility menu:

- **Configure/View Host Adapter Settings**

Select this choice 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 screen.

You can view or change the following controller settings:

- **Host Adapter SCSI ID**

Select this choice to view the SCSI controller ID, normally 7.

- **SCSI Parity Checking**

Select this choice to view the assigned value of *Enabled*.

- **Host Adapter SCSI Termination**

Select this choice to view the assigned value of *Automatic*.

- **Boot Device Options**

Select this choice 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 choice 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 Ultra-3 SCSI LVD devices is 160.0
- The transfer rate for Ultra-2 SCSI LVD devices is 80.0
- The transfer rate for Fast SCSI devices is 20.0

- **Advanced Configuration Options**

Select this choice 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 choice 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 screens carefully before making a selection.

Note: If you press Ctrl+A before the selected drives are ready, an Unexpected SCSI Command Failure screen might appear. Restart the server and watch the SCSISelect messages as each drive spins up. After the drive that you want to view or format spins up, press Ctrl+A.

Unexpected SCSI Command Failure

Target SCSI ID: 4
SCSI CDB Sent: 03 00 00 00 0E 00 07 00 02 00
Host Adapter Status: 00h - No host adapter error
Target Status: 02h - Check condition
Sense Key: 02h - Not ready
+Sense Code: 04h
+Sense Code Qualifier: 02h

Press 'Esc' to continue.

- **Format Disk**

Attention: The Low-Level Format program erases *all* data and programs.

Select this choice 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 two 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 the server has a PCI RAID adapter 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 is working, make a backup copy of all the files and programs on the hard disk drive. (See the operating system information for instructions.)
2. Select **Format Disk**; then, follow the instructions on the screen.

Note: Hard disks normally contain more tracks than their stated capacity (to allow for defective tracks). A message appears on the screen if the defect limit is reached. If this happens, replace the hard disk drive.

Installing options

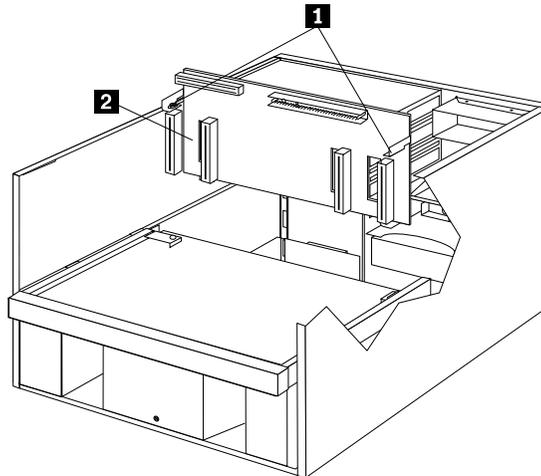
This chapter provides instructions to help you add options to the server.

Note: The illustrations in this book are similar to the server; details might vary.

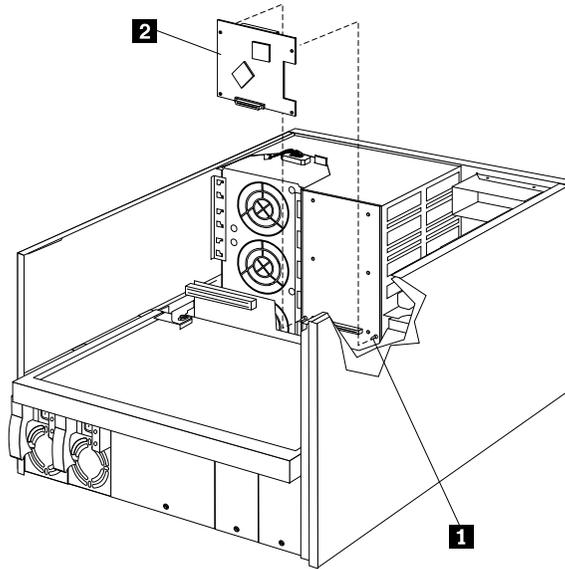
Major components of the Netfinity 7600

The orange color on components and labels in your server identifies hot-swap or hot-plug components. This means that you can install or remove the components while the system is running, provided that your system is configured to support this function. For complete information about installing or removing a hot-swap or hot-plug component, see the information provided in the detailed procedures in this document.

The blue color on components and labels indicates touch points where a component can be gripped, a latch moved, and so on.



- 1** Hot-swap drive
- 2** Power supply
- 3** Fan assembly
- 4** Filler panel
- 5** Removable-media drive



- 1** Memory board
- 2** Memory module
- 3** Microprocessor terminator card
- 4** Voltage regulator module
- 5** I/O board
- 6** Shuttle

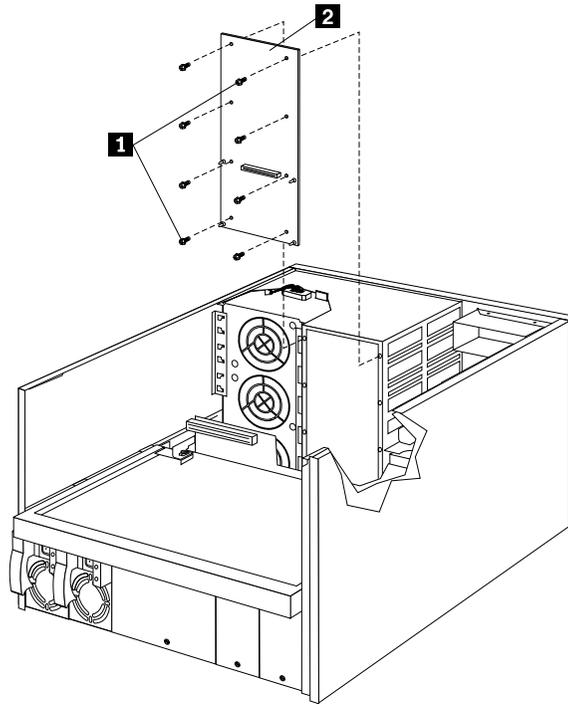
Component locations

This section provides illustrations of the I/O board, processor board, and memory board component locations.

I/O board component locations

The following illustration shows the location of the input/output (I/O) connectors on the I/O board.

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



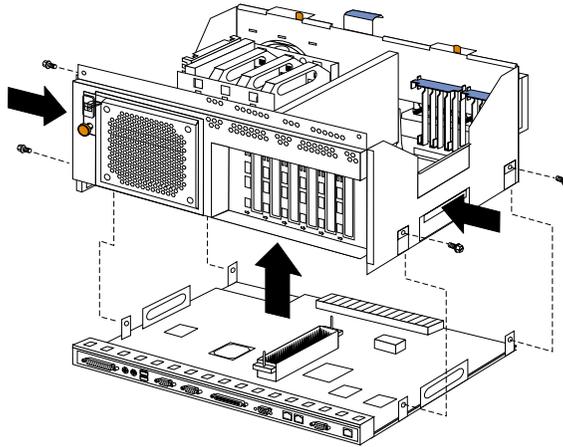
- 1** Power backplane connector
- 2** Processor board connector
- 3** Ethernet port connector (J14)
- 4** USB 1 and USB 2 port connectors (J31)
- 5** Video port connector (J2)
- 6** Mouse connector (J30)
- 7** Keyboard connector (J32)
- 8** SCSI external connector (J21)
- 9** Parallel port connector (J33)
- 10** ASM Interconnect connector (J10)
- 11** Serial port B connector (J15)
- 12** Serial port A connector (J16)
- 13** Management port connector (J18)

Processor board component locations

The following illustration shows the location of the LEDs, connectors, and jumpers on the processor board.

Processor board LEDs

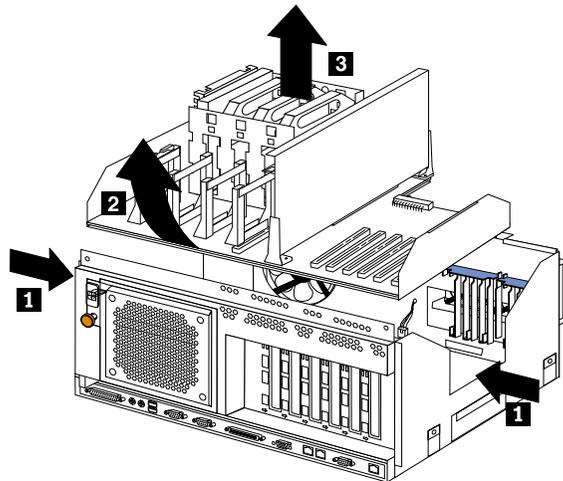
The following illustration shows the location of the LEDs.



- 1** Microprocessor 1 error LED (CR9)
- 2** Microprocessor 2 error LED (CR3)
- 3** Microprocessor 3 error LED (CR8)
- 4** Microprocessor 4 error LED (CR4)
- 5** Battery
- 6** PCI
- 7** VRM 4 error LED (CR10)
- 8** VRM 3 error LED (CR5)
- 9** VRM 2 error LED (CR7)
- 10** VRM 1 error LED (CR6)

Processor board connectors

The following illustration shows the connectors.

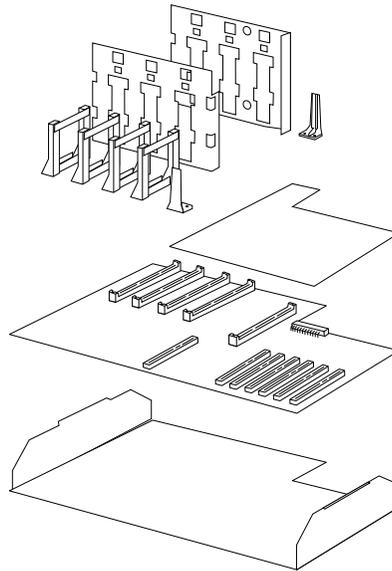


- 1** Microprocessor 1 connector
- 2** Microprocessor 2 connector
- 3** Microprocessor 3 connector
- 4** Microprocessor 4 connector
- 5** Memory board connector

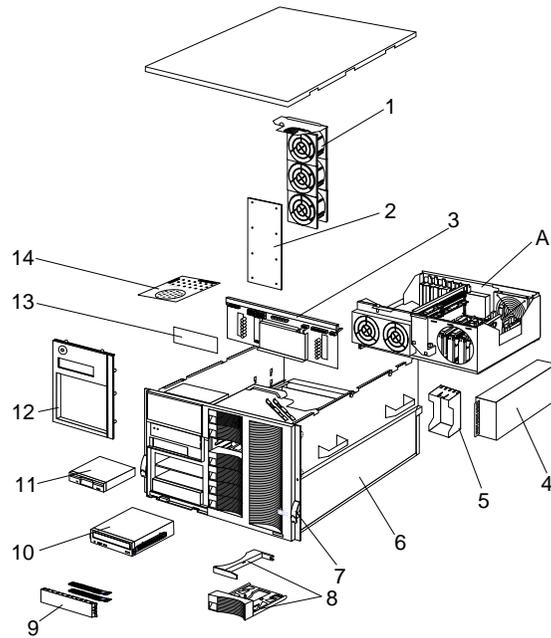
- 6** Battery
- 7** PCI slots 3-6 (on PCI bus B)
- 8** PCI slots 1-2 (on PCI bus A)
- 9** VRM 4 connector
- 10** VRM 3 connector
- 11** VRM 2 connector
- 12** VRM 1 connector

Processor board jumpers

The following illustration shows the jumpers.



- 1** Jumper block (J8) (Reserved)
- 2** Jumper block (J9) (Reserved)
- 3** Jumper block (J10-J16)
- 4** Flash ROM page-swap jumper block (J56)
- 5** Power-on password override jumper block (J48)
- 6** Battery
- 7** Power-on control jumper block (J23)
- 8** 3.3 V standby power for slot 2 (J20)
- 9** 3.3 V standby power for slot 1 (J47)
- 10** Advanced System Management Processor reset jumper block (J59)



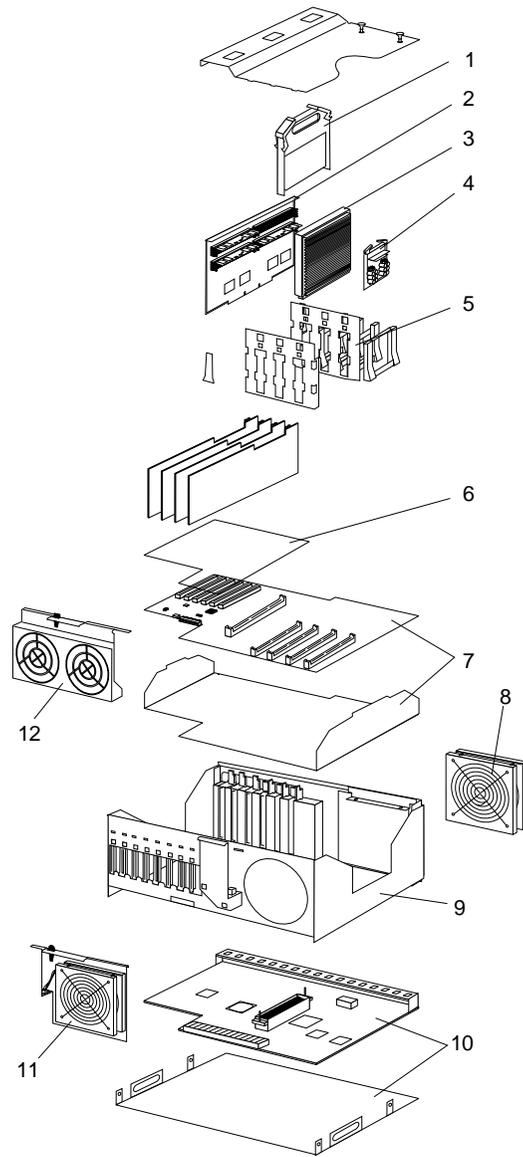
- 1** Microprocessor core-frequency-selection jumper block (J13-J16)
- 2** Reserved (J10)
- 3** Reserved (J12)
- 4** Reserved (J11)

Memory board component locations

The illustrations in this section show certain locations on the memory board.

Memory board connectors

The following illustration shows the location of the DIMM connectors on the memory board.

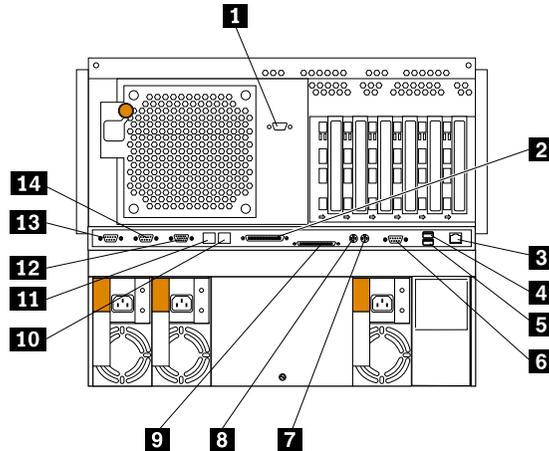


- 1** Connector 1 (J1)
- 2** Connector 2 (J2)
- 3** Connector 3 (J3)
- 4** Connector 4 (J4)
- 5** Connector 5 (J5)
- 6** Connector 6 (J6)
- 7** Connector 7 (J7)
- 8** Connector 8 (J8)
- 9** Connector 9 (J9)
- 10** Connector 10 (J10)
- 11** Connector 11 (J11)
- 12** Connector 12 (J12)
- 13** Connector 13 (J13)

- 14** Connector 14 (J14)
- 15** Connector 15 (J15)
- 16** Connector 16 (J16)

Memory board LED locations

The following illustration shows the location of the error LEDs on the memory board.



- 1** DIMM 1 error LED (CR4)
- 2** DIMM 2 error LED (CR5)
- 3** DIMM 3 error LED (CR2)
- 4** DIMM 4 error LED (CR1)
- 5** DIMM 9 error LED (CR13)
- 6** DIMM 10 error LED (CR12)
- 7** DIMM 11 error LED (CR15)
- 8** DIMM 12 error LED (CR16)
- 9** DIMM 13 error LED (CR11)
- 10** DIMM 14 error LED (CR14)
- 11** DIMM 15 error LED (CR10)
- 12** DIMM 16 error LED (CR9)
- 13** Processor board connector
- 14** DIMM 8 error LED (CR8)
- 15** DIMM 7 error LED (CR7)
- 16** DIMM 6 error LED (CR3)
- 17** DIMM 5 error LED (CR6)

Before you begin

Before you begin to install options in the server, read the following information:

- Become familiar with the safety and handling guidelines provided in “Safety information” on page 249, and “Handling electrostatic discharge-sensitive devices” on page 252. These guidelines will help you work safely while working with the server or options.

- You do not need to turn off the server to install or replace hot-swap power supplies, hot-swap drives, hot-swap fans, or hot-plug PCI adapters.
- The orange color on components and labels in the server identifies hot-swap or hot-plug components. This means that you can install or remove the component while the system is running, provided that the system is configured to support this function.
- The blue color on components and labels identifies touch points where you can grip a component, move a latch, and so on.
- Make sure that you have an adequate number of properly grounded electrical outlets for the server, monitor, and any other options that you intend to install.
- Back up all important data before you make changes to disk drives.
- For a list of supported options for the Netfinity 7600, refer to <http://www.ibm.com/pc/us/compat> on the World Wide Web.

Working inside the server with the power on

The server is designed with features that make it highly available. These features are hot-add and hot-plug devices. Hot-plug devices allow you to replace the device without turning off the server. Hot-add devices allow you to add an identical device without turning off the server. In the past you would need to turn off the server and disconnect power to perform these operations. With the hot-plug features, you can remove the top cover of the server with the power on.

The server supports hot plug, hot add, and hot swap devices and is designed to operate safely while turned on with the top cover removed. The server is designed to protect you and the server. Follow these guidelines when you work inside a server that is turned on:

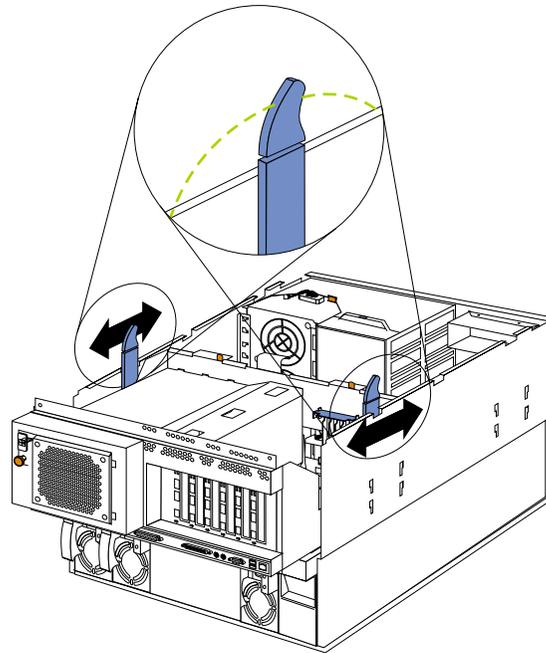
- Avoid loose-fitting clothing on your forearms. Button long-sleeved shirts before working inside the server; do not wear cuff links while you are working inside the server.
- Do not allow your necktie to hang inside the server.
- Remove jewelry, such as bracelets, necklaces, rings, and loose-fitting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

Removing the server top cover and bezel

Before you begin:

- Read “Safety information” on page 249.
- Review the information in “Before you begin” on page 60.

Removing the top cover



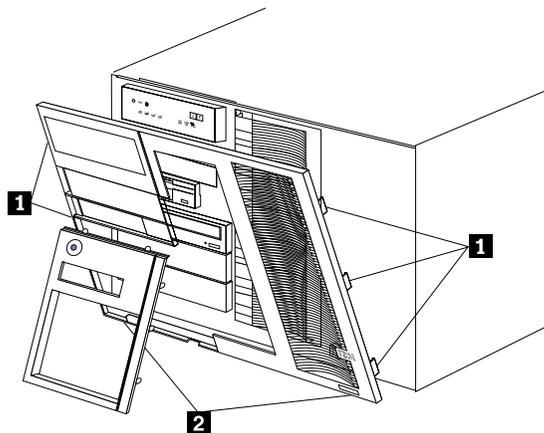
- 1** Top cover
- 2** Captive screws

To remove the server top cover:

1. Loosen the two thumbscrews on the back edge of the top cover.
2. Slide the top cover slightly toward the rear of the server. Lift the cover off the server and set the cover aside.

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

Removing the media-bay bezel

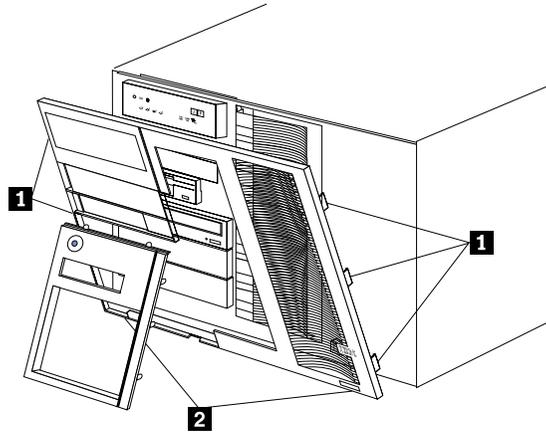


- 1** Media-bay bezel

To remove the media-bay bezel:

1. Release the two tabs at the bottom edge of the media-bay bezel and pull the bottom of the bezel slightly away from the server.
2. Pull the media-bay bezel down to release the two tabs at the top edge of the bezel. Store the bezel in a safe place.

Removing the front trim bezel



1 Side tabs

2 Bottom tabs

1. Release the three tabs on the right side of the front trim bezel and release the two tabs on the left side of the bezel.
2. Gently separate the bezel partly from the server.
3. Release the two bottom tabs on the bezel and lift the bezel away from the server.

Working with adapters

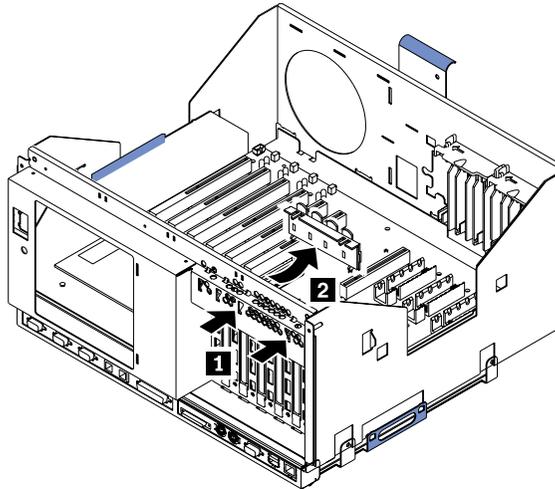
You can install up to six PCI adapters in the expansion connectors on the processor board. All six of the slots are peripheral component interconnect (PCI) expansion slots.

The server comes with an integrated super video graphics array (SVGA) video controller, which is not removable. If you want to disable this controller and use a video adapter instead, you can install a video adapter in an expansion slot. When you install a PCI video adapter, the server BIOS automatically disables the integrated video controller.

Note: Video adapters are supported in all six PCI slots.

The following illustration shows the location of the 64-bit PCI expansion slots on the processor board.

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



- 1** Non-hot-plug PCI slots 1-2 (on PCI bus A) (3.3 volt)
- 2** Hot-plug PCI slots 3-6 (on PCI bus B)
- 3** Power LEDs for hot-plug slots
- 4** Internal Attention LEDs for hot-plug slots
- 5** External Attention LEDs for hot-plug slots

Adapter considerations

Before you continue with the adapter-installation procedure:

- Review the documentation that comes with the adapter and follow those instructions in addition to the instructions given in this chapter. If you need to change the switch or jumper settings on the adapter, follow the instructions that come with the adapter documentation.
- Slots 3 through 6 support 5.0V, 3.3V, and universal PCI adapters.
Note: Universal PCI adapters support both 3.3V and 5.0V operation.
- Slots 1 and 2 support 3.3 V and universal non-hot-swap PCI adapters only.
- The server uses a rotational interrupt technique to configure PCI adapters. Because of this technique, you can install a variety of PCI adapters that currently do not support sharing of PCI interrupts.
- The system scans PCI slots 1 through 6 to assign system resources; then the system starts (boots) the PCI devices in the following order: processor board devices, slots 1 and 2, and then slots 3 through 6.
- The performance of the PCI adapters depends on the types of adapters in the system.

Installing a hot-plug adapter

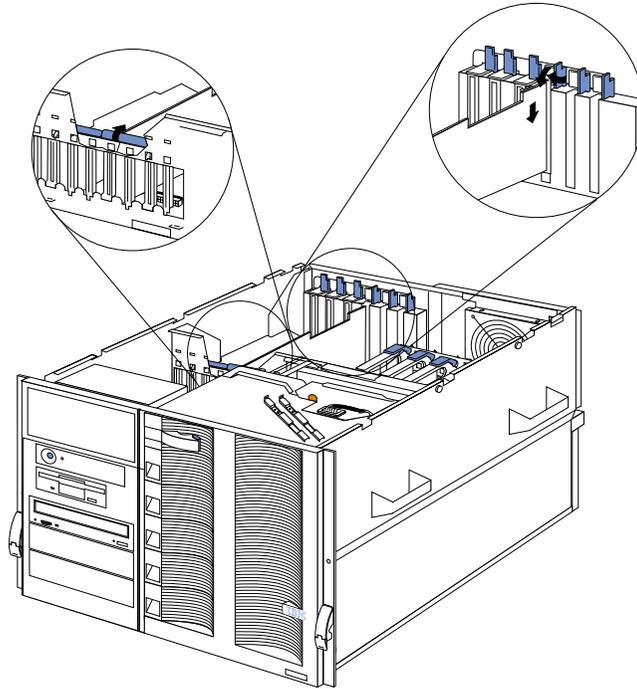
Refer to the following illustration to install a hot-plug PCI adapter.

Note: The illustrations in this book may be slightly different from your server.

Before you begin:

- Read “Safety information” on page 249.

- Review the information in “Before you begin” on page 60.
- Read the documentation that comes with the option.



- 1** Adapter retention latch
- 2** Tab
- 3** Adapter retention latch
- 4** Adapter

To install a hot-plug PCI adapter:

Attention: Do not remove a hot-plug adapter before performing the operating-system-defined procedure for disabling the hot-plug PCI slot that contains the adapter. Failure to do so might cause the system to lock up. Refer to the operating system documentation.

1. Review the information in “Before you begin” on page 60.
2. Remove the top cover.
3. Determine which expansion slot you will use for the adapter.
Note: You can install hot-plug PCI adapters in PCI slots 3-6 only.
4. Disable the selected PCI slot from the operating system. (Refer to the documentation that comes with the operating system for information about disabling a hot-plug PCI slot.) Disabling the PCI slot turns off the power light for that PCI slot.
Attention: Make sure the power light for the hot-plug PCI slot is off before you continue with the next step.
5. Remove the expansion-slot cover:
 - a. Rotate the adapter retention latch counterclockwise.
 - b. Lift the tab covering the top of the expansion-slot cover and then remove the expansion-slot cover from the server. Store it in a safe place for future use.
 - c. Press on the rear latch and lift the rear retainer clip.

- Attention:** You must install expansion-slot covers on all empty slots. This maintains the electromagnetic emissions characteristics of the system and ensures proper cooling of system components.
6. Refer to the documentation that comes with the adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.
 7. Remove the adapter from the static-protective package.

Attention: Avoid touching the components and gold-edge connectors on the adapter. If you need to put down the adapter, place the adapter, component-side up, on a flat, static-protective surface.
 8. Install the adapter:
 - a. Carefully grasp the adapter by its top edge or upper corners, and align it with the expansion slot on the processor board.
 - b. Press the adapter *firmly* into the expansion slot.

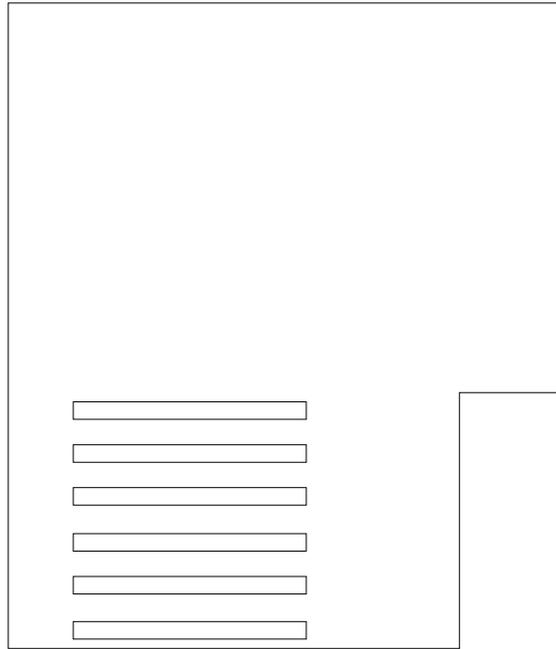
Attention: When you install an adapter in the server, be sure that it is completely and correctly seated in the processor-board connector. Incomplete insertion might cause damage to the processor board or the adapter.
 - c. Lower the tab over the top corner of the adapter. Rotate the adapter retention latch clockwise until it snaps into place.
 - d. Lower the rear retainer clip over the top of the adapter until it snaps into place.
 9. Connect any needed cables to the adapter.
 10. Enable the PCI slot from the operating system. (Refer to the documentation that comes with the operating system for information about enabling a hot-plug PCI slot.) Make sure that the power light for the hot-plug PCI slot is on.
 11. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 79.

Installing internal drives

If you add different types of drives, the system can read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette
- Hard disk
- CD-ROM
- Tape

Internal drives are installed in bays. Your server comes with one 3.5-inch, 1.44 MB diskette drive and one IDE CD-ROM drive.



- 1** 3.5 inch diskette drive
- 2** CD-ROM drive
- 3** Media bays 1 and 2
- 4** Hot-swap hard disk

Your server contains hardware that enables you to replace a failed hard disk drive without turning off the server. Therefore, you have the advantage of continuing to operate the system while a hard disk drive is removed or installed. These drives are known as *hot-swap* drives.

Each hot-swap drive has two indicator lights on the front of the server. If the amber hard-disk status light for a drive is lit continuously, that individual drive is faulty and needs to be replaced. When the hard-disk status light indicates a drive fault, you can replace a hot-swap drive without turning off the server.

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

Internal drive bays

Internal drives are installed in *bays*.

- Your server comes with one CD-ROM drive and one 3.5-inch, 1.44 MB diskette drive.
- The left front bays support 5.25-inch, half-high, removable-media drives. Any two adjacent 5.25-inch, half-high bays can be converted to a single full-high bay.
Note: The server EMI integrity and cooling are both protected by having the left front 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.
- You cannot install hard disk drives in the left front bays. You can install hot-swap hard disk drives only in the hot-swap hard disk drive bays on the right front side of the server.

- If you are installing a device with a 50-pin connector in one of the left front bays, you will need a 68-to-50-pin converter (option number 32G3925).
- Your server supports ten 1-inch (26 mm) slim-high or seven 1.6-inch (42 mm) half-high, 3.5-inch hot-swap hard disk drives in the hot-swap bays.
- The hot-swap bays connect to a hard disk drive *backplane*. The backplane is a printed circuit board behind the bays.

Some drives have a special interface called *small computer system interface*, or SCSI. Using this interface, you can attach multiple drives to a single SCSI controller.

Notes:

1. Any information about SCSI drives also applies to other SCSI devices, such as scanners and printers.
2. If you plan to install both internal and external SCSI devices, you must follow the instructions in “Connecting external options” on page 81, in addition to the instructions in this section.

A 16-bit (wide) low voltage differential (LVD) SCSI cable connects the hard disk drive backplane to the ServeRaid adapter located in a PCI slot on the processor board. An additional 16-bit, two-drop SCSI cable comes with the server. It is located in the bottom of the server media bay and is restrained with a cable clamp.

If you want to install SCSI devices in the removable media bays:

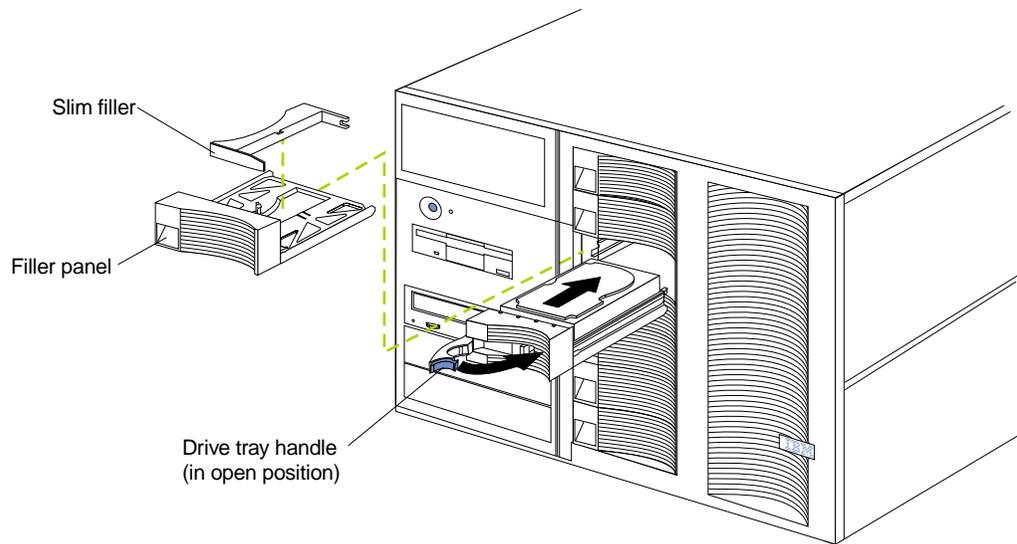
1. Locate the internal SCSI connector on the power backplane.
2. Use the 16-bit two-drop SCSI cable located in the bottom of the server media bay.
3. Connect the SCSI device(s) in the removable media bay to the internal SCSI connector on the power backplane.

Installing a hot-swap hard disk drive

Refer to the following illustration when installing a hot-swap drive.

Before you begin:

- Read “Safety information” on page 249.
- Review the information in “Before you begin” on page 60.
- Read the documentation that comes with the option.



Note: You do not have to turn off the server to install hot-swap drives in these bays.

To install a drive in a hot-swap bay:

1. Review the information in “Before you begin” on page 60.
2. Remove the filler panel from one of the empty hot-swap bays by inserting your finger into the depression at the left side of the filler panel and pulling it away from the server.

Attention: To maintain proper system cooling, do not operate the server for more than 10 minutes without either a drive or a filler panel installed for each bay.

3. Install the hard disk drive in the hot-swap bay:
 - a. If there is a small gap above or below the drive, separate the slim filler from the filler panel, and insert it in the gap.

Note: A drive placement guide is located on the inside edge of the bezel. The drive placement guide indicates the placement for slim-high and half-high drives. The guide also shows the SCSI ID assigned to the drive.
 - b. Ensure the tray handle is open (that is, perpendicular to the drive).
 - c. Align the drive assembly with the guide rails in the bay.
 - d. Gently push the drive assembly into the bay until the drive stops.
 - e. Push the tray handle to the closed (locked) position.
 - f. Check the hard disk drive status indicators to verify that the hard disk drive is operating properly.

If the amber hard-disk status light for a drive is lit continuously, that individual drive is faulty and needs to be replaced. If the green hard-disk activity light is flashing, the drive is being accessed.

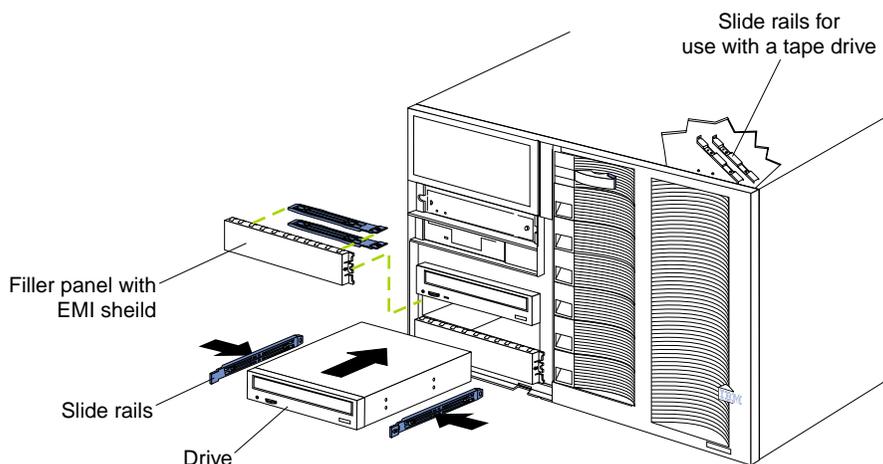
Note: Because the server has a RAID controller installed, you must configure the disk arrays after installing hard disk drives. Refer to “Chapter . Installing and configuring ServeRAID controllers,” on page 139 for information.

Installing a 5.25-inch removable-media drive

Refer to the following illustrations when installing a 5.25-inch removable media drive.

Before you begin:

- Read “Safety information” on page 249.
- Review the information in “Before you begin” on page 60.
- Read the documentation that comes with the option.



Choose the bay in which you want to install the drive. Also, check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive.

To install a removable-media drive in one of the left front bays:

1. Review the information in “Before you begin” on page 60.
2. Turn off the server and all attached devices. Disconnect all external cables and remove the top cover.
3. Remove the media-bay bezel.
4. Remove the filler panel from the bay opening. Keep the filler panel nearby.
Note: The server EMI integrity and cooling are both protected by having the left front 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.
5. Touch the static-protective bag containing the drive to any unpainted metal surface on the server; then, remove the drive from the bag and place it on a static-protective surface.
6. Remove the snap-on slide rails from the filler panel and snap the rails on the drive. Store the filler panel for later use.
Note: Slide rails for installing a tape drive are attached with screws. Use the screws to attach the rails to the side of the tape drive.
7. Align the slide rails on the drive with the guide rails in the bay; then, slide the drive into the bay until it snaps into place.
Note: If you are installing a tape drive, use the screws that are shipped next to the tape drive rails to attach the tape drive to the front of the chassis.
8. Disconnect the shuttle (see “Disconnecting the shuttle” on page 128).

9. If you are installing a SCSI device, go to step 10.. If you are installing an IDE device, go to step 11..
10. Install the two-drop SCSI cable:
 - a. Locate the two-drop SCSI cable. The two-drop SCSI cable is located in the bottom of the server between the open bays and the power supply area. It is folded and restrained with a cable clamp.
 - b. Connect one of the connectors on the two-drop SCSI cable to the back of the drive. Go to step 12..
 - c. Connect the other end of the two-drop SCSI cable to the SCSI connector on the power backplane.
 - d. Go to step 12..
11. To install an IDE device, such as a CD-ROM or a DVD-ROM, use the two-drop IDE cable that comes with the option.
 - a. Remove the cable that connects the CD-ROM to the IDE connector on the power backplane.
 - b. Using the two-drop cable that came with the IDE option, connect the CD-ROM and IDE device you are installing to the IDE connector on the power backplane.
 - c. Set the jumper on the back of the new IDE option as secondary.
12. Connect a power cable to the back of the drive. Power cables for removable-media drives come installed in the server. The connectors are keyed and can be inserted only one way.
13. If you are installing another 5.25-inch drive, do so now. Otherwise, continue with step 14..
14. Connect the shuttle.
 - a. Slide the shuttle back into the server
 - b. Disengage the retaining levers from the notches on the chassis.
 - c. Move the retaining levers toward the front of the server.
 - d. Secure the retaining levers in the horizontal position.
15. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 79.

Installing memory-module kits

Before you continue with the memory-installation procedure, review the following:

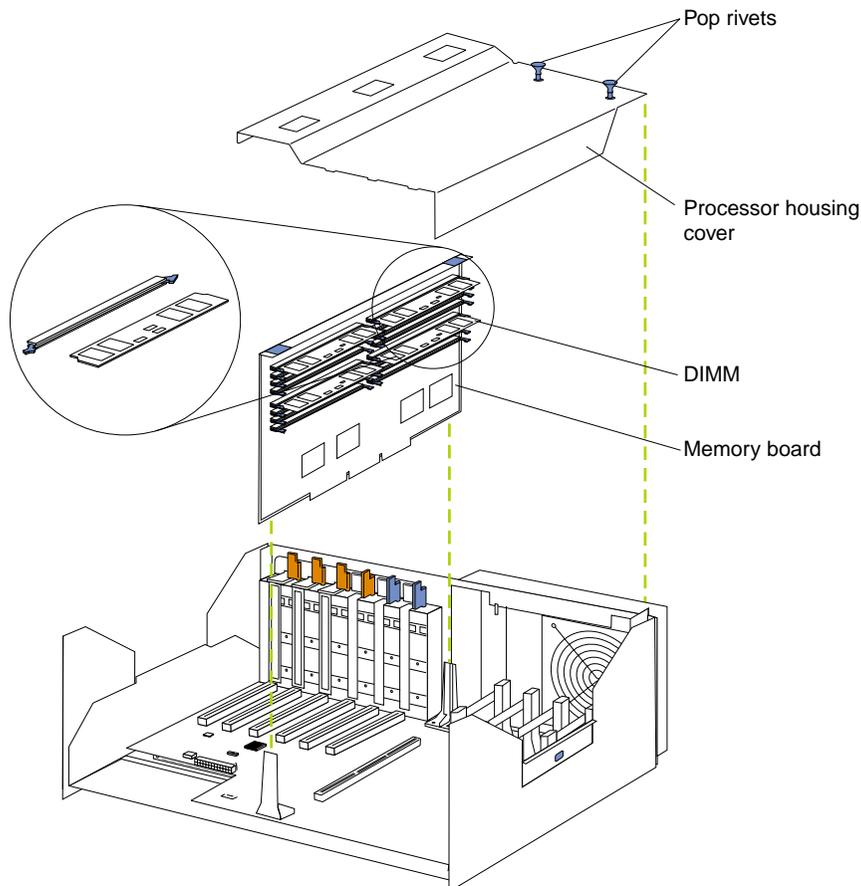
- Review the information in “Before you begin” on page 60.
- All the DIMMs installed in each set must be the same size and speed, but all the sets do not have to contain DIMMs of the same size and speed.
- The memory board contains 16 DIMM connectors and supports 4-way memory interleaving.
- Install only 3.3 V, 168-pin, 8-byte, registered DIMMs. Only 100 MHz, 72-bit, registered, synchronous, error correcting code (ECC), SDRAM configuration DIMM memory is supported for the 128 MB, 256 MB, 512 MB and 1 GB (when available) DIMMs.
- If you install 4 GB of memory, some of the memory is reserved for system resources. The amount reserved for system resources depends on the configuration of the server.

- If you install 16 GB of memory, the Configuration/Setup Utility will display the memory that is usable by the network operating system. This amount of memory might differ from the amount of memory you have installed.
- Installing or removing DIMMs changes the configuration information in the server. Therefore, after installing or removing a DIMM, you must save the new configuration information in the Configuration/Setup Utility program. Refer to “Using the Configuration/Setup Utility program” on page 43 for more information.
- Install the DIMMs in the order provided in Table 7.
- For the locations of the DIMM connectors, see “Memory board component locations” on page 58.

Table 7. DIMM installation order.

Set of 4 DIMMs	Install DIMMs in these connectors:
First set (shipped as standard)	J1, J5, J9, J13
2nd set	J2, J6, J10, J14
3rd set	J3, J7, J11, J15
4th set	J4, J8, J12, J16

Refer to the following illustration when installing memory.



To install a memory module:

Before you begin:

- Read “Safety information” on page 249.
 - Read the documentation that comes with your option.
1. Review “Before you begin” on page 60.
 2. Turn off the server and all attached devices. Disconnect external cables and power cords and remove the top cover.
 3. Pull up the two pop rivets on the processor housing cover and remove the cover from the processor housing.
 4. Remove the memory board assembly:
 - a. Lift up on the memory board assembly and remove it from the server.
 - b. Place the memory board assembly on a static-protective surface, such as the static-protective package in which the option came.
 5. Locate the DIMM connectors on the memory board. Determine the DIMM connectors into which you will install the DIMMs. (See the notes at the beginning of this procedure.)
 6. Touch the static-protective package containing the DIMM option to any unpainted metal surface on the server. Then, remove the DIMM from the package.

Note: To avoid breaking the retaining clips or damaging the DIMM connectors, handle the clips gently.
 7. To install the DIMMs, repeat the following steps for each DIMM that you install.
 - a. Turn the DIMM so that the pins align correctly with the DIMM connector.
 - b. Insert the DIMM by pressing the DIMM straight into the connector. Be sure that the retaining clips snap into the closed position.
 8. Install the memory board assembly:
 - a. Hold the memory board assembly and align it over the memory board connector.
 - b. Insert the memory board assembly into the connector.
 9. Install the processor housing cover and push the two pop rivets down to secure the cover.
 10. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 79.

Installing a microprocessor kit

The server comes with one microprocessor installed on the processor board. If you install an additional microprocessor kit, the server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load among the microprocessors.

Table 8. Microprocessor core frequency selection.

Microprocessor speed (MHz) – Core/Bus fraction	Jumper			
	J13	J14	J15	J16
550 – 5.5	Pins 1 and 2	Pins 2 and 3	Pins 2 and 3	Pins 2 and 3
700 – 7.0	Pins 2 and 3	Pins 1 and 2	Pins 1 and 2	Pins 2 and 3
750 – 7.5	Pins 2 and 3	Pins 2 and 3	Pins 1 and 2	Pins 2 and 3

Table 8. Microprocessor core frequency selection.

Microprocessor speed (MHz) – Core/Bus fraction	Jumper			
	J13	J14	J15	J16
800 – 8.0	Pins 2 and 3	Pins 1 and 2	Pins 2 and 3	Pins 1 and 2

Notes:

1. Thoroughly review the documentation that comes with the microprocessor, so that you can determine whether you need to update the server basic input/output system (BIOS) code. The latest level of BIOS code for the server is available through the World Wide Web. Go to <http://www.pc.ibm.com/support/>, select IBM Servers, and make the selections for your server.
2. Obtain an SMP-capable operating system (optional). For a list of supported operating systems, see <http://www.ibm.com/pc/us/compat/> on the World Wide Web.

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

3. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.
4. If you replace the microprocessor in the server with a microprocessor that operates at a different speed, be sure to set the microprocessor core-frequency-selection jumpers correctly. See Table 8 on page 73.
5. Your server comes standard with one microprocessor installed. The microprocessor is installed in microprocessor connector J2 and is the startup (boot) processor. A microprocessor installed in microprocessor connector J3 is processor 2; a microprocessor installed in microprocessor connector J4 is processor 3; a microprocessor installed in microprocessor connector J5 is processor 4. If more than one microprocessor is installed, the highest numbered processor is the one the server will start from. The lower numbered microprocessors are used as application processors.

The following table and the label on the inside of the top cover of the server show the order in which additional microprocessors and voltage regulator modules (VRMs) must be installed.

Table 9. Microprocessor and VRM installation order.

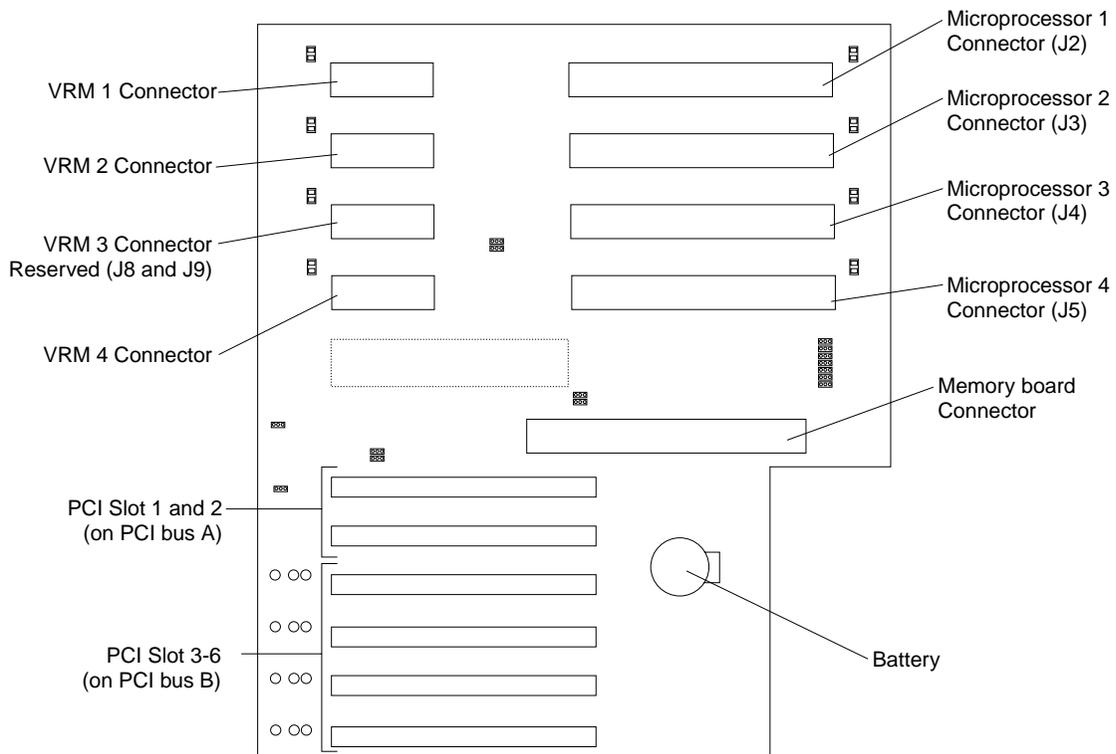
Note: "T" indicates an installed terminator card; "X" indicates an installed microprocessor or VRM. A terminator card must be installed in each microprocessor connector that does not contain a microprocessor.							
One microprocessor installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	T	T	T	X			
Two microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)

Table 9. Microprocessor and VRM installation order.

X	X	T	T	X	X		
Three microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	X	X	T	X	X	X	
Four microprocessors installed							
Microprocessor connectors				VRM connectors			
J2 (P1)	J3 (P2)	J4 (P3)	J5 (P4)	J37 (VRM 1)	J38 (VRM 2)	J39 (VRM 3)	J41 (VRM 4)
X	X	X	X	X	X	X	X

To install an additional microprocessor kit:

1. Review “Before you begin” on page 60.
2. Turn off the server and all attached devices. Disconnect all external cables and power cords and remove the top cover.



3. Pull up the two pop rivets on the processor housing cover and remove the cover from the processor housing.
4. Determine the slots where you will install the microprocessor and VRM.
5. Remove the terminator card from the microprocessor connector.
6. Install the microprocessor:

- a. Touch the static-protective package containing the new microprocessor to any *unpainted* metal surface on the server; then, remove the microprocessor from the package.
 - b. Hold the microprocessor by the open latches, and center the microprocessor over the microprocessor connector.
Attention: Make sure the microprocessor is oriented and aligned correctly before you try to close the latches.
 - c. Carefully close the latches to seat the microprocessor in the connector.
 - d. Store the terminator card in a safe place in the static-protective package that the new microprocessor comes in; you will need to install it again if you ever remove the microprocessor.
7. Install the voltage regulator module (VRM):
- a. Center the VRM over the connector. Make sure that the VRM is oriented and aligned correctly.
Note: If you remove the microprocessor later, remember to install the terminator card in the appropriate microprocessor connector and to remove the VRM for that microprocessor.
 - b. Carefully close the latches to seat the VRM in the connector.
8. Install the processor housing cover and push down on the two pop rivets.
9. If you have other options to install or remove, do so now; otherwise, go to “Completing the installation” on page 79.

Installing a hot-swap power supply



CAUTION:

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



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

Before you continue with the power supply-installation procedure, review the following.

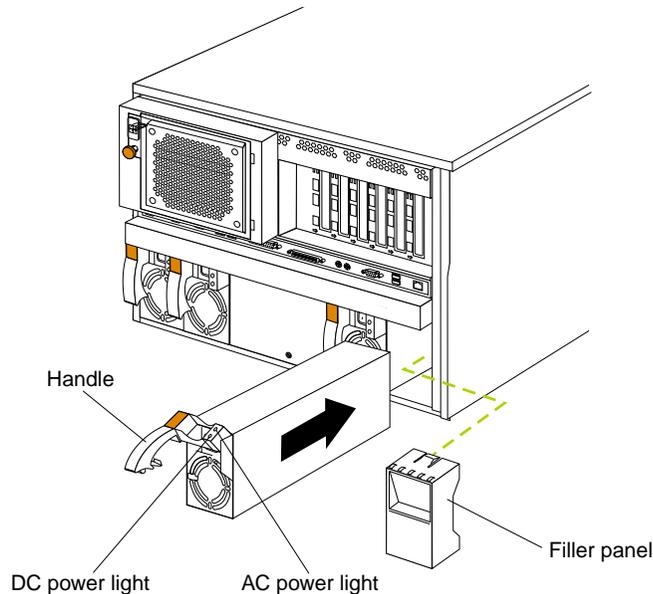
Notes:

1. During normal operation, each power supply bay must have either a power supply or filler panel installed for proper cooling.
2. Before you install a power supply in the right-most power supply bay, you must disconnect the cable-management arm. You can connect the cable-management arm after installing the power supply.

Before you begin:

- Read “Safety information” on page 249.
- Review the information in “Before you begin” on page 60.
- Read the documentation that comes with the option.

Refer to the following illustration to install a hot-swap power supply.



CAUTION:

If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

To install an additional power supply:

1. Review “Before you begin” on page 60.
2. Remove the filler panel.
3. Place the handle on the power supply in the open position.
4. Slide the power supply into the chassis and close the handle.
5. Plug one end of the power cord into the power supply; then, plug the other end of the cord into a properly grounded electrical outlet.
6. Verify that the DC Power light and the AC Power light on the power supply are lit, indicating that the power supply is operating properly.



CAUTION:

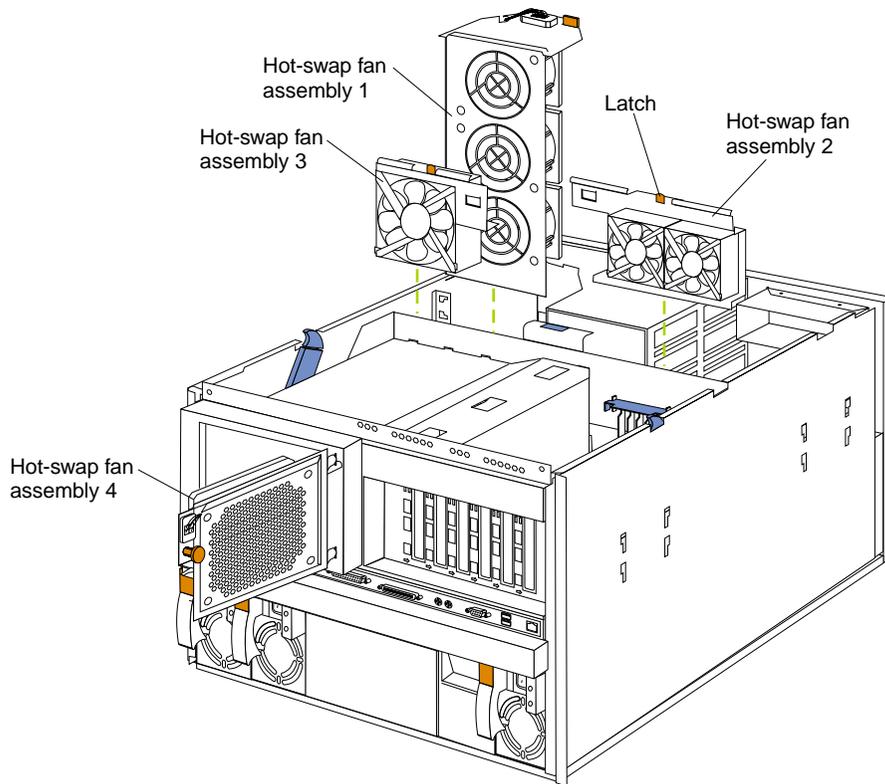
If you install a strain-relief bracket option over the end of the power cord that is connected to the device, you must connect the other end of the power cord to an easily accessible power source.

Replacing a hot-swap fan

Before you begin:

- Read “Safety information” on page 249.
- Review the information in “Before you begin” on page 60.
- Read the documentation that comes with the option.

Refer to the following illustration to replace a hot-swap fan.



To replace a hot-swap fan assembly:

1. Review the information in “Before you begin” on page 60.
2. If you are replacing fan assembly 1, 2, or 3:
 - a. Remove the top cover.
 - Attention:** To ensure proper system cooling, keep the cover removed for no more than 30 minutes during this procedure.
 - b. Press the fan release latch and lift the fan assembly out of the server.
 - c. Slide the replacement fan assembly into the server. The latch will snap into place and secure the fan in the server.
 - d. Replace the top cover
3. If you are replacing fan assembly 4:

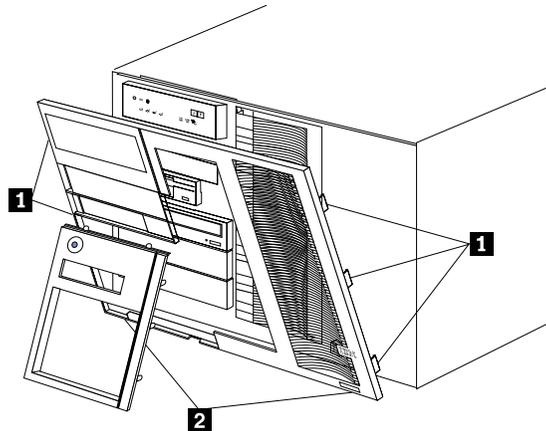
- a. Pull out on the orange pop rivet on the rear fan bracket; then, lift the fan assembly up and out of the hinge cutouts.
- b. Slide the replacement fan assembly into the server. (Make sure the fan assembly fits correctly into the hinge cutouts on the rear of the shuttle.)
- c. When you have the fan assembly properly seated, push on the pop rivet until it clicks into place.

Completing the installation

To complete the installation, you must reinstall the front trim bezel, reinstall the media bay bezel, reinstall the top cover, reconnect all the cables that you disconnected, and for certain options, run the Configuration/Setup Utility program. Follow the instructions in this section.

Attention: For proper cooling and airflow, install the top cover before turning on the server. Operating the server for extended periods of time (over 30 minutes) with the top cover removed might damage server components.

Installing the front trim bezel

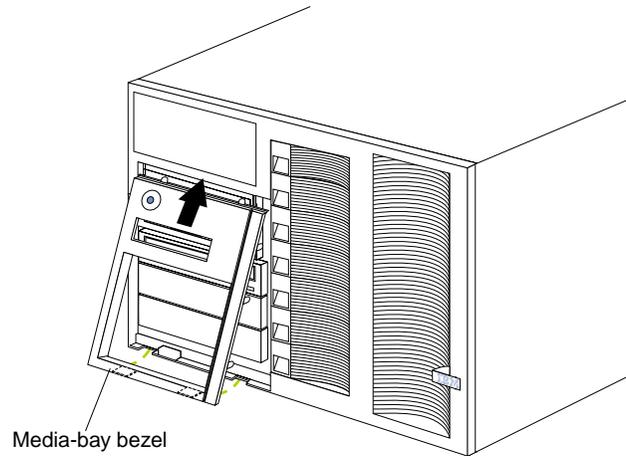


- 1** Side tabs
- 2** Bottom tabs

1. Align the two bottom tabs with the notches on the bottom front of the server.
2. Align the side tabs with the notches on the sides of the server.
3. Gently press the bezel into place.

Installing the media-bay bezel

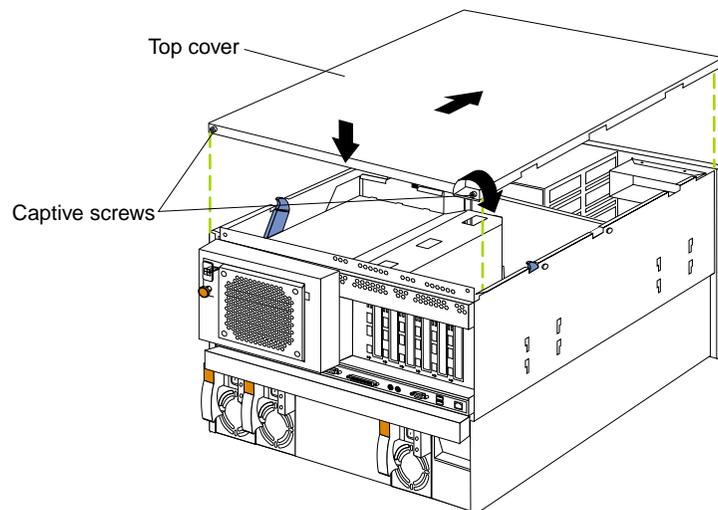
Refer to the following illustration to install the media-bay bezel.



To install the media-bay bezel:

1. Insert the two tabs on the top of the media-bay bezel into the matching holes on the server chassis.
2. Push the bottom of the media-bay bezel toward the server until the two tabs at the bottom of the bezel snap into place.

Installing the top cover



To install the server top cover:

1. Before installing the cover, check that all cables, adapters, and other components are installed and seated correctly and that you have not left loose tools or parts inside the server.
2. Lower the cover with the rear edge of the cover about 25 mm (1 inch) back from the rear edge of the server.
3. Slide the cover forward.
4. Tighten the two captive screws on the back edge of the cover.

5. If you disconnected any cables from the back of the server, reconnect the cables; then, plug the power cords into properly grounded electrical outlets.

Note: If necessary, see “Cabling the server” on page 93 for connector locations.

Reconfiguring the server

When you start the server for the first time after you add or remove an internal option or an external SCSI device, you might see a message telling you that the configuration has changed. Run the Configuration/Setup Utility program to save the new configuration information. See “Chapter . Configuring the server,” on page 43.

Some options have device drivers that you need to install. Refer to the documentation that comes with the option for information about installing any required device drivers.

If you have installed a new microprocessor, you might want to upgrade the operating system to support symmetric multiprocessing (SMP).

Run the Configuration/Setup Utility program to save the new configuration information. See “Chapter . Configuring the server,” on page 43.

If you have installed or removed a hard disk drive, refer to “Chapter . Installing and configuring ServeRAID controllers,” on page 139 for information about reconfiguring the disk arrays.

Connecting external options

Review the information in “Before you begin” on page 60. Also, read the documentation that comes with the options.

To attach an external device:

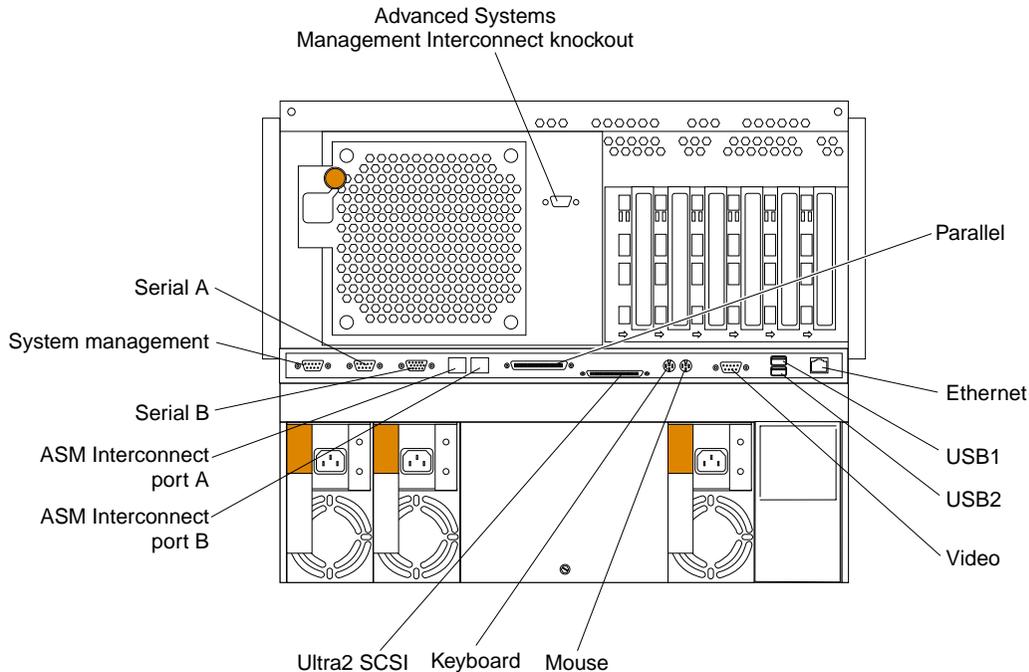
1. Turn off the server and all attached devices.
2. Follow the instructions that come with the option to prepare it for installation and to connect it to the server.

Input/output ports

This section provides information about the input/output (I/O) ports on the rear of the server. These ports include the following:

- One parallel port
- One video port
- One keyboard port
- One auxiliary-device port (mouse)
- One dual-channel Ultra-2 SCSI port
- Two serial ports
- Two Universal Serial bus (USB) ports
- One Ethernet port
- Three communication ports dedicated to the Netfinity Advanced System Management processor

Refer to the following illustration for the location of input and output connectors.



Parallel port

The server has one parallel port. This port supports three standard Institute of Electrical and Electronics Engineers (IEEE) 1284 modes of operation: Standard Parallel Port (SPP), Enhanced Parallel Port (EPP), and Extended Capability Port (ECP).

Viewing or changing the parallel-port assignments

You can use the built-in Configuration/Setup Utility program to configure the parallel port as bidirectional; that is, so that data can be both read from and written to a device. In bidirectional mode, the server supports the ECP and EPP modes.

To view or change the parallel-port assignment:

1. Restart the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.

Note: The Devices and I/O Ports choice appears only on the full configuration menu. If you set two levels of passwords, you must enter the administrator password to access the full configuration menu.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.
4. Select the parallel port; then, use the arrow keys to advance through the settings available.

Note: When you configure the parallel port as bidirectional, use an IEEE 1284-compliant cable. The maximum length of the cable must not exceed 3 meters (9.8 feet).
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Parallel port connector

The following table shows the pin-number assignments for the 25-pin, female D-shell parallel-port connector on the rear of the server.

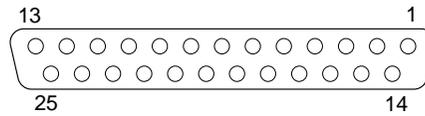


Table 10. Parallel-port connector pin-number assignments.

Pin	I/O	SPP/ECP Signal	EPP Signal
1	O	-STROBE	-WRITE
2	I/O	Data 0	Data 0
3	I/O	Data 1	Data 1
4	I/O	Data 2	Data 2
5	I/O	Data 3	Data 3
6	I/O	Data 4	Data 4
7	I/O	Data 5	Data 5
8	I/O	Data 6	Data 6
9	I/O	Data 7	Data 7
10	I	-ACK	-ACK
11	I	BUSY	-WAIT
12	I	PE (paper end)	PE (paper end)
13	I	SLCT (select)	SLCT (select)
14	O	-AUTO FD (feed)	-AUTO FD
15	I	-ERROR	-ERROR
16	O	-INIT	-INIT
17	O	-SLCT IN	-SLCT IN
18	—	Ground	Ground
19	—	Ground	Ground
20	—	Ground	Ground
21	—	Ground	Ground
22	—	Ground	Ground
23	—	Ground	Ground
24	—	Ground	Ground
25	—	Ground	Ground

Video port

Your server comes with an integrated super video graphics array (SVGA) video controller. This controller is not removable, but you can disable it by installing a PCI video adapter.

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

The following table shows the pin-number assignments for the 15-pin analog video connector on the rear of the server.

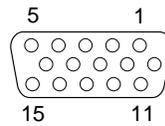


Table 11. Video-port connector pin-number assignments.

Pin	Signal
1	Red
2	Green or monochrome
3	Blue
4	Monitor ID bit 2
5	Ground
6	Ground
7	Ground
8	Ground
9	+5 V dc
10	Ground
11	Monitor ID bit 0
12	DDC SDA
13	Horizontal synchronization (Hsynch)
14	Vertical synchronization (Vsynch)
15	DDC SCL

Keyboard port

There is one keyboard port connector on the rear of the server.

Note: If you attach a standard (non-USB) keyboard to the keyboard connector, the USB ports and devices will be disabled during the power-on self-test (POST).

The following table shows the pin-number assignments for the keyboard connector on the rear of the server.

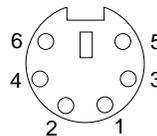


Table 12. Keyboard connector pin-number assignments .

Pin	I/O	Signal
1	I/O	Data
2	N/A	Reserved
3	N/A	Ground
4	N/A	+5 V dc
5	I/O	Keyboard clock
6	N/A	Reserved

Auxiliary-device (pointing device) port

The I/O board has one auxiliary-device port that supports a mouse or other pointing device.

The following table shows the pin-number assignments for the auxiliary-device connector on the rear of the server.

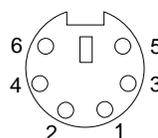


Table 13. Auxiliary-device connector pin-number assignments .

Pin	Signal
1	Data
2	Not connected
3	Ground
4	+5 V dc
5	Clock
6	Not connected

Ultra2 SCSI ports

The server comes with an IBM ServeRAID controller. This controller provides three independent SCSI channels. A 16-bit (wide) LVD SCSI cable connects the hard disk drive backplane to one channel of the RAID controller. Two 68-pin SCSI connectors for two additional channels are on the rear of the server. Refer to “Chapter . Installing and configuring ServeRAID controllers,” on page 139.

The server has a dual-channel Ultra-2 small computer system interface (SCSI) controller. This controller supports two independent SCSI channels: one external and one internal. Each of these channels supports up to 15 SCSI devices. You can use the external LVD SCSI channel connector, on the rear of the server, to connect different types of SCSI devices, such as drives or printers.

SCSI cabling requirements

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 reseller or IBM marketing representative.

For information about the maximum length of SCSI cable between the terminated ends of the cable, refer to the ANSI SCSI standards. Adhering to these standards will help ensure that the server operates properly.

Setting SCSI IDs

Each SCSI device 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.

The hot-swap-drive backplane controls the SCSI IDs for the internal hot-swap drive bays. However, when you attach SCSI devices to the external SCSI connector, you must set a unique ID for the device. Refer to the information that is provided with the device for instructions to set its SCSI ID.

SCSI connector pin-number assignments

The following table shows the pin-number assignments for the 68-pin SCSI connectors.

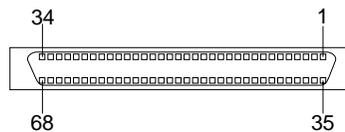


Table 14. 68-pin SCSI connector pin-number assignments.

Pin	Signal	Pin	Signal
1	+Data 12	35	-Data 12
2	+Data 13	36	-Data 13
3	+Data 14	37	-Data 14
4	+Data 15	38	-Data 15
5	+Data P1	39	-Data P1
6	+Data 0	40	-Data 0
7	+Data 1	41	-Data 1
8	+Data 2	42	-Data 2
9	+Data 3	43	-Data 3
10	+Data 4	44	-Data 4
11	+Data 5	45	-Data 5
12	+Data 6	46	-Data 6
13	+Data 7	47	-Data 7
14	+Data P	48	-Data P
15	Ground	49	Ground

Table 14. 68-pin SCSI connector pin-number assignments.

Pin	Signal	Pin	Signal
16	DIFFSENS	50	Ground
17	Term power	51	Term power
18	Term power	52	Term power
19	Reserved	53	Reserved
20	Ground	54	Ground
21	+Attention	55	-Attention
22	Ground	56	Ground
23	+Busy	57	-Busy
24	+Acknowledge	58	-Acknowledge
25	+Reset	59	-Reset
26	+Message	60	-Message
27	+Select	61	-Select
28	+Control/Data	62	-Control/Data
29	+Request	63	-Request
30	+Input/Output	64	-Input/Output
31	+Data 8	65	-Data 8
32	+Data 9	66	-Data9
33	+Data 10	67	-Data 10
34	+Data 11	68	-Data 11

Serial ports

The server has two standard serial ports: Serial port A and Serial port B. The operating system can use and share both serial ports; however, the integrated Netfinity Advanced System Management Processor can use and share only Serial port A.

Some application programs require specific ports, and some modems function properly only at certain communication port addresses. You might need to use the Configuration/Setup Utility program to change communication port address assignments to prevent or resolve address conflicts.

Viewing or changing the serial-port assignments

To view or change the serial-port assignments:

1. Restart the server and watch the monitor screen.
2. When the message Press F1 for Configuration/Setup appears, press F1.
3. From the main menu, select **Devices and I/O Ports**; then, press Enter.

Note: The Devices and I/O Ports choice appears only on the full configuration menu. If you set two levels of passwords, you must enter the administrator password to access the full configuration menu.

4. Select the serial port; then, use the arrow keys to advance through the settings available.
5. Select **Save Settings**; then, select **Exit Setup** to exit from the Configuration/Setup Utility main menu.

Serial-port connectors

The following table shows the pin-number assignments for the 9-pin, male D-shell serial-port connectors on the rear of the server. These pin-number assignments conform to the industry standard.

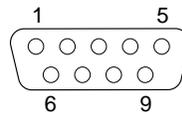


Table 15. Serial-port connectors pin-number assignments.

Pin	Signal	Pin	Signal
1	Data carrier detect	6	Data set ready
2	Receive data	7	Request to send
3	Transmit data	8	Clear to send
4	Data terminal ready	9	Ring indicator
5	Signal ground		

Universal Serial Bus ports

The server has two Universal Serial Bus (USB) ports that configure automatically. USB is an emerging serial interface standard for telephony and multimedia devices. It uses Plug and Play technology to determine the type of device attached to the connector.

Notes:

- 1.If you attach a standard (non-USB) keyboard to the keyboard connector, the USB ports and devices will be disabled during the power-on self-test (POST).
- 2.If you install a USB keyboard that has a mouse port, the USB keyboard emulates a mouse and you will not be able to disable the mouse settings in the Configuration/Setup Utility program.
- 3.Check to make sure your NOS supports USB devices.

USB cables and hubs

You need a 4-pin cable to connect devices to USB 1 or USB 2. If you plan to attach more than two USB devices to the machine, you must use a hub to connect the devices. The hub provides multiple connectors for attaching additional external USB devices with a maximum of 127 external devices.

USB technology provides up to 12 megabits-per-second (Mbps) speed with a maximum of 127 external devices and a maximum signal distance of five meters (16 ft.) per segment.

USB-port connectors

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

The following table shows the pin-number assignments for the USB-port connectors on the rear of the server.

Table 16. USB-port connector pin-number assignments.

Pin	Signal
1	VCC
2	-Data
3	+Data
4	Ground

Ethernet port

Your server comes with an integrated Ethernet controller. This controller provides an interface for connecting to 10-Mbps or 100-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 port, connect a Category 3, 4 or 5 unshielded twisted-pair (UTP) cable to the RJ-45 connector on the rear of the server.

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

Configuring the Ethernet controller

When you connect the server to the network, the Ethernet controller automatically detects the data-transfer rate (10Mbps or 100Mbps) on the network and then sets the controller to operate at the appropriate rate. That is, the Ethernet controller will adjust to the network data rate, whether the data rate is standard Ethernet (10BASE-T), Fast Ethernet (100BASE-TX), half duplex (HDX), or full duplex (FDX). The controller supports half-duplex (HDX) and full-duplex (FDX) modes at both speeds.

The Ethernet controller is a PCI Plug and Play device. You do not need to set any jumpers or configure the controller for the operating system before you use the Ethernet controller. However, you must install a device driver to enable the operating system to address the Ethernet controller. The device drivers are provided on the ServerGuide CDs.

Failover for redundant Ethernet

The IBM Netfinity 10/100 Fault Tolerant Adapter is an optional redundant network interface card (NIC adapter) that you can install in the server. If you install this NIC adapter and connect it to the same logical LAN segment as the primary Ethernet controller, you can configure the server to support a *failover* function. You can configure either the integrated Ethernet controller or the NIC adapter as the primary Ethernet controller. In failover mode, if the primary Ethernet controller detects a link failure, all Ethernet traffic associated with it is switched to the redundant (secondary) controller. This switching occurs without any user intervention. When the primary link is restored to an operational state, the Ethernet traffic switches back to the primary Ethernet controller. The switch back to the primary Ethernet controller can be automatic or manually controlled, depending on the setup and operating system.

Note that only one controller in the redundant pair is active at any given time. For example, if the primary Ethernet controller is active, then the secondary Ethernet controller cannot be used for any other network operation.

Note: The operating system determines the maximum number of IBM Netfinity 10/100 Fault Tolerant Adapters that you can install in the server. See the documentation that comes with the adapter for more information.

Considerations when combining failover and hot-plug

functions: If the operating system supports hot-plug PCI adapters and the optional redundant NIC adapter is installed in a hot-plug PCI slot, you can replace the NIC adapter without powering off the server — even if it is the primary Ethernet controller. Disconnecting the Ethernet cable from the primary Ethernet controller will cause the Ethernet traffic to switch automatically to the secondary Ethernet controller. This can be very useful if a faulty adapter causes a network problem, or if you want to upgrade the primary adapter hardware.

Note: If you hot replace the primary adapter while the Ethernet traffic is being handled by the secondary Ethernet controller, the traffic does not automatically switch back to the primary adapter when the primary adapter comes back online. See “Configuring for failover”.

Configuring for failover: The failover feature currently is supported by OS/2™, Windows NT Server, and IntraNetWare. The setup required for each operating system follows.

Windows NT Server: IBM offers hot-plug support for Windows NT Server Version 4.0. Failover can work in conjunction with hot-plug support or independently. If you are not using hot-plug support, go to “Windows NT Server failover setup” on page 91.

Windows NT Server hot-plug setup: IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package is available for download from the IBM Web site at:

<http://www.pc.ibm.com/support>

Enter the brand type of **Server**, click on **Downloadable files** and look for **Hot Plug**. The IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package uses the Intel Desktop Management Interface (DMI) to control hot-plug support for the Ethernet controllers. The Ethernet controller in the computer is DMI compliant. Download and install the following software in the order listed:

1. IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent
2. IBM Netfinity PCI Hot Plug for Windows NT 4.0 Solution
3. IBM Netfinity 10/100 Fault Tolerant Adapter device drivers

Note: The order of installation is important. You must install the IBM Netfinity Hot Plug for Windows NT Server 4.0 package before you install the IBM Netfinity 10/100 Fault Tolerant Adapter driver. If you install the adapter device driver before the PCI Hot Plug Solution package, the adapter device driver will not recognize the hot-plug code. This happens because the adapter device driver only checks the NT registry for the Hot Plug package during installation. If the PCI Hot Plug Solution package is added after the adapter device driver is installed, the adapter must be removed and added again in order for it to detect the PCI Hot-Plug Solution code.

To install the IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent:

1. Download the IBM Netfinity PCI Hotplug for Windows NT 4.0 Failover DMI Agent DMI Agent file from the Netfinity Support web page and extract the files onto a diskette.
2. Insert the diskette into the diskette drive.
3. From the Start menu, select the **Run** option.

4. Type A:\SETUP.EXE in the Open box.
5. Click **Ok**. The setup wizard opens.
6. Follow the instructions that are given by the setup wizard until the program is installed.
7. Restart the server.

To install the IBM Netfinity PCI Hot Plug for Windows NT 4.0 Solution package:

1. Download the IBM Netfinity PCI Hot Plug for Windows NT 4.0 Solution file from the Netfinity Support web page and extract the files onto a diskette.
2. Log on to Windows NT Server as a user in the Administrator group.
3. Insert the diskette into the diskette drive.
4. From the Start menu, select the **Run** option.
5. Type A:\SETUP.EXE in the Open box.
6. Click **OK**. The Setup wizard opens.
7. Follow the instructions given by the setup wizard until the program is installed.

Windows NT Server failover setup: To install the IBM Netfinity 10/100 Fault Tolerant Adapter device drivers:

1. Add the redundant NIC adapter according to the instructions that are provided with the adapter.
2. Use the ServerGuide CDs to install the AMD PCNet Ethernet Family adapter device driver.
3. Do not select the Grouping box at this point; you must first restart the machine.
4. From the Windows NT Server desktop, select **Control Panel**, then select the **Network** icon, then select the **Adapters** tab.
5. Highlight one of the adapters that will be in the redundant pair and then click the **Properties...** button.
6. Check the Grouping box. This will show the possible combinations for redundant pairs.
7. Select the adapter pair you want and then select **OK**. Note that the integrated Ethernet controller is located at PCI C.

Two options are available for recovering from a failover condition. The options are determined by the Enable for DMI / Hot Swap Support checkbox. If the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package is installed, this checkbox will appear at the bottom of the Adapter Properties panel. If you do not have the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package installed on the server, you will not see the Enable for DMI / Hot Swap Support checkbox.

If the Enable for DMI / Hot Swap Support checkbox is not checked or is not present, traffic will automatically switch back to the primary adapter when the primary link status is restored. In this mode, the adapter cannot be hot-swapped. Users with the IBM Netfinity Hot Plug PCI for Windows NT Server 4.0 package installed should check the Enable for DMI / Hot Swap Support checkbox.

If the Enable for DMI / Hot Swap Support checkbox is checked, traffic will remain on the secondary adapter until the user directs it to return to the primary adapter. This can be done after the hot-swap replacement of the primary adapter or by using the DMI interface.

8. Select **Close** to exit from the Network setup.

When you restart the server, the failover function will be in effect.

If a failover occurs, a message is written to the NT Event Viewer log. In addition, if the Enable for DMI / Hot Swap Support checkbox is checked, a DMI alert will also be generated.

IntraNetWare: The IBM PCI Hot Plug System Bus Driver Diskette for Novell Netware V4.41, V4.42, and V5.0 is available for download from the IBM Web site at:

<http://www.pc.ibm.com/support>

The failover function is now enabled. If a failover occurs:

- The operating system console generates a message.
- The custom counters for the device driver contain variables that define the state of the failover function and the location of the redundant pair. You can use the NetWare Monitor to view the custom counters.

Note: If the primary adapter was hot-replaced while the Ethernet traffic was being handled by the secondary Ethernet controller, the traffic does not automatically switch back to the primary adapter when the primary adapter comes back online. In this case, issue the command:

```
LOAD d:\path\PCNTNW SCAN
```

where *d* and *path* are the drive and path where the driver is located. This command causes the device driver to locate the primary adapter and switch the Ethernet traffic to it.

Ethernet port connector

The following table shows the pin-number assignments for the RJ-45 connector. These assignments apply to both 10BASE-T and 100BASE-TX devices.

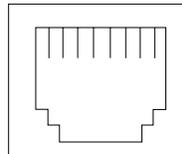


Table 17. Ethernet RJ-45 connector pin-number assignments..

Pin	Signal	Pin	Signal
1	Transmit data+	5	Not connected
2	Transmit data-	6	Receive data -
3	Receive data+	7	Not connected
4	Not connected	8	Not connected

Advanced System Management ports

Your server has three communication ports dedicated to the Netfinity Advanced System Management Processor. One port uses a standard D-shell serial-port connector, connector C. The other two ports, which are used for the ASM Interconnect function, use a dual RJ-45 connector.

You can attach a dedicated modem to the D-shell system-management connector on the rear of the server to communicate with the integrated Netfinity Advanced System Management Processor.

The ASM Interconnect function uses the RJ-45 system-management connectors. This function enables you to connect the Advanced System Management Processors of several rack-mounted servers so that they can communicate with each other in half-duplex mode.

Cabling the server

Refer to the following illustration for the location of input and output connectors.

Refer to the following illustration for an example of proper cable routing.



Installing the server in a rack

Refer to the *Rack Installation Instructions* for rack installation and removal instructions.

Netfinity Manager

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Netfinity Manager is a group of distributed applications designed to enhance the hardware systems-management capabilities of a network. Netfinity Manager has a flexible, modular design that allows for a variety of system-specific installations. Each of these installation configurations provides a set of Netfinity Manager services that enables you to perform, locally, a variety of powerful hardware systems-management and monitoring functions. These services can be installed using the Client Services for Netfinity Manager installation program included with this package. For information on how to install only the Client Services for Netfinity Manager, see the *Client Services for Netfinity Manager User's Guide*

Netfinity Manager provides powerful hardware systems-management capabilities, including access to all systems on the network that are running Netfinity Manager or Client Services for Netfinity Manager. In addition to all standard Client Services for Netfinity Manager functions, Netfinity Manager also features bidirectional file and directory transfers, remote screen captures, and remote command-line sessions. Netfinity Manager also enables you to export data collected by System Information Tool, System Profile, Software Inventory, and System Monitor to a DB2, Lotus Notes, or SQL or DB2 via an open database connectivity (ODBC) database (ODBC export is available on Windows NT systems only). Finally, Netfinity Manager enables some services to be started at scheduled times and dates for simplified, automated systems management.

Netfinity Manager also provides two powerful features that enable you to access the Netfinity Manager system and all Netfinity Manager systems in the managing system network from a system that is not attached to the managing system network:

- **Serial Connection Control**
Use the Serial Connection Control service to use a Netfinity Manager system modem to establish a connection with any Netfinity Manager system that has a modem. Once this connection is established, the Netfinity Manager has full access to Netfinity Manager services, just as though the remote system were part of the managing system network.
- **Netfinity Manager for Web**
Netfinity Manager for Web enables access and remote control of the Netfinity Manager system over the Internet, using any system that has an Internet connection and a World Wide Web (WWW) browser. With the Netfinity Manager for Web, the Netfinity Manager systems can be accessed and managed from anywhere in the world.

Managing your IBM Netfinity server with Netfinity Manager

The copy of Netfinity Manager that is included with ServerGuide entitles you to one Netfinity Manager installation. You are also entitled to additional installations of Client Services for Netfinity Manager. To use Netfinity Manager to monitor and manage this Netfinity server, install Netfinity Manager on a system in your network that you will use as a system-management console, and then install Client Services for Netfinity Manager on your Netfinity server. You can also install additional copies of Client Services for Netfinity Manager on other systems in your network. Furthermore, additional Netfinity Manager and Client Services for Netfinity Manager licenses are available for purchase from your IBM representative.

Netfinity Manager documentation

Online versions of all Netfinity Manager documentation are included in the Netfinity directory on the *ServerGuide Netfinity Applications* CD. These documents are provided in Adobe Acrobat format (*.PDF). For more information on included documentation, see “Getting more information about Netfinity Manager” on page 122.

Netfinity Manager system requirements

The minimum system requirements for Netfinity Manager vary based on which supported operating system is running on your system.

- If you are installing Netfinity Manager for OS/2, see “Netfinity Manager for OS/2 system requirements”.
- If you are installing Netfinity Manager for Windows 95 (or Windows 98), see “Netfinity Manager for Windows 95 and Windows 98 system requirements” on page 97.
- If you are installing Netfinity Manager for Windows NT, see “Netfinity Manager for Windows NT system requirements” on page 97.

Netfinity Manager for OS/2 system requirements

The minimum system requirements for Netfinity Manager for OS/2 are:

- OS/2 version 3.0 or later
- Approximately 19 MB–22 MB of hard disk space (space required depends on system configuration)
- A LAN adapter card and one or more of the following communications protocols:
 - IBM TCP/IP for OS/2 version 1.2 or later (required for Netfinity Manager with Web Enhancement)
 - NetBIOS
 - Note:** The Netfinity Manager NetBIOS requirements are three names, two sessions, and nine network control blocks (NCBs).
 - IPX
 - SNA (IBM Communications Manager/2 version 1.1 only)
 - Note:** Systems using Netfinity Manager with Microsoft SNA Server cannot communicate with systems running the Microsoft SNA Server client. Netfinity Manager supports only server-to-server communications between systems running Microsoft SNA Server software. However, Netfinity Manager systems running Microsoft SNA Server can

communicate with Netfinity Manager systems using any of the other supported SNA stacks.

- A 9600 baud or greater modem (optional).

The hard disk requirement for Client Services for Netfinity Manager is 6.5 MB–9 MB of hard disk space. All other system requirements are the same as for Netfinity Manager for OS/2.

Note: Serial Connection Control will not function on systems that do not have a properly installed and configured modem.

Netfinity Manager for Windows 95 and Windows 98 system requirements

The minimum system requirements for Netfinity Manager for Windows 95 are:

- Microsoft Windows 95 or later
- Approximately 17 MB–20 MB of hard disk space (space required depends on system configuration)
- A LAN adapter card and one or more of the following communications protocols:
 - TCP/IP (must be WinSock Version 1.1-compatible; required for Netfinity Manager with Web Enhancement)
 - NetBIOS

Note: The Netfinity Manager NetBIOS requirements are three names, two sessions, and nine network control blocks (NCBs).

- IPX
- SNA (PCOMM 4.1 or later SNA stack)

Note: Systems using Netfinity Manager with Microsoft SNA Server cannot communicate with systems running the Microsoft SNA Server client. Netfinity Manager supports only server-to-server communications between systems running Microsoft SNA Server software. However, Netfinity Manager systems running Microsoft SNA Server can communicate with Netfinity Manager systems using any of the other supported SNA stacks.

- A 9600 baud or greater modem (optional).

The hard disk requirement for Client Services for Netfinity Manager is 6.5 MB–9 MB of hard disk space. All other system requirements are the same as for Netfinity Manager for Windows NT.

Note: Serial Connection Control will not function on systems that do not have a properly installed and configured modem.

Netfinity Manager for Windows NT system requirements

The minimum system requirements for Netfinity Manager for Windows NT are:

- Microsoft Windows NT version 4.0 or later
- Approximately 17 MB–20 MB of hard disk space (space required depends on system configuration)
- A LAN adapter card and one or more of the following communications protocols:
 - TCP/IP (must be WinSock Version 1.1-compatible; required for Netfinity Manager with Web Enhancement)

- NetBIOS

Note: The Netfinity Manager NetBIOS requirements are three names, two sessions, and nine network control blocks (NCBs).

- IPX

- SNA (Microsoft SNA Server version 2.11 with Service Pack 1 and WCPIC32.DLL dated 01/22/97 or later. This DLL is available from Microsoft)

Note: Systems using Netfinity Manager with Microsoft SNA Server cannot communicate with systems running the Microsoft SNA Server client. Netfinity Manager supports only server-to-server communications between systems running Microsoft SNA Server software. However, Netfinity Manager systems running Microsoft SNA Server can communicate with Netfinity Manager systems using any of the other supported SNA stacks.

- A 9600 baud or greater modem (optional).

The hard disk requirement for Client Services for Netfinity Manager is 6.5 MB–9 MB of hard disk space. All other system requirements are the same as for Netfinity Manager for Windows NT.

Notes:

1. Serial Connection Control will not function on systems that do not have a properly installed and configured modem.
2. To most effectively manage Windows NT systems, any user that will be using Netfinity Manager on a Windows NT system (locally or remotely) must have administrator-level access to the system.

Starting the Netfinity Manager installation program

For instructions on installing Client Services for Netfinity Manager, see the documentation listed in “Getting more information about Netfinity Manager” on page 122.

To start the Netfinity Manager installation program on a system that is running Windows NT 4.0:

1. Start the computer with your operating system.
2. Place the *ServerGuide Netfinity Applications* CD into the CD-ROM drive.
3. Follow the instructions for your operating system below:

- OS/2 Warp Server
 - a. From a command prompt, type

`x:`

where *x* is the CD-ROM drive letter, and then press **Enter**.

- b. Type
`SCOS2`

and then press **Enter**. The ServerGuide Netfinity Applications windows opens.

- c. Select **IBM Netfinity Manager** from the Available Applications selection list.

Note: To install Client Services for Netfinity Manager, select **Client Services for Netfinity Manager** from the Available Applications list and then refer to the *Client Services for Netfinity Manager User's Guide* for additional installation instructions.

- d. Click **Install Product** to start the installation process.

- Windows 95, 98, or NT
 - a. Click the **Start** button.
 - b. Click **Run...** from the Start button menu.
 - c. Type
x:\SCW95

where *x* is the drive letter of the CD-ROM drive in the **Command Line** field and then click **OK**. The ServerGuide Netfinity Applications windows opens.

- d. Select **IBM Netfinity Manager** from the Available Applications selection list.

Note: To install Client Services for Netfinity Manager, select **Client Services for Netfinity Manager** from the Available Applications list and then refer to the *Client Services for Netfinity Manager User's Guide* for additional installation instructions.

- e. Click **Install Product** to start the installation process.

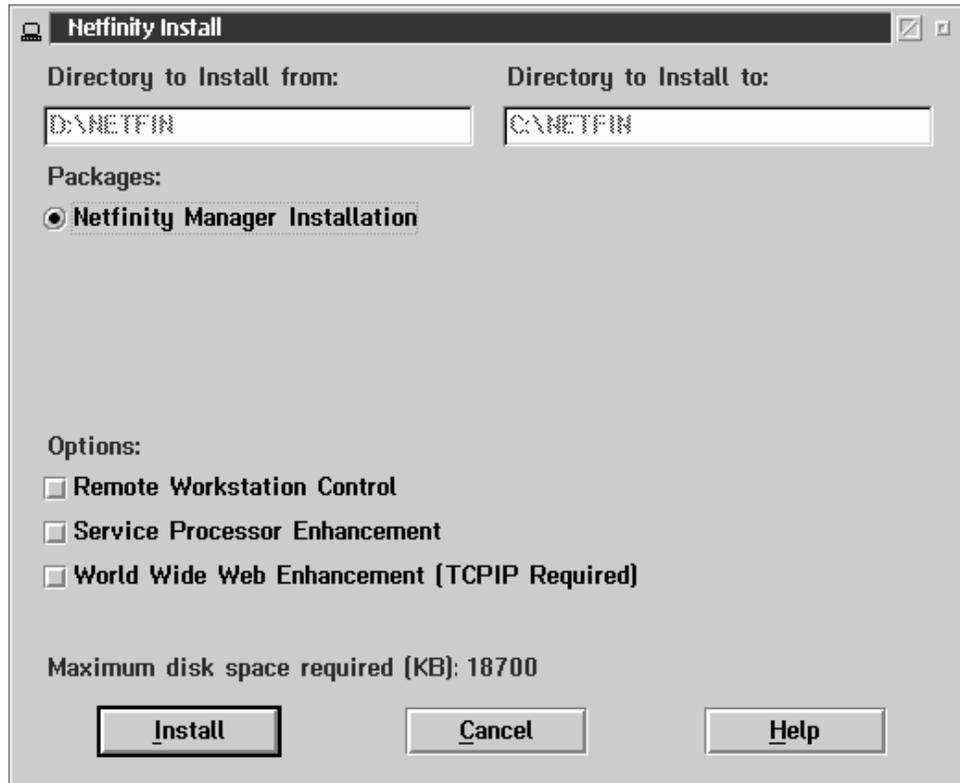
4. Choose a drive and directory from which the Netfinity Manager program files will be copied.

Type in the **Directory to Install from** field the drive and directory name where the Netfinity Manager program files are located. The default is the drive and directory from which the Netfinity Manager installation program was started.

5. Type in the **Directory to Install to** field the drive and directory in which to install the Netfinity Manager files.

Enter the drive and directory name to which the Netfinity Manager program files will be copied. The default is C:\NETFIN (on systems running OS/2) or C:\WNETFIN (on systems running Windows 95 or Windows NT).

6. Click **OK** to save these settings and open the Netfinity Manager Installation Program window.



7. Select installation options.

There is only one installation configuration for Netfinity Manager. However, the Netfinity Manager program offers several installation options. Each option enables additional specialized feature of this product.

The available installation options are:

- **Advanced System Management Support**
Click **Advanced System Management Support** to install the Advanced System Management service on this system. Use this service to monitor and manage IBM Advanced System Management processors and adapters.

Note: If you install Advanced System Management support an enhanced version of the Serial Connection Control service, named Dynamic Connection Manager, will be installed instead of Serial Connection Control. For more information on Advanced System Management and the Dynamic Connection Manager service see the *Advanced System Management Information* section of this server library.
- **Capacity Manager**
Click **Capacity Management** to install the Capacity Management service on this system. Capacity Management is an easy to use resource management and planning tool for network managers and administrators, allowing remote performance monitoring of every server on the network.
- **Remote Workstation Control**
Click **Remote Workstation Control** to enable the Remote Workstation Control service on this system. Use Remote Workstation Control to monitor or control the screen display of remote systems that are running Netfinity Manager or Client Services for Netfinity Manager.

- Update Connector Manager (NT 4.0, TCP/IP, and Web Browser Required)

Click **Update Connector Manager (NT 4.0, TCP/IP, and Web Browser Required)** if Netfinity Manager is being installed on a system that will be used to manage system updates on client systems using updates that are available from the IBM selection server.

- World Wide Web Enhancement (TCP/IP Required)

Click **World Wide Web Enhancement (TCP/IP Required)** if the Netfinity Manager is being installed on a system that will be used to manage other Netfinity Manager systems, and can be accessed and controlled remotely over the Internet using a World Wide Web browser.

8. Install Netfinity Manager.

When an installation configuration has been chosen, click **Install**. The installation program copies all program files required by the installation configuration. A window appears, displaying the name of the file currently being copied, as well as the percentage of the installation that is complete.

Note: Click **Cancel** to halt the installation process.

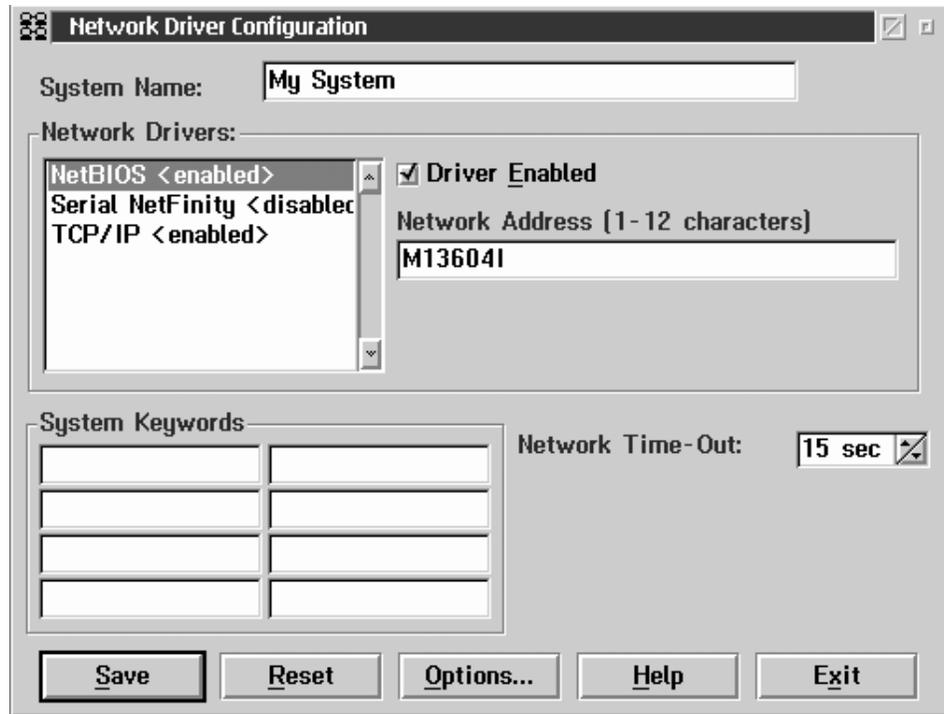
Network communication drivers and the following Netfinity Manager services are installed:

- Alert Manager
- Alert on LAN® Configuration (available only on systems running Windows 95 or later or Windows NT 4.0 or later)
- Capacity Management (available only on systems running Windows NT 4.0 or later)
- Cluster Manager (available only on systems running Windows NT 4.0 or later)
- Critical File Monitor
- DMI Browser (requires DMI Service Layer)
- ECC Memory Setup (requires ECC memory)
- Event Scheduler
- File Transfer
- Power On Error Detect
- Predictive Failure Analysis® (requires PFA-enabled hard disk drive)
- Process Manager
- RAID Manager (requires RAID adapter)
- Remote Session
- Remote System Manager
- Remote Workstation Control
- Screen View
- Security Manager
- Serial Connection Control
- Service Configuration Manager
- Service Processor Manager
- Service Manager
- Software Inventory
- System Diagnostics Manager
- System Information Tool
- System Monitor
- System Partition Access (requires System Partition)
- Update Connector Manager (available only on systems running Windows NT 4.0 or later)
- System Profile
- Web Manager Configuration (installed only if the Netfinity Manager Installation with Web Enhancement installation configuration is selected)

Note: The graphical user interface (GUI) program files for DMI Browser, ECC Memory Setup, System Partition Access, RAID Manager, and Predictive Failure Analysis will be installed regardless of whether the system has a DMI Service Layer, ECC Memory, a System Partition, a RAID adapter, or a PFA-enabled disk drive. This enables a network administrator to remotely access these services on other systems within a network. However, the base program that enables local use of the service will be installed only if the required hardware or system configuration is present.

9. Configure the Network Drivers.

If the installation configuration allows for network access, enter information regarding the communication protocols that are supported by the system. The Network Driver Configuration window will appear.



Follow these steps to continue configuring the system:

a. Enter a System Name.

Enter a name for the system in the **System Name** field. This name will help other Netfinity Manager users identify the system on the network.

b. Select a Network Driver.

Select one of the available Network Drivers that are displayed in the **Network Drivers** field. Once selected, the Network Driver will assign a network address to the system.

Notes:

1)The fields that appear beneath the **Driver Enabled** check box will change depending on which Network Driver has been selected.

2)When enabling the IPX or TCP/IP Network Driver, the network address cannot be altered and it will not appear on the screen. No field will

appear beneath the **Driver Enabled** check box if the IPX or TCP/IP Network Driver is selected.

- 3) When enabling the NetBIOS Network Driver, a network address will be selected and displayed in the **Network Address** field. To change this default name, enter any 1–8 character address. However, this address *must* be unique to the system. If this NetBIOS address is identical to the NetBIOS address of another system on the network, it will prevent Netfinity Manager from starting properly.
- 4) When enabling the Serial Netfinity Manager driver, type a name that will be used to identify the system in the **Unique Machine Dialup Name** field. This name can be up to 32 characters long, and must be unique to the system. If this name is not unique, it can prevent remote Netfinity Manager users from using the Serial Connection Control service to access the system.

c. Enable the Network Driver.

When all required information has been entered, click the **Driver Enabled** check box to activate the driver on startup.

If the system supports multiple network interfaces, add additional network drivers by repeating steps b and c.

d. Identify the system with System Keywords (optional).

To make full use of the Remote System Manager's discovery process, identify the system (and each of the Netfinity Manager systems that are on the network) with descriptive system keywords. Enter these keywords in the appropriate **System Keywords** fields.

e. Select Netfinity Manager Options (optional)

Click on the **Options** button to open the Netfinity Manager Options window. The Netfinity Manager Options window contains special options that affect Netfinity Manager network operations. Available options include:

- Force Remote Logons

If the **Force Remote Logons** option is enabled, the system will not be able to save the User ID/Password combinations that were used when accessing remote systems. This will force you to manually log on each time a remote stem is accessed. Service Execution Alerts

- Service Execution Alerts

If the **Service Execution Alerts** option is enabled, the Netfinity Manager Service Manager will generate a Netfinity Manager alert whenever one of *the user's* Netfinity Manager services is started by a remote user. The alert includes the name of the service that was run and information about the user that started the service.

- Show Network Support

If the **Show Network Support** option is enabled, the Netfinity Manager Support Program (or Network Interface) will be visible as a minimized process in the Windows NT 4.0 taskbar. This enables the user to shut down the Netfinity Manager Support Program. If the Netfinity Manager Support Program is to remain invisible to the user, do not enable this option.

- Remote User Authorization for Screen Access

If the **Remote User Authorization for Screen Access** option is enabled, a remote user cannot use either Remote Workstation Control or Screen View on your system without your permission. When this option is enabled and a remote user attempts to use one of these services on your system, a window will pop up on your desktop alerting you that a remote

user is attempting to use the Remote Workstation Control or Screen View service and asking whether you want to permit this user to use this service on your system. You can click **Yes** or **No**. If you do not make a selection within 15 seconds (for example, if you are not sitting at your system when the access attempt is made), Netfinity Manager will automatically prevent the remote user from using the service on your system.

- **Disable DNS Name Resolution**

If the **Disable DNS Name Resolution** option is enabled, Netfinity Manager will use only a numeric TCP/IP address (for example, 8.24.67.32) to communicate with remote systems and will not attempt to resolve the numeric address into an alphanumeric, Domain Name Server (DNS) address (for example, your.system.ibm.com). Select this option if you are using Netfinity Manager in a WINS networking environment or if you are using TCP/IP in an environment that does not have a Domain Name Server.

To implement one or more of the available Netfinity Manager Options:

- 1) Click **Options...**
 - 2) Select the Netfinity Manager options to be enabled.
 - 3) Click **Save**.
- f. Set the Network Timeout Value (optional).

The **Network Timeout** field shows the number of seconds that Netfinity Manager will attempt to communicate with a remote system that is not responding. If Netfinity Manager does not establish contact with the remote system within this time, it cancels the communication attempt. The Network Timeout default setting is 15 seconds. This default setting might not need to be altered.

- g. Save the configuration and continue.

Click **Save** to save the configuration. Then, click **Exit** to continue.

Note: The configuration can be changed later by double-clicking the **Network Driver Configuration** object in the Netfinity Manager folder.

10. After finishing configuring the system for network access, the installation program displays a list of changes that must be made to the system configuration files, and asks whether the installation program should make the changes. For example, if Netfinity Manager for Windows 95 is being installed, the installation program will display a list of changes that must be made to the CONFIG.SYS file. Click either **Yes** or **No**.

Note: These changes must be made to the system configuration for Netfinity Manager to run correctly.

- If you click **Yes** the changes are automatically made to the system configuration.
 - If you click **No** the commands are saved to a file named CONFIG.NEW in the destination directory (and to AUTOEXEC.NEW, if appropriate) so that they can be added later.
11. The installation is now complete. Shut down and restart the system for the system configuration changes to take effect.

Netfinity Manager database support

Netfinity Manager supports the collection and export of a vast amount of system-specific data to a Netfinity Manager database.

Netfinity Manager databases can be created on database management systems using DB2®, Lotus Notes®, or Microsoft SQL. Microsoft SQL is supported through open database connectivity (ODBC), and is available on systems running Netfinity Manager for OS/2, Windows 95, or Windows NT. If the system supports ODBC, the user can access and export DB2 data through ODBC as well. Once support for one or more of these databases has been installed along with Netfinity Manager, data can be exported from these Netfinity Manager services:

- Alert Manager
- Software Inventory
- System Information Tool
- System Profile
- System Monitor

Information on how to install and configure support for database export follows.

- If support for DB2 database export is being installed, see “DB2 database support”.
- If support for Lotus Notes database export is being installed, see “Lotus Notes database support” on page 109.
- If support for ODBC database export is being installed, see “ODBC database support” on page 111.

DB2 database support

Support for DB2 database export is automatically configured during installation of the Netfinity Manager. However, the database system itself must be configured. Instructions for configuring the database follow.

A raw data dump to a file is also available and will run without a database.

System requirements

Netfinity Manager DB2 database export is supported on systems running Netfinity Manager for OS/2, Netfinity Manager for Windows 95, Netfinity Manager for Windows 98, and Netfinity Manager for Windows NT. For more information about supported version numbers refer to Table 18 on page 114 and Table 19 on page 115.

Attention: Using Netfinity Manager database support with systems running unsupported versions of DB2 or the DB2 Client might cause unpredictable results and might halt the system.

See the *DB2 Installation Guide* for general requirements and supported protocols.

Installing and configuring the database

The following information describes the steps to install and configure the DB2 database.

Note: If your primary system is OS/2, refer to “Installing the database on OS/2” on page 106.

1. Start a DB2 command window.

Note: If it's not already running, start the DB2 database manager.

2. Type the following command:

```
DB2 CREATE databasename ON d
```

where

- *databasename* is the name of the database
- *d* is the drive where the database is created

3. Press Enter.
4. Next, you must configure the tables for ODBC database support so the tables can be configured. For information on configuring the database for ODBC, refer to “ODBC database configuration” on page 112. For information on creating the tables, refer to “Creating the Netfinity Manager tables” on page 112.
5. Finally, you must bind the database. For information on binding the database, refer to “Activating the database”.

Installing the database on OS/2:

1. Insert the Netfinity Manager CD into the CD-ROM drive (in this example, drive D; individual drive letters might be different).
2. Start an OS/2 window or full-screen session.
3. Make the CD-ROM drive the active drive.
Type D: and then press Enter.
4. Type the following command at the OS/2 prompt:
NETFINDB CREATE /DBNAME=*databasename* /DRIVE=*d*

where *databasename* is the name of the database and *d* is the drive where the database will be located.

Note: If any part of the database already exists, the utility program will create only the portions of the database that are missing.

5. Press Enter.

Activating the database

The following information describes how to connect, bind, and grant privileges to the database.

1. Connecting to the Database
 - a. Start a DB2 command window.
 - b. Type the following command:
DB2 CONNECT TO *databasename*

where *databasename* is the name of the database as specified in the database installation step.

- c. Press Enter.
2. Bind the package and the database

To prepare SQL statements stored in the bind file and store the package in the database, perform the following steps from a system on which Netfinity Manager for OS/2, Netfinity Manager for Windows 95, or Netfinity Manager for Windows NT has been installed:

- a. Open a DB2 command window.

- b. In the DB2 command window, type the following command:

```
DB2 BIND x:\directory\DB2SQLC0.bnd
```

where *x:\directory* is the name of the drive and directory where Netfinity Manager is installed.

- c. Press Enter.

Granting and revoking database privileges

The following information describes how to grant and revoke database privileges.

Note: If your primary system is OS/2, refer to “Database privileges on OS/2 systems”.

1. Start a DB2 command window.

Notes:

- a. If it is not already running, start the DB2 database manager.
- b. If you are not connected to the DB2 Netfinity database now connect to the database.

2. Type the following command:

```
DB2 GRANT privilegecode ON TABLE tablename TO userid
```

where

- *privilegecode* is one of the following privilege codes:

- ALL
- ALL PRIVILEGES

Note: Grants all the appropriate privileges, except CONTROL, on the database.

- ALTER
- CONTROL
- DELETE
- INDEX
- INSERT
- REFERENCES
- SELECT
- UPDATE

- *tablename* is the name of the table as specified during database installation. A listing of the Netfinity database table names can be found in the *Netfinity User's Guide* (Appendix H: Netfinity Relational Database Tables).

Note: The Netfinity Database Administration Tool can also be used to GRANT or REVOKE privileges.

- *userid* is the user ID to be granted access

3. Press Enter to execute the command.

To revoke privileges, substitute REVOKE for GRANT in the command line.

Database privileges on OS/2 systems:

1. Use the GRANT EXECUTE command to enable Netfinity Manager to access the database.

Type the following command at the OS/2 prompt:

```
DB2 GRANT EXECUTE ON PACKAGE NETFIN.DB2SQLC0 TO PUBLIC
```

and then press Enter.

Note: Specify PUBLIC or authorize only specific manager systems. To limit access to the database, substitute the authorization name of the managing system for PUBLIC.

2. Use the CONNECT RESET command to disconnect current users from the database.

Type the following command at the OS/2 prompt:

```
DB2 CONNECT RESET
```

and then press Enter.

3. Use the NETFINDB GRANT command to grant (or revoke) database privileges.

To grant or revoke table privileges on OS/2:

- a. Insert the Netfinity Manager CD into the CD-ROM drive (in this example, drive D; individual drive letters might be different).
- b. Make the CD-ROM drive the active drive.

Type D: and then press Enter.

- c. Type the following command:

```
NETFINDB GRANT /ID=id PUBLIC /DBNAME=databasename  
/PRIV=privilegecode
```

where

- *id* is the user ID to be granted access
- *databasename* is the name of the database as specified during NETFINDB execution
- *privilegecode* is one of the following privilege codes:
 - ALL
 - ALTER
 - CONTROL
 - DELETE
 - INDEX
 - INSERT
 - REFERENCES
 - SELECT
 - UPDATE

- d. Press Enter to execute the command.

Note: Use PUBLIC or authorize only a specific ID or group name. Netfinity Manager update programs use the DB2SQLC0 package and do not require specific table privileges.

To revoke privileges, substitute REVOKE for GRANT in the command line.

To configure Netfinity Manager to discontinue export data through ODBC for use on DB2, refer to “ODBC database support” on page 111.

Cataloging the database in the managing system: If the manager is using a remote database, catalog the node the database resides on and then catalog the database to that node.

Once this step has been completed, the name of the Netfinity Manager database will appear in the System Information Tools Database Selection window.

Deleting the database

The following information describes how to delete the database for all supported operating systems.

Note: If your operating system is OS/2, refer to “Deleting the database on OS/2”.

1. Start a DB2 command window.
2. Type

```
DB2 DROP DATABASE databasename
```

where

databasename is the name of the database as specified during the database installation.

3. Press Enter.

Deleting the database on OS/2: 1. Insert the *Netfinity Manager CD-ROM* into the database server CD-ROM drive (in this example, the CD-ROM drive is E).

2. Start an OS/2 window or full-screen session.
3. Make the CD-ROM drive the active drive.
Type E: and press Enter.
4. Type the following command at the OS/2 prompt:

```
NETFINDB DELETE /DBNAME=databasename
```

where *databasename* is the name of the database as specified during NETFINDB execution.

5. Press Enter.

To configure Netfinity Manager to discontinue export data through ODBC for use on DB2, refer to “ODBC database support” on page 111.

Lotus Notes database support

To enable the Netfinity Manager to export system data to a Lotus Notes database, the following must be done:

1. Install the Netfinity Manager database template on the Lotus Notes server.
2. Enable Netfinity Manager to export to the Lotus Notes server.

Instructions on installing the Lotus Notes database template and enabling the Netfinity Manager to export to the Lotus Notes database follow.

System requirements

The minimum requirements for Netfinity Manager to export data to a Lotus Notes database are:

- Lotus Notes

- Lotus Notes client

For information on what versions of Lotus Notes and the Lotus Notes client are supported, see Table 18 on page 114. See the *Notes Administrator's Guide* for general system requirements and supported communications protocols.

Installing the database

To enable Netfinity Manager to export system data to a Lotus Notes database, install the Netfinity Manager database template on the Lotus Notes server. During Netfinity Manager installation, a Lotus Notes database template file (named NETFINDB.NTF) was copied to the Netfinity Manager program directory. To install the database template on the Lotus Notes server:

1. Copy NETFINDB.NTF from the Netfinity program directory to the Notes data directory on the Lotus Notes server.
2. Start Lotus Notes on the server.
3. Click **New Database...** from the Notes File pull-down menu.
This opens the New Database window.
4. Click **Netfinity Database** from the Template selection list.
5. Check the **Inherit Future Design Changes** check box.
This enables future releases of Netfinity Manager to automatically apply changes to this Netfinity Manager database.
6. Click **Local** from the Servers selection list.
Note: When installing the database on a remote server, select the name of the remote server from the Servers list.
7. Type in the **Filename** field:
NETFINDB.NSF
8. Type in the **Title** field:
Netfinity Database
9. Click **New** to create the database and close the New Database window.
10. Double-click the Netfinity Database icon in the Lotus Notes workspace.
11. Click **Database** in the File pull-down menu.
12. Click **Access Control...** in the Database pull-down menu.
13. Set the Access Level for all Netfinity Manager systems that will be exporting data to this database to **Editor**.
14. Check the **Can Delete Documents** check box.
15. Click **OK**.

Once the Lotus Notes database is installed, enable Netfinity Manager systems to export to the Lotus Notes server.

- If the Netfinity Manager system is running Netfinity Manager for OS/2, ensure that the Lotus Notes directories are included in the CONFIG.SYS file LIBPATH, PATH, and DPATH statements. If the directories are not included in these statements, it is not possible to export to the Lotus Notes database.
- If the system is running Netfinity Manager for Windows NT, ensure that the Lotus Notes directory path is included in the Global Windows NT environment settings.
- If the system is running Netfinity Manager for Windows 95, ensure that the Lotus Notes directories are included in the AUTOEXEC.BAT file PATH statement. If the

directories are not included in this statement, it is not possible to export to the Lotus Notes database.

Once these steps have been completed, export system information from Netfinity Manager to an easy-to-browse Lotus Notes database.

Browsing the Netfinity Manager Lotus Notes database

To browse the data contained in the Netfinity Manager Lotus Notes database:

1. Open the Netfinity Database object in the Lotus Notes Workspace.
2. Select from the View pull-down menu the section of the Netfinity Manager database to be browsed.

The Netfinity Manager database is divided into sections that contain data gathered by specific Netfinity Manager services. Click the name of the service that gathers the data to be viewed (for example, **Alert Logs**).

Note: Some menu selections will contain submenus.

3. Information contained in the part of the Netfinity Manager database that has been selected is now listed in the window. For more detailed information about any displayed data item, double-click the data item.
4. Some data items can be expanded to reveal additional information. These items are identified by a plus sign (+) in the left side border of the Notes window, beside the name of the data item. To expand the data item, select the item and then click **Expand** in the View pull-down menu.

ODBC database support

Netfinity Manager supports exporting data via ODBC for use on SQL or DB2 database systems.

Note: ODBC database export is available only on systems that are running Netfinity Manager.

System requirements

The minimum requirements for Netfinity Manager ODBC database export are:

- Windows NT
 - ODBC
 - ODBC support for one or more of the following database management systems (DBMS):
 - IBM DB2
 - Microsoft SQL Server
- Windows 95, with:
 - ODBC
 - ODBC support for one or more of the following database management systems:
 - IBM DB2
 - Microsoft SQL Server
- OS/2

- Microsoft SQL Server (using the Visigenic driver provided with Microsoft SQL Server)
- or*
- IBM DB2

For detailed information about supported ODBC platforms, see Table 18 on page 114 and Table 19 on page 115.

Note: The ODBC database name must not be longer than 8 characters.

ODBC database configuration

This section describes the procedures you must complete before Netfinity Manager can create the Netfinity Database Tables using ODBC.

1. Define the NETFIN ID so the Netfinity Database Administration can create the Netfinity Database tables with a table qualifier of NETFIN.

Attention: NETFIN is a restricted user ID. The password is not retained by Netfinity Database Administration after use. Do not use this ID for exports.

Notes:

a. In OS/2 and Windows 95, NETFIN must either be the owner of the database or must be given administrator authority.

b. In Windows NT, when exporting to DB2, NETFIN must either be the owner of the database or be defined as a system administrator through the NT User Manager for Domains or the NT User Manager.

In Windows NT, when exporting to MS SQL, NETFIN must be the owner of the database or be given table create rights.

2. Create the database with the appropriate relationship with the NETFIN ID.
3. Make a database ODBC source either using the ODBC tools shipped with the operating system or the database.
4. On Windows NT, configure the Netfinity Support Program to export data using the ODBC database.
 - a. Open **Services** from the Control Panel.
 - b. Click **Netfinity Support Program** from the **Services** field, then click **Startup**.
 - c. Click **Automatic** in the Startup Type button group.
 - d. Click **This Account** in the **Log On As** field group. Enter in the **This Account** field the user name of the account that made this database an ODBC source.
 - e. Click **OK**.

Note: If the Event Scheduler or Alert Manager will be used to export data using ODBC, continue to have the ID which made the database an ODBC source logged on during the time Event Scheduler will be exporting data.

Creating the Netfinity Manager tables

To create the tables needed to enable Netfinity Manager to export data:

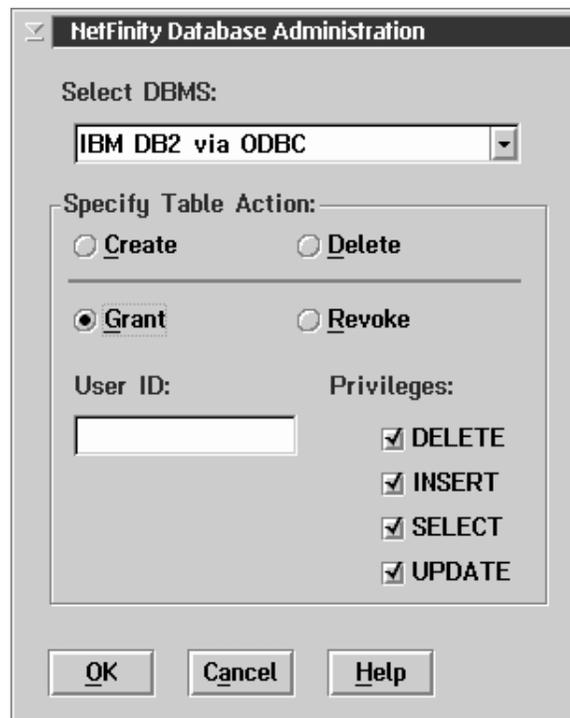
1. Open the Netfinity Manager Database Administration service.

The Netfinity Manager Database Administration service is found in the Netfinity Manager folder or Netfinity Manager program group. Double-click this icon to open the Netfinity Manager Database Administration window.



2. Select a DBMS.

Click in the **Select DBMS** listing the name of the DBMS which Netfinity Manager will be using to export data.



3. To create the Netfinity Manager table groups within the database, click **Create** and then click **OK** to open the Database Server window.

The following table actions are also available:

- Delete

To remove the Netfinity Manager table groups from the database, click **Delete** and then click **OK** to open the Database Server window.

- Grant

Permits access to a database for a specified user ID. To grant access:

- a. Click **Grant**.
- b. In the **User ID** field type the user ID that will be permitted to access the database.
- c. Select privileges for this ID.

All privileges (Insert, Delete, Select, and Update) are selected by default. A user ID must have all of these privileges to export data to the database.

- d. Click **OK** to open the Database Server window.
- **Revoke**
Disables access to a database for a specified user ID. To revoke access:
 - a. Click **Revoke**.
 - b. In the **User ID** field type the user ID that will have access to the database revoked.
 - c. Deselect privileges to be revoked for this ID.
All privileges (Insert, Delete, Select, and Update) are selected by default. A user ID must have all of these privileges to export data to the database. Some or all of these privileges can be revoked.
 - d. Click **OK** to open the Database Server window.
4. Select the database within which the table groups will be created.
5. Click **OK**.
The Netfinity Manager Database Access window opens.
6. Type in the **User ID** field
netfin

netfin is the qualifier name of the Netfinity Manager database.

7. In the **Password** field type the password that enables access to the Netfinity Manager database.
8. Click **OK**.

As the information is processed, a Creating tables status message should be displayed. When the operation completes, a Requested Action Completed message should be displayed.

Supported and certified databases

The following tables show databases and operating systems that are certified for use with this release of Netfinity Manager.

Table 18. Supported Netfinity Databases for Windows.. Reference by operating system and database client version.

Product	Windows 95	Windows NT 3.51	Windows NT 4.0
IBM DB2 Version 2.1.2	Yes	Yes	Yes
IBM DB2 Universal Database 5.0	Yes	Yes	Yes
ODBC - IBM DB2 Version 2.1.2	Yes, DB2 Driver	Yes, DB2 Driver	Yes, DB2 Driver
ODBC - IBM DB2 Universal Database 5.0	Yes, DB2 Driver	Yes, DB2 Driver	Yes, DB2 Driver
ODBC - Microsoft SQL Version 7.0	Yes, Microsoft SQL Driver	Yes, Microsoft SQL Driver	Yes, Microsoft SQL Driver
ODBC - Microsoft SQL Version 6.5	Yes, Microsoft SQL Driver	Yes, Microsoft SQL Driver	Yes, Microsoft SQL Driver
Lotus Notes Version 4.5.2	Yes	Yes	Yes

Table 18. Supported Netfinity Databases for Windows.. Reference by operating system and database client version.

Product	Windows 95	Windows NT 3.51	Windows NT 4.0
Lotus Notes Version 4.5.3a	Yes	Yes	Yes
Lotus Notes Version 4.6	Yes	No	Yes
Lotus Notes Version 4.6a	Yes	No	Yes
Lotus Notes Version 4.63	Yes	No	Yes
Oracle Version 7.3	Yes, Oracle Driver Version 2.0.3.1.1	Yes, Oracle Driver Version 2.0.3.1.1	Yes, Oracle Driver Version 2.0.3.1.1
Oracle Version 8.0	Yes, Oracle Driver Version 8.0.3.0.0	No	Yes, Oracle Driver Version 8.0.3.0.0
Sybase SQL Version 11.0	Yes, Sybase Driver Version 10.0.3T4	Yes, Sybase Driver Version 10.0.3T4	Yes, Sybase Driver Version 10.0.3T4
Note: The above applies to Netfinity Manager Release 5.2.0 and later.			

Table 19. Supported Netfinity Databases for OS/2.. Reference by operating system and database client version.

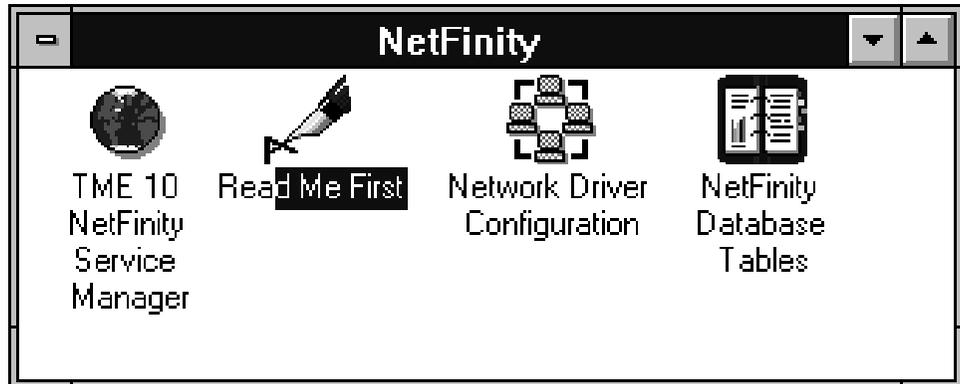
Product	OS/2 Warp Connect	OS/2 Warp 4.0
IBM DB2 Version 2.1.2	Yes	Yes
IBM DB2 Universal Database 5.0	Yes	Yes
ODBC - IBM DB2 Version 2.1.2	Yes, DB2 Driver	Yes, DB2 Driver
ODBC - IBM DB2 Universal Database 5.0	Yes, DB2 Driver	Yes, DB2 Driver
ODBC - Microsoft SQL Version 7.0	Yes, Visigenic Driver Version 1.10	No
ODBC - Microsoft SQL Version 6.5	No	No
Lotus Notes Version 4.5.2	Yes	Yes
Lotus Notes Version 4.5.3a	Yes	Yes
Lotus Notes Version 4.6	No	No
Lotus Notes Version 4.6a	No	No
Lotus Notes Version 4.63	No	No
Oracle Version 7.3	No	No
Oracle Version 8.0	No	No
Sybase SQL Version 11.0	No	No
Note: The above applies to Netfinity Manager Release 5.2.0 and later.		

Starting Netfinity Manager

To start Netfinity Manager:

1. Open the Netfinity Manager folder or program group.

During installation of Netfinity Manager, a Netfinity Manager folder (OS/2, Windows 95, or Windows NT 4.0 only) or a Netfinity Manager program group (Windows NT 3.51 only) was added to the Desktop. The Netfinity Manager folder or program group contains the Netfinity Manager Service Manager object.

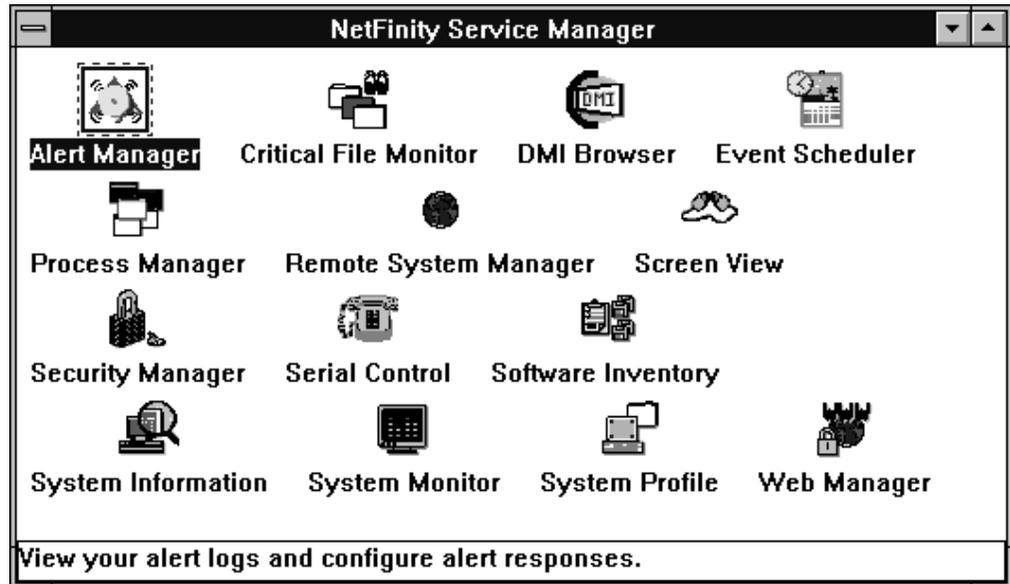


Notes:

- a. In your Netfinity Manager folder or program group is a document titled *Read Me First*, which contains information about Netfinity Manager that might not be covered in your documentation.
 - b. The Netfinity Manager folder also contains the Network Driver Configuration object, which you can use to reconfigure your network protocols and system keywords, and the Netfinity Manager Database Tables object, which contains a handy online reference for all of the data tables in the Netfinity Manager database. For more information on Netfinity Manager database support see "Netfinity Manager database support" on page 105.
 - c. The Netfinity Manager folder also contains a Netfinity Database Administration object. You can use Netfinity Database Administration to configure Netfinity Manager database support. For more information on Database Administration, see "ODBC Database Support" in *Netfinity Manager Quick Beginnings*.
2. Start the Netfinity Service Manager.
- To start the Netfinity Service Manager, double-click the Netfinity Service Manager object.

Netfinity Manager Service Manager

All Netfinity Manager services that are supported by the operating system can be started from the Netfinity Manager Service Manager window. The services that are available for use depend on the installation configuration that was selected during installation.



To start any Netfinity Manager service that appears in the Service Manager window, double-click the icon for that service. To start a Netfinity Manager service on a remote system, use the Remote System Manager service.

Netfinity Manager service descriptions

Each Netfinity Manager service consists of a base program and a graphical user interface (GUI). The service base programs enable the individual services to be accessed remotely by Netfinity Manager, but do not allow for local access. The service GUIs, when functioning along with their respective base program, enable access to the service.

Some services are available only on systems with certain system configurations. These services are:

- Alert on LAN Configuration (available only on systems running Windows 95 or later or Windows NT 4.0 or later)
- Capacity Management (available only on systems running Windows NT 4.0 or later)
- Cluster Manager (available only on systems running Windows NT 4.0 or later)
- DMI Browser (requires DMI Service Layer)
- ECC Memory Setup (requires ECC memory)
- Predictive Failure Analysis (requires a PFA-enabled hard disk drive)
- RAID Manager (requires a RAID hard disk drive subsystem)
- System Partition Access (requires a built-in System Partition)
- Update Connector Manager (available only on systems running Windows NT 4.0 or later)

Brief descriptions of each of the Netfinity Manager services follow. Complete instructions on how to use each of these services can be found in the service-specific chapters of the *Netfinity Manager User's Guide*.

Advanced System Management

The Advanced System Management service provides extensive functionality available for your IBM PC Server Advanced System Management Adapter, Netfinity Advanced System Management PCI Adapter, or Netfinity Advanced System Management Processor. With the Advanced System Management service, you can configure system management events (such as POST, loader, and operating system timeouts or critical temperature, voltage, and tamper alerts). If any of these events occurs, the Advanced System Management service can be configured to use a modem or your Netfinity Manager system to automatically forward a Netfinity alert to other Netfinity Manager systems or to a numeric or alphanumeric pager.

Alert Manager

The Alert Manager is an extendable facility that allows receiving and processing of application-generated alerts. A variety of actions can be taken in response to alerts, including logging alerts, notifying the user, forwarding the alert to another system, executing a program, playing a WAV file (available only on multimedia systems), generating an SNMP alert message, dialing out to a digital pager service (available only on systems that have a modem), or taking an application-defined action. Actions are user-definable, using a flexible action management interface.

Also, an extensive, detailed log is kept of all alerts received by the Alert Manager. Logged information includes date and time the alert was received, type and severity of the alert, the ID of the application that generated the alert, as well as any text that was generated and any action taken by the Alert Manager. Individual or multiple alerts can be selected from the log and printed for later reference, or deleted once problems are corrected. This service is available for both stand-alone and network use.

Alert on LAN configuration

Use the Alert on LAN configuration service to configure monitoring options of Alert on LAN-capable systems locally and remotely. Systems with Alert on LAN capability provide critical status information about system states. The data is reported by hardware or software (depending upon whether the systems are currently powered on or not) using TCP/IP.

Capacity Management

Capacity Management is an easy-to-use resource management and planning tool for network managers and administrators, allowing remote performance monitoring of every server on the network.

Cluster Manager

Cluster Manager is an application designed to enhance the cluster management capabilities of the Microsoft Cluster Server (MSCS) administration console, included with Microsoft Windows NT Version 4.0 Enterprise Edition. Cluster Manager builds on the power of MSCS, providing an integrated graphical interface that enables you to quickly and easily monitor and manage the clustered systems on your network. This service is available only on systems running Windows NT Workstation 4.0.

Critical File Monitor

Critical File Monitor can warn you whenever critical system files on the system are deleted or altered. Critical File Monitor makes it simple to generate Netfinity alerts when an important System File (such as the CONFIG.SYS file) changes date, time,

size, or when it is deleted or created. Critical File Monitor can also be used to monitor any other files that reside on a Netfinity Manager system.

DMI Browser

DMI Browser enables you to examine information about the DMI-compliant hardware and software products installed in or attached to the system.

ECC Memory Setup

The ECC Memory Setup allows for monitoring of ECC memory single-bit errors, and can automatically "scrub," or correct, the ECC memory when errors are detected. Also, a running count of single-bit errors can be kept, and can set a single-bit error threshold that will cause a nonmaskable interrupt (NMI) if the ECC single-bit error threshold is exceeded. This service is available for both stand-alone and network use by any system that has ECC memory.

Event Scheduler

Use Event Scheduler to automate many Netfinity Manager services. With Event Scheduler, you can automatically gather and export System Information Tool, System Profile, and Software Inventory data, distribute or delete files, restart systems, execute commands, and access and manage System Partitions on all of the Netfinity Manager systems on the network. Scheduled events can be performed one time only, or can be performed according to a user-defined schedule.

File Transfer

Use the File Transfer service to easily send, receive, or delete files or entire directories to and from remote Netfinity Manager systems on the network.

Power-On Error Detect

The Power-On Error Detect service can warn you immediately when a remote Netfinity Manager system has start-up problems, enabling you to react quickly to problems and minimize downtime.

Predictive Failure Analysis

The Predictive Failure Analysis (PFA) service enables continual monitoring and managing of PFA-enabled hard disk drives. A PFA-enabled hard disk drive features hardware designed to help detect drive problems and predict drive failures before they occur, thus enabling you to avoid data loss and system downtime.

Process Manager

Use Process Manager to view detailed information about all processes that are currently active on any system. It is also possible to stop or start processes and generate Netfinity Manager alerts if a process starts, stops, or fails to start within a specified amount of time after system startup.

RAID Manager

The RAID Manager service can monitor, manage, and configure an assortment of Redundant Arrays of Independent Disk (RAID) adapters and arrays without requiring the RAID system to be taken offline to perform maintenance. Use the RAID Manager to gather data about the system RAID array and RAID adapter, rebuild failing drives, add (or remove) logical drives, perform data integrity tests, and many

other RAID system tasks. This service is available for both stand alone and network use by any system that has a supported RAID adapter.

Remote Session

Use Remote Session to establish a fully active command session with any remote Netfinity Manager system.

Remote System Manager

Use Remote System Manager to access and manage any Netfinity Manager service on any Netfinity Manager system in the network. The Netfinity Manager system on the network is organized into easy-to-manage logical groups that can be updated automatically using the auto-discovery feature.

Remote Workstation Control

Remote Workstation Control can monitor or control the screen display of a remote system that is running Netfinity Manager (or Client Services for Netfinity Manager). Once you initiate a Remote Workstation Control session with another Netfinity Manager system, you can passively monitor events that are occurring on the display of the remote system or actively control the remote system desktop. When you initiate an active Remote Workstation Control session, all mouse clicks and keystrokes entered on your system are automatically passed to the remote system. With Remote Workstation Control, you can remotely start programs, open and close windows, enter commands, and much more.

Screen View

The Screen View service takes a "snapshot" of the system graphic display or any remote system running Netfinity Manager or Client Services for Netfinity Manager and displays it on the screen. These snapshots can be saved as bitmaps and viewed later.

Security Manager

The Security Manager service can prevent unauthorized access to some or all of the Netfinity Manager services. It uses incoming user ID and password combinations, and is available for network use only.

Serial Connection Control

The Serial Connection Control service enables remote systems running Netfinity Manager to access the system through a phone line and modem. With the Serial Connection Control service, you do not have to be attached to a network to benefit from the outstanding remote system access, monitoring, and management capabilities of Netfinity Manager.

Note: The system *must* have a properly installed and configured modem that supports at least 9600 baud for the Serial Connection Control service to function.

Service Configuration Manager

Service Configuration Manager can save the configuration of a Netfinity Manager service from a selected system to a service configuration file (SCF). Once created, SCF files can be used by Event Scheduler to restore the configuration to the same system, or it can be used (in conjunction with Event Scheduler) to duplicate that configuration on other similar systems you choose.

Software Inventory

Software Inventory enables the user to create and manage software product dictionaries that can be used to easily maintain an inventory of all application programs installed on the system.

System Diagnostics Manager

System Diagnostics Manager enables you to initiate a variety of diagnostic tasks on systems that support ROM-based diagnostics. The results of all previously run diagnostic sessions are stored and can be examined using System Diagnostics Manager to help diagnose and resolve system problems.

System Information Tool

The System Information Tool enables quick and convenient access to detailed information on the hardware and software configurations of the system. System Information Tool gathers information about almost any computer; however, the most detail is provided when this service is used with IBM computers. This service is available for both stand-alone and network use.

System Monitor

The System Monitor provides a convenient method of charting and monitoring the activity of a number of components in a system, including processor usage, disk space used, and ECC memory errors. These convenient monitors are detachable and scalable, enabling only the monitors needed to remain available at all times. Use the System Monitor Threshold Manager to set threshold levels for any of the monitored components. When exceeded, these thresholds will generate user-configured alerts.

Data is continually collected from the time the system starts. A sophisticated data-handling technique is used to weigh the individual values, average concurrent samples, and post single values that accurately reflect long-term system activity. This technique allows system activity records to be maintained without creating enormous data files. This service is available for both stand-alone and network use.

System Partition Access

The System Partition Access allows for greatly simplified system partition file handling, both locally and remotely. Individual files and entire directories can be renamed or deleted from the system partition. Individual files can be renamed, deleted, or copied into the system partition. Also, the entire partition can be backed-up, restored, or deleted. This service is available for both stand-alone and network use by any system that has a System Partition.

System Profile

The System Profile provides a convenient notebook of pertinent data about a particular user or system. It features many predefined fields for extensive user-specific data, including name, address, office number and location, and phone number. System Profile also includes many predefined fields for system-specific data that might not be available to the System Information Tool, including model and serial numbers and date of purchase. Finally, there are many user-definable miscellaneous fields that can be used to hold any data the user or administrator requires.

Update Connector Manager

Use Update Connector Manager to quickly and easily gather information about various updates that are available for your client systems. Once available updates are

discovered, use Update Connector Manager to apply updates to your systems remotely. Updates can be applied to individual systems, or you can apply multiple updates to multiple systems, all from Netfinity Manager. You can also use Update Connector Manager to remove previously applied updates. Update Connector Manager also includes a scheduler that you can use to discover, apply, or remove updates automatically and periodically.

Web Manager Configuration

Use the Web Manager Configuration service to limit access to the Netfinity Manager for Web to user-specified TCP/IP host or ranges of TCP/IP host addresses. Enable or disable the Netfinity Manager for Web and specify the TCP/IP port number to which the Netfinity Manager Web server functions.

Delaying Netfinity Manager startup on OS/2 systems

In some cases, it might be necessary for you to delay the automatic startup of the Netfinity Manager Network Interface (NETFBASE.EXE) in order to allow other time-sensitive applications to start up correctly or to allow your system to fully configure itself prior to beginning network operations. NETFBASE.EXE includes a parameter (WAIT) that you can use to specify the number of seconds that NETFBASE.EXE will wait before starting.

During Netfinity Manager installation, the Netfinity Manager Network Interface object is placed in the Startup folder. To configure Netfinity Manager to wait a specified number of seconds before starting:

1. Shut down the Netfinity Manager Network Interface if it is running.
2. Open the Startup folder.
3. Using the right mouse button, click the **Netfinity Manager Network Interface** object. This will open the Netfinity Manager Network Interface context menu.
4. Click **Settings** to open the Netfinity Manager Network Interface **Settings** notebook.
5. In the **Parameters** field type

WAIT:x

where *x* is the number of seconds that you want the Netfinity Manager Network Interface to wait before starting.

6. Close the Netfinity Manager Network Interface **Settings** notebook.

With the WAIT parameter set to *x*, whenever you start your system, the Netfinity Manager Network Interface will wait *x* seconds before starting.

Note: This feature is available only on systems that are running OS/2.

Getting more information about Netfinity Manager

Complete information on how to use Netfinity Manager (as well as Client Services for Netfinity Manager) is included in Adobe Acrobat format on the Netfinity Manager CD.

The \DOCS subdirectory contains the following files:

Filename	Document Title	Description
DOCSREAD.ME	DOCSREAD.ME	Text file that contains brief descriptions of each of the Adobe Acrobat-readable PDF file contained in this directory.
README.SCO	Client Services for Netfinity Manager for SCO UnixWare Read Me	Text file that contains installation and setup information for Client Services for Netfinity Manager for SCO UnixWare.
NFMGRQB.PDF	Netfinity Manager Quick Beginnings	Installation and setup information for Netfinity Manager.
NFMGRUG.PDF	Netfinity Manager User's Guide	Detailed information on how to use Netfinity Manager.
NFMGRCR.PDF	Netfinity Manager Command Reference	Detailed information on Netfinity Manager command line functions.
NFCSVCQB.PDF	Client Services for Netfinity Manager Quick Beginnings	Installation and setup information for Client Services for Netfinity Manager.
NFSVCUG.PDF	Client Services for Netfinity Manager User's Guide	Detailed information on how to use Client Services for Netfinity Manager.
NFSVCNW.PDF	Client Services for Netfinity Manager for NetWare User's Guide	Installation, setup, and usage information for Client Services for Netfinity Manager for NetWare.
ASMUPDT.PDF	Advanced System Management Information	Updated information on the Advanced System Management and Dynamic Connection Manager services. These services are included with this version of Netfinity Manager.
NFSCOBAS.PDF	Client Services for Netfinity Manager for SCO UnixWare User's Guide	Installation, setup, and usage information for Client Services for Netfinity Manager for SCO UnixWare.

Installation options

This appendix describes methods for performing automated installations of Netfinity Manager and creating customized Netfinity Manager installations.

Automated installation

If the system has a CID-enabled (CID stands for customization, installation, and distribution) software distribution manager utility (such as LAN CID, included with IBM Network Transport Services/2), Netfinity Manager can be installed on systems within the network by using the Netfinity Manager installation program command line parameters and response file. First, a source directory must be created for the installation.

To create a source directory for a Client Services for Netfinity Manager installation:

1. Create a new directory on your system. This new directory will serve as a source directory for the program files.
2. Copy the files from the appropriate Client Services for Netfinity Manager directory location on the CD-ROM to source directory you created.

For example, when creating a source directory to distribute Netfinity Manager Services for OS/2, copy all of the files from the OS2/SERVICES directory into the created directory.

To create a source directory for a Netfinity Manager installation:

1. Create a new directory on your system. This new directory will serve as a source directory for the program files.

Important: Be sure to copy the Client Services for Netfinity Manager source files before the copying the Netfinity Manager source files because the Netfinity Manager directory contains some files that will overwrite files from the Client Services for Netfinity Manager directory. Only Netfinity Manager installations can be done from this directory.

2. Copy the files from the appropriate Client Services for Netfinity Manager directories.

For example, when creating a source directory to distribute Netfinity Manager for OS/2, copy all of the files from the OS2/SERVICES directory into the source directory.

3. Copy the files from the appropriate Netfinity Manager directory.

For example, when creating a source directory to distribute Netfinity Manager for OS/2, copy all of the files from the OS2/MANAGER directory into the source directory.

After an installation source directory has been created, use a response file and the Netfinity Manager installation program command-line parameters. The Netfinity Manager installation program supports the following command-line parameters:

/R: *drive+path+filename*

Specifies the drive, path, and file name of the response file. See the NETFBASE.RSP file (located in the directory in which Netfinity Manager was installed) for an example of a response file with comments on the included parameters.

/S: *drive+path*

Specifies the drive and path to install *from*. This is the directory to which the files were copied.

/T: *drive*

Specifies the drive to install *to*. Default is the current startup drive.

/TU: *drive+path*

Specifies the drive and path of the CONFIG.SYS file to update. The default is to change the CONFIG.SYS in the root directory of the drive specified in the /T parameter (or the startup drive). This parameter is ignored if the *ChangeConfig* parameter in the response file is FALSE.

For example, the line:

```
NETFINST /R:NETFBASE.RSP /S:Y:\NETFIN  
/T:C /TU:D:\
```

will install Netfinity Manager, using the options in the response file NETFBASE.RSP, from the directory Y:\NETFIN, to drive C: (the directory to which the files are installed is taken from the response file), and will modify the CONFIG.SYS file in the D:\ directory.

Note: For information on how to use a CID-enabled software distribution manager, refer to the publications provided with the individual CID-enabled product.

Customized installation

For security reasons, not all users might need to have access to all services. User access can be restricted by creating a customized installation that will prevent some services from being installed.

To create a customized installation, the INSTALL.INI file must be edited. For example, when creating a customized Netfinity Manager for Windows 95 or NT installation, edit the INSTALL.INI file that is found on Netfinity Manager directory.

The INSTALL.INI file has three sections, separated by the line

```
[==]
```

The first section contains the installation configuration that can be selected during installation. There can be no more than eight choices. Each choice takes up two lines. The first line is the text that is displayed next to the installation configuration radio button. The second line is a list of the options in the third section that will be installed when this choice is selected for installation.

For example:

```
;IBM SysMgt Install Script, Version 2 (Do not remove this comment line)
Netfinity Manager Installation [Manager 16900]
    Advanced System Management Support [ServProc 450]
    Capacity Manager Enhancement [CapMgt 5600]
    Remote Workstation Control [RWC 2000]
    World Wide Web Enhancement (TCPIP Required) [WebManager 3000] IsTcipip
[==]
Netfinity Manager CD for Windows 95/NT
[==]
NetFinity Admin
NULL Manager
    CL 0 1 NETFBASE.EXE
    CCL 0 1 NETDOM.INI
    CCL 0 1 NETNODES.INI
    CCL 0 1 INSTALL.BAT
    CCL 0 1 NETFINST.EXE
    CCL 0 1 INSTALL.INI
    CCL 0 1 WININST.HLP
    CL 0 1 APCKINST.DLL
;Screen Capture GUI
;NULL Manager
;    CL 0 1 SAVEG.EXE
;    CL 0 1 SAVEG.HLP
```

This INSTALL.INI will create a Netfinity Manager installation configuration that also installs Advanced System Management, Capacity Manager, Remote Workstation Control, and Netfinity Manager World Wide Web enhancement.

The second section contains the names of the CD that this installation script will use.

The third section contains the list of options that can be installed. These are the options that are selected by the choices in the first section. The options are consecutively numbered starting at 1, so any inserted options will change the number of all following options. Each option uses the following format:

```
Option Name
Dll-entrypoint
    option file
    option file
    ...
install command
install command
...
```

Option Name An identifying comment by the installation program. All options must have a different Option Name. This is used only for identification.

Dll-entrypoint Used to determine whether an option is valid for a given target machine. In most cases, it should be the reserved string "NULL."

The easiest way to customize an installation is to simply put a semicolon in front of any service that you want to remove from the installation.

To add a line item in a specific section, add all the necessary item information in the format shown in the following example.

Before:

```
Screen Capture GUI
NULL Manager
    CL 0 1 SAVEG.EXE
    CL 0 1 SAVEG.HLP
```

After:

```
Screen Capture GUI
NULL Manager
    CL 0 1 SAVEG.EXE
    CL 0 1 SAVEG.HLP
    CL 0 1 CUSTOM.INI
```

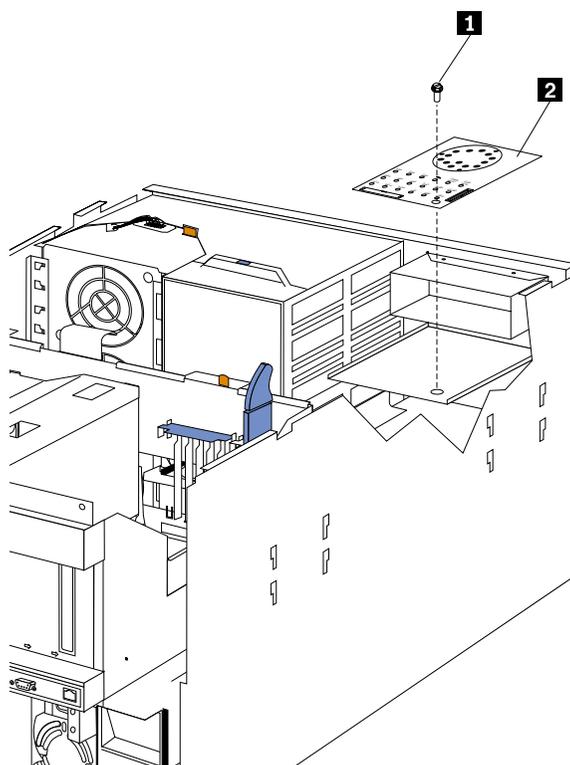
FRU information (service only)

Field Replacement Units (FRUs) should be replaced by qualified service personnel only.

Diagnostic switch card

Use the following illustration when replacing the diagnostic switch card.

Review the information in “Before you begin” on page 60.



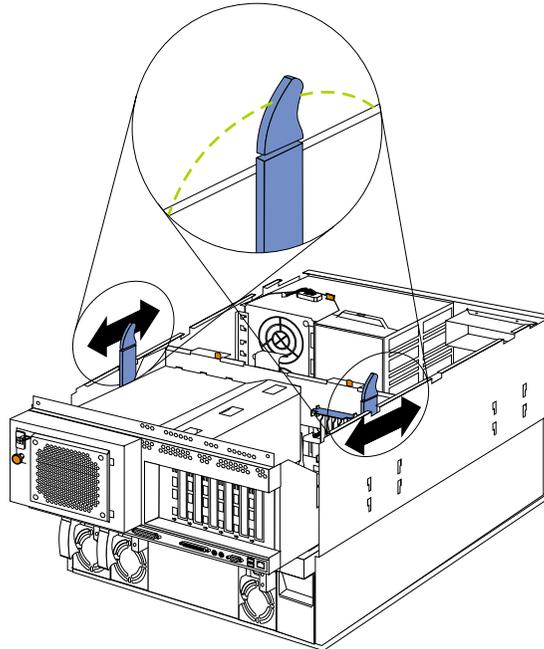
- 1** Holding screw
- 2** Diagnostic switch card

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the shuttle (see “Disconnecting the shuttle” on page 128) and move it back slightly.
5. Disconnect the front LED card assembly cable from the diagnostic switch card.
6. Disconnect the diagnostic switch card cable.
7. Remove the screw from the diagnostic switch card.

8. Replace the card and reattach the front LED card cable and the diagnostic switch card cable.

Disconnecting the shuttle

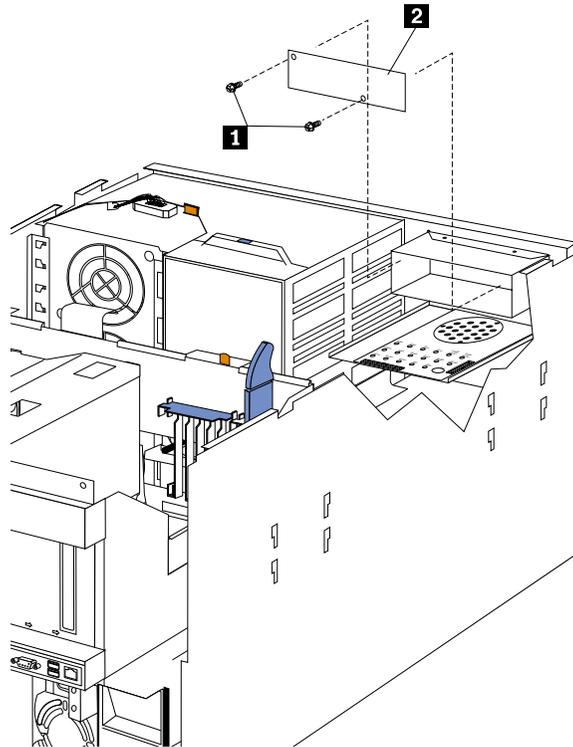
Review the information in “Before you begin” on page 60.



1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Flip the top end of each diagonal side latch inward.
5. Move each latch toward the rear of the shuttle until the latch is vertical.
6. Fold the hinged top end of each latch outwards at the notch of the chassis.
7. Slide the shuttle toward the rear of the server.
8. To remove the shuttle, see “Removing the shuttle” on page 135.

Front LED card assembly

Review the information in “Before you begin” on page 60.



- 1** Retaining screws
- 2** Front LED card assembly

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the cable to the diagnostic switch card.
5. Remove the two retaining screws that secure the board in place.
6. Remove and replace the board.

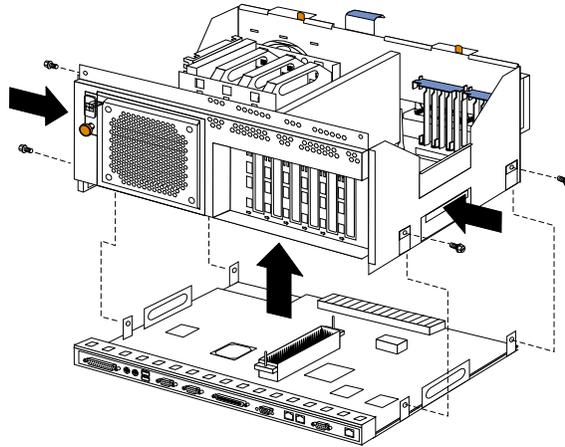
I/O Legacy board

Review the information in “Before you begin” on page 60.

Attention:

- Existing system configuration will be lost. If possible, save the existing system configuration or obtain a previously saved copy.
- After replacing the I/O Legacy board, flash the system with the latest level BIOS. Match the BIOS level currently installed on the system.

Use the following illustration as a guide to removing the I/O Legacy board.

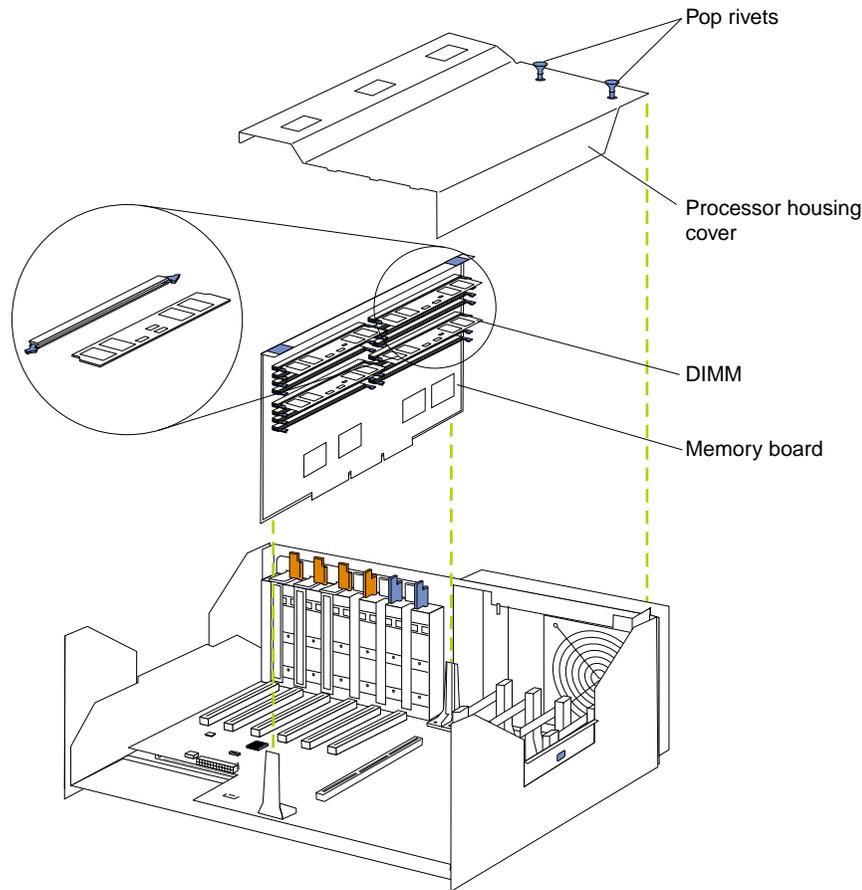


1. Power-off the server off, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the shuttle (see “Disconnecting the shuttle” on page 128.)
5. Remove the shuttle (see “Removing the shuttle” on page 135).
6. Remove the four shuttle screws (two on each side).
7. Push in on the shuttle touchpoints.
8. Separate the shuttle from the I/O Legacy board.
9. To replace the I/O Legacy board, reverse this procedure.

Memory card removal

Before you begin:

- Read “Safety information” on page 249.
- Review “Before you begin” on page 60.



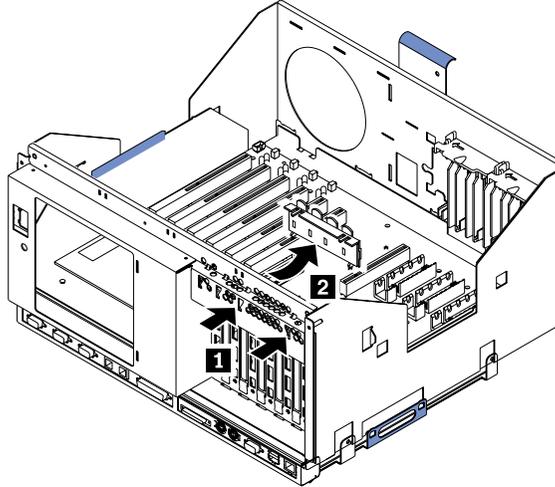
To replace the memory card assembly:

1. Power-off the server and all attached devices. Disconnect external cables and power cords and remove the top cover.
2. Pull up the two pop rivets on the processor housing cover and remove the cover from the processor housing.
3. Lift up on the memory card assembly and remove it from the server.
Note: When setting down the memory card assembly, be sure to place the assembly only on a static-protective surface, such as a static-protective package.
4. Remove the memory modules (DIMMs) from the memory card assembly and seat them in the new memory card assembly. See “Installing memory-module kits” on page 71.
Note: Be sure to put the memory modules in the same positions on the replacement assembly as they occupied on the assembly that has been removed from the server.
5. Install the memory card assembly:
 - a. Hold the memory card assembly and align it over the memory card connector.
 - b. Insert the memory card assembly into the connector.
6. Install the processor housing cover and push the two pop rivets down to secure the cover.

PCI switch card

Before you begin:

- Read “Safety information” on page 249.
- Review “Before you begin” on page 60.



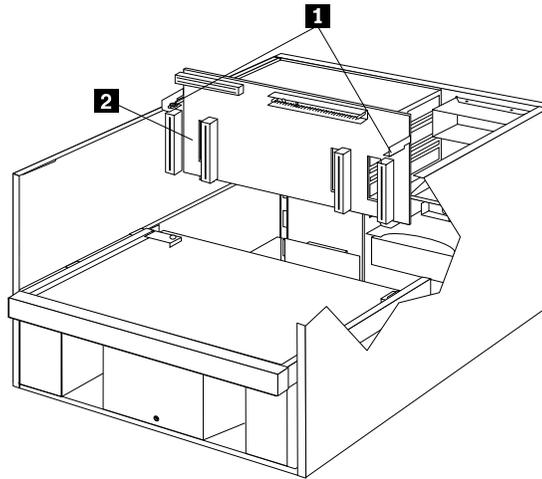
- 1** Switch card latches
- 2** Switch card assembly

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the switch card cable from the Processor/PCI board.
5. Disengage the switch card:
 - a. Press the switch card latches toward the front and sides of the server.
 - b. Push the latches through the notches.
6. When the switch card latches have been disengaged from the notches, gently pull the switch card free and lift it up and out of the server.
Note: You may have to tilt the top of the switch card toward the front of the server when removing it.
7. To replace the switch card, reverse the steps above.

Power backplane assembly

Before you begin:

- Read “Safety information” on page 249.
- Review “Before you begin” on page 60.



1 Retaining screws

2 Power backplane assembly

1. Power-off the server, if it is on.

2. Disconnect the power cord for each power source from the electrical outlet.

Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.

3. Remove the top cover (see “Removing the top cover” on page 62).

4. Remove the shuttle (“Removing the shuttle” on page 135).

5. Remove the hot-swap power supplies (reverse the steps in “Installing a hot-swap power supply” on page 76).

6. Turn the two retaining screws one-quarter turn.

7. Lift the power backplane assembly.

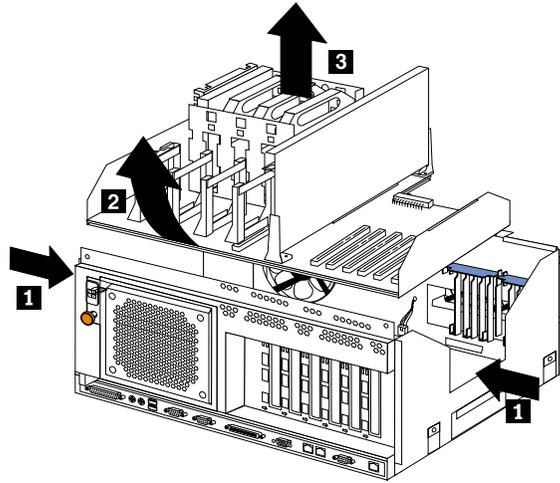
8. To replace the power backplane assembly, reverse this procedure.

Note: When replacing the power backplane assembly, you must align the bottom of the assembly with the notches on the floor of the server.

Processor/PCI backplane

Review the information in “Before you begin” on page 60.

Note: Existing system configuration will be lost. If possible, save the existing system configuration or obtain a previously saved copy.



- 1** Cutouts
- 2** Processor/PCI Backplane assembly
- 3** Microprocessors

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the shuttle (see “Disconnecting the shuttle” on page 128).
5. Remove the shuttle (see “Removing the shuttle” on page 135).
6. Disconnect the power cable.
7. Disconnect the front fan cable.
8. Disconnect the rear fan cable.
9. Remove any hot-plug adapters (reverse the steps in “Installing a hot-plug adapter” on page 64.)
10. Remove microprocessors, voltage regulator modules and terminator cards (reverse the steps in “Installing a microprocessor kit” on page 73.)
11. Remove memory card.
12. Press the assembly inward at the cutouts to release the notches.
13. Lift the assembly out of the shuttle.
Note: Lift the assembly at an angle for easier removal.
14. To install the new Processor/PCI board, reverse the above procedure.

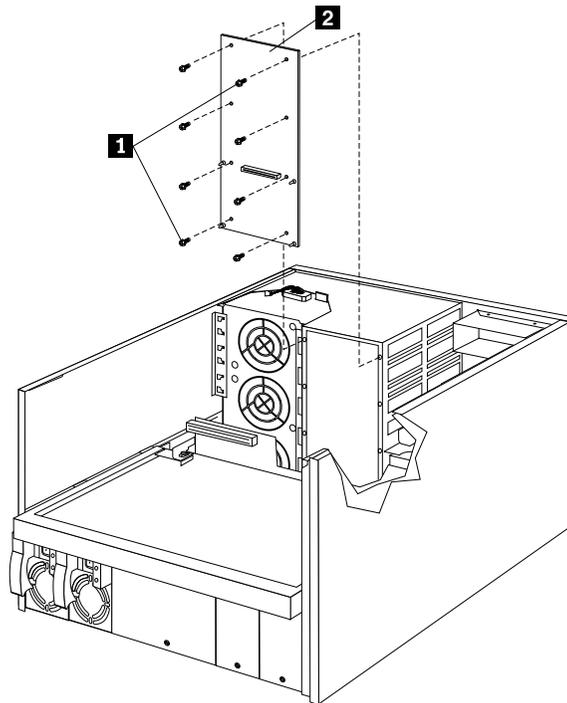
Removing the shuttle



1. Power-off the server, if it is on.
2. Disconnect the power cord for each power supply from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power supply from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Disconnect the shuttle (see “Disconnecting the shuttle” on page 128.)
5. Place one hand on the handle at the front portion of the shuttle, and place the other hand on the ledge at the rear of the shuttle.
6. Lift the shuttle at an angle with the rear of the shuttle being removed first and remove the shuttle from the server.

SCSI backplane assembly

Review the information in “Before you begin” on page 60.

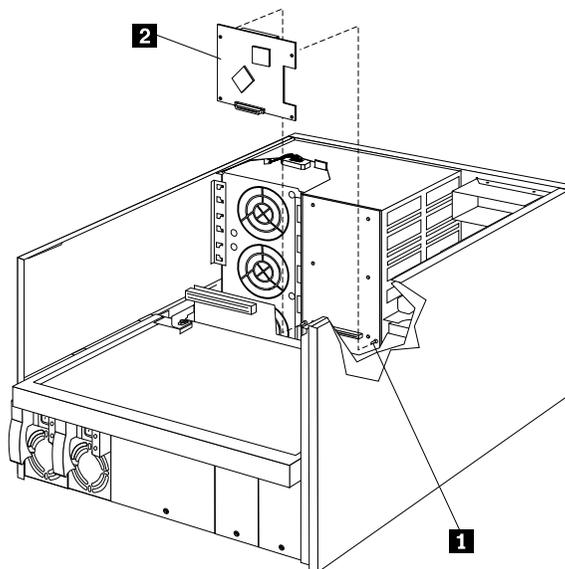


1 SCSI backplane

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Remove all hot-swap hard drives.
Note: When you reinstall the hot-swap hard drives after replacing the SCSI Backplane, each drive will need to be replaced in the same bay from which it was removed.
5. Remove the shuttle (see “Removing the shuttle” on page 135).
6. Remove the vertical hot-swap fan assembly.
7. Grasp the handhold and lift the SCSI backplane assembly with backerplate up and out of the server.
8. To install the SCSI backplane assembly, reverse the above procedure.

SCSI daughter card

Review the information in “Before you begin” on page 60.



- 1** Retaining pins
- 2** SCSI daughter card

1. Power-off the server, if it is on.
2. Disconnect the power cord for each power source from the electrical outlet.
Attention: The presence of ac standby power might result in damage to the hardware unless you disconnect the power cord for each power source from the electrical outlet.
3. Remove the top cover (see “Removing the top cover” on page 62).
4. Remove the shuttle (“Removing the shuttle” on page 135).
5. Disconnect the SCSI cable.
6. Remove the SCSI assembly (see “SCSI backplane assembly” on page 135).

7. Pry the SCSI daughter card off of the four retaining pins.
8. To install a SCSI daughter card, reverse the above procedure.

Installing and configuring ServeRAID controllers

This section contains information about the features and connector locations of the ServeRAID-4H controller, the ServeRAID-4L controller, and the ServeRAID-4M controller (hereafter sometimes referred to as IBM ServeRAID-4x Ultra-160 SCSI controllers), and describes the following steps needed to install and configure the controller:

- Step 1. Update the BIOS and firmware on any existing controllers using the 4.10 software
- Step 2. Install and cable the ServeRAID controller
- Step 3. Update BIOS and firmware code
- Step 4. Configure the ServeRAID controller

Information for obtaining ServeRAID updates is included at the end of the chapter.

Features and connector locations of ServeRAID-4H controller

This section contains important information on the controller features and connector locations.

Controller features

Standard features of the ServeRAID-4H controller are as follows.

Feature	ServeRAID-4H
Arrays (max.)	8
Battery-backup cache	Yes
Cache memory	128 MB
Hard disk drives (max.)	60
Logical drives (max.)	8
Microprocessor	266 MHz
SCSI channels	4
SCSI transfer speed (max.)	160 MB per sec.
Supported RAID levels	0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50
System PCI data bus	64 bit at 33 MHz

Connector locations

This section provides illustrations of the SCSI channel connectors and cable connectors for the ServeRAID-4H controller.

The light-emitting diodes (LEDs) on the controllers indicate activity on the SCSI channels and provide diagnostic information for trained service technicians.

SCSI channel connectors

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.

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.

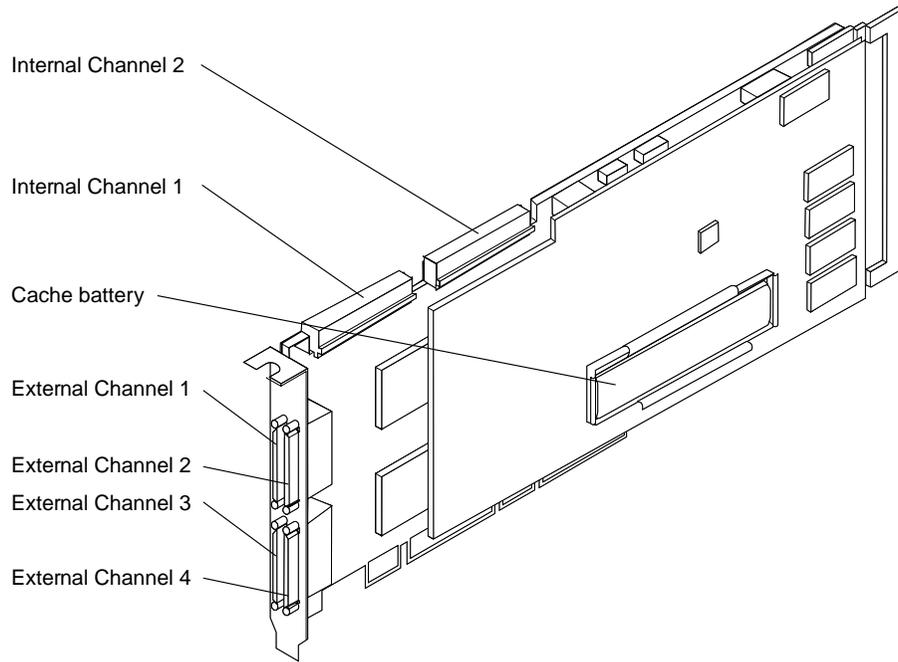


Figure 1. ServeRAID-4H controller

You can attach internal SCSI devices to the Channel 1 and Channel 2 connectors. You can attach external SCSI devices to the Channel 1, Channel 2, Channel 3, and Channel 4 connectors.

Note: The ServeRAID-4H controller does not support configurations that use both the internal and external connectors on the same channel *concurrently*. For example, you cannot use both external Channel 1 and internal Channel 1.

CAUTION:
The ServeRAID-4H controller uses a lithium battery.

CAUTION:



When replacing the lithium battery, use only IBM Part Number 38L3386 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.

Features and connector locations of ServeRAID-4L controller

This section contains important information on the controller features and connector locations.

Controller features

Standard features of the ServeRAID-4L controller are as follows.

Feature	ServeRAID-4L
Arrays (max.)	8
Battery-backup cache	No
Cache memory	16 MB
Hard disk drives (max.)	15
Logical drives (max.)	8
Microprocessor	100 MHz
SCSI channels	1
SCSI transfer speed (max.)	160 MB per sec.
Supported RAID levels	0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50
System PCI data bus	64 bit at 33 MHz

Connector locations

This section provides illustrations of the SCSI channel connectors and cable connectors for the ServeRAID-4L controller.

The light-emitting diodes (LEDs) on the controllers indicate activity on the SCSI channels and provide diagnostic information for trained service technicians.

SCSI channel connector

The ServeRAID-4L controller has one independent SCSI channel connector: Channel 1. This SCSI channel supports up to 15 physical devices.

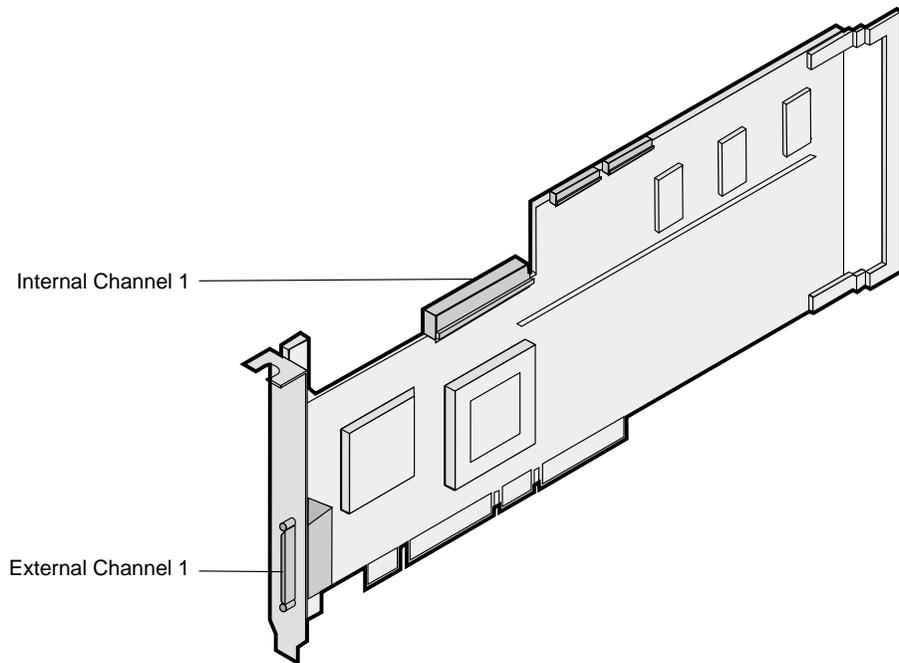


Figure 2. ServeRAID-4L controller

You can attach internal SCSI devices to the Channel 1 connector. You can attach external SCSI devices to the Channel 1 connector.

Note: The ServeRAID-4L controller does not support configurations that use both the internal and external connectors on the same channel *concurrently*. For example, you cannot use both external Channel 1 and internal Channel 1.

Note: The ServeRAID-4L controller uses the module (P/N 38L3386) containing a lithium battery.

CAUTION:



When replacing the lithium battery, use only IBM Part Number 38L3386 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.

Features and connector locations of ServeRAID-4M controller

This section contains important information on the controller features and connector locations.

Controller features

Standard features of the ServeRAID-4M controller are as follows.

Feature	ServeRAID-4M
Arrays (max.)	8
Battery-backup cache	Yes
Cache memory	64 MB
Hard disk drives (max.)	30
Logical drives (max.)	8
Microprocessor	100 MHz
SCSI channels	2
SCSI transfer speed (max.)	160 MB per sec.
Supported RAID levels	0, 1, 5, Enhanced-1 (1E), and Enhanced-5 (5E), 00, 10, 1E0, 50
System PCI data bus	64 bit at 33 MHz

Connector locations

This section provides illustrations of the SCSI channel connectors and cable connectors for the ServeRAID-4M controller.

The light-emitting diodes (LEDs) on the controllers indicate activity on the SCSI channels and provide diagnostic information for trained service technicians.

SCSI channel connectors

The ServeRAID-4M controller has two independent SCSI channel connectors: Channel 1 and Channel 2. Each of these SCSI channels supports up to 15 physical devices.

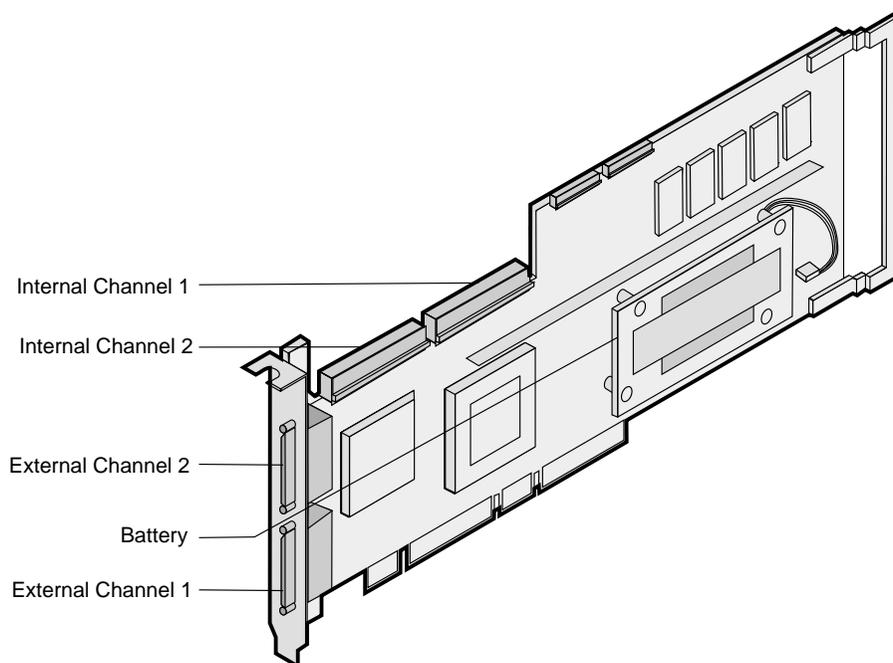


Figure 3. ServeRAID-4M controller

You can attach internal SCSI devices to the Channel 1 and Channel 2 connectors. You can attach external SCSI devices to the Channel 1 and Channel 2 connectors.

Note: The ServeRAID-4M controller does not support configurations that use both the internal and external connectors on the same channel *concurrently*. For example, you cannot use both external Channel 1 and internal Channel 1.

Note: The ServeRAID-4M controller uses the module (P/N 38L3386) containing a lithium battery.

CAUTION:



When replacing the lithium battery, use only IBM Part Number 38L3386 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.

Using a ServeRAID-4x controller in a server with Hot-plug PCI features

Some IBM servers support Hot-plug (Active) PCI features. You can use these features to install or remove PCI controllers without turning off the server. The ServeRAID-4x controller supports Hot-plug PCI functions on Windows NT 4.0, Windows 2000, and NetWare. The following table summarizes which operating systems support these features:

Feature	Windows NT 4.0	Windows 2000	NetWare 4.x	NetWare 5.x
Hot add	Yes	Yes	No	Yes
Hot remove	No	Yes	Yes	Yes
Hot replace	Yes	No	No	No

You can use the hot-add feature to expand capacity in a server by adding a controller. Use the hot-remove feature to remove a controller from a running server. If a controller fails, use the hot-replace feature to replace a controller with an identical controller.

Using Windows NT 4.0 with Hot-plug PCI features

To use Hot-plug PCI with Windows NT 4.0 and a ServeRAID-4x controller, you must install the IBM Netfinity Hot Plug for Windows NT 4.0 Package, version 4.1 or later. This package is available from the IBM Support Web site; select downloadable files for the IBM server you are using. See “Downloadable files from the World Wide Web” on page 163 for additional information.

Note: Be sure to read the instructions and restrictions for this software program.

Also, when installing the ServeRAID Manager program, you must choose to install the IBM ServeRAID Hot Replace Wizard.

To perform a hot-replace operation, start the IBM ServeRAID Hot Replace Wizard. You can start this program from within either the IBM Netfinity Hot Plug for Windows NT 4.0 program or the ServeRAID Manager program. You can use the ServeRAID Manager program to start the wizard either on the server with the failed controller, or across the network from a remote installation of the ServeRAID Manager.

Note: It is useful to start the IBM ServeRAID Hot Replace Wizard from a remote installation when the server with the failed controller does not have a monitor.

Attention: Do *not* attempt a hot-replace operation on Windows 2000 or NetWare by hot-removing a failed controller; then, hot-adding a new controller. Loss of data can occur. If a controller fails on these operating systems, you *must* shut down the server to replace the controller.

Step 1: Installing and cabling a ServeRAID controller

This section provides installation and cabling instructions for ServeRAID-4H, -4L and -4M controllers as well as basic information about the standard features of these controllers.

If you are using a ServeRAID controller built into an IBM server system board, you will not need the information in this section. Continue with “Step 2: Updating BIOS and firmware code” on page 151.

Installing the ServeRAID controller

During the installation, you might need a small, flat-blade screwdriver and the documentation that comes with your server.

To install the ServeRAID-4H, -4L and -4M controllers:

1. Review the Safety Information book provided with your IBM server.

Note: Some IBM servers support Hot-plug PCI features, which allow you to install or remove PCI controllers without turning off the server. If your IBM server model provides Hot-plug PCI support and you are using Windows NT 4.0, Windows 2000, or NetWare 5.x, you do not need to turn off the server to install this controller. This operation is referred to as a hot-add operation. Review the following information before performing this operation on ServeRAID-4H, -4L and -4M controllers and your server:

- Information that is provided with the server to determine if your model supports these features.
- Documentation that is provided with the operating system for using these features.
- Refer to “Using a ServeRAID-4x controller in a server with Hot-plug PCI features” on page 145.
- If you intend to perform a hot-add operation using Windows NT 4.0, use the documentation that is provided with the IBM server Hot Plug for Windows NT 4.0 package.

2. If your server model does not support Hot-plug PCI, turn off the server and disconnect all power cords and cables from the server.
3. Remove the server cover and locate an empty PCI expansion slot for the controller. Choose a slot that is farthest from other installed components, such as the microprocessor. If necessary, see the server documentation for more detailed information about the expansion slots.

Note: For Netfinity 3000 servers, the ServeRAID controllers are supported only when installed in PCI slot 3. *Do not* install these controllers in PCI slots 1 or 2. Before you can install a ServeRAID controller in a Netfinity 3000, you must first remove the standard SCSI controller that comes in PCI slot 3. You can install and use the standard SCSI controller in PCI slots 1 or 2, but devices attached to the standard SCSI controller will no longer provide startup (boot) support.

4. Remove the expansion-slot cover, if applicable.
5. Touch the static-protective package containing the controller to an unpainted metal expansion-slot cover on the server. This drains any static electricity from the package and from your body.
6. Remove the controller from the static-protective package, holding the controller by the edges. Do not touch any exposed components on the controller.

7. Insert the controller in the PCI expansion slot. Press the controller firmly into the slot so that it is fully seated.

Note: The following illustration depicts the ServeRAID-4H controller. The ServeRAID-4L and -4M controllers will have a slightly different appearance.

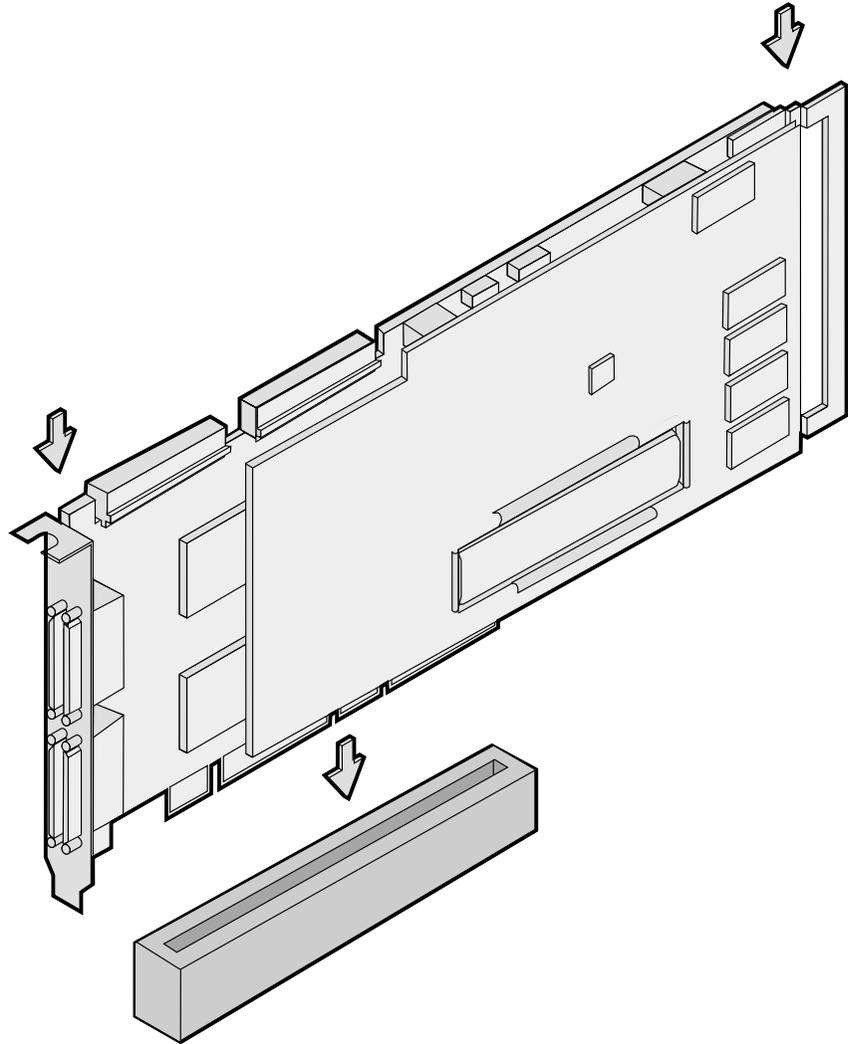


Figure 4. Inserting a ServeRAID-4H controller into the PCI expansion slot

8. Secure the controller by either tightening the expansion-slot screw on the top of the controller or closing the latch, depending on your server.
9. Connect the SCSI cables to the controller. If you intend to attach external devices only, go to step 13 on page 148. Otherwise, continue with step 10.
10. Connect one end of a 68-pin ANSI (American National Standards Institute) standard cable (separately purchased or already in your server) to the internal channel connector on the ServeRAID controller.

Notes:

- a. See “Features and connector locations of ServeRAID-4H controller” on page 139 for the channel connector locations of the 4H controller, “Features and connector locations of ServeRAID-4L controller” on page 141 for the channel connector locations of the 4L controller, and “Features and connector locations of ServeRAID-4M controller” on page 143 for the channel connector locations of the 4M controller.
- b. The following illustration depicts the ServeRAID-4H controller. The ServeRAID-4L controller will have a slightly different appearance.

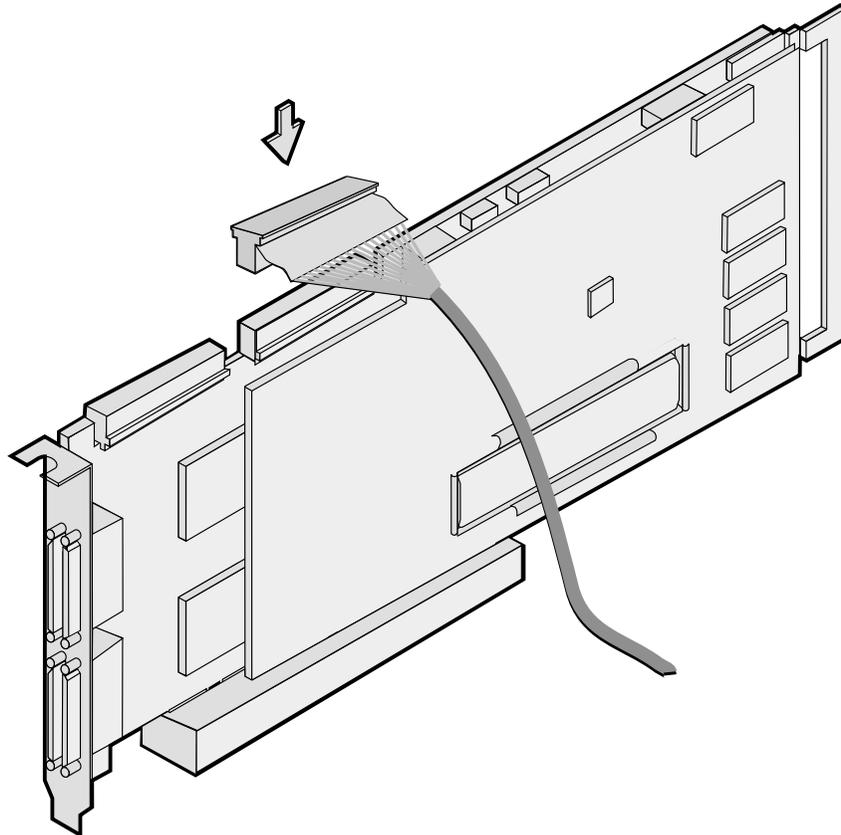


Figure 5. Connecting a ServeRAID-4H controller internal channel connector

11. Connect the other end of the SCSI cable to the Active PCI backplane or to a SCSI device in the server. (See your server documentation or the system label inside the server cover for the location of the SCSI connector on the backplane.)
12. If you have physical drives to install, install them now. See your server documentation for drive installation instructions.
Note: The ServeRAID controllers use SCSI ID 7 and/or 6.
13. Install the server cover.
14. If you disconnected the cables and power cords in step 2 on page 146, reconnect the cables and cords. See your server documentation if you need detailed instructions.

15. If you want to attach an external SCSI device to the ServeRAID controller, continue with “Connecting external devices” on page 150. Otherwise, go to “Step 2: Updating BIOS and firmware code” on page 151.

Connecting external devices

Note: The ServeRAID-4H, -4L and -4M controllers do not support configurations that use both the internal and external connectors on the same channel *concurrently*. For example, you cannot use both external Channel 1 and internal Channel 1.

To attach SCSI devices to an external channel connector on the ServeRAID controller:

1. Connect one end of a 68-pin very high density connector interface (VHDCI) SCSI cable to an external channel connector on the ServeRAID controller.

Notes:

- a. See “Features and connector locations of ServeRAID-4H controller” on page 139 for the channel connector locations of the 4H controller, “Features and connector locations of ServeRAID-4L controller” on page 141 for the channel connector locations of the 4L controller, and “Features and connector locations of ServeRAID-4M controller” on page 143 for the channel connector locations of the 4M controller.
- b. The following illustration depicts the ServeRAID-4H controller. The ServeRAID-4L and -4M controllers will have a slightly different appearance.

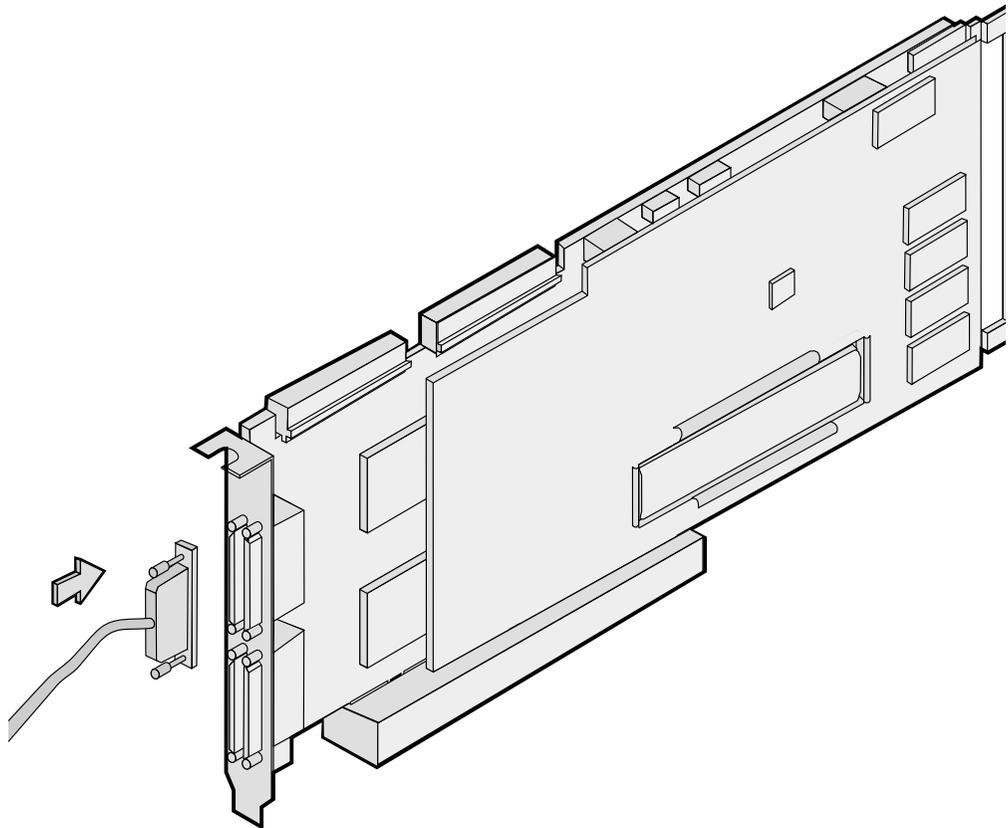


Figure 6. Connecting a ServeRAID-4H controller external channel connector

2. Connect the other end of the SCSI cable to the external SCSI device.

3. Continue with “Step 2: Updating BIOS and firmware code”.

Step 2: Updating BIOS and firmware code

Before configuring the ServeRAID controller, you must have the latest BIOS and firmware code installed on your server.

Note: You must update *all* RAID software at the same time to ensure compatibility with all of the levels of the software. This includes:

- BIOS/firmware
- Device drivers
- ServeRAID Manager
- IBM ServeRAID Cluster Solution software

1. Insert the *IBM ServeRAID Support* CD into the server CD-ROM drive.
2. Turn on the server. The IBM ServeRAID ROM Update Wizard program automatically starts.

The IBM ServeRAID ROM Update Wizard is an easy to use program that simplifies the updating of BIOS and firmware code on ServeRAID controllers. The IBM ServeRAID ROM Update Wizard automatically scans and identifies each ServeRAID controller in your system. After scanning completes and if an update is required, a report screen opens with the following information:

- Controller types found
- Controller slot number, if known
- Firmware version
- BIOS version
- Update status. If a controller has outdated BIOS or firmware, the IBM ServeRAID ROM Update Wizard marks the controller as a candidate for update.

If the BIOS and firmware code do not require updating, the IBM ServeRAID ROM Update Wizard automatically exits and the ServeRAID Manager program opens. Continue with “Step 3: Configuring ServeRAID controllers”.

If the BIOS and firmware code require updating, the IBM ServeRAID ROM Update Wizard asks if you want to update. You decide whether to update your controllers, but you must update all the controllers or none (that is, you cannot selectively update).

3. Click **Update**. The IBM ServeRAID ROM Update Wizard displays a progress indicator as it updates the controllers. If the IBM ServeRAID ROM Update Wizard detects an error, it displays the error message and saves the error message to a file on the disk.
If you do not want to update your ServeRAID controllers, click **Cancel**.
4. When all updates are complete, scroll through the Features window. This window reports the changes that the IBM ServeRAID ROM Update Wizard applied to your ServeRAID controllers.
5. Leaving the *IBM ServeRAID Support* CD in the CD-ROM drive, shut down and restart the server.

Step 3: Configuring ServeRAID controllers

This section provides information about configuring and using the ServeRAID Manager program. You can use the ServeRAID Manager program to configure the ServeRAID controllers, view the ServeRAID configuration and associated devices, create arrays and logical drives, delete an array, dynamically increase the logical-drive size, change RAID levels, and much more.

The information in this section is an overview of the ServeRAID Manager program and its capabilities. For instructions on specific processes using the ServeRAID Manager program, refer to the ServeRAID Manager online help.

Using the ServeRAID Manager program

When you start the ServeRAID Manager program from the startable *IBM ServeRAID Support* CD, you can configure your ServeRAID controller *before* you install your operating system. In startable-CD mode, you can also change specific ServeRAID controller settings after you have configured the ServeRAID controller and installed the operating system. Refer to “Using Information mode” on page 162 for additional information.

The ServeRAID Manager program runs in two modes: *Configuration* mode and *Information* mode.

In Configuration mode, you can create disk arrays, create logical drives, and define your hot-spare drives. When this mode is active, a limited set of functions is available from the menu and tool bars. See “Using Configuration mode” on page 154 for more information.

In Information mode, you can view and modify the existing device and configuration information for your ServeRAID subsystem. When this mode is active, you can use the functions available from the menu and tool bars to customize settings for your ServeRAID controllers. See “Using Information mode” on page 162 for more information.

To start the ServeRAID Manager program, do the following:

Turn on the server; then,

1. Insert the *IBM ServeRAID Support* CD (or the CD that contains the ServeRAID Manager program that came with your system) into the CD-ROM drive.

One of the following windows will open:

- If the ServeRAID Manager program detects unconfigured ServeRAID controllers, the program starts in Configuration mode and a window similar to the following opens.

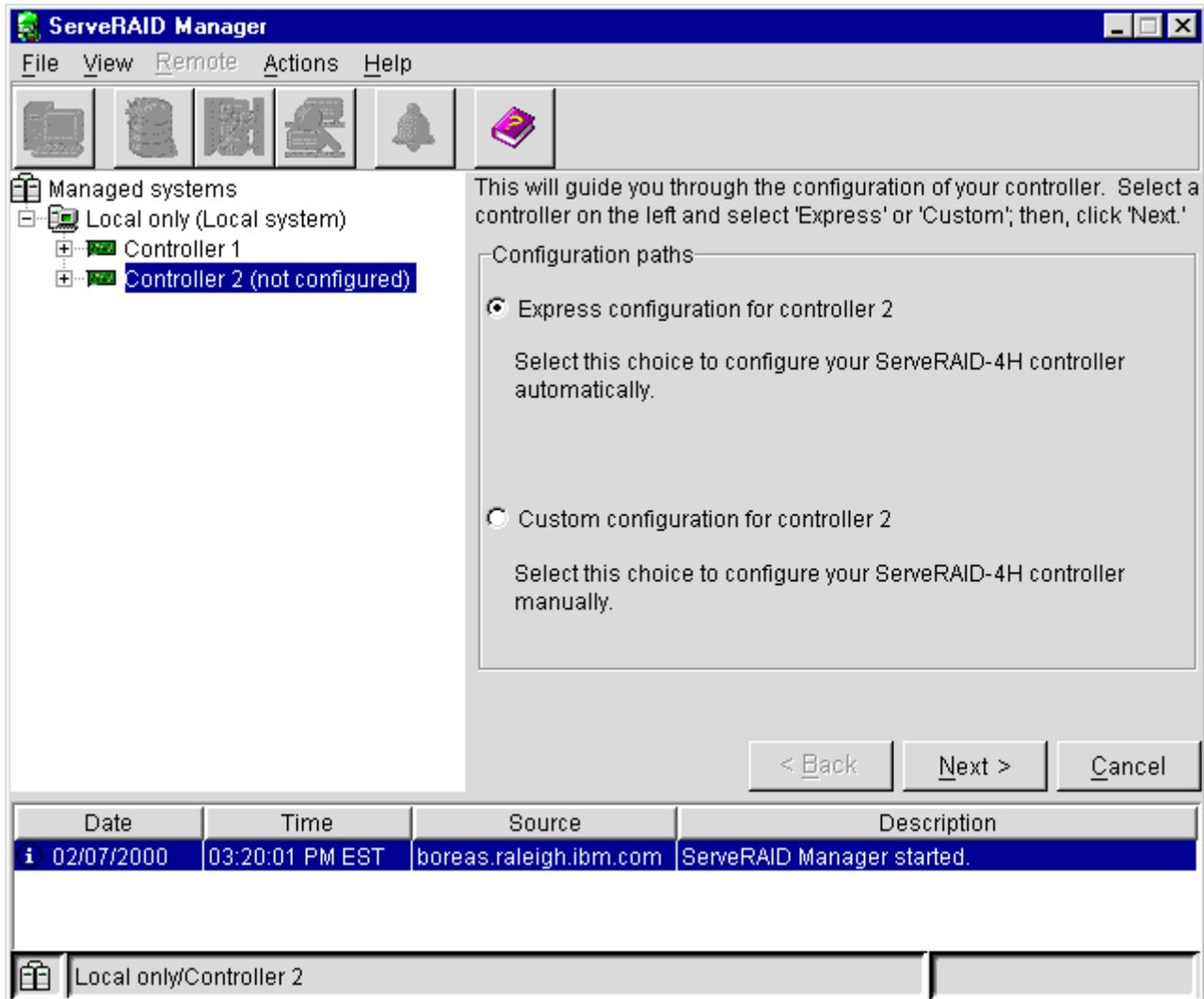


Figure 7. Configuration mode window

Follow the instructions in the right panel to create logical drives on your ServeRAID controller. If you do not want to configure your ServeRAID controller, click **Cancel**. This will switch the program from Configuration mode to Information mode.

- If the ServeRAID Manager program detects that all ServeRAID controllers in the server are configured, the program starts in Information mode and a window similar to the following opens.

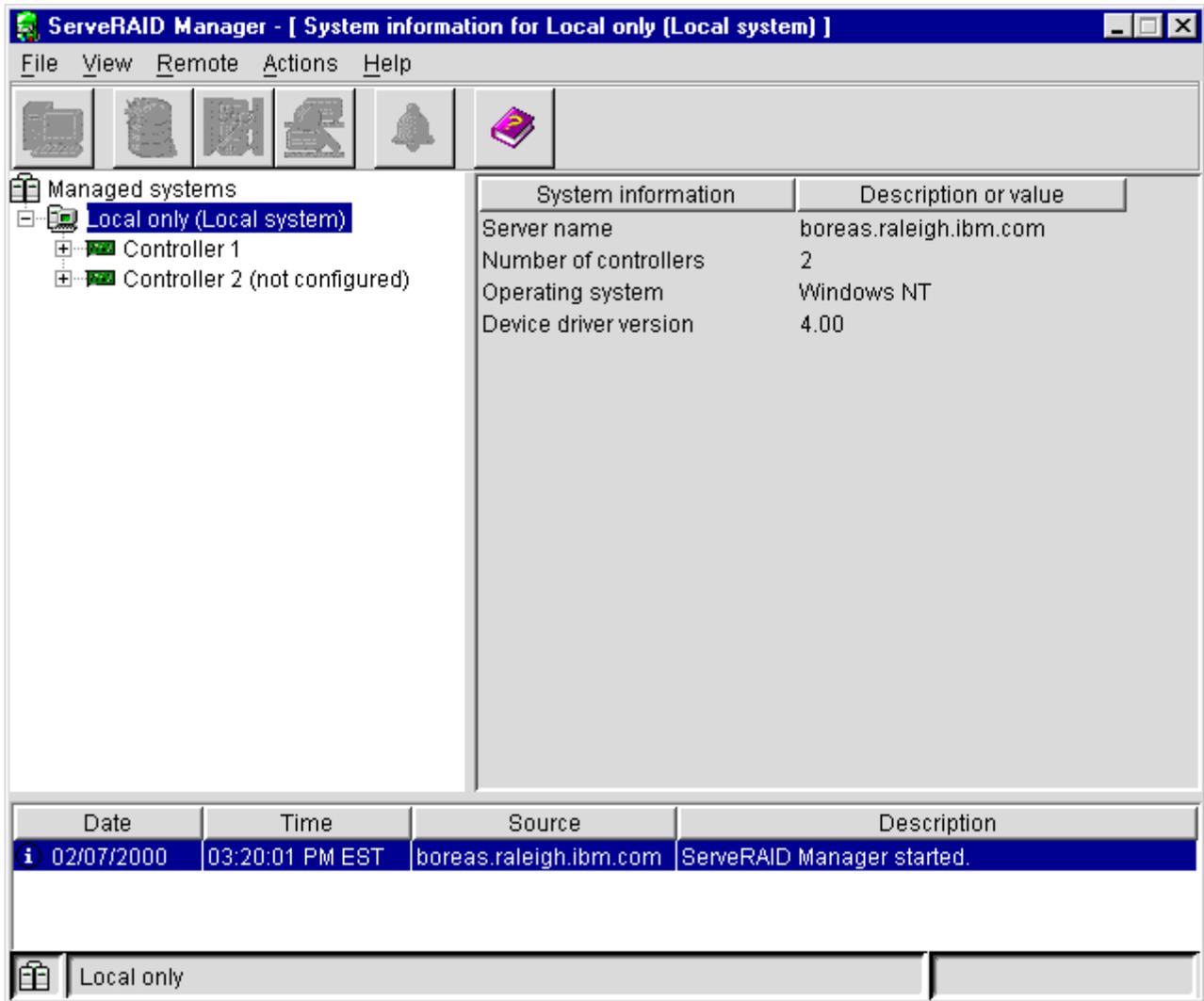


Figure 8. Information mode window



Click  (Create arrays) on the tool bar to switch from Information mode to Configuration mode.

2. Continue with one of the following:
 - “Using Configuration mode”.
 - “Using Information mode” on page 162.

Using Configuration mode

You can use Configuration mode to create up to eight independent disk arrays for each ServeRAID controller. Configuration mode provides two configuration options: Express configuration and Custom configuration (see Figure 7 on page 153). You can also use Custom configuration to create spanned arrays and configure the logical drive to RAID level-x0.

Attention: The new controller stripe-unit size is set at the factory to 8 KB. If you need to change this setting, you must change the stripe-unit size before you store data in the logical drives. After you store data in the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives. To change the stripe-unit size, do the following:



1. Click  (Create arrays) on the tool bar to switch from Configuration mode to Information mode.
2. In the Main Tree, click the new controller.
3. Click **Actions** → **Change stripe-unit size**.
4. Click the new stripe-unit size for your installation on the menu.

Using Express configuration: To use Express configuration:

Note: If the Express configuration mode or Custom configuration mode buttons do



not display on the right panel, click  (Create arrays) on the tool bar.

1. In the Main Tree, click the ServeRAID controller that you want to configure.
2. If it is not already selected, click the **Express configuration** radio button.
3. Click **Next**. The Configuration summary window opens.
4. Review the information that displays in Configuration summary window.

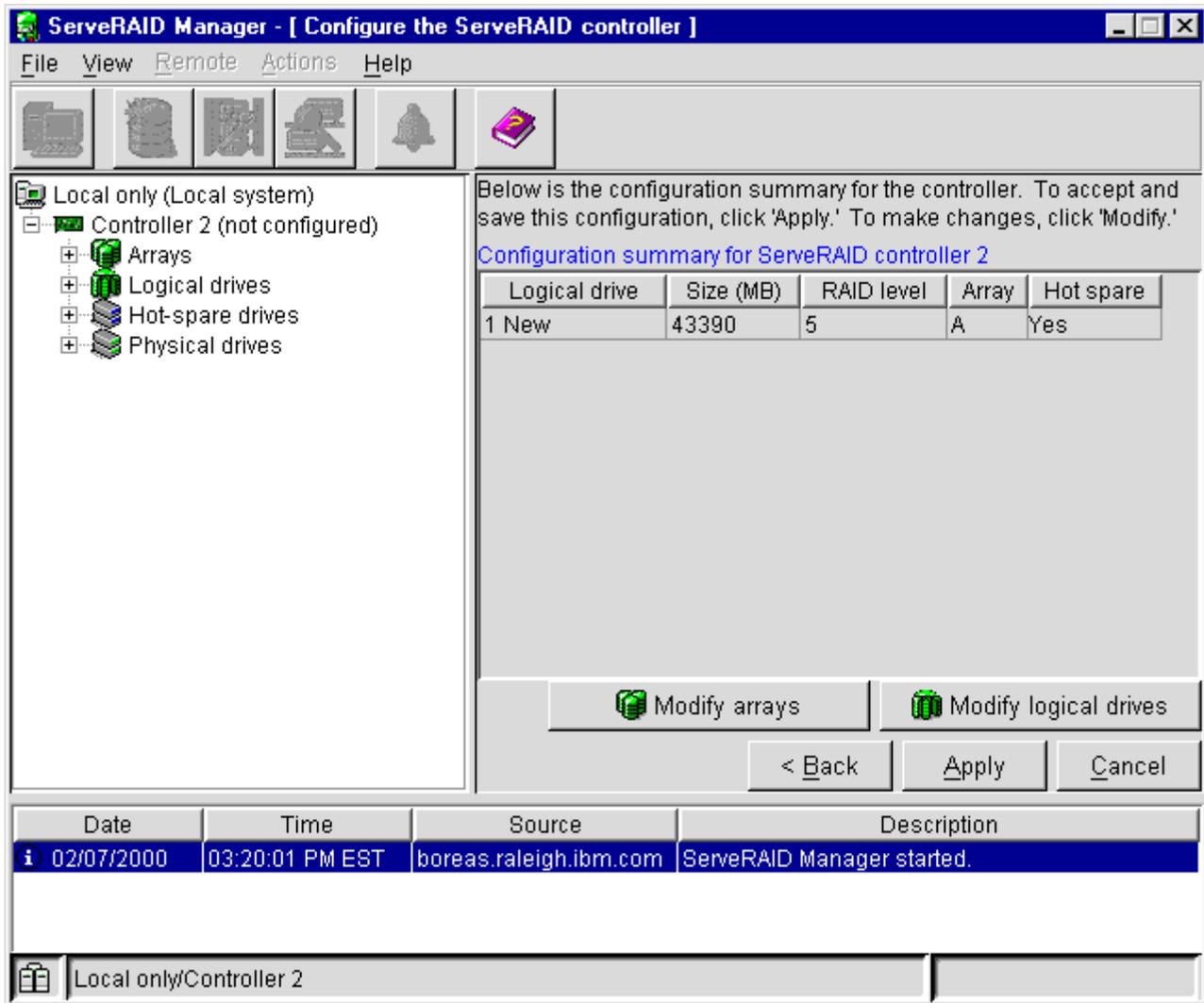


Figure 9. Configuration summary window

Notes:

- a. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. See your operating-system documentation for more detailed information.
- b. To change the configuration, click **Modify arrays** or **Modify logical drives**.
5. Click **Apply** to accept and save the configuration. The configuration is saved in the ServeRAID controller and in the physical drives.
6. If you have multiple controllers, for each controller repeat steps 1 on page 155 through step 5..
7. When you have completed configuration, you can change to Information mode and change controller settings. See “Using Information mode” on page 162 for more information. If you do not want to change any settings, exit the ServeRAID Manager program and remove the CD from the CD-ROM drive.
8. Restart the server.

Note: If you are configuring your startup (boot) ServeRAID controller, you *must* install the device driver while installing the operating system.

Using Custom configuration: To use Custom configuration:

Note: If the Express configuration mode or Custom configuration mode buttons do



not display on the right panel, click (Create arrays) on the tool bar.

1. In the Main Tree, click the ServeRAID controller that you want to configure.
2. Click the **Custom configuration** radio button.
3. Click **Next**. The Create arrays window opens:

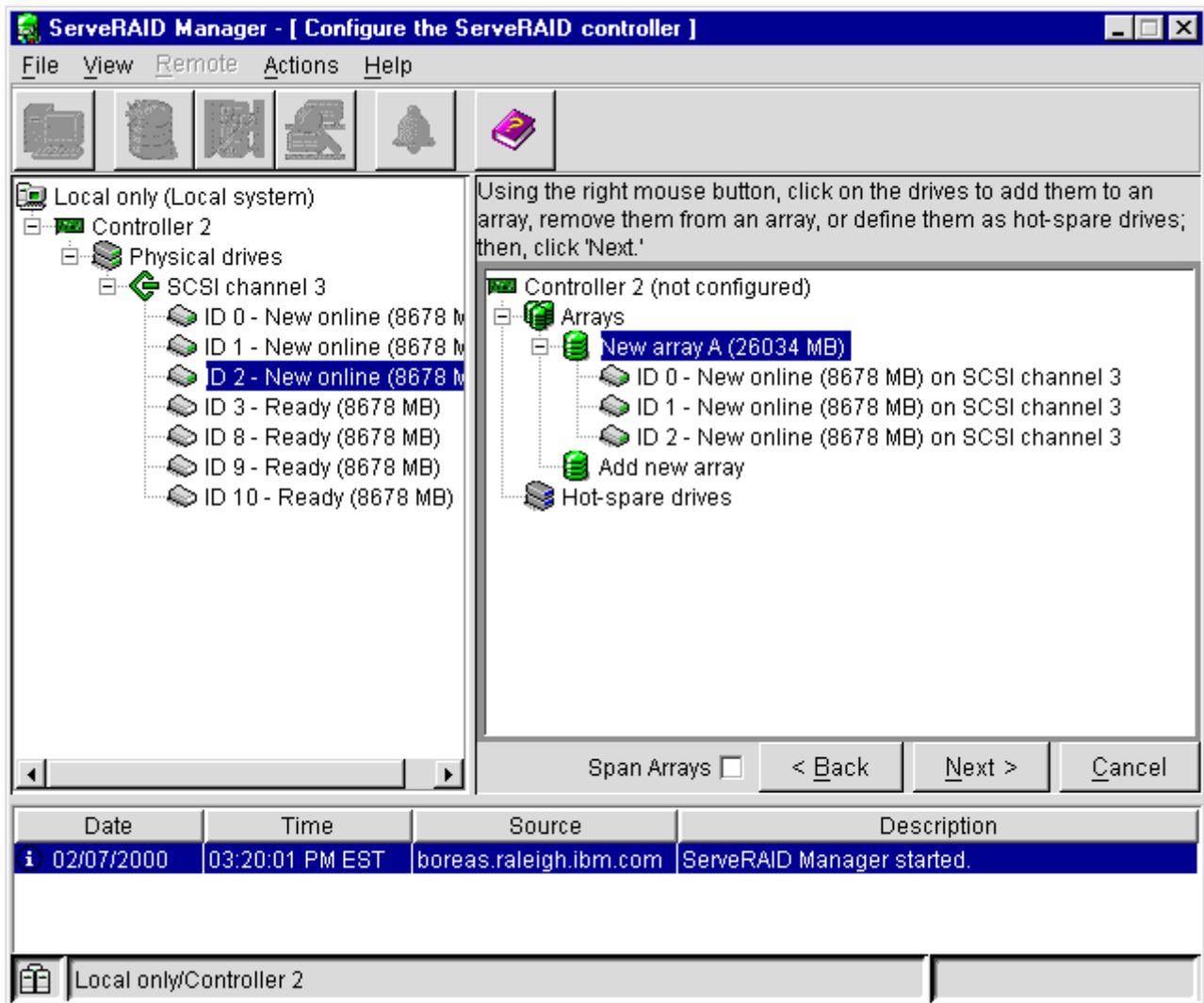


Figure 10. Create arrays window

4. Using the right mouse button, click the drive or SCSI channel icons in the Main Tree to select the drives that you want to add to your arrays, delete from your arrays, or define as hot-spare drives; then, select a choice from the pop-up list. If you want to create a spanned array, click the **Span Arrays** box.

- After you select the ready drives for your arrays and define your hot-spare drives, click **Next**. If you are not creating spanned arrays, the Create logical drives window opens. Continue with step 8 on page 159.
If you are creating spanned arrays, the Create spanned arrays window opens.

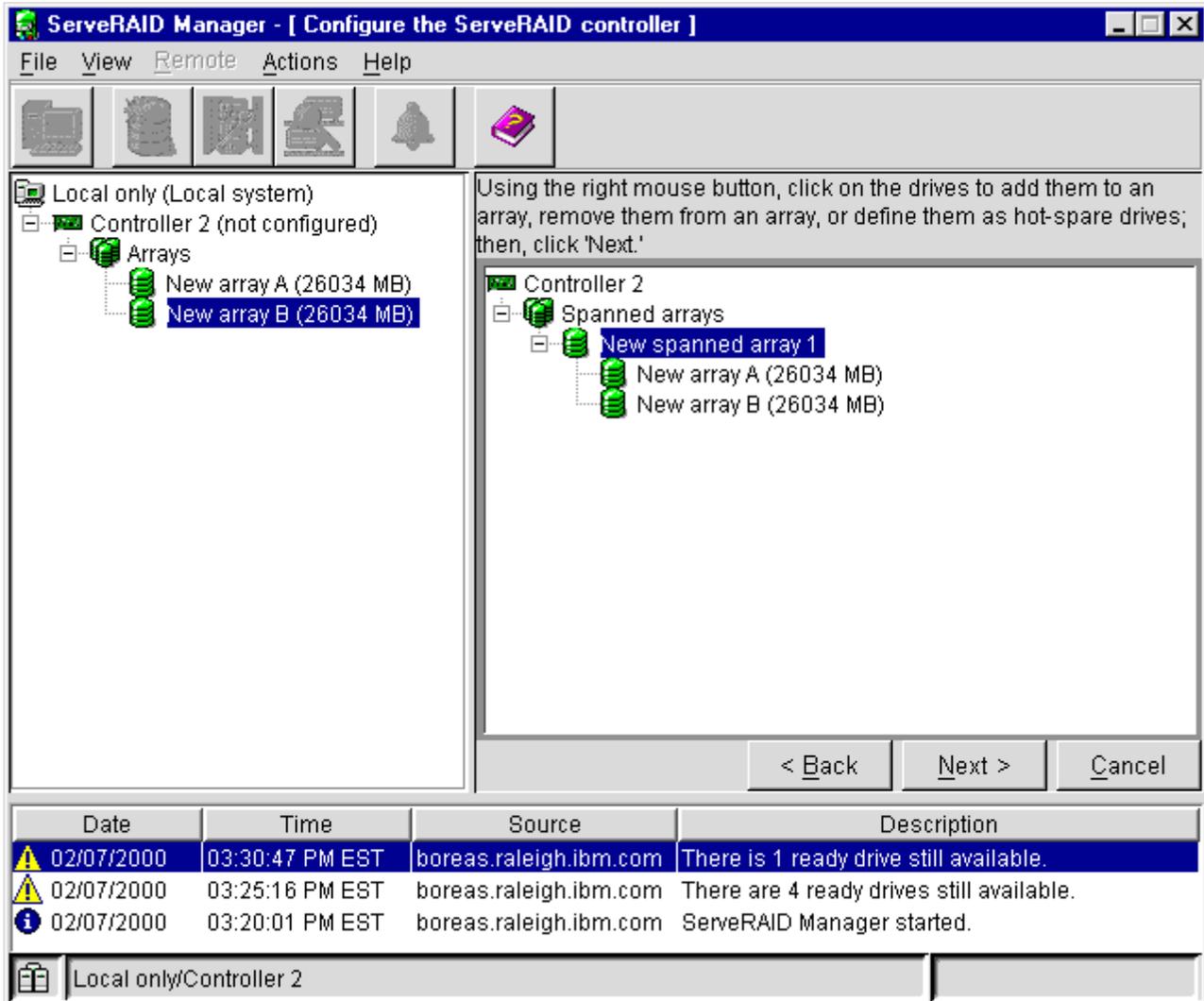


Figure 11. Create spanned arrays window

- Using the right mouse button, click the array icons in the Main Tree to select the arrays that you want to add or delete to your spanned arrays; then, select a choice from the pop-up list.
- After you select the arrays for your spanned arrays, click **Next**. The Create logical drives window opens.

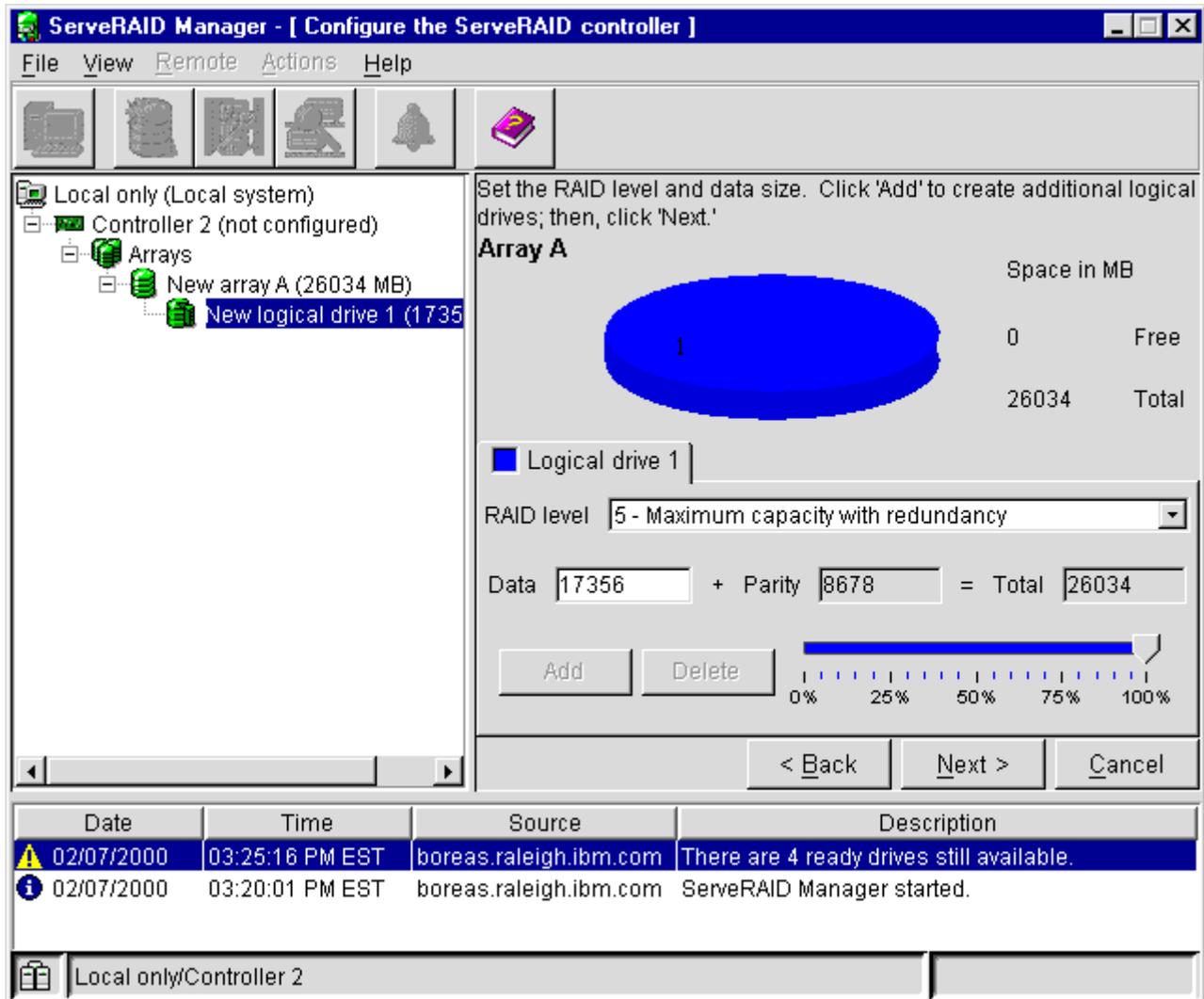


Figure 12. Create logical drives window

8. When creating your logical drives, you might change your mind about the arrays you created. If so, you can:
 - Remove a specific drive from a newly defined array or delete an entire newly defined array. To do this, click **Back**; then, using the right mouse button, click the specific drive or Array icon in the Main Panel on the right. Select **Remove from new array** or **Delete new array**.
 - Remove a specific hot-spare drive or all newly defined hot-spare drives. To do this, click **Back**; then, using the right mouse button, click the Hot-spare drive icon in the Main Panel on the right, and then select **Remove new hot-spare drive** or **Remove all new hot-spare drives**.
9. Select a RAID level for the logical drive from the RAID pull-down menu in the Main Panel.
10. If you do not want to use the maximum size for the logical drive, move the sliding bar in the Main Panel from right to left to allot data and parity space for the logical drive, or type in the size in the data field.

Notes:

- a. You can define from one to eight logical drives.
 - b. Some operating systems have size limitations for logical drives. Before you save the configuration, verify that the size of the logical drive is appropriate for your operating system. See your operating-system documentation for more detailed information.
 - c. Typically, the first logical drive defined on the first ServeRAID controller found by system BIOS during startup will be your startup (boot) drive.
11. If free space is available and you want to define another logical drive, click **Add** in the Main Panel.

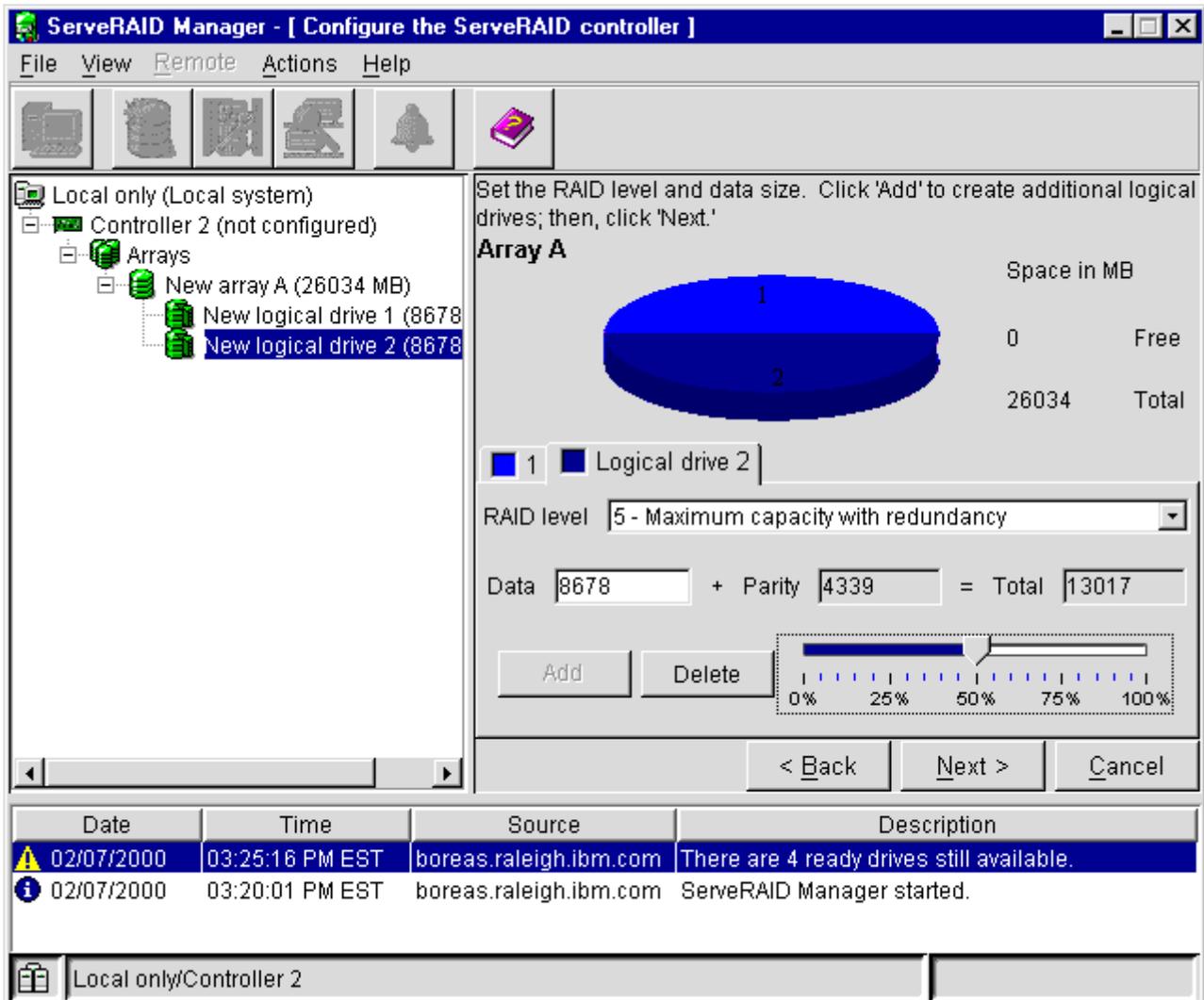


Figure 13. Adding another logical drive

- 12. Repeat steps 9 on page 159 through 11. for each logical drive that you want to define in this array; then, continue with step 13..
- 13. If you are defining multiple arrays, click the next New array tree node; then, repeat steps 9 on page 159 through 12.. When you are finished, go to step 14..
- 14. Click **Next**. The Configuration summary window opens.
- 15. Review the information that displays in the Configuration summary window.

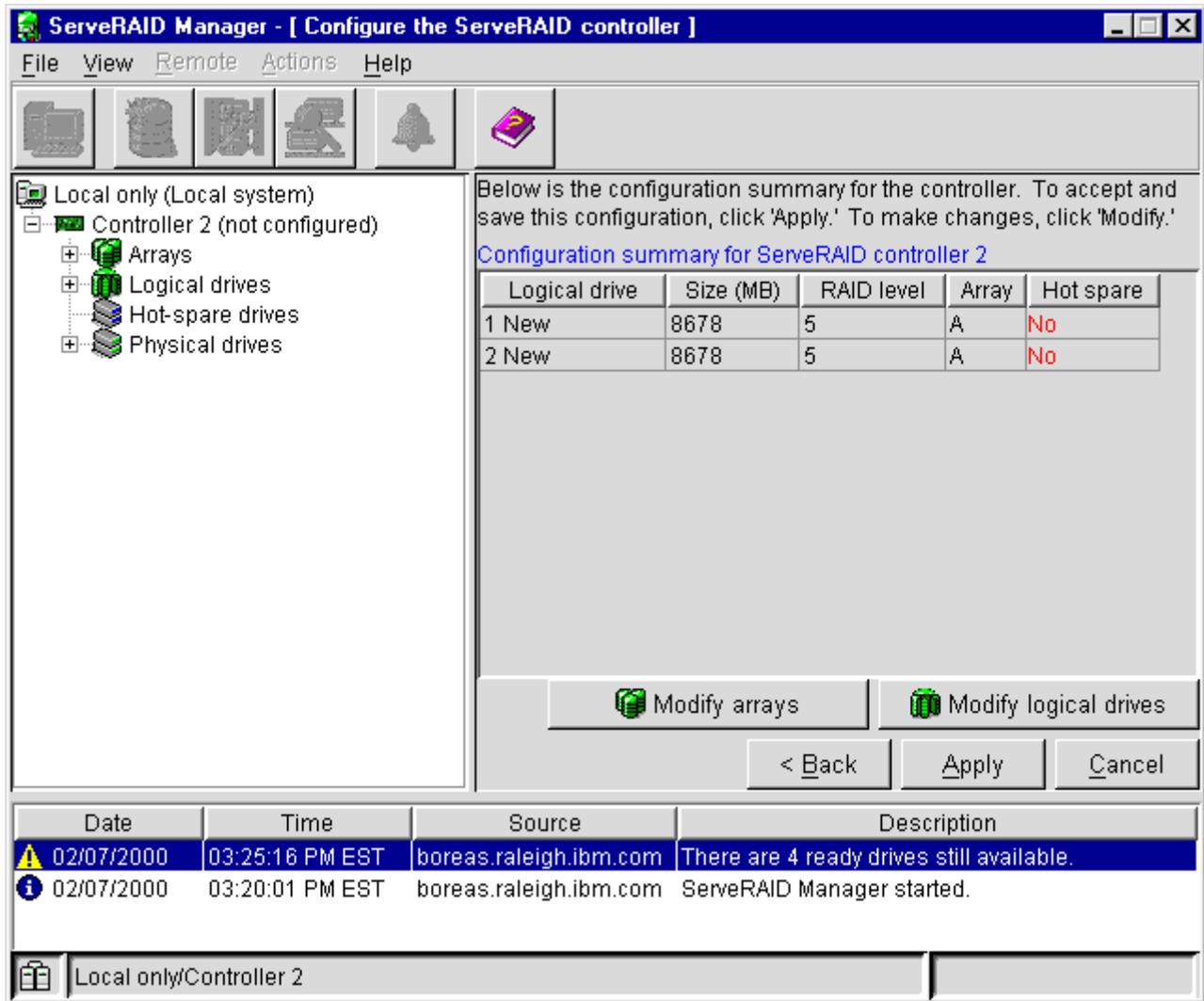


Figure 14. Configuration summary window

Note: To change the configuration, click **Modify arrays** or **Modify logical drives**.

16. Click **Apply** to accept and save the configuration. The configuration is saved in the ServeRAID controller and on the physical drives.
17. If you have multiple controllers, for each controller repeat steps 1 on page 157 through step 16.
18. When you have completed configuration, you can change to Information mode and change controller settings. See “Using Information mode” on page 162 for more information. If you do not want to change any settings, exit the ServeRAID Manager program and remove the CD from the CD-ROM drive.
19. Restart the server.

Note: If you are configuring your startup (boot) ServeRAID controller, you *must* install the device driver while installing the operating system.

Using Information mode

You can use Information mode to view the configuration information of ServeRAID controllers, arrays, logical drives, hot-spare drives, and physical drives that make up your ServeRAID subsystem (see Figure 8 on page 154). You also can use this mode to change some of the ServeRAID controller settings. These settings include:

- Write-cache mode (ServeRAID-4H, -4L and -4M controllers only)
Note: (NetWare 5.0 only) If you are preparing to install Novell NetWare 5.0 from the startable *Novell NetWare 5.0* CD, set the write-cache mode *only* to write-through mode.
- Controller and partner names
- SCSI initiator IDs
- Merge group numbers
- Read-ahead cache mode
- Stripe-unit size
- Unattended mode
- BIOS compatibility mapping
- Rebuild rate
- SCSI transfer speed

Click an item in the Main Tree and select the Actions menu to display available actions for that item.

Viewing the device and configuration information: To view the current settings:

1. Click the plus (+) box next to the object in the Main Tree to expand that portion of the tree.
2. Click the icon for the server, ServeRAID controller, array, logical drive, hot-spare drive, or physical drive to view its current settings.

Detailed information about the selected device will display in the Main Panel on the right.

Obtaining ServeRAID updates

IBM periodically makes updated versions of the ServeRAID firmware, device drivers, and utility programs available from the IBM Support page on the World Wide Web. In addition to the updated device drivers and utility programs, there is a command-line program available from the World Wide Web.

Note: If you need to update any ServeRAID software, you must update *all* ServeRAID software at the same time to ensure compatibility with all of the levels of the software. This includes:

- BIOS/firmware
- Device drivers
- ServeRAID Manager program
- Command-line programs.

You can download the most current versions of the ServeRAID device drivers and utility programs or a copy of the *IBM ServeRAID Command-Line Programs* diskette from the World Wide Web (see “Downloadable files from the World Wide Web” on page 163).

Refer to the README file on your diskette or CD for installation instructions.

If you do not have access to the World Wide Web, contact your place of purchase, your IBM reseller, or your IBM marketing representative for replacement CDs or diskettes.

The *IBM ServeRAID Support* CD contains the following:

- ServeRAID Manager program. Use this program to configure arrays and logical drives using ServeRAID controllers. This program is available in the following directory:

d:/PROGRAMS/operatingsystem/MANAGER

where *d* is the CD-ROM drive and *operatingsystem* is the specific operating system you are using in the ServeRAID installation.

- Device drivers. These files are available in the following directory:

d:/PROGRAMS/operatingsystem/DRIVER

where *d* is the CD-ROM drive and *operatingsystem* is the specific operating system you are using in the ServeRAID installation.

- Command-line programs. These command-line programs are available in the following directory:

d:/PROGRAMS/operatingsystem/CMDLINE

where *d* is the CD-ROM drive and *operatingsystem* is the specific operating system you are using in the ServeRAID installation.

- ServeRAID files needed to install Microsoft Cluster Service (MSCS) when using Microsoft® Windows® NT® or Windows 2000 and an IBM ServeRAID-4x Ultra160 SCSI controller. These files are available in the following directory:

d:/PROGRAMS/WINNT/CLUSTER

where *d* is the CD-ROM drive.

The *IBM ServeRAID Device Drivers* diskette contains the following:

- Device drivers for Microsoft Windows NT, Windows 2000, IBM OS/2®, Novell NetWare, and Red Hat Linux 6.1
- DOS CD-ROM drive device drivers

The *IBM ServeRAID Device Drivers for SCO Operating Systems - UnixWare HBA and OpenServer BTL* diskette contains the following:

- Device drivers for SCO OpenServer 5.0.5
- Device drivers for SCO UnixWare 7.1

Downloadable files from the World Wide Web

Download new and updated files for the IBM ServeRAID and Clustering products from the IBM Support Web site:

<http://www.ibm.com/pc/support/>

To access ServeRAID and Clustering support, follow these steps:

1. Click **Servers** on the IBM Support page. The IBM server support page appears.
2. Select **ServeRAID** or **Clustering** from the **Family** list box. The ServeRAID or Clustering Support page appears.
3. On this page, you can select from the following categories in the left margin:

Downloadable files

Download the latest versions of Clustering software, the ServeRAID Manager program, BIOS/firmware, device driver updates, and other important information.

Hints and tips

Obtain useful information for the IBM Clustering and for ServeRAID products and troubleshooting potential problems.

Online publications

Download the installation and user's guides, references, redbooks, and other IBM publications.

You can also review information on parts, products, and software.

ServeRAID device driver order on Windows 2000 and Windows NT 4.0

For Windows 2000 and Windows NT 4.0, the ServeRAID-4M and ServeRAID-4L controllers use a different device driver than other ServeRAID controller models. If you install ServeRAID-4M or ServeRAID-4L controllers in a server with other ServeRAID controller models, the order that the devices are listed for Windows 2000 and Windows NT might not match the order the devices are listed in the startable (bootable) ServeRAID Manager program on the *ServeRAID Support* CD and the ServeRAID Mini-Configuration program.

The startable ServeRAID Manager program orders the ServeRAID controllers by scanning the PCI slots for the first ServeRAID controller that is one of the following types:

- A ServeRAID-4M or ServeRAID-4L
- Another ServeRAID controller model

Then, the startable ServeRAID Manager program lists the controllers of the first type scanned before the controllers of the other type. The ServeRAID Mini-Configuration program also uses this procedure to order controllers.

For example, a server has four ServeRAID controllers installed in the following PCI-scan order:

1. ServeRAID-4M
2. ServeRAID-4H
3. ServeRAID-4L
4. ServeRAID-3HB

Because the first controller scanned is a ServeRAID-4M, all ServeRAID-4M and ServeRAID-4L controllers are listed first. Subsequently, other ServeRAID models are listed. In this example, the controller order in the server is the following:

1. ServeRAID-4M
2. ServeRAID-4L
3. ServeRAID-4H
4. ServeRAID-3HB

Note: To determine the PCI slot scan order, refer to your server reference manual.

Windows NT and Windows 2000 order SCSI controllers based on the device driver load order. For example, the device driver that is loaded first has its controllers listed first. Then, the device driver that is loaded second has its controllers listed second, and so on.

When installing Windows NT, the order that you add device drivers to the server is the order that the device driver is loaded. If you have a ServeRAID-4M or ServeRAID-4L controller and another ServeRAID controller model installed in the

server, you can control the order that the controllers are listed by installing the device drivers for the controllers in the same order that you want to have them listed.

When installing Windows 2000, the device driver for ServeRAID models other than the ServeRAID-4L and ServeRAID-4M is included on the *Windows 2000* CD and is loaded before any device drivers you add at installation time, such as the ServeRAID-4M and ServeRAID-4L device drivers. You can change the load order on Windows 2000 *only* by editing the Windows registry after installation.

Note: Refer to Microsoft knowledge base articles Q141832 and Q115486 for more information about editing the Windows registry to control the following:

1. The order the device drivers are loaded.
2. The order the controllers are listed.

Using utility programs

This section provides the information that is needed to start and use the ServeRAID Mini-Configuration program, and the IPSEND and IPSMON command-line programs.

Using the ServeRAID Mini-Configuration program

The ServeRAID Mini-Configuration program provides a quick way to display the current settings for the ServeRAID controller. You also can use this program to perform a limited set of the configuration functions without using the *IBM ServeRAID Support CD*.

To access the Mini-Configuration program:

1. Turn on the server. If the server already is running, shut down the operating system and restart the server.
2. When the ServeRAID Mini-Configuration prompt appears, press Ctrl+I.
3. If your server contains more than one ServeRAID controller, a selection screen will appear. To continue:
 - a. Use the Up Arrow or Down Arrow (↓) key to select a controller.
 - b. Press Enter.

If your server contains only one ServeRAID controller, or after you select a ServeRAID controller, the Main Menu appears.

Descriptions of the choices available from the Main Menu of the Mini-Configuration program are as follows:

- **View Controller Status** shows the current status of the ServeRAID controller. (See “Viewing the controller status” on page 166 for more information.)
 - **View Configuration** shows the current configuration information for the ServeRAID controller. (See “Viewing the configuration” on page 166 for more information.)
 - **Advanced Functions** is used to restore factory defaults, import configuration from drives, configure BIOS settings, and view the controller and PCI information. (See “Using the advanced configuration functions” on page 166 for more information.)
4. Use the Up Arrow or Down Arrow (↓) key to highlight your choice; then, press Enter.
 5. Follow the instructions that appear on the screen.
 6. Click **Exit**; then, press Enter.

Viewing the controller status

When you select **View Controller Status** from the Main Menu, the following information appears on the screen:

- All physical drives and their states
- **Unattended** shows the current state of the Unattended mode.
 - When this option is set to **Off**, you can choose the recovery method when a ServeRAID controller startup error occurs.
 - When this option is set to **On**, the ServeRAID controller chooses the recovery method when a startup error occurs.
- **Read Ahead** shows the current state of the read-ahead cache mode.
- **BootCD** shows the current state of the Bootable CD-ROM function (not supported in ServeRAID-4 family of products.)
- **CompMode** shows the current BIOS compatibility mode. **Off** indicates 8 gigabyte (GB) Extended; **On** indicated 2 gigabyte (GB) Limited.
- **Clustered** shows the current state for clustering.
- **BBWC** shows the cache size of the battery-backup write cache, if it is installed (for example, 8 = 8 MB, 32 = 32 MB, etc.) or **No** if there is a no battery-backup write cache installed.
- **Boot Blk** shows the version number of the startable microcode (or firmware) loaded for the ServeRAID controller.
- **Code Blk** shows the current version number of the microcode (or firmware) loaded for the ServeRAID controller.
- **Rebuild Rate** shows the current speed setting for rebuilds: High, Medium, or Low.
- **Number of Defunct drives** shows the current number of defunct physical drives.
- **Number of Offline drives** shows the current number of offline logical drives.
- **Number of Critical drives** shows the current number of critical logical drives.
- **Config. Updates** shows the number of times that the configuration has been changed since it has been initialized. When you initialize the configuration, the Config. Update resets to zero.
- **Bad Stripe, Locked Stripe, or Blocked Drive** identifies the logical drives that are affected.
 - **Bad Stripe Drives** indicates logical drives that have inaccessible areas.
 - **Locked Stripe Drives** is a reserved field.
 - **Blocked Drives** indicates the logical drives that are blocked. You must unblock a blocked drive before you can use it. See “Logical drive state descriptions” on page 203 for more information.

Viewing the configuration

You can select **View Configuration** from the Main Menu to display the number of each logical drive, and to display the size, RAID level, state, stripe-unit size, write policy, read-ahead status, and creation date for each logical drive.

Using the advanced configuration functions

You can select the **Advanced Functions** to restore the controller configuration to factory default settings, copy the configuration to the controller from the connected physical drives, configure BIOS settings, and view the controller and PCI information.

When you select the **Advanced Functions** from the Main Menu, the following choices appear on the screen.

Attention: Be careful when making selections from this menu. If you change the configuration, you might lose data.

- **Restore to Factory Default Settings** is used to reset the configuration. When you reset the configuration, you will not have access to any data stored on the logical drives attached to the selected ServeRAID controller.

This choice deletes the existing configuration information, sets all functional physical drives attached to the controller to the ready state, and deletes all logical drives defined for the controller.

- **Copy the Configuration from Drives to Controller** reads the most common configuration from the drives in the server and copies it to the ServeRAID controller.
- **Configure BIOS Settings** is used to modify the BIOS settings, such as the Bootable CD-ROM setting, for the ServeRAID controller (not supported in ServeRAID family of products).
- **View Controller and PCI Information** shows the ServeRAID controller hardware and PCI register information.
- **Exit** is used to exit from the Mini-Configuration program.

Using the IPSEND command-line program

The IPSEND command-line program provides a number of functions. Some of these functions are useful as diagnostic or error-recovery tools. This manual addresses only these diagnostic and error-recovery functions. Descriptions of the other functions of the IPSEND command-line program can be found in the documentation that shipped with the controller.

When you run IPSEND with no parameters, a list of available functions and their specific parameters appears. The available functions and their parameters are described in the sections that follow.

To run the IPSEND program with no parameters:

- If you are using Windows NT 4.0, Windows 2000, or OS/2:
 1. Type:
`c:\ipsadm\ipssend`
where *c* is the drive letter of the drive where Windows NT 4.0, Windows 2000, or OS/2 is installed.
 2. Press **Enter**.
- If you are using NetWare:
 1. From the console, type:
`load ipssend`
 2. Press **Enter**.
- If you are using Linux, OpenServer, or UnixWare:
 1. Type:
`/usr/bin/ipssend`
 2. Press **Enter**.
- If you are using DOS:
 1. Insert the startable IPSEND diskette into diskette drive A; then type:
`a:\ipssend`
where *a* is the drive letter of the diskette drive.
 2. Press **Enter**.

Server roll-out functions

Server roll-out functions are for server roll-out and building systems only; these functions are not for restoring systems. Do not use these commands for servicing systems.

The following lists the IPSEND server roll-out functions:

- autosync
- backup
- copyId
- init
- restore
- synch

Error-recovery functions

The IPSSSEND error-recovery functions include the following:

getstatus

Use the **getstatus** function to display the current logical-drive status for the most recent rebuild, synchronization, or logical-drive migration. The status includes such information as the remaining size of the logical drive, the percentage completed for the function in process, and information about the most recently completed logical-drive function.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend getstatus controller**

where:

controller is the ServeRAID controller number (1–12)

rebuild Use the **rebuild** function to rebuild a designated disk drive. This function is valid for disk arrays that contain one or more logical drives that are in the critical state. Progress is indicated during the rebuild operation, but you can also use the **getstatus** function to obtain progress information about the rebuild.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend rebuild controller dch dsid nch nsid**

where:

- *controller* is the ServeRAID controller number (1–12)
- *dch* is the channel number for the defunct drive (1, 2, 3, or 4)
- *dsid* is the SCSI ID for the defunct drive (0–15)
- *nch* is the channel number for the new drive (1, 2, 3, or 4)
- *nsid* is the SCSI ID for the new drive (0–15)

setstate Use the **setstate** function to change the state of a physical device from its current state to a new state.

Attention: You must be very careful when you use this function. For example, you might lose data if you reset a defunct device to online without first performing a rebuild operation.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend setstate controller channel sid nstate**

where:

- *controller* is the ServeRAID controller number (1–12)
- *channel* is the channel number for the drive (1, 2, 3, or 4)
- *sid* is the SCSI ID for the drive (0–15)
- *nstate* is the new state for the drive. Valid states are:
 - EMP for Empty
 - RDY for Ready
 - HSP for Hot spare
 - SHS for Standby hot spare
 - DDD for Defunct disk drive
 - DHS for Defunct hot spare
 - RBL for Rebuild
 - SBY for Standby
 - ONL for Online.

unblock Use the **unblock** function to gain access to a blocked logical drive. RAID level-0 logical drives become blocked if they are in an array that contains RAID level-1 or level-5 logical drives and the array is being rebuilt. Because the RAID level-0 logical drives cannot be rebuilt, the data stored on the RAID level-0 logical drives is damaged and should not be accessed. After you issue the **unblock** function, you must re-create or restore the data previously stored on the RAID level-0 logical drives.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend unblock controller drivenum**

where:

- *controller* is the ServeRAID controller number (1–12)
- *drivenum* is the logical drive number (1–8)

Problem-isolation and debug functions

The IPSEND problem-isolation and debug functions include the following:

certify Use the **certify** function to verify the media of a physical drive. When the program finds a media error, it reassigns the sectors. A summary of reassignments and PFA errors appears upon completion of the verification.

Supported operating system: DOS

Command: **ipssend certify controller channel sid**

where:

- *controller* is the ServeRAID controller number (1–12)
- *channel* is the channel number for the device (1, 2, 3, or 4)
- *sid* is the SCSI ID for the device (0–15)

eraseevent Use the **eraseevent** function to clear all logged entries in the designated event log. See **getevent** help for information about the contents of the device event log and the controller soft and hard event logs.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend eraseevent controller options**

where:

- *controller* is the ServeRAID controller number (1–12)
- *options* is the designated event log:
 - DEVICE for the device event log
 - SOFT for the ServeRAID controller soft event log
 - HARD for the ServeRAID controller hard event log

getbst Use the **getbst** function to display the number of bad stripes in the bad stripe table for each logical drive.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, Unixware, and DOS

Command: **ipssend getbst controller**

where:

controller is the ServeRAID controller number (1–12)

format Use the **format** function to perform a low-level format of a physical drive.

Attention:

1. When you issue this function, all data on the disk will be lost.
2. After a **format** function is issued, do not stop it. If a format process is stopped for any reason, the hard disk that was being formatted will not respond to any functions except the **format** function. Thus, the ServeRAID controller will not be able to recognize functions anymore. To recover the drive, refer to “Recovering from an incomplete format of a physical drive” on page 185.

Supported operating system: DOS

Command: **ipssend format controller channel sid**

where:

- *controller* is the ServeRAID controller number (1–12)
- *channel* is the channel number for the device (1, 2, 3, or 4)
- *sid* is the SCSI ID for the device (0–15)

getevent

Use the **getevent** function to display information about various unexpected events. IBM uses the soft and hard event logs for development and debugging purposes only. The device event log contains event counters for each attached physical device. These counters include:

- **Parity:** An unexpected event occurred while data was being transferred on the SCSI bus. This usually indicates a problem with the SCSI cable, connectors, or terminators.
- **Soft:** A SCSI device detected a check-condition event.
- **Hard:** The SCSI controller detected an unexpected event. The controller is the most likely cause.
- **Misc:** The ServeRAID controller detected an event that was most likely caused by the device.

The device event log also provides Predictive Failure Analysis (PFA) alerts, which indicate that the device has signaled the ServeRAID controller that it might fail in the near future.

Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS

Command: **ipssend getevent controller options**

where:

- *controller* is the ServeRAID controller number (1–12)
- *options* is the designated event log:
 - DEVICE for the device event log
 - SOFT for the ServeRAID controller soft event log
 - HARD for the ServeRAID controller hard event log

selftest

The **selftest** function is used to direct a controller or a device to perform its self-test.

Supported operating systems: DOS

Command: **ipssend selftest controller options**

where:

- *controller* is the ServeRAID controller number (1–12)
- *options* is the designated self-test:
 - AD for the ServeRAID controller self-test
 - PD *channel sid* for the device self-test

Note: *channel* represents the drive channel (1, 2, 3, or 4), and *sid* is the SCSI ID for the device (0–15).

startdely

Use the **startdely** function to set the number of drives in a group to start up simultaneously and to set the delay in seconds between the startup of these groups of drives.

Supported operating systems: DOS

Command: **ipssend startdely controller options**

where:

- *controller* is the ServeRAID controller number (1–12)
- *options* is one of the following:
 - ? displays the concurrent drive startup count and the delay time.
 - A number (1–16) that specifies the new concurrent drive startup count.
 - A number (1–16) that specifies the new concurrent drive startup count and a number (3–15) that specifies the startup delay time, in seconds.

RAID Configuration functions

The IPSSEND RAID configuration functions include the following:

- devinfo** Use the **devinfo** function to retrieve information (such as size and state) about a specific device.
- Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS
- Command: **ipssend devinfo controller channel sid**
- where:
- *controller* is the ServeRAID controller number (1–12)
 - *channel* is the channel number for the device (1, 2, 3, or 4)
 - *sid* is the SCSI ID for the device (0–15)
- drivever** Use the **drivever** function to display the vendor ID, microcode version, and serial number of a SCSI device. The IPSSEND program retrieves this information directly from the device.
- Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS
- Command: **ipssend drivever controller channel sid**
- where:
- *controller* is the ServeRAID controller number (1–12)
 - *channel* is the channel number for the device (1, 2, 3, or 4)
 - *sid* is the SCSI ID for the device (0–15)
- getconfig** Use the **getconfig** function to display the ServeRAID controller configuration information. This includes information about the firmware version; initiator ID and rebuild rate; logical-drive status, RAID level, and size; and physical device type, SCSI ID, and PFA error.
- Supported operating systems: Windows NT, Windows 2000, OS/2, NetWare, Linux, OpenServer, UnixWare, and DOS
- Command: **ipssend getconfig controller options**
- where:
- *controller* is the ServeRAID controller number (1–12)
 - *options* is one of the following:
 - AD for the controller information
 - LD for the logical drive information
 - PD for the physical device information
 - AL for all information. This is the default option.
- stripesize** **Attention:** You must change the stripe-unit size before you store data in the logical drives. After you store data in the logical drives, you cannot change the stripe-unit size without destroying data in the logical drives.

Using the IPSMON command-line program (NetWare only)

The IPSMON command-line program provides a quick way to monitor ServeRAID controllers for specific conditions. The IPSMON program is available for Novell NetWare only.

To run the IPSMON program:

1. From the console, type:
 load ipsmon
2. Press Enter.

When you start IPSMON, it immediately begins polling all ServeRAID controllers for specific conditions. If a condition being monitored is found, this program logs a message to the screen, to a file, or to both the screen and a file.

Note: IPSMON continuously polls the ServeRAID controllers until you type unload ipsmon at the system console.

Supported operating systems: NetWare

Command: **ipsmon options**

where:

- *options* is one of the following optional parameters:
 - *-F:filename* to specify the name of the file in which to record messages. The default file name is IPSMON.LOG.
 - *-S* to display messages on the standard output (usually the monitor)
 - *-?* to obtain a current list of valid parameters

Note: If you start this program without any command-line parameters, the IPSMON program will log the messages to the IPSMON.LOG file, and the messages will not appear on the screen.

During operation, IPSMON logs various messages. Each message contains an alert code and a location specifier.

- The alert code begins with the message type and number; for example, INF, WRN, or CRT (followed by the message number).
- The location specifier comes after the alert code:
 - A followed by the controller number
 - SID followed by the SCSI ID (if required)
 - C followed by the channel number (if required)

For example, a message of CRTxxx:A2C3SID04 signifies that a Critical condition (CRTxxx) was found on Controller 2 (A2), Channel 3 (C3), SCSI ID 4 (SID04).

The IPSMON program can log the following messages, based on the required condition.

Information Messages:

```
<Date and Time> INF000:A1C-SID-- no errors detected
<Date and Time> INF001:A1C-SID-- rebuild started
<Date and Time> INF002:A1C-SID-- rebuild completed
<Date and Time> INF003:A1C-SID-- synchronization started
<Date and Time> INF004:A1C-SID-- synchronization completed
<Date and Time> INF005:A1C-SID-- migration started
<Date and Time> INF006:A1C-SID-- migration completed
```

Warning Messages:

```
<Date and Time> WRN001:A2C3SID12 PFA Error detected
```

Critical Messages:

```
<Date and Time> CRT001:A3C2SID04 dead drive detected
<Date and Time> CRT002:A1C-SID-- not responding to commands
```

Introduction to IBM ServeRAID cluster solution

A *cluster* is a type of parallel or distributed system that consists of interconnected computers that are used as a single, unified computing resource. In other words, a group of computers linked together in such a way that they share and manage a set of resources that can support a number of users at the same time.

This *high-availability clustering solution* is based on a two-server cluster, where both servers can access the same storage devices, but only one server at a time controls the storage devices shared by both servers. If one of the two running server fails, the surviving server automatically assumes control of the shared resources managed by the failed server while still controlling its own resources at the same time. The failed server can then be repaired offline without the loss of time or work efficiency because the shared data and applications earlier managed by the failed server are still online to the clients.

When the failed server is operational again, it can be placed back into the cluster; the resources are reallocated between the two servers and the cluster resumes normal operations.

A *controller* is a device that coordinates and controls the operation of one or more input and output devices, such as workstations, and synchronizes the operation of such devices with the operation of a system as a whole.

IBM ServeRAID Cluster Solution, as discussed in this book, uses the IBM ServeRAID-4x Ultra160 SCSI controller. IBM ServeRAID Cluster Solution also uses IBM expansion enclosures, such as the following:

- IBM Netfinity EXP15 Rack Expansion Enclosure
- IBM Netfinity EXP200 Rack Expansion Enclosure
- IBM Netfinity EXP300 Rack Expansion Enclosure

You can install IBM ServeRAID Cluster Solution by using one of the following software applications:

- Microsoft Cluster Service, which is part of Windows NT Server Enterprise Edition
- Microsoft Cluster Service using Windows 2000, which is part of Windows 2000 Advanced Server Edition or Windows 2000 Datacenter Server Edition
- Vinca High Availability for Novell IntranetWare, which is part of the IBM Netfinity Cluster Pack by Vinca
- Novell High Availability Server 1.0

The following figure shows an example of a detailed view of a cluster.

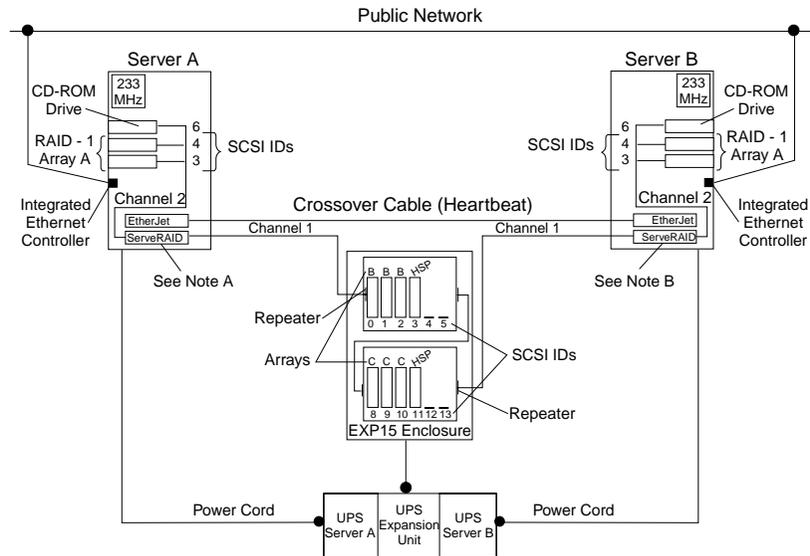


Figure 15. A detailed view of a cluster

Note A: Server A

- Shared Channel 1 - SCSI ID 6
- Non-shared Channel 2 - SCSI ID 6
- Non-shared Channel 3 - SCSI ID 7

Note B: Server B

- Shared Channel 1 - SCSI ID 7
- Non-shared Channel 2 - SCSI ID 7

The solution you use for your installation depends on your own specific requirements. For more information about requirements and types of installations, refer to the *IBM Shared Disk Clustering Hardware Reference*. You can obtain this publication from the IBM Support Web site. See “Downloadable files from the World Wide Web” on page 163 for additional information.

Monitoring and updating an IBM ServeRAID cluster solution

Note: Cluster configurations apply only to the ServeRAID-4H controller.

You can use the ServeRAID Manager program to check the ownership of a physical drive on another server or to add or remove a logical drive in the cluster. The ServeRAID Manager program supports three features for cluster functions:

- Validate cluster
- Configure for clustering
- View shared drives.

Note: Make sure that the ServeRAID Manager program is installed on the server.

Checking the ownership of a physical drive

A physical drive that is owned (and configured) on Server B will appear in the ready or defunct state on Server A. To determine if a ready drive is owned by the other server, do the following:

1. In the Main Tree, click the controller that contains the ready drives.
2. Click **Actions** → **Clustering actions**.
3. Click **View shared drives**. The View shared drives window opens.
4. Click **Enable view shared drives**.
5. Select the SCSI channel and SCSI ID of a physical drive on a shared channel.
6. Click **OK**. Physical drives that are available for use are labeled **Ready** in the Main Tree. If the physical drive is not available for use (that is, it is owned by the other server), the drive is labeled **Reserved** in the Main Tree.

Important: Hot-spare drives owned by the other server are not labeled **Reserved**. Be sure you do not inadvertently use a hot-spare drive in *both* servers.

Adding logical drives to a cluster

If you want to add logical drives to a cluster, do the following:

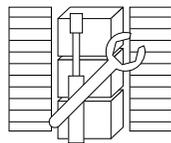
1. Install the hard disk drives in the server or shared expansion enclosure. For installation information, refer to the documentation that is included with the hard disk drive and the server.

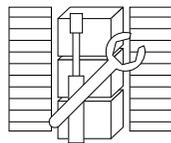
Attention: Physical drives that are configured by one controller in the pair must appear as ready drives to the other controller in the pair. Be sure to verify this status when you add drives *after* the servers are started. Before creating logical drives, restart both servers, or scan for new drives using the ServeRAID Manager program on both servers, to make sure the added physical drives appear as ready drives on both servers.

2. Using the ServeRAID Manager program, configure the physical drives for the ServeRAID controller. Refer to “Installing and configuring ServeRAID controllers” on page 139 for instructions.

Note: If the drives will be shared, define only one logical drive per array.

3. In the Main Tree, click the controller for the cluster.
4. Click



5.  on the tool bar. A window similar to the following opens.

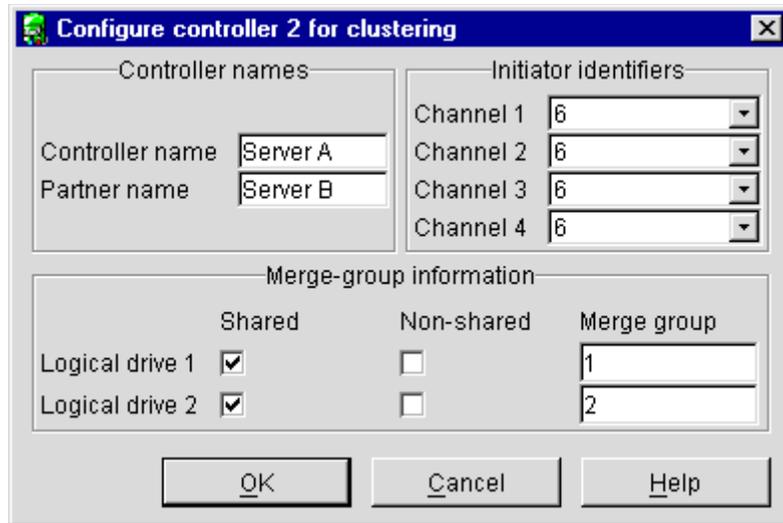


Figure 16. Configure controller for clustering window

6. Click **Shared** or **Non-shared** for the logical drive you have just defined.
7. Select the merge group number you want to use for the logical drive you just defined.
8. Click **OK**.

Validating a cluster

Use this feature to determine if your cluster is configured correctly.

Note: You must have the ServeRAID Manager program installed on all servers in the cluster for this feature to work.

To validate a cluster, do the following:

1. In the Main Tree, click a server in the cluster.
2. Click **Actions** → **Validate cluster**. A window similar to the following opens.

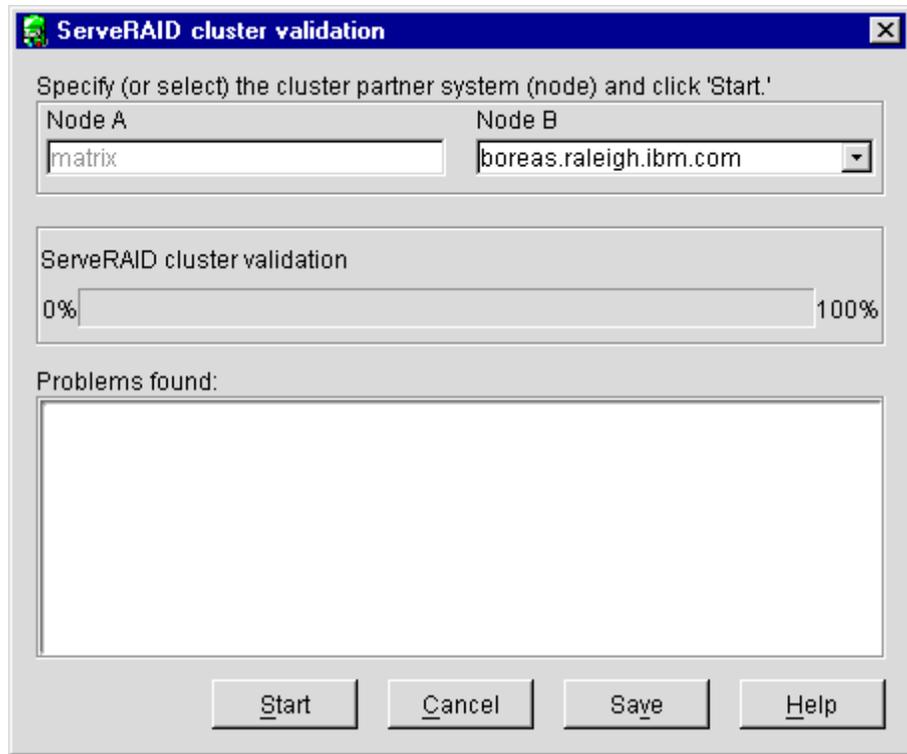


Figure 17. ServeRAID cluster validation window

The server you selected in step 1 on page 178 is listed in the Node A box.

Note: You cannot change the Node A system in the Cluster validation window. To select a different system, click **Cancel** to return to the Main Tree.

3. From the Node B pull-down menu, select your second server.

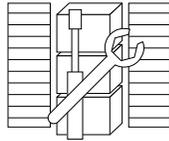
Note: The Node B system defaults to the first system in the Main Tree other than the Node A system. If there are no remote systems in the Main Tree, click **Cancel** to return to the Main Tree and add a remote system. You can also type in the Node B name.

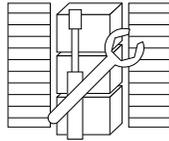
4. Click **Start**. The ServeRAID Manager program scans both systems to verify the ServeRAID cluster configuration. The progress indicator reports the progress of the validation.
5. If you want to stop the validation before it completes, click **Cancel**. Otherwise, if the ServeRAID Manager program finds problems with the ServeRAID cluster configuration, it reports the problems in the **Problems found** message field. If there are no problems with the ServeRAID cluster configuration, the message field reports only the cluster pairings found.
6. To view the problem report events in an easy-to-read window, double-click an event in the **Problems found** message field.
7. To save the contents of the **Problems found** message field, click **Save**. A Save as window opens. Specify the file name for the message field log and click **OK**.
8. Click **Done** to exit the Cluster validation window. If the ServeRAID cluster configuration has problems, fix the problems; then, use **Validate cluster** again.

Viewing merge group numbers and other cluster information

To view the merge group numbers and other cluster information, do the following:

1. In the Main Tree, click the controller you are using for the cluster.



2. Click  on the tool bar. A window similar to the following opens.

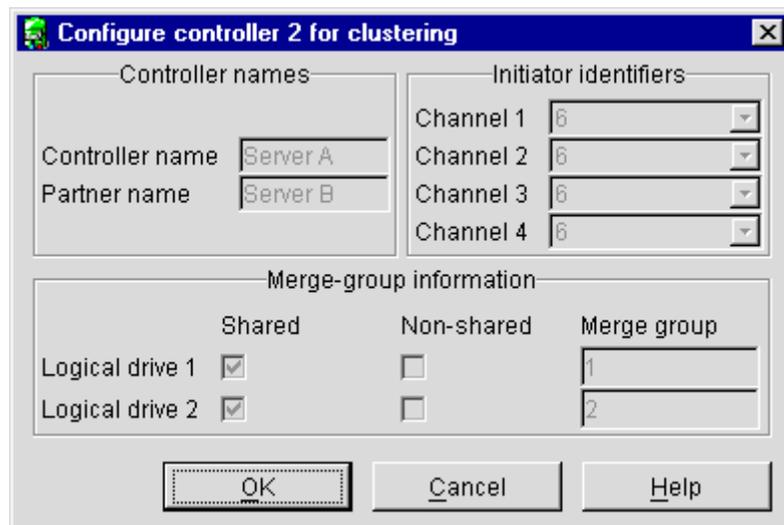


Figure 18. Configure controller for clustering window

Note: In this case, you can view this information only. You cannot change the information.

POST (ISPR) error codes and procedures

This section lists the ServeRAID-4 controller error codes/messages, and the error procedures.

ServeRAID-4 Controller error codes/messages

The error codes/messages are displayed on the screen 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 182 and correct the problem.

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

+-----+

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

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 codes" on page 182 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, 2000
Ver: 3.00.12 08/14/2000

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/or Error information.

+-----+

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

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

+-----+

Note: Do not replace a ServeRAID-4 controller or a system board containing an imbedded ServeRAID-4 controller for ServeRAID problems unless replacing the controller is listed in the “Symptom-to-FRU index” on page 215.

POST (ISPR) error codes

The ISPR (Interrupt Status Port Register), BCS (Basic Configuration Status), and ECS (Extended Configuration Status) codes identify the controller state.

Note: Do not replace the ServeRAID-4x controller or an imbedded controller on a system board unless such a replacement is indicated in the recommended Actions in an error code list that appears in “Symptom-to-FRU index” on page 215.

POST (ISPR) error procedures

The 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 the “Symptom-to-FRU index” on page 215.

Note: Where the ISPR Error Procedures refer to a SCSI backplane, see the Hardware Maintenance Manual for the system you are servicing.

EF10 (Default ISPR)

1. No ISPR Error Present.

9ZXX thru BZXX (SCSI bus error caused either by cables, termination, defective drives, etc.)

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

CAUTION:

Do not press F5. Doing so changes the customer’s configuration.

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

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

Notes:

- a. Refer to the HMM (Hardware Maintenance Manual) specific to the system comprising the SCSI channel for SCSI cable details.
 - b. The adapter/controller detects a configuration change. **Do not choose Save Changes.** Instead, press **F10** to bypass any options to this effect.
2. If 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 the following table:

Note: ServeRAID-4H controllers have 4 channels; ServeRAID-4L controllers have only one channel; and ServeRAID-4M controllers have 2 channels.

Table 20. SCSI identifier.

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

- b. Confirm that the channel(s) identified from the error in step a on page 182 is (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.
Note: Refer to the HMM (Hardware Maintenance Manual) specific to the system comprising the SCSI channel for termination details.
- d. Check for proper backplane jumper configuration.
Note: Refer to the HMM (Hardware Maintenance Manual) specific to the system comprising the SCSI channel for jumper details.
- e. Check for proper cabling configuration in systems that use DASD status cables. Reconnect all cables removed in step 1 above.
- f. Disconnect one drive at a time attached to the channel identified in step a on page 182; then, reboot to determine which drive is causing the error.
- g. Replace SCSI cable.
- h. Replace SCSI backplane.

FFFF or other code not listed

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

CAUTION:

Do not press F5. Doing so will change the customer's configuration.

If 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 termination of identified channel in step a.
Note: Refer to the HMM (Hardware Maintenance Manual) specific to the system comprising the SCSI channel for termination details.
 - c. Disconnect one drive at a time attached to channel identified in step a. and reboot each time to determine which drive is causing the problem.
 - d. Replace SCSI Cable attached to channel identified in step a..
 - e. Replace Backplane attached to channel identified in step a..
2. If original ISPR code is still present after disconnecting all SCSI cables and rebooting, perform the following actions until the error is no longer present:
 - Reseat the controller
 - Replace the controller

Recovery procedures for defunct (DDD) drives

This section includes information on the following:

- “Drive replacement (rebuilding a defunct drive)”
- “Software and physical replacement” on page 187
- “Using and understanding the ServeRAID Monitor Log” on page 188
- “Recovery from ServeRAID controller failure” on page 189
- “Recovery procedures” on page 189

Note: The following information applies only to drives that are part of the same array.

Drive replacement (rebuilding a defunct drive)

A hard disk drive goes defunct when there is a loss of communication between the controller and the hard disk drive. This can be caused by any of the following:

- An improperly connected cable, hard disk drive, or controller
- A loss of power to a drive
- A defective cable, backplane, hard disk drive or controller
- A defective drive

In each case, the communication problem needs to be resolved, and then a Rebuild operation is required to reconstruct the data for the device in its disk array. The ServeRAID controllers can reconstruct redundant arrays, but they cannot reconstruct data stored in non-redundant arrays. See “Reference information” on page 192 for more information.

To prevent data-integrity problems, the ServeRAID controllers set the non-redundant logical drives to Blocked during a Rebuild operation. After the Rebuild operation completes, you can unblock the non-redundant logical drives and access them once again. Remember, however, that the logical drive might contain damaged data.

Steps for recovering from defunct drives

If the defunct drives are part of an array, do the following:

- If more than one hard disk drive in an array is defunct, see “Recovery procedures” on page 189.
- If a Rebuild operation is in progress, wait until the Rebuild is complete.
- If one hard disk drive is Defunct, replace drive with a new one. Refer to “Recovery procedures for one defunct drive” on page 190.

Rebuilding a hot-swap drive

A hot-swap rebuild refers to a rebuild operation that is started by the ServeRAID controller. The rebuild begins when the controller detects that a drive that is part of an array and in the defunct state has been removed and reinserted on the SCSI cable or backplane. The reinsertion of the hard disk drive, whether it is the same drive or a new drive, will trigger the ServeRAID controller to start the Rebuild operation. During the Rebuild operation, the drive being rebuilt is in the rebuild state, and the logical drive remains critical until the Rebuild operation has been successfully completed.

On IBM servers, when a hot-spare drive is available, the Rebuild operation will begin automatically without the requirement to replace the failed drive.

To start a hot-swap rebuild, do the following:

1. **Without removing the drive completely**, gently remove the hard disk drive from the server, using the handle of the hot-swap tray. If necessary, refer to the documentation that comes with your server on removing a hard disk drive.
2. Wait 20 seconds to allow the disk drive to completely spin down.

Note: When power is removed from a hot-swap drive, the drive immediately parks the heads, locks the actuator in the “landing zone”, and begins spinning down. However, the spinning down of the disk might require up to 20 seconds after power is removed. Do not move the drive while it is spinning down. Moving the drive while it is spinning down may damage the drive.

3. Remove Defunct Drive and gently install replacement drive. Make sure the drive is completely installed in the backplane connector.

Recovering from an incomplete format of a physical drive

During formatting of a physical drive, if the format process is stopped by a system reset, system shut down, power outage, or by some other means, the physical drive becomes inoperable.

To enable the physical drive to communicate with the ServeRAID controller again, do the following:

1. Note the channel of the ServeRAID controller to which the physical drive is connected.
2. Note the SCSI ID of the physical drive.
3. Use the **ipssend format** function to restart the format of the physical drive. The syntax is: **ipssend format *controller channel sid***

where:

- *controller* is the ServeRAID controller number (1-12)

- *channel* is the channel number for the device (1, 2, or 3)
- *sid* is the SCSI ID for the device (0-15)

After the **format** is complete, the ServeRAID controller will be able to recognize the drive again.

Recovering from a failure in a failover-environment

In a failover environment, when the ServeRAID device driver is unable to send a command to the primary controller and the primary controller does not respond to a reset command, the device driver attempts to failover to the secondary controller.

Note: Loose cables or defective physical drives will not cause a failover to occur.

Replacing a non-hot-plug controller in a failover pair

If a failed controller is not in a hot-plug PCI slot, do the following to replace it:

1. Shut down the server.
2. Replace the failed controller.
3. Reconfigure the new controller.

Note: Be sure the firmware level of the new controller is the same as the controller you are replacing.

Be sure to use the same Controller Name, Partner Name, and SCSI Initiator ID for the controller you are replacing.

If the failed controller is in a hot-plug slot, refer to the documentation that comes with the server for instructions for replacing the controller.

Guidelines for the rebuild operation

- The replacement hard disk drive must have a capacity equal to or greater than the failed drive.
- If the hard disk drive being rebuilt is part of a non-redundant array, the non-redundant logical drive is blocked.
 - You must unblock any non-redundant logical drives at the end of the rebuild operation.
 - If you use the ServeRAID Manager to initiate the rebuild operation, you can unblock the blocked non-redundant array when the rebuild operation completes.
- Data in a logical drive with RAID level-0 is lost when the drive fails. If you backed up the data before the drive failed, you can restore the data to the new drive.

General information about the rebuild operation

A physical hard disk drive can enter the rebuild state if:

- You physically replace a defunct drive that is part of the critical logical drive.

When you physically replace a defunct drive in a critical logical drive, the ServeRAID controller rebuilds the data on the new physical drive *before* it changes the logical drive state back to *Okay*.
- The ServeRAID controller adds a hot-spare or a standby hot-spare drive to the array and changes its state from *Hot-Spare* or *Standby Hot-Spare* to *Rebuilding*.

Automatically rebuilding the defunct drive

The ServeRAID controller will rebuild a defunct drive automatically when all of the following conditions exist:

- The physical drive that failed is part of a redundant RAID logical drive. See “Reference information” on page 192 for more information on data redundancy.
 - A hot-spare or standby hot-spare drive with a capacity equal to or greater than the capacity of the defunct drive is available the moment the drive fails.
 - When multiple hot-spare drives are available, the ServeRAID controller searches for a hot-spare drive of the appropriate size. The smallest drive that meets this requirement enters the Rebuild state.
 - If no hot-spare or standby hot-spare drives are available, the rebuild operation will start the moment you replace the defective drive.
- Note:** If you physically replace the drive and the new drive does not appear in the Physical Drives branch of the Main Tree, you must scan for new or removed Ready drives.
- No rebuild, synchronization, logical-drive migration, or RAID level-5E compression/decompression operation is in process.

Software and physical replacement

When the ServeRAID controller communicates with the hard disk drive and receives an unexpected response, the controller will mark the drive defunct in order to avoid any potential data loss. For example, this could occur in the event of a power loss to any of the components in the SCSI ServeRAID subsystem. In this case, the ServeRAID controller will err on the side of safety and will no longer write to that drive, although the drive may not be defective in any way.

It is recommended to use a software replace to recover data when multiple Defunct (DDD) drives occur. In this situation, you may lose data on drives that are not actually defective if you run a normal rebuild process.

Perform a software replace or a physical replace according to the following criteria:

- A software replace is recommended when trying to recover data when multiple Defunct (DDD) drives occur.

Warning: If you use the wrong order when you attempt a software replace, your data will be corrupted.
- Do not perform a software replace for a single Defunct (DDD) drive. All single defunct drives should be physically replaced.
- Replace the Defunct (DHS) drive physically if a Defunct (DDD) drive has been replaced by an HSP. The drive must be replaced physically to ensure that a good HSP drive is present in the system.

Using ServeRAID Manager to determine the correct order to software replace

The following lists describe the correct order to software replace under two conditions: operating system is accessible and operating system is not accessible.

When the operating system is accessible, to determine the correct order to software replace follow the following steps:

1. Using ServeRAID Manager, note the hard disk drive(s) that are defunct.

2. In ServeRAID Manager select the system with Defunct (DDD) drives.
3. Right click on the system and choose "Save printable configuration and event logs." These logs are saved into the installation directory of ServeRAID Manager, usually Program Files\RAIDMAN. The log files are saved as RAIDX.log where X is the controller number.
4. Open the correct log for the controller with Defunct Drives and find the heading "ServeRAID Defunct (DDD) event log."
5. Mark hard disk drive online in order, starting from the bottom of this log.
6. Rebuild the last drive.

When the operating system is not accessible, to determine the correct order to software replace, follow the following steps:

1. Boot to the ServeRAID options CD.
2. Right click on the local system.
3. Insert diskette in drive and select "Save printable configuration and event logs."
4. Take logs to another system and view. The log files are saved as RAIDX.log where X is the controller number.
5. Open the correct log for the controller with Defunct Drives and find the heading "ServeRAID Defunct (DDD) event log."
6. Mark hard disk drive online in order, starting from the bottom of this log.
7. Rebuild the last drive.

Using and understanding the ServeRAID Monitor Log

The ability to read the ServeRAID log, generated by ServeRAID monitor, is a most important part of recovering an array when one or more drives are marked Defunct (DDD). From the ServeRAID log, you can determine in what order drives went Defunct (DDD), and, if multiple drives are Defunct (DDD), which one is the "inconsistent" or "out-of-synch" drive. The ServeRAID log is created by running either ServeRAID monitor or Netfinity Manager. ServeRAID monitor is available from the IBM web site:

<http://www.ibm.com/pc/files.html>

Search on "ServeRAID."

Netfinity Manager is part of ServerGuide, which is shipped with every IBM server.

The following is an excerpt from a ServeRAID log created by ServeRAID monitor:

Table 21. Sample ServeRAID log.

RAID log
09/12/97 09:33:36 INF003:A1C-B -- synchronization started
09/12/97 09:40:22 INF004:A1C-B -- synchronization completed
09/12/97 09:41:43 CRT001:A1C3B03 -- dead drive detected
09/12/97 09:42:13 INF001:A1C-B -- rebuild started
09/12/97 09:52:11 INF002:A1C-B -- rebuild completed
09/12/97 09:55:24 CRT001:A1C3B04 -- dead drive detected

The original configuration was:

- SID 1: HSP
- SID 2: ONL
- SID 3: ONL
- SID 4: ONL

The format is as follows:

date time error type: Ax Cx Bxx message

The *x* following A is the controller number; the *x* following C is the channel, and the *xx* following B is the SID number. An error type can be either *informational* or *critical*. The message gives a brief description of the RAID event that has occurred.

The first two lines of the ServeRAID log show that a synchronization was started and proceeded to complete successfully. At a later point in time, on line 3 of the ServeRAID log, a dead drive is detected on controller 1, channel 3, SID 3. In this case, since an HSP drive is defined, the rebuild starts automatically. Both the start and finish of the rebuild is logged by the controller. Later on, the drive in SID 4 is marked dead, but no rebuild is started because the HSP drive has already been used.

In the current ServeRAID log, the drive in SID 4 is the “inconsistent” drive, and must be physically replaced. If this is the case, you should mark other drives ONL and then rebuild drive SID 4.

Note: If the drive containing the operating system is not accessible see “Using ServeRAID Manager to determine the correct order to software replace” on page 187.

Before you perform any actions on the hardware, make a photocopy of the Channel Record table, Table 22 on page 191. Use Netfinity Manager or ServeRAID monitor to fill in the copy of the Channel Record table at the end of this manual with the current status of all the drives, both internal and external. This table provides a four-channel diagram to accommodate all types of ServeRAID controllers.

For the ServeRAID controllers, if power is lost or another drive is marked Defunct (DDD) during a rebuild operation, the rebuild fails and the drive being rebuilt remains in the Rebuild (RBL) state. Consequently, the “inconsistent” drive remains recognizable.

Recovery from ServeRAID controller failure

When a ServeRAID controller fails, you must replace the ServeRAID controller and then restore the ServeRAID configuration to the new ServeRAID controller. To restore the ServeRAID configuration:

1. Press **CTRL+I** during POST to enter the Mini-Configuration.
2. Select **Advanced Functions**.
3. Select **Copy Configuration from Drives to Controller**.

Recovery procedures

This section describes the recovery procedures for the following conditions:

- “Recovery procedures for one defunct drive” on page 190
- “More than one defunct (DDD) drive, all logical drives in critical or OK state” on page 190
- “More than one defunct (DDD) drive and one or more arrays offline” on page 190

Note: these instructions are valid both when your operating system is accessible and when it is not accessible. If it is accessible, use the ServeRAID Manager. If it is not, boot the ServeRAID options CD.

Recovery procedures for one defunct drive

Follow the steps below when one hard disk drive is Defunct and all Logical Drives are working.

To Replace a single Defunct Drive:

1. Right-click on defunct drive and choose “Replace Drive.”
2. A pop-up message will appear. Replace the drive and please follow the directions.
3. If this does not work, gently remove the drive and reinsert.

More than one defunct (DDD) drive, all logical drives in critical or OK state

If a hot-spare (HSP) existed prior to the drive failures, the system should still run as long as the logical drives are configured as redundant. The logical drives in the array will be in the critical (CRT) state due to one drive in the array being defunct.

Note: Because the operating system is functional, this procedure assumes you are using the ServeRAID Manager Utility within the operating system to recover.

- Verify that you are in this state by left-clicking on the Defunct drives and noting the Array Letter in the drive information window.
- One Defunct Drive should show an array letter, while the other should not.

Perform the following steps to bring the logical drive from CRT to OKY status:

1. Highlight the Drive and right-click.
2. Choose “Replace Defunct Drive.”
3. A pop-up message will appear. Follow the instructions and replace the drive.
4. Repeat these steps for each Defunct Drive.

More than one defunct (DDD) drive and one or more arrays offline

Note: The following procedure for multiple Defunct (DDD) drives assumes that the two or more Defunct drives are part of the same array. You can confirm this by using the ServeRAID Manager or Options CD and looking at the log file on another machine to determine the “inconsistent” drive. When you know which drive is “inconsistent”, you can attempt to recover data.

Note: Once you lose more than one drive in a set of RAID-5 or RAID-1 logical drives, loss of data is definitely a possibility. The steps below guide you through a recovery. However, a recovery may not be possible in every case.

Warning: If you use the wrong order when you set the drive's state to ONL, data corruption results. See the following note to determine the last drive marked Defunct (DDD) by the ServeRAID controller.

1. Refer to “Using and understanding the ServeRAID Monitor Log” on page 188 or “Using ServeRAID Manager to determine the correct order to software replace” on page 187 for information on how to gather and interpret the Defunct Drive log.

Reference information

This section contains information to help you understand the principles and uses of high-performance, redundant array of independent disk (RAID) controllers. This section describes the different ways that drives can be grouped together to create data-storage environments that require superior performance, flexibility, and reliable data storage. A listing of important acronyms, terms, and definitions is also included at the end of this section.

Understanding RAID technology

RAID is the technology of grouping several physical drives in a computer into an *array* that you can define as one or more logical drives. Each *logical* drive appears to the operating system as a single drive. This grouping technique greatly enhances logical-drive capacity and performance beyond the physical limitations of a single physical drive.

When you group multiple physical drives into a logical drive, the ServeRAID controller can transfer data in parallel from the multiple drives in the array. This parallel transfer yields data-transfer rates that are many times higher than with nonarrayed drives. This increased speed makes the system better able to meet the *throughput* (the amount of data processed in a given amount of time) or productivity needs of the multiple-user network environment.

The ability to respond to multiple data requests provides not only an increase in throughput, but also a decrease in response time. The combination of parallel transfers and simultaneous responses to multiple requests allows disk arrays to provide a high level of performance in network environments.

Stripe-unit size

With RAID technology, data is *striped* across an array of physical drives. This data-distribution scheme complements the way the operating system requests data.

The granularity at which data is stored on one drive of the array before subsequent data is stored on the next drive of the array is called the *stripe-unit size*.

You can control the stripe-unit size and maximize the performance of your ServeRAID controller by setting a stripe-unit size to a value that is close to the size of the system I/O requests. You can set the stripe-unit size to 8 KB, 16 KB, 32 KB, or 64 KB. For example, performance in transaction-based environments, which typically involve large blocks of data, might be optimal when the stripe-unit size is set to 32 KB or 64 KB. However, performance in file and print environments, which typically involve multiple small blocks of data, might be optimal when the stripe-unit size is set to 8 KB or 16 KB.

The collection of stripe units, from the first drive of the array to the last drive of the array, is called a *stripe*.

Supported RAID levels

Disk arrays are used to improve performance and reliability. The amount of improvement depends on the application programs that you run on the server and the RAID levels that you assign to the logical drives.

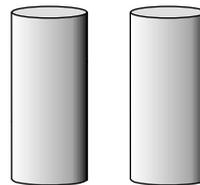
The ServeRAID controllers support RAID level-0, 1, 1E, 5, 5E, 00, 10, 1E0, and 50.

Understanding RAID level-0: RAID level-0 stripes the data across all the drives in the array. This offers substantial speed enhancement, but provides no data redundancy. RAID level-0 provides the largest storage capacity of the RAID levels that are offered, because no room is taken for redundant data or data-parity storage.

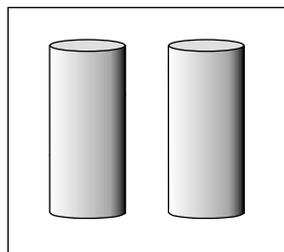
RAID level-0 requires a minimum of one drive and supports a maximum of 16 drives.

The following illustration shows an example of a RAID level-0 logical drive.

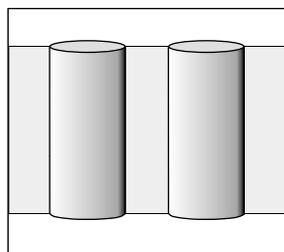
Start with two physical drives.



Create an array using the two physical drives.

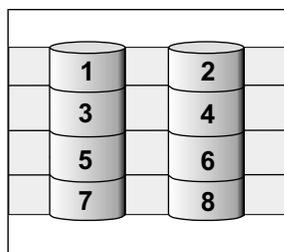


Then, create a logical drive within that array.



The data is striped across the drives, creating blocks.

Notice that the data is striped across all the drives in the array, but no redundant data is stored.



A physical drive failure within the array results in loss of data in the logical drive assigned RAID level-0, but only in that logical drive. If you have logical drives assigned RAID level-1, 1E, 5, or 5E in the same array, they will not lose data.

Note: If you have an array that contains only one physical drive, you can assign only RAID level-0 to the logical drive in that array.

When you replace a failed drive, the ServeRAID controller can rebuild all the RAID level-1E and RAID level-5E logical drives automatically onto the replacement physical drive. However, any data stored in a failed RAID level-0 logical drive is lost.

Although the risk of data loss is present, you might want to assign RAID level-0 to one of the logical drives to take advantage of the speed this RAID level offers. You can use this logical drive to store data that you back up each day and for which safety is not of primary importance, that is, data that you can re-create easily. You also might want to use a RAID level-0 logical drive when you require maximum capacity.

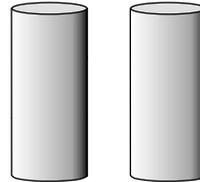
Understanding RAID level-1: RAID level-1 provides 100% data redundancy and requires only two physical drives. With RAID level-1, the first half of a stripe is the

original data; the second half of a stripe is a *mirror* (that is, a copy) of the data, but written to the other drive in the RAID level-1 array.

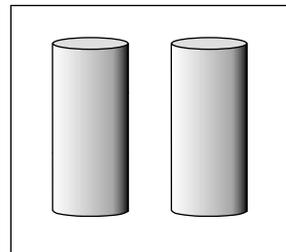
Because the data is mirrored, the capacity of the logical drive when assigned RAID level-1 is 50% of the array capacity.

The following illustration shows an example of a RAID level-1 logical drive.

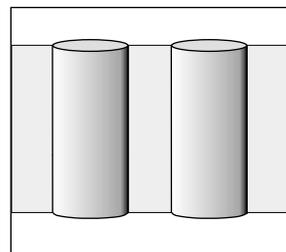
Start with two physical drives.



Create an array using the two physical drives.

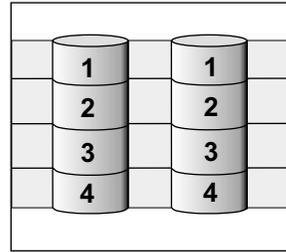


Then, create a logical drive within that array.



The data is striped across the drives, creating blocks.

Notice that the data on the drive on the right is a copy of the drive on the left.



With RAID level-1, if one of the physical drives fails, the ServeRAID controller switches read and write requests to the remaining functional drive in the RAID level-1 array.

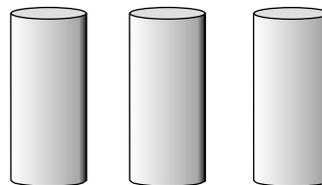
Understanding RAID level-1 Enhanced: If you have three or more physical drives in the array, you cannot select RAID level-1; you can select RAID level-1 Enhanced (RAID level-1E).

RAID level-1E combines mirroring with data striping. This RAID level stripes data and copies of the data across all of the drives in the array. As with the standard RAID level-1, the data is mirrored, and the capacity of the logical drive is 50 percent of the array capacity of the grouping of physical drives in the array.

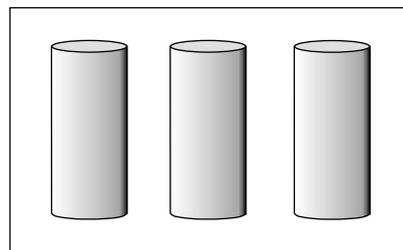
RAID level-1E requires a minimum of 3 drives and supports a maximum of 16 drives.

The following illustration is an example of a RAID level-1E logical drive.

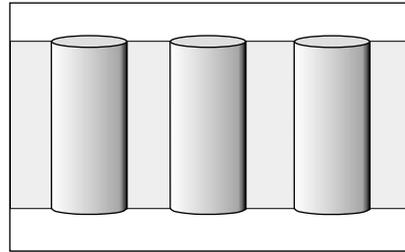
Start with three physical drives.



Create an array using the physical drives.

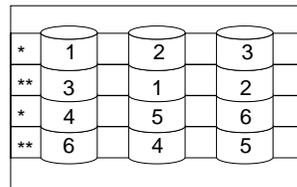


Then, create a logical drive within that array.



The data is striped across the drives, creating blocks.

Notice that the stripe labeled * is the data stripe and the stripe labeled ** is the copy of the preceding data stripe. Also notice that each block on the mirror stripe is shifted one drive.



With RAID level-1E, if one of the physical drives fails, the ServeRAID controller switches read and write requests to the remaining functional drives in the RAID level-1E array.

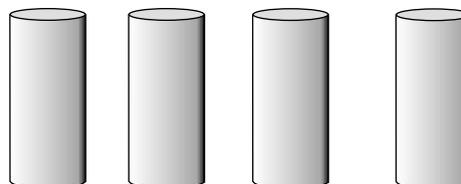
Understanding RAID level-5: RAID level-5 requires a minimum of three physical drives. This RAID level stripes data and parity across all drives in the array. When you assign RAID level-5 to an array, the capacity of the array is reduced by the capacity of one drive (for data-parity storage).

RAID level-5 offers both data protection and increased throughput. RAID level-5 gives you higher capacity than RAID level-1, but RAID level-1 offers better performance.

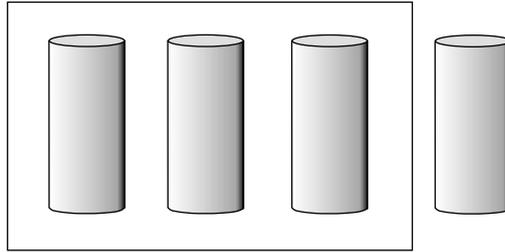
RAID level-5 requires a minimum of 3 drives and supports a maximum of 16 drives.

The following illustration is an example of a RAID level-5 logical drive.

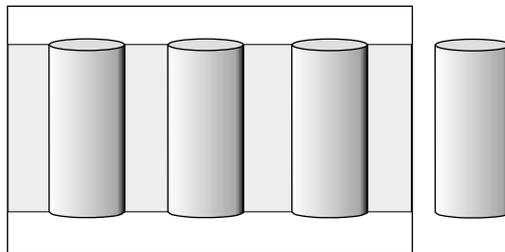
Start with four physical drives.



Create an array using three of the physical drives, leaving the fourth as a hot-spare drive.



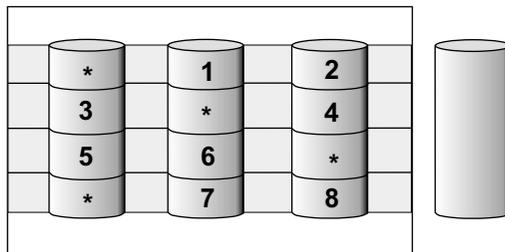
Then, create a logical drive within that array.



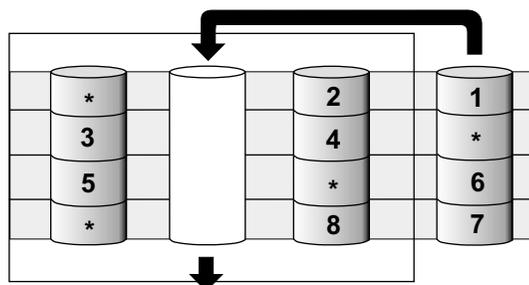
The data is striped across the drives, creating blocks.

Notice that the storage of the data parity (denoted by *) also is striped, and it shifts from drive to drive.

A parity block (*) contains a representation of the data from the other blocks in the same stripe. For example, the parity block in the first stripe contains data representation of blocks 1 and 2.



If a physical drive fails in the array, the ServeRAID controller switches read and write requests to the remaining functional drive in the RAID level-5 array, which is a hot-spare drive.



Understanding RAID level-5 Enhanced: RAID level-5 Enhanced (RAID level-5E) requires a minimum of four physical drives. RAID level-5E is also firmware-specific. You can think of RAID level-5E as “RAID level-5 with a built-in spare drive.”

Reading from and writing to four disk drives is more efficient than three disk drives and an idle hot spare and therefore improves performance. Additionally, the spare drive is actually part of the RAID level-5E array, as shown in the following example. With such a configuration, you cannot share the spare drive with other arrays. If you want a spare drive for any other array, you must have another spare drive for those arrays.

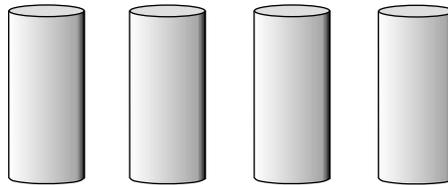
Like RAID level-5, this RAID level stripes data and parity across all of the drives in the array. When an array is assigned RAID level-5E, the capacity of the logical drive is reduced by the capacity of two physical drives in the array (that is, one for parity and one for the spare).

RAID level-5E offers both data protection and increased throughput, in addition to the built-in spare drive.

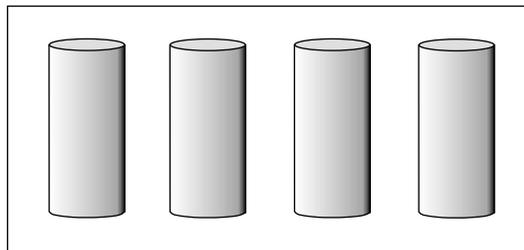
Note: For RAID level-5E, you can have only one logical drive in an array. When using RAID level-5E, you can have a maximum of seven logical drives on the controller.

RAID level-5E requires a minimum of 4 drives and supports a maximum of 16 drives. The following illustration is an example of a RAID level-5E logical drive.

Start with four physical drives.

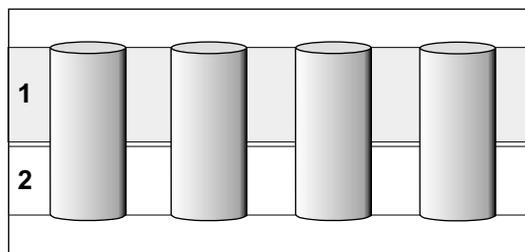


Create an array using all four physical drives.



Then, create a logical drive (labeled as 1) within the array.

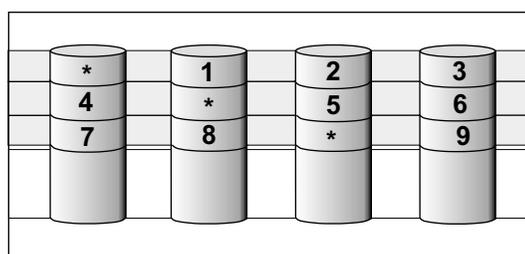
Notice that the distributed spare drive is the free space (labeled as 2) shown below the logical drive.



The data is striped across the drives, creating blocks in the logical drive.

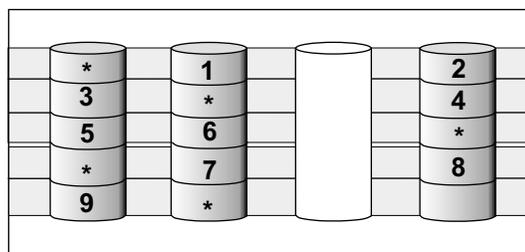
The storage of the data parity (denoted by ★) is striped, and it shifts from drive to drive as it does in RAID level-5.

Notice that the spare drive is **not** striped.



If a physical drive fails in the array, the data from the failed drive is compressed into the distributed spare drive. The logical drive remains RAID level-5E.

When you replace the failed drive, the data for the logical drive decompresses and returns to the original striping scheme.



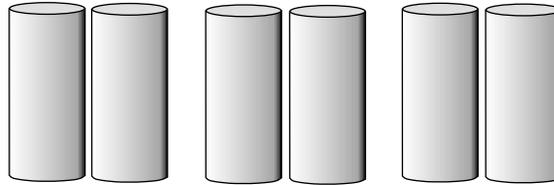
Note: The ServeRAID Manager program Express configuration does not default to RAID level-5E. If you have four physical drives, Express configuration defaults to RAID level-5 with a hot-spare drive.

Understanding RAID level-x0: RAID level-x0 refers to RAID levels-00, 10, 1E0, and 50. RAID level-x0 includes more physical drives in an array. The benefits of doing so are larger logical drives, increased performance, and increased reliability. RAID levels-0, 1, 1E, 5, and 5E cannot use more than 16 physical drives in an array. However, RAID levels-00, 10, 1E0, and 50 include more physical drives by managing an array of arrays, or a *spanned array*. The operating system uses the spanned array logical drive the same as a regular array logical drive.

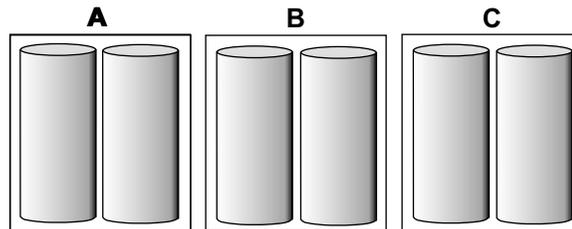
Note: RAID level-x0 is only available on the IBM ServeRAID-4H and ServeRAID-4L Ultra160 SCSI controllers. RAID level-x0 requires a minimum of 2 drives and supports a maximum of 60 drives.

The following illustration is an example of a RAID level-10 logical drive.

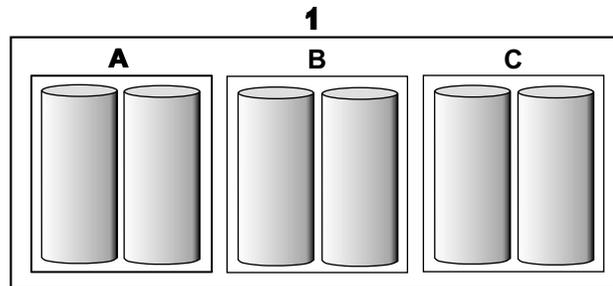
Start with six physical drives.



Create three arrays (labeled A, B, and C), each array using two physical drives.

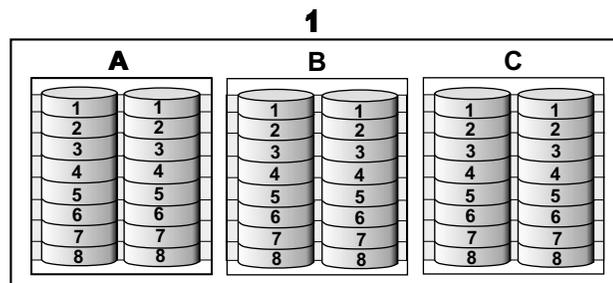


Then, create a *spanned* array (labeled as 1) that spans the three arrays.

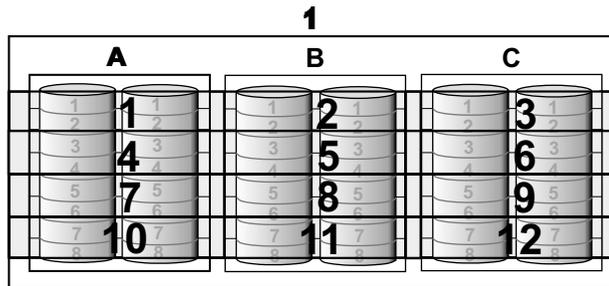


A sub-logical drive is created within *each* array (A, B, and C). Then, the data is striped across the physical drives in the array, creating blocks.

Notice that, in each array, the data on the drive on the right is a copy of the drive on the left. This is because the sub-logical drives (A, B, and C) are RAID level-1 in a RAID level-10 implementation (see the following table).



Then, create a logical drive within the spanned array (1). The data is striped across this logical drive, creating blocks. Notice that none of these blocks are redundant. This is because the logical drive (1) is RAID level-0 in a RAID level-x0 implementation (see the following table).



RAID level	means the sub-logical drive is	and the spanned array logical drive is
00	RAID level-0	RAID level-0
10	RAID level-1	RAID level-0
1E0	RAID level-1E	RAID level-0
50	RAID level-5	RAID level-0

With RAID level-10, 1E0, and 50, if one of the physical drives fails in a sub-logical drive, the ServeRAID controller switches read and write requests to the remaining functional drives in the sub-logical drive. With RAID level-00, a physical drive failure within the sub-logical drive results in loss of data.

Drive state descriptions

This section provides descriptions of the physical and logical drive states.

Physical drive state descriptions: The following table provides descriptions of the valid physical drive states.

Drive State	Meaning
Defunct	A physical drive in the online, hot-spare, or rebuild state has become defunct. It does not respond to commands, which means that the ServeRAID controller cannot communicate properly with the drive. If a physical drive has become defunct, refer to “Drive replacement (rebuilding a defunct drive)” on page 184.
Hot spare	A hot-spare drive is a physical drive that is defined for automatic use when a similar drive fails.
Online	The drive is online. It is functioning properly and is part of an array.
Rebuilding	The drive is being rebuilt. For more information on rebuilding a drive, refer to “Drive replacement (rebuilding a defunct drive)” on page 184.
Ready	The ServeRAID controller recognizes a ready drive as being available for definition.

Drive State	Meaning
Standby Hot Spare	A standby hot spare is a hot-spare drive that the ServeRAID controller has spun down. If an online drive becomes defunct and no suitable hot-spare drive is available, a standby hot-spare drive of the appropriate size automatically spins up, and enters the rebuild state.

Logical drive state descriptions: The following table provides descriptions of the valid logical drive states.

Drive State	Meaning
Blocked	<p>During a rebuild operation, the ServeRAID controller sets the state of any RAID level-0 logical drives associated with a failed array to the blocked state; then, it reconstructs the data that was stored in RAID level-1, RAID level-1E, RAID level-5 and RAID level-5E logical drives.</p> <p>After the rebuild operation completes, you can unblock the RAID level-0 logical drives, and access them once again. However, the logical drive might contain damaged data. You must either re-create, reinstall, or restore the data from the most recent backup disk or tape to the RAID level-0 logical drive.</p>
Critical Migrating	A logical drive in the critical state that is undergoing a logical drive migration (LDM).
Critical System	The ServeRAID controller uses this reserved state during a logical drive migration (LDM) when the logical drive is in the critical state.
Critical	<p>A RAID level-1, RAID level-1E, RAID level-5, or RAID level-5E logical drive that contains a defunct physical drive is in the critical state. A critical logical drive is accessible, despite a physical drive failure.</p> <p>Attention: If the state of the logical drive is critical, refer to “Drive replacement (rebuilding a defunct drive)” on page 184.</p>
Migrating	The logical drive is undergoing a logical drive migration; that is, a change in RAID levels, a change in logical drive size, an increase in free space, or a RAID level-5E compression or decompression.
Offline	<p>The logical drive is offline and not accessible. This state occurs when one of the following is true.</p> <ul style="list-style-type: none"> • One or more physical drives in a RAID level-0 logical drive are defunct. • Two or more physical drives in a RAID level-1, RAID level-1E, or RAID level-5 logical drive are defunct. • Three or more drives in a RAID level-5E logical drive are defunct. <p>If any of these are true, refer to “Drive replacement (rebuilding a defunct drive)” on page 184.</p>
Okay	The logical drive is okay. It is in a good, functional state.
System	The ServeRAID controller uses this reserved state during logical drive migration (LDM).

Device drivers: The ServeRAID controller requires the installation of device drivers. See the README file on the Device Driver Diskette and Device Drivers for SCO Operating Systems for detailed instructions.

If the operating system is installed from the ServerGuide CD, the device drivers are installed automatically. However, if the operating system is installed from another source, the device drivers must be installed. See the README file on the Device Driver diskette for installation instructions.

Miscellaneous programs: The IPSSEND and IPSMON programs are advanced command-line programs that can be used to manage the ServeRAID controllers. You can use the IPSSEND program to view the configuration of a ServeRAID controller, rebuild a defunct drive, and perform other functions. You can use the IPSMON program to monitor a ServeRAID controller for defunct drives, predictive failure analysis (PFA) warnings, rebuild operations synchronizations, and logical drive migration. See the README files for installation instructions.

Using ServeRAID Controllers to avoid data loss: RAID-5 and RAID-1 technology provides the ability to continue operation after the failure of a hard drive and the ability to rebuild the lost data onto a replacement drive. In conjunction with the bad sector remapping capabilities of the hard drives, RAID-5 and RAID-1 can also help recreate data lost due to sector media corruption.

Defective sectors on hard drives are not uncommon. Data scrubbing helps you detect and correct these errors before they become a problem. If the ServeRAID Array is not properly set up and/or maintained, a significant risk of data loss grows with the passage of time. This manual examines how to avoid data loss wherever possible.

Drive failures: Three types of drive failures can typically occur in a RAID-5 or RAID-1 subsystem that may endanger the protection of stored data:

- “Catastrophic drive failures”
- “Grown sector media errors”
- “Combination failures” on page 205

Catastrophic drive failures: How They Occur

Catastrophic drive failures occur when all data on a drive, including the ECC data written on the drive to protect information, is completely inaccessible due to mechanical or electrical problems.

Grown sector media errors: How They Occur

Grown sector media errors occur due to the following:

- Latent imperfections on the disk
- Media damage due to mishandling of the disk
- Harsh environments

The drive itself can often repair these errors by recalculating lost data from Error Correction Code (ECC) information stored within each data sector on the drive. The drive then remaps this damaged sector to an unused area of the drive to prevent data loss.

Note: Sector media errors, which affect only a small area of the surface of the drive, may not be detected in seldom used files or in non-data areas of the disk. These errors are only identified and corrected if a read or write request is made to data stored within that location.

Data scrubbing forces all sectors in the logical drive to be accessed so that sector media errors are detected by the drive. Once detected, the drive's error recovery procedures are launched to repair these errors by recalculating the lost data from the ECC information described above. If the ECC information is not sufficient to recalculate the lost data, the information may still be recovered if the drive is part of a RAID-5 or RAID-1 array. RAID-5 and RAID-1 arrays can provide their own redundant information (similar to the ECC data written on the drive itself), which is stored on other drives in the array. The ServeRAID controller can recalculate the lost data and remap the bad sector.

Note:

The act of synchronization executes data scrubbing.

Data scrubbing can be performed in the background while allowing concurrent user disk activity on RAID-5 and RAID-1 logical drives.

Combination failures: How They Occur

Combination failures occur when a catastrophic drive failure occurs while there are still undetected, uncorrected sector media errors on the remaining drives in the array; the controller cannot rebuild all the data. In such cases, a double failure exists; files must be restored from backup media.

See “Combination failure protection” on page 208 for information about protection provided at the ServeRAID controller level.

Note: IBM provides management software, Netfinity Director, with IBM servers that ship with ServerGuide. The software monitors the status of the hardware and provides alerts when conditions are not optimal. Netfinity Director enables customers to obtain all of the information necessary for data protection. Installation of Netfinity Director or similar tools to monitor and track disk subsystem integrity is critical for the protection of stored data.

Drive protection features: Note: This section explains the Drive Protection Features in greater detail. You may wish to skip this section and proceed to the procedures for synchronization and data scrubbing in the next section.

The following sections describe the drive protection features of the ServeRAID controllers:

- “Remapping bad sectors”
- “Error Correction Code (ECC)”
- “Predictive Failure Analysis (PFA)”

Remapping bad sectors: Sector media errors that show up over time usually only affect a single 512 byte block of data on the disk. This sector can be marked as “bad”; the location can then be reassigned, or “remapped,” to a spare sector of the drive.

Most drives reserve one spare sector per track of data and can perform this operation automatically.

Error Correction Code (ECC): The drive avoids potential problems by using only “reliable” sections of the disk when remapping bad sectors.

For example, if a media problem develops after the data has been written, during a disk read, most drives can correct minor sector media errors automatically by using error correction code (ECC) information stored along with the data and then used in rewriting the data on the disk. If the sector is badly damaged and the data cannot be reliably rewritten to the same spot, the drive remaps the data to a spare sector on the disk. If the sector is very badly damaged, the drive may not be able to recreate the data automatically with the ECC. If no other protection (such as RAID) is in place, the system reports a read failure and the data is lost. These lost data areas are typically reported to the user via operating system messages.

Predictive Failure Analysis (PFA): Note: Replace all PFA drives as soon as possible.

As with any electrical/mechanical device, there are two basic failure types:

1. *Gradual performance degradation* of components can create a catastrophic drive failure (see “Catastrophic drive failures” on page 204).

Predictive Failure Analysis performs the following remedial operations:

- Monitors performance of drives

- Analyzes data from periodic internal measurements
- Recommends replacement when specific thresholds are exceeded

The data from periodic internal measurements is collected when data sectors are accessed.

Data scrubbing performs the following operations:

- Forces all data sectors to be read
- Provides more data to improve the accuracy of PFA

The thresholds have been determined by examining the history logs of drives that have failed in actual customer operation. When PFA detects a threshold exceeded failure, the system administrator can be notified through Netfinity Director. The design goal of PFA is to provide a minimum of 24 hours warning before a drive experiences “catastrophic” failure.

2. A cable breaking, a component burning out, a solder connection failing, are all examples of “on/off” *unpredictable catastrophic failures*. As assembly and component processes have improved, these types of defects have been reduced but not eliminated. PFA cannot always provide warning for on/off unpredictable failures.

Device Event Table: This table contains counters indicating the number of times unexpected events were reported through the storage subsystem. These events may be caused by several sources, including:

ServeRAID controller, Cables (external and internal), Connectors, Hot-Swap Backplane(s), Hot-Swap Drive Trays, Target Devices (Disk Drives, CD-ROMs, etc.), and SCSI Terminators.

The Device Event Table can be displayed using the IPSSSEND program or the .

Using the IPSSSEND program

Note: In the following command, replace <controller> with the ServeRAID controller number.

At a command prompt, type the following:

```
ipssend getevent <controller> device
```

Frequently asked questions regarding the Device Event Table: In the

Device Event Table, what are hard events?: The hard event count entry in the device event table is a count of events detected by the SCSI I/O processor since the Device Event Table was last cleared. These events are usually not caused by the target device. The controller processor can detect many types of events. Usually these events are related to SCSI cabling, back planes or internal problems in the ServeRAID controller. Hard events are usually not related to the hard drives or other SCSI devices that are on the bus.

How should hard events be handled?: If you find a hard event entered into the Event log, first check to see if there is a discernible pattern to the events in the device error table. For example a large number of events on a particular drive or channel may indicate a problem with the cabling or back plane for that particular drive, channel, etc. Always check for cables being properly seated, bent pins, pushed pins, damaged cables and proper termination. Before replacing the ServeRAID controller, replace the SCSI cables followed by the back plane. If you have exhausted all other possibilities, then replace the ServeRAID controller. Remember that the ServeRAID card is the least likely item in the subsystem to cause hard events and the most expensive to replace.

In the Device Event Table what is the meaning of soft events?: The soft event entry in the device error table is a count of the SCSI check conditions (other than unit attention)

received from the target device (hard disk drive, CD ROM, tape drive, etc.) since the Device Error Table was last cleared. There are many types of SCSI check conditions that can be received by the ServeRAID controller. Some of the check conditions indicate errors while others indicate unexpected (but not error) conditions such as the command queue on a drive being temporarily full.

How should soft events be handled?: An occasional soft event in the absence of PFA, parity and hard event entries is usually not a problem. Check for cables being properly seated, bent pins, pushed pins, damaged cables and proper termination of the SCSI bus. No further action is necessary if there are only a small number of random events.

Is there a threshold guide line to follow before replacing the drive?: As with hard errors, a pattern of entries for a particular drive or channel may indicate a problem. There is not an absolute threshold for soft errors and when drives should be replaced. The ServeRAID controller internally filters the types of soft errors and will mark a disk drive defunct when appropriate.

In the Device Error Table what is the meaning of parity events?: The parity event entry in the device event table is the number of parity or ECC errors on the SCSI bus found by the ServeRAID controller since the last time the Device Event Table was cleared. Parity errors found by the targets (hard disk drive, tape drive, etc.) are reported as soft events.

How should parity events be handled?: Check for cables being properly seated, bent pins, pushed pins, damaged cables and proper termination of the SCSI bus. If some or all of the devices are operating at Fast or Ultra speeds, then ensure that the maximum cable lengths for the SCSI interface are not exceeded. No further action is necessary if there are only a small number of random events. A large number of events on a particular channel or to a particular target may require replacement of the backplane or SCSI cabling. It is possible but unlikely that the ServeRAID controller has caused the parity errors.

In the Device Event Table what is the meaning of miscellaneous events?: Miscellaneous events are all entries that are not parity, soft, hard or PFA entries. Miscellaneous events are very often target (hard drive, tape drive, etc.) problems.

How should miscellaneous events be handled?: Some common events that cause miscellaneous errors are selection time-out when accessing the drive, unexpected SCSI bus free detected by the SCSI I/O processor or SCSI phase error. Check for cables being properly seated, bent pins, pushed pins, damaged cables and proper termination of the SCSI bus. If all the preceding items are correct, then suspect the target indicated in the log. The least likely cause would be a problem in the ServeRAID controller.

What is PFA and do all drives have this capability?: PFA stands for Predictive Failure Analysis. Most server class hard disk drives have the capability of monitoring internal parameters in the drive that could predict a future failure in the drive. The algorithms and data monitored are very complex and in most cases proprietary.

If a drive determines that a failure is likely, then it notifies the ServeRAID controller of a possible future failure. This notification is included as a Device Event Table entry. Any drive with a PFA entry in the Device Event Table should be replaced as soon as possible.

How should PFA events be handled?: For RAID-1 or RAID-5, replace the drive immediately and rebuild the array. For RAID-0 back up all data to tape immediately, replace the drive and then restore the data to the RAID-0 array.

RAID-5 controller level protection: At the controller level, RAID-5 has become an industry standard method to provide increased availability for servers. RAID-5 and RAID-1 implementations allow servers to continue operation even if there is a “catastrophic” failure of a hard drive.

During normal operations in a RAID-5 environment, redundant information is calculated and written out to the drives. In a n disk environment, $n-1$ disks of data are provided with one disk of space dedicated to redundant “check sum” or “parity” information. For example, three 2GB drives provide 4GB of data space and 2GB of redundancy.

Note: The redundant data is actually spread out over all the disks for performance reasons.

Catastrophic disk failure protection: If a drive that is a member of a RAID-5 array fails, the remaining members of the array can use their redundant information to recalculate the lost data, either to respond to user requests for data or to rebuild the data stored on the lost drive when it is replaced with a new one.

For example, information in Record 1 from Drive 1 is combined with the check sum information on Drive 3 to recreate information that is not available from Drive 2.

As long as the array controller can access the remaining $n-1$ drives, the rebuild will be successful. Naturally, if a second disk failure were to suddenly occur, the array and its data would be lost. RAID-5 can only protect against the loss of a single drive.

Grown sector media error protection: In this scenario, as the drive attempts to read data in a read request, it determines that Record 1 of Disk 1 has a bad sector. If the media error is minor, the drive corrects or remaps the information using the drive ECC information, which is transparent to the RAID array.

If the disk cannot recreate the information from the ECC information on the drive, the controller determines if the data is still lost, as it was without RAID support. In such a case, ServeRAID controllers can recognize the fault and re-create the data from redundant information stored on other drives.

For example:

1. Record 1 is corrected from data stored in Record 2 on Drive 2 and check sum information on Drive 3.

The ServeRAID controller requests that Record 1 be rewritten.

2. The drive remaps the bad sector elsewhere on the drive. Record 1 now has good data.

In this example, RAID-5 has increased the availability of the information by re-creating data that otherwise would have been lost. It is initially assumed that this process was initiated by accessing this data on the drive. Were this data not accessed, this error would not be detected. This problem can be significant if a catastrophic failure occurs before the data is corrected.

Combination failure protection: In this example, an undetected sector media error exists within Record 1 of Disk 1.

This error occurred within an archived section of the user's database that is seldom accessed. Before this error is recognized and corrected, a “catastrophic” failure of Drive 2 is sustained. So far, no data problems are noticed.

User requests for information other than Record 1 can still be serviced with RAID protection and data recalculation. When Drive 2 is replaced and a rebuild is initiated, the ServeRAID controller attempts to recalculate Record 2 from the failed Drive 2 by

combining Record 1 with the check sum data on Drive 3. At this point, the media sector error is discovered.

- If the error is minor, the disk can re-create the missing information from its ECC data (as before) and potentially remap the bad sector.
- If the error is too severe, the disk cannot recover the data. The rebuild process cannot complete successfully because it does not have a complete Record 1 to combine with the check sum data to rebuild the lost data on Drive 2. The Rebuild, therefore, skips that stripe and continues rebuilding the rest of the logical drive. Once the rebuild has completed, a “rebuild failed” message is displayed.

The ServeRAID controller brings the rebuilt drive online and takes the array out of “critical” mode. To protect data integrity, it also blocks access to the damaged stripes of the array. Data files covered by these damaged stripes still report data errors and must be restored from a previous backup. The necessity for a full restore due to a “rebuild failed” message caused by one or two bad stripes is thereby prevented.

Configuration procedures required to provide RAID-5 protection: Synchronization and initialization are required before installing an operating system or storing any customer data on a RAID-5 array for data integrity and to provide data protection. The RAID-5 arrays write data out to drives in stripe units.

The size of the stripe unit can be configured to:

- 8KB
- 16KB
- 32KB
- 64KB

Synchronization performs the following operations:

- Reads all the data bits in each stripe unit
- Calculates the parity for that data
- Compares the calculated parity with the existing parity for all stripe units in the array
- Updates the existing parity, if inconsistent

Initialization writes zeroes out to the logical drive.

Operating systems may not install properly if the first few sectors are not set to zero (approximately the first 32 sectors).

After creating an array, the user must create a logical drive. *Physical drives* are the individual disk drives that are inside the machine. A *logical drive* is the drive that the array controller shows the operating system. A logical drive spans across multiple physical drives.

All redundant RAID logical drives are automatically synchronized by the ServeRAID-4 controller in the background when the logical drive is defined. No other user action is required.

Providing additional protection for redundant RAID logical drives: Full tape backups and automatic data scrubbing provide protection against multiple drive failure and unprotected grown media defects.

Full tape backups: Periodic full tape backups force all data files to be read and copied to tape. This procedure provides two advantages:

- It provides an archive of all data in case it is needed to restore from a multiple drive failure or user error that could cause data loss/corruption.

- By reading every file on the disk, the backup process forces the disk and the controller to discover any sector media errors and to correct them, greatly decreasing the likelihood of the rebuild failures described in the previous section. If weekly tape backups are performed, data scrubbing is still recommended to detect and correct sector media errors in non-data areas of the drives.

If a sector media error has not been discovered and an array rebuild fails as described previously, a full tape backup can then be performed to minimize data loss. The tape backup saves all files except for the one containing the damaged sector. The drives can then be restored from the configuration disk and synchronized, forcing the remapping of bad sectors. The data can then be restored. The files that were contained on the damaged sector would then have to be restored from a prior backup.

Automatic Data scrubbing: Automatic data scrubbing continuously reads all sectors of all logical drives in the background while the system is running. If a defective sector is found, it is automatically repaired. The advantage to this procedure, when used in addition to tape backups, is that data scrubbing examines unallocated sectors of the drive, in addition to those that have been allocated, that is, data areas protected by a tape backup. If any sector media errors are found during this process, they are corrected at the disk level using disk ECC information, if possible, or at the array level using RAID parity information, if necessary. Automatic data scrubbing is enabled by defaults.

Note: You do not need to synchronize RAID level-0 or 1 logical drives before storing data.

Data scrubbing continuously reads all sectors of RAID-1 and RAID-5 logical drives in the background while the system is running. If a defective sector is found, it is automatically repaired. As a result of this feature, you no longer have to synchronize logical drives on a weekly basis.

Acronyms, terms, and definitions

Acronyms and terms are listed in alphabetical order in the following table.

array An arrangement of data in one or more dimensions: a list, a table, or a multidimensional arrangement of items. In the ServeRAID environment, data is striped across multiple physical hard drives. The array is defined as the set of hard drives included in the data striping.

block A string of data elements recorded or transmitted in a unit. The elements may be characters, words, or physical records.

byte A string of eight bits that is treated as a unit, and that represents a character.

cache memory

A special buffer storage, smaller and faster than main storage, that is used to hold a copy of instructions and data in main storage that are likely to be needed next by the processor, and that have been obtained automatically from main storage.

CDR CD-ROM

CRT Critical

DASD Direct access storage device.

Data Scrubbing

The process that forces all data sectors in a logical drive to be accessed so that sector media errors are identified and corrected at the disk level using disk ECC information, if possible, or at the array level using ServeRAID parity information, if necessary. For a high level of data protection, perform data scrubbing weekly.

DDD Defunct disk drive.

defunct Unrecoverable; failed; not responding.

DHS Defunct hot-spare. A hot-spare or standby hot-spare drive enters the defunct hot-spare (DHS) state if it fails to respond to the adapter commands. Once a Defunct (DHS) drive is replaced, its state changes from DHS to HSP. Only the IBM ServeRAID adapter has the DHS state.

disk array

A grouping of hard disks that can be logically considered one drive.

A grouping of hard disks over which a data file is spread.

electronically erasable programmable read-only memory (EEPROM)

A PROM that can be erased by a special process and reused.

EMP Empty. No device is present in the SID or the adapter cannot communicate with the drive. This state is represented with dashes (- - -) on the IBM ServeRAID configuration screen, or a blank space on the Administration and Monitor screen. Only the IBM ServeRAID adapter has this state.

GB Gigabyte; equal to approximately one billion bytes.

hard disk drive

A stand-alone disk drive that reads and writes data on rigid disks.

hot-spare drive

A hard disk drive that is installed in a computer and configured by the system for use in the event of a drive failure.

HSP Hot-Spare. In the ServeRAID family of controllers, a hot-spare (HSP) drive is a drive designated to be a replacement for the first Defunct (DDD) drive that occurs. The state of the drive appears as HSP. When a Defunct (DDD) drive occurs and a HSP is defined, the hot-spare drive takes over for the drive that appears as Defunct (DDD). The HSP drive is rebuilt to be identical to the Defunct (DDD) drive. During the rebuilding of the HSP drive, this drive changes to the Rebuild (RBL) state. The RBL state will turn to ONL once the drive is completely rebuilt and fully operating for the Defunct (DDD) drive.

initialize

To set counters, switches, addresses, or contents of storage to zero or other starting values at the beginning of, or at prescribed points in, the operating of a computer routine.

To prepare for use; for example, to initialize a hard disk or diskette.

interleave

To arrange parts of one sequence of things or events so that they alternate with parts of one or more other sequences of the same nature and so that each sequence retains its identity.

interleave depth

The granularity at which data from one file is stored on one drive of the array before subsequent data is stored on the next drive in the array.

interleaving

The simultaneous accessing of two or more bytes or streams of data from distinct storage units.

ISPR Interrupt Status Port register.

KB Kilobyte; equal to approximately 1000 bytes.

LDM Logical drive migration.

logical drive

Part of an array.

The array specifies which drives to include in the striping of data. Each array is subdivided into one or more logical drives. The logical drives specify the following:

- The number and size of the physical drives as seen by the operating system. The operating system sees each defined logical drive as a physical drive.
- The RAID level. When a logical drive is defined, its ServeRAID level (0, 1, or 5) is also defined.

low-level format

The writing of track and sector control information on the disk so that a computer system can store data in and subsequently retrieve data from the disk.

mapping

The establishing of correspondences between a given logical structure and a given physical structure.

MB Megabyte; equal to approximately 1 000 000 bytes.

menu-driven

Concerning application software allowing user to select operations from one or more menus without entering keyboard commands.

mirroring

The process of writing the same data to two disk units within the same auxiliary storage pool (disk array) at the same time. The two disk units become a mirrored pair, allowing the system to continue when one of the mirrored units fails.

non-volatile random access memory (NVRAM)

Random access memory that retains its contents after electrical power is shut off.

NVRAM Non-volatile random access memory.

OFL Offline, a good drive that replaces a defunct drive in a RAID level-1 or level-5 array. This drive is associated with the array but does not contain any data. Drive status remains OFL during the rebuild phase.

OKY Good functional state. The ServeRAID adapter's logical drive state in which all drives in the array are online and fully operational.

ONL Online, a drive that ServeRAID adapter detects as installed, operational, and configured into an array appear as this state.

overlap To perform an operation at the same time another operation is being performed; for example, to perform input/output operations while instructions are being executed by the processing unit.

parity The state of being odd or even used as the basis of a method of detecting errors in binary-coded data.

parity bit

A binary digit appended to a group of binary digits to make the sum of all the digits, including the appended binary digit, either odd or even as pre-established.

PFA The firmware of a hard drive uses algorithms to track the error rates on the drive. The drive alerts the user with a Predictive Failure Analysis (PFA) alert via the and Netfinity Director when degradation of drive performance (read/write errors) is detected. When a PFA alert occurs, physical replacement of the drive is recommended.

pop-up window

A box on the display screen that displays information or asks the user to make choices.

POST Power-on self-test.

RAID Redundant array of independent disks.

RBL Rebuild. A drive in this state is being rebuilt. Only the IBM ServeRAID adapter has this state.

RDY Ready. RDY appears as the status of a drive that the ServeRAID adapter detects as installed, spun up, but not configured in an array.

redundancy

In a functional unit, the existence of more than one means for performing a required function.

RAID-0 RAID level-0 stripes the data across all of the drives of the array. RAID-0 offers substantial speed enhancement, but provides for no data redundancy. Therefore, a defective hard disk within the array results in loss of data in the logical drive assigned level-0, but only in that logical drive.

RAID-1 RAID level-1 provides an enhanced feature for disk mirroring that stripes data as well as copies of the data across all the drives of the array. The first stripe is the data stripe, and the second stripe is the mirror (copy) of the first data stripe. The data in the mirror stripe is written on another drive. Because data is mirrored, the capacity of the logical drive when assigned level-1 is 50% of the physical capacity of the grouping of hard disk drives in the array.

RAID-5 RAID level-5 stripes data and parity across all drives of the array. When a disk array is assigned RAID-5, the capacity of the logical drive is reduced by one physical drive size because of parity storage. The parity is spread across all drives in the array. If one drive fails, the data can be rebuilt. If more than one drive fails but one or none of the drives are actually defective, then data may not be lost. You can use a process called software replacement on the non-defective hard drives.

SID SCSI ID. A zero based counting scheme (0, 1, ... 15) for the SCSI devices on a channel.

SBY Standby. A standby drive is a hard disk drive that the ServeRAID adapter has spun down. Devices such as tape drives and CD-ROM drives are also considered to be in a standby state. Only the IBM ServeRAID adapter has the state.

sector A predetermined angular part of a track or band on a magnetic disk that can be addressed.

server In a network, a data station that provides facilities to other stations; for example, a file server, a print server, a mail server.

stripe The collection of sectors, in logical order, from the first to the last drive of the disk array, over which data is stored.

striping The process of storing data across all the drives grouped in an array.

synchronize

In a disk array, to compute and store the parity of all the data in the array.

software replace

Refers to when the hard disk drive is not physically replaced in the system. A drive may have been marked defunct but brought back online using . The drive is rebuilt without having been physically replaced. This could occur because, when the ServeRAID adapter communicates with the hard file and receives an unexpected response, the adapter marks the drive defunct to avoid any potential data loss.

synchronization

The process that reads all the data bits of the entire logical drive, calculates the parity bit for the data, compares the calculated parity with the existing parity, and updates the existing parity if inconsistent.

SYS System.

TAP Tape.

throughput

A measure of the amount of work performed by a computer system over a period of time, for example, number of jobs per day.

toggle To switch between two modes.

WB Write-back.

write-back

WB.

The write policy mode that sends a completion status to the system when the data is entered into memory.

Compare with *write-through*.

write operation

An output operation that sends a processed record to an output device or an output file.

write policy

The mode set by the system controller that determines when the completion status is sent to the system; it can be either when the data is written to the hard disk (write-through mode) or when the data is entered into memory (write-back mode).

WT Write-through.

write-through

WT.

The write policy mode that sends a completion status to the system when the data is written to the device.

Compare with *write-back*.

Symptom-to-FRU index

This index supports Netfinity 7600 – Type 8665 servers.

Notes:

1. Check the configuration before you replace a FRU. Configuration problems can cause false errors and symptoms.
2. The default configuration can be loaded by starting the system and then pressing the reset button four times, waiting 15 seconds between each press. Once the configuration has reset to the default, it must be saved in Setup to be stored in CMOS.
3. For IBM devices not supported by index, refer to the manual for that device.
4. Always start with “Chapter . General checkout,” on page 1.

The Symptom-to-FRU lists symptoms, errors, and the possible causes. The most likely cause is listed first. Use this Symptom-to-FRU index to help you decide which FRUs to have available when servicing the computer. The POST BIOS displays POST error codes and messages on the screen.

Beep symptoms

Beep symptoms are short tones or a series of short tones separated by pauses (intervals without sound). See the following examples.

Note: One beep after successfully completing POST indicates the system is functioning properly.

Beeps	Description
1-2-3	<ul style="list-style-type: none"> • One beep • A pause (or break) • Two beeps • A pause (or break) • Three Beeps
4	Four continuous beeps

Beep/Symptom	FRU/Action
1-1-3 (CMOS write/read test failed)	<ol style="list-style-type: none"> 1. Battery 2. I/O Legacy Board
1-1-4 (BIOS EEPROM checksum failed)	<ol style="list-style-type: none"> 1. I/O Legacy Board
1-2-1 (Programmable Interval Timer failed)	<ol style="list-style-type: none"> 1. I/O Legacy Board
1-2-2(DMA initialization failed)	<ol style="list-style-type: none"> 1. I/O Legacy Board
1-2-3(DMA page register write/read failed)	<ol style="list-style-type: none"> 1. I/O Legacy Board

Beep/Symptom	FRU/Action
1-2-4 (RAM refresh verification failed)	1. DIMM 2. Processor/PCI Board 3. Memory Card
1-3-1 (1st 64K RAM test failed)	1. DIMM 2. Processor/PCI Board 3. Memory Card
1-3-2 (1st 64K RAM parity test failed)	1. DIMM 2. I/O Legacy board
2-1-1 (Secondary DMA register failed)	1. I/O Legacy Board
2-1-2 (Primary DMA register failed)	1. I/O Legacy Board
2-1-3 (Primary interrupt mask register failed)	1. I/O Legacy Board
2-1-4 (Secondary interrupt mask register failed)	1. I/O Legacy Board
2-2-2 (Keyboard controller failed)	1. I/O Legacy Board 2. Keyboard
2-2-3 (CMOS power failure and checksum checks failed)	1. Battery 2. I/O Legacy board
2-2-4 (CMOS configuration info validation failed)	1. Battery 2. I/O Legacy board
2-3-1 (Screen initialization failed)	1. Jumper on J6 2. I/O Legacy Board
2-3-2 (Screen memory failed)	1. I/O Legacy board
2-3-3 (Screen retrace failed)	1. I/O Legacy board
2-3-4 (Search for video ROM failed)	1. I/O Legacy board
2-4-1 (Video failed, screen believed operable)	1. I/O Legacy board
3-1-1 (Timer tick interrupt failed)	1. I/O Legacy Board
3-1-2 (Interval timer channel 2 failed)	1. I/O Legacy Board
3-1-3 (RAM test failed above address OFFF h)	1. DIMM 2. Memory card 3. Processor/PCI board 4. I/O Legacy board
3-1-4 (Time-Of-Day clock failed)	1. Battery 2. I/O Legacy Board
3-2-1 (Serial port failed)	1. I/O Legacy board
3-2-2 (Parallel port failed)	1. I/O Legacy board

Beep/Symptom	FRU/Action
3-2-3 (Math coprocessor failed)	<ol style="list-style-type: none"> 1. Optional processor (if installed) 2. Processor 3. Processor/PCI board
3-2-4 (Failure comparing CMOS memory size against actual)	<ol style="list-style-type: none"> 1. DIMM 2. Processor/PCI board 3. Battery 4. I/O Legacy board
3-3-1 (Memory size mismatch occurred, see "Memory Settings" on page 47)	<ol style="list-style-type: none"> 1. DIMM 2. Processor/PCI board 3. Battery
3-3-2 (Critical SMBUS error occurred)	<ol style="list-style-type: none"> 1. Disconnect the server power cord from outlet, wait 30 seconds and retry. 2. I/O Legacy Board 3. Processor/PCI Board 4. DIMMs 5. Memory Card 6. DASD Backplane 7. Power Supply 8. Power Supply Backplane 9. 12C Cable
3-3-3 (No operational memory in system)	<ol style="list-style-type: none"> 1. Install or reseat the memory modules, then power-on the system (see "Using the Configuration/Setup Utility program" on page 43). 2. If problem persists, restart the system 3 times. Note: Restarting the system three times will load default settings. 3. DIMMs 4. Memory Board 5. Processor/PCI Board 6. I/O Legacy Board
Two Short Beeps (Information only, the configuration has changed)	<ol style="list-style-type: none"> 1. Run Diagnostics 2. Run Configuration/Setup
Three Short Beeps	<ol style="list-style-type: none"> 1. DIMM 2. Processor/PCI Board 3. I/O Legacy Board
One Continuous Beep	<ol style="list-style-type: none"> 1. Processor 2. Optional Processor (if installed) 3. Processor/PCI Board 4. I/O Legacy Board
Repeating Short Beeps	<ol style="list-style-type: none"> 1. Keyboard 2. I/O Legacy Board
One Long and One Short Beep	<ol style="list-style-type: none"> 1. Video adapter (if present) 2. I/O Legacy Board

Beep/Symptom	FRU/Action
One Long and Two Short Beeps	<ol style="list-style-type: none"> 1. Video adapter (if present) 2. I/O Legacy Board
Two Long and Two Short Beeps	<ol style="list-style-type: none"> 1. Video adapter

No beep symptoms

No Beep Symptom	FRU/Action
No beep and the system operates correctly.	<ol style="list-style-type: none"> 1. Diagnostic LED Panel
No Beeps occur after successfully completing POST (The Power-On Status is disabled.)	<ol style="list-style-type: none"> 1. Run Configuration/Setup, set the Start Options Power-On Status to enable. 2. Diagnostic LED Panel 3. I/O Legacy Board
No ac power (Power supply ac LED is off)	<ol style="list-style-type: none"> 1. Check the power cord. 2. Power Supply (If two are installed, swap them to determine if one is defective.) 3. Power Backplane
No beep and no video	<ol style="list-style-type: none"> 1. See “Undetermined problems” on page 241
System will not power-up (Power supply ac LED is on)	<ol style="list-style-type: none"> 1. See “Power supply LED errors” on page 225

Diagnostic panel LEDs

The system error LED is turned on when an error is detected. If the system error LED is on, remove the cover and check the diagnostic panel LEDs. The following is a complete list of diagnostic panel LEDs followed by the FRU/Action for correcting the problem.

Note: If a diagnostic panel LED is on and the information LED panel system error LED is off, there is probably an LED problem. Run LED diagnostics.

Notes:

- 1.To locate the LEDs on the processor board see “Processor board component locations” on page 55.
- 2.Check the System Error Log for additional information before replacing a FRU.
- 3.It may be necessary to view the system error log from a remote connection, such as MOST.
- 4.The memory card DIMM error LEDs, processor error LEDs, and VRM error LEDs turn off when the system is powered down.

Diagnostic Panel LED	FRU/Action
All LEDs off (Check System Error Log for error condition, then clear System Error Log when the problem is found.)	<ol style="list-style-type: none"> 1. System Error Log is 75% full; clear the log. 2. Bad, missing or mis-installed processor terminator; remove and reinsert terminator. 3. PFA alert; check Netfinity log for failure; clear PFA alert; remove AC power for at least 20 seconds, reconnect, then power up system. 4. If failure reading I2C device, check devices on bus "X"; see "I2C bus fault messages" on page 239. 5. Run Information Panel diagnostics.
CPU LED on (The LED next to the failing CPU should be on.)	<ol style="list-style-type: none"> 1. Processor 1, 2, 3, or 4. 2. Processor/PCI Board.
VRM LED on (The LED next to the failing VRM should be on.)	<ol style="list-style-type: none"> 1. Corresponding voltage regulator module. 2. Processor/PCI Board.
DASD LED on (Check amber drive LED for a failing hard drive.)	<ol style="list-style-type: none"> 1. Be sure the fans are operating correctly and the air flow is good. 2. Failing drive. 3. SCSI Backplane.
FAN LED on	<ol style="list-style-type: none"> 1. Check individual fan LEDs. 2. Replace respective fan. 3. Fan Cable. 4. Processor/PCI Board. 5. I/O Legacy Board. 6. Power Backplane Board.
MEM LED on (The LED next to the failing DIMM is on.)	<ol style="list-style-type: none"> 1. Failing DIMM(s) in slot J1-J16. 2. Memory Card. 3. Processor/PCI Board.
NMI LED on	<ol style="list-style-type: none"> 1. Reboot the system. 2. Check the System Error Log.
PCI A LED on	<ol style="list-style-type: none"> 1. PCI Card in slot 1 or 2. See "Processor board component locations" on page 55. 2. Remove all PCI adapters from slots 1-6. 3. Processor/PCI Board 4. I/O Legacy Board.
PCI B LED on	<ol style="list-style-type: none"> 1. Card in slots 3-6. See "Processor board component locations" on page 55. 2. Remove all PCI adapters from slots 1-6. 3. Processor/PCI Board. 4. I/O Legacy Board.
PCI C LED on	<ol style="list-style-type: none"> 1. Remove all PCI adapters from slots 1-6. 2. Processor/PCI Board. 3. I/O Legacy Board.

Diagnostic Panel LED	FRU/Action
PS1 LED on	<ol style="list-style-type: none"> 1. Check the DC Good LED on power supply 1. If off, replace power supply 1. 2. Power Backplane.
PS2 LED on	<ol style="list-style-type: none"> 1. Check the DC Good LED on power supply 2. If off, replace power supply 2. 2. Power Backplane.
PS3 LED on	<ol style="list-style-type: none"> 1. Check the DC Good LED on power supply 3. If off, replace power supply 3. 2. Power Backplane.
PS4 LED on	<ol style="list-style-type: none"> 1. Check the DC Good LED on power supply 4. If off, replace power supply 4. 2. Power Backplane.
SMI LED on	<ol style="list-style-type: none"> 1. Reboot the system.
TEMP LED on	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications. See “Features and specifications” on page 3, and “Temperature error messages” on page 236. 2. Ensure fans are operating correctly. 3. Examine System Error Log. <ol style="list-style-type: none"> a. System over recommended temperature <ol style="list-style-type: none"> 1) Information LED Panel 2) I/O Legacy Board b. DASD over recommended temperature (DASD LED also on) <ol style="list-style-type: none"> 1) Overheating hard drive 2) DASD Backplane 3) I/O Legacy Board c. System over recommended temperature for CPU X (where X is CPU 1, 2, 3, or 4) (CPU LED also on) <ol style="list-style-type: none"> 1) CPU X 2) Processor/PCI Board d. I/O Legacy Board over recommended temperature <ol style="list-style-type: none"> 1) Processor/PCI Board 2) I/O Legacy Board

Diagnostic error codes

Note: In the following error codes, if *XXX* is *000*, *195*, or *197* **do not** replace a FRU. The description for these error codes are:

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

For all error codes, replace/follow the FRU/Action indicated.

Error Code/Symptom	FRU/Action
001-XXX-000 (Failed core tests)	1. Processor/PCI Board
001-XXX-001 (Failed core tests)	1. Processor/PCI Board
001-250-000 (Failed System Board ECC)	1. Processor/PCI Board
001-250-001 (Failed Processor Board ECC)	1. Processor/PCI Board
005-XXX-000 (Failed Video test)	1. Video Adapter (if installed) 2. I/O Legacy Board
011-XXX-000 (Failed COM1 Serial Port test)	1. I/O Legacy Board
011-XXX-001 (Failed COM2 Serial Port test)	1. I/O Legacy Board
014-XXX-000 (Failed Parallel Port test)	1. I/O Legacy Board
015-XXX-001 (USB interface not found. Board damaged.)	1. I/O Legacy Board.
015-XXX-015 (Failed USB External Loopback Test)	1. Make sure parallel port is not disabled. 2. Re-run USB External Loopback Test. 3. I/O Legacy Board
015-XXX-198 (USB device connected during USB test)	1. Remove USB devices from USB1 and USB2. 2. Re-run test. 3. I/O Legacy Board
020-XXX-000 (Failed PCI Interface test)	1. Processor/PCI Board 2. System Board
020-XXX-001 (Failed Hot-Swap Slot 1 PCI Latch test)	1. PCI Hot-Swap Latch Assembly 2. Processor/PCI Board
020-XXX-002 (Failed Hot-Swap Slot 2 PCI Latch test)	1. PCI Hot-Swap Latch Assembly 2. Processor/PCI Board
020-XXX-003 (Failed Hot-Swap Slot 3 PCI Latch test)	1. PCI Hot-Swap Latch Assembly 2. Processor/PCI Board
020-XXX-004 (Failed Hot-Swap Slot 4 PCI Latch test)	1. PCI Hot-Swap Latch Assembly 2. Processor/PCI Board
030-XXX-000 (Failed Internal SCSI interface test)	1. I/O Legacy Board
030-XXX-00N (Failed SCSI test on PCI slot N. Check system error log before replacing a FRU.)	1. Adapter
035-XXX-099	1. No adapters were found. 2. If adapter is installed re-check connection.
035-XXX-S99 (Failed RAID test on PCI slot S. S = number of failing PCI slot. Check System Error Log before replacing a FRU.)	1. Cable 2. SCSI Backplane 3. Adapter

Error Code/Symptom	FRU/Action
035-XXX-SNN (Check System Error Log before replacing a FRU. S = number of failing PCI slot; NN = SCSI ID of failing fixed disk.)	1. Fixed Disk with SCSI ID NN on RAID adapter in PCI slot S.
035-253-S99 (RAID adapter initialization failure)	1. ServeRAID Adapter in slot S is not configured properly. Obtain the basic and extended configuration status and refer to the ServeRAID Hardware Maintenance Manual for more information. 2. Cable 3. SCSI Backplane 4. Adapter
075-XXX-000 (Failed Power Supply test)	1. Power Supply
089-XXX-001 (Failed Microprocessor test)	1. VRM for Microprocessor 1 2. Microprocessor
089-XXX-002 (Failed Optional Microprocessor test)	1. VRM for Optional Microprocessor 2 2. Optional Microprocessor
089-XXX-003 (Failed Optional Microprocessor test)	1. VRM for Optional Microprocessor 3 2. Optional Microprocessor
089-XXX-004 (Failed Optional Microprocessor test)	1. VRM for Optional Microprocessor 4 2. Optional Microprocessor
165-XXX-000 (Failed Service Processor test)	1. Check error log for any I2C messages (see “I2C bus fault messages” on page 239). 2. Remove ac power from system for 20 seconds, then rerun service processor test. If problem persists, proceed to step 3.. 3. I/O Legacy Board. Before replacing the I/O Legacy Board, ensure that I/O Legacy Board jumper J28 is not installed (the default) when the error occurs.
180-XXX-000 (Diagnostics LED failure)	1. Run Diagnostic LED test for the failing LED.
180-XXX-001 (Failed information LED panel test)	1. Information LED Panel 2. Diagnostic LED Panel 3. I/O Legacy Board
180-XXX-002 (Failed Diagnostics LED Panel test)	1. Diagnostics LED Panel 2. I/O Legacy Board
180-XXX-003 (Failed System Board LED test)	1. System Board
180-XXX-004 (Failed Processor Board LED test)	1. Processor/PCI Board 2. I/O Legacy Board
180-XXX-005 (Failed SCSI Backplane LED test)	1. SCSI Backplane 2. SCSI Backplane Cable 3. I/O Legacy Board
180-XXX-006 (Memory Board LED test)	1. Memory Board 2. Processor/PCI Board 3. I/O Legacy Board

Error Code/Symptom	FRU/Action
201-XXX-0NN (Failed Memory test, see "Memory Settings" on page 47.) NN = DIMM location.	1. DIMM Location J1-J16 2. Memory card
201-XXX-999 (Multiple DIMM failure, see error text.)	1. See error text for failing DIMMs 2. Memory card
202-XXX-001 (Failed System Cache test)	1. VRM 1 2. Microprocessor CPU 1
202-XXX-002 (Failed System Cache test)	1. VRM 2 2. Microprocessor CPU 2
202-XXX-003 (Failed System Cache test)	1. VRM 3 2. Microprocessor CPU 3
202-XXX-004 (Failed System Cache test)	1. VRM 4 2. Microprocessor CPU 4
206-XXX-000 (Failed Diskette Drive test)	1. Cable 2. Diskette Drive 3. I/O Legacy Board
215-XXX-000 (Failed IDE CD-ROM test)	1. CD-ROM Drive Cables 2. CD-ROM Drive 3. I/O Legacy Board
217-XXX-000 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 1
217-XXX-001 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 2
217-XXX-002 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 3
217-XXX-003 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 4
217-XXX-004 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 5

Error Code/Symptom	FRU/Action
217-XXX-005 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 6
217-XXX-006 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 7
217-XXX-007 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 8
217-XXX-008 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 9
217-XXX-009 (Failed BIOS Fixed Disk test) Note: If RAID is configured, the fixed disk number refers to the RAID logical array.	1. Fixed Disk 10
264-XXX-0NN (NN = SCSI ID of failing Tape Drive)	1. Tape Cartridge, if user executed the Read/Write Tape Drive test (XXX = 256) 2. SCSI or power cable connected to the tape drive with SCSI ID NN 3. Tape drive with SCSI ID NN – refer to Help and Service Information appendix of tape drive’s User Guide. 4. I/O Legacy Board or SCSI Controller – run SCSI Controller diagnostic to determine of SCSI bus is functioning properly.
264-XXX-999 (Errors on multiple tape drives, see error text for more info)	1. See error messages/text in the PC Doctor error log for detailed information on each individual tape drive error.
301-XXX-000 (Failed Keyboard test)	1. Keyboard
405-XXX-000 (Failed Ethernet test on controller on the I/O Legacy Board)	1. Verify that Ethernet is not disabled in BIOS. 2. I/O Legacy Board
405-XXX-00N (Failed Ethernet test on adapter in PCI slot N) Note: Insure modem is present and attached to server.	1. Adapter in PCI slot N. 2. I/O Legacy Board
415-XXX-000 (Failed Modem test)	1. Cable 2. Modem 3. I/O Legacy Board

Error symptoms

Error Symptom	FRU/Action
CD is not working properly.	<ol style="list-style-type: none"> 1. Clean the CD. 2. Run CD-ROM diagnostics. 3. CD-ROM Drive
CD-ROM drive tray is not working. (The server must be powered-on.)	<ol style="list-style-type: none"> 1. Insert the end of a paper clip into the manual tray-release opening. 2. Run CD-ROM diagnostics. 3. CD-ROM Drive
CD-ROM drive is not recognized.	<ol style="list-style-type: none"> 1. Run Configuration/Setup, enable primary IDE channel. 2. Check cables and jumpers. 3. Check for correct device driver. 4. Run CD-ROM diagnostics. 5. CD-ROM drive 6. I/O Legacy Board
Power switch does not work and reset button does work.	<ol style="list-style-type: none"> 1. Verify that the power-on control jumper on J23 is on pins 1 and 2. 2. Power Switch Assembly 3. I/O Legacy Board
Diskette drive in-use light stays on, or the system bypasses the diskette drive, or the diskette drive does not work.	<ol style="list-style-type: none"> 1. If there is a diskette in the drive, verify that: <ol style="list-style-type: none"> a. The diskette drive is enabled in the Configuration/Setup utility program. b. The diskette is good and not damaged. (Try another diskette if you have one.) c. The diskette is inserted correctly in the drive. d. The diskette contains the necessary files to start the server. e. The software program is OK. f. Cable is installed correctly (proper orientation) 2. Run Diskette Drive Diagnostics. 3. Cable 4. Diskette Drive 5. I/O Legacy Board
Monitor problems (general). Some IBM monitors have their own self-tests. If you suspect a problem with the monitor, refer to the information that comes with the monitor for adjusting and testing instructions.	<ol style="list-style-type: none"> 1. Monitor 2. Run Video Diagnostics. If diagnostics pass, the problem may be a video driver. 3. Display Adapter / I/O Legacy Board

Power supply LED errors

Use the power supply LED information on the following page to troubleshoot power supply problems.

Note: The minimum configuration required for the DC Good light to come on is:

- Power Supply

- Power Backplane
- Processor/PCI Board (with pins 2 and 3 on J23 connected together to bypass the power switch; see “Processor board jumpers” on page 57).
- Processor/PCI Board (Verify that Processor/PCI Board and I/O Legacy Board are properly connected together; see “Processor board component locations” on page 55).

AC Good LED	DC Good LED	Description	FRU/Action
Off	Off	No power to system or ac problem.	<ol style="list-style-type: none"> 1. Check ac power to system. 2. Power Supply
On	Off	Standby mode or dc problem.	<ol style="list-style-type: none"> 1. Move jumper on J23 to pins 2-3 to bypass power control. If the DC Good LED comes on, press Ctrl+Alt+Delete. Watch the screen for any POST errors. Check the System Error Log for any listed problems. If the system powers up with no errors: <ol style="list-style-type: none"> a. Power Switch Assembly 2. Remove the adapters and disconnect the cables and power connectors to all internal and external devices. Power-on the system. If the DC Good LED comes on, replace the adapters and devices one at a time until you isolate the problem. 3. Power Supply 4. Power Backplane 5. I/O Legacy Board 6. Processor Board
On	On	Power is OK.	N/A

POST error codes

In the following error codes, X can be any number or letter.

Error Code/Symptom	FRU/Action
062 (Three consecutive boot failures using the default configuration.)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Battery 3. I/O Legacy Board 4. Processor/PCI Board 5. Processor
101, 102 (System and processor error)	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Processor/PCI Board
106 (System and processor error)	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Processor/PCI Board
111 (Channel check error)	<ol style="list-style-type: none"> 1. Failing adapter 2. DIMM 3. I/O Legacy board

Error Code/Symptom	FRU/Action
114 (Adapter read-only memory error)	<ol style="list-style-type: none"> 1. Failing adapter 2. Run diagnostics
129 (Internal cache error)	<ol style="list-style-type: none"> 1. Processor 2. Optional processor (if installed) 3. Processor/PCI board
151 (Real time clock error)	<ol style="list-style-type: none"> 1. Run Diagnostics 2. Battery 3. I/O Legacy Board
161 (Real time clock battery error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Battery 3. I/O Legacy Board
162 (Device Configuration Error) Note: Be sure to load the default settings and any additional desired settings; then, save the configuration.	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Battery 3. Failing Device 4. I/O Legacy Board
163 (Real-Time Clock error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Battery 3. I/O Legacy Board
164 (Memory configuration changed, see "Memory Settings" on page 47.)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. DIMM 3. Processor/PCI Board
175 (Hardware error)	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Processor/PCI Board
176 (Computer cover or cable cover was removed without a key being used)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board 3. C2 Security Switch
177, 178 (Security hardware error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board
184 (Power-on password corrupted)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board
185 (Drive startup sequence information corrupted)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board
186 (Security hardware control logic failed)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board
187 (VPD serial number not set.)	<ol style="list-style-type: none"> 1. Set serial number in Setup 2. I/O Legacy Board
188 (Bad EEPROM CRC #2)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. I/O Legacy Board
189 (An attempt was made to access the server with invalid passwords)	<ol style="list-style-type: none"> 1. Run Configuration/Setup, enter the administrator password 2. I/O Legacy Board.

Error Code/Symptom	FRU/Action
201 (Memory test error, see "Memory Settings" on page 47.) If the server 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. Run memory diagnostics. 2. DIMM 3. Memory card 4. Processor/PCI Board 5. I/O Legacy Board
229 (Cache error)	<ol style="list-style-type: none"> 1. Processor 2. Optional Processor (if installed) 3. Processor/PCI Board
289 (DIMM has been disabled by user or system, see "Memory Settings" on page 47.)	<ol style="list-style-type: none"> 1. Run Configuration/Setup, if disabled by user 2. Disabled DIMM, if not disabled by user. 3. Processor/PCI Board
301 (Keyboard or keyboard controller error)	<ol style="list-style-type: none"> 1. Keyboard 2. I/O Legacy Board
303 (Keyboard controller error)	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Keyboard
602 (Invalid diskette boot record)	<ol style="list-style-type: none"> 1. Diskette 2. Diskette Drive 3. Cable 4. I/O Legacy Board
604 (Diskette drive error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup and Diagnostics 2. Diskette Drive 3. Drive Cable 4. I/O Legacy Board
605 (Unlock error)	<ol style="list-style-type: none"> 1. Diskette drive 2. Drive cable 3. I/O Legacy board
662 (Diskette drive configuration error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup and Diagnostics 2. Diskette Drive 3. Drive Cable 4. I/O Legacy Board
762 (Coprocessor configuration error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup utility 2. Battery 3. Processor 4. Processor/PCI board
962 (Parallel port error)	<ol style="list-style-type: none"> 1. Disconnect external cable on parallel port. 2. Run Configuration/Setup 3. I/O Legacy Board
11XX (System board serial port 1 or 2 error)	<ol style="list-style-type: none"> 1. Disconnect external cable on serial port. 2. Run Configuration/Setup 3. I/O Legacy Board

Error Code/Symptom	FRU/Action
1301 (cable to front panel not found)	<ol style="list-style-type: none"> 1. Cable 2. Front Panel 3. Power Switch Assembly 4. I/O Legacy Board
1302 (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. I/O Legacy Board
1303 (cable from system board to power backplane not found)	<ol style="list-style-type: none"> 1. Cable 2. Power Backplane 3. I/O Legacy Board
1304 (cable to diagnostic LED board not found)	<ol style="list-style-type: none"> 1. Cable 2. Diagnostic LED Board 3. Power Switch Assembly 4. I/O Legacy Board
1600 (The Service Processor is not functioning) Do the following before replacing a FRU: <ol style="list-style-type: none"> 1. Ensure that a jumper is not installed on J51. 2. Remove the ac power to the system, wait 20 seconds; then, re-connect the ac power. Wait 30 seconds; then, power-on the system. 	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Processor/PCI Board
1601 (The system is able to communicate to the Service Processor, but the Service Processor failed to respond at the start of POST.) Do the following before replacing a FRU: <ol style="list-style-type: none"> 1. Remove the ac power to the system, wait 20 seconds; then, re-connect the ac power. Wait 30 seconds; then, power-on the system. 2. Flash update the Service Processor. 	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. Processor/PCI Board
1762 (Fixed Disk Configuration error)	<ol style="list-style-type: none"> 1. Fixed Disk Drive 2. Fixed Disk Cables 3. Run Configuration/Setup 4. Fixed Disk Adapter 5. SCSI Backplane 6. I/O Legacy Board
178X (Fixed Disk error)	<ol style="list-style-type: none"> 1. Fixed Disk Cables 2. Run Diagnostics 3. Fixed Disk Adapter 4. Fixed Disk Drive 5. I/O Legacy Board

Error Code/Symptom	FRU/Action
1800 (No more hardware interrupt available for PCI adapter)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
1962 (Drive does not contain a valid boot sector)	<ol style="list-style-type: none"> 1. Verify a bootable operating system is installed. 2. If RAID system, refer to the IBM ServeRAID Hardware Maintenance Manual for more information. 3. Run Diagnostics 4. Hard Disk Drive 5. Cable 6. SCSI Backplane 7. I/O Legacy Board
2400 (Video controller test failure)	<ol style="list-style-type: none"> 1. Video Adapter (if installed) 2. I/O Legacy Board
2462 (Video memory configuration error)	<ol style="list-style-type: none"> 1. Video Adapter (if installed) 2. I/O Legacy Board
5962 (IDE CD-ROM configuration error)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. CD-ROM Drive 3. CD-ROM Power Cable 4. IDE Cable 5. I/O Legacy Board 6. Battery
8603 (Pointing Device Error)	<ol style="list-style-type: none"> 1. Pointing Device 2. I/O Legacy Board
00012000 (Machine check architecture error)	<ol style="list-style-type: none"> 1. Processor 2. Optional Processor 3. Processor/PCI Board
00019501 (Processor 1 is not functioning - check VRM and processor LEDs)	<ol style="list-style-type: none"> 1. VRM 1 2. Processor 1 3. Processor Board 4. I/O Legacy Board
00019502 (Processor 2 is not functioning - check VRM and processor LEDs)	<ol style="list-style-type: none"> 1. VRM 2 2. Processor 2 3. Processor Board 4. I/O Legacy Board
00019503 (Processor 3 is not functioning - check VRM and processor LEDs)	<ol style="list-style-type: none"> 1. VRM 3 2. Processor 3 3. Processor Board 4. I/O Legacy Board

Error Code/Symptom	FRU/Action
00019504 (Processor 4 is not functioning - check VRM and processor LEDs)	<ol style="list-style-type: none"> 1. VRM 4 2. Processor 4 3. Processor/PCI Board 4. I/O Legacy Board
00019701 (Processor 1 failed BIST)	<ol style="list-style-type: none"> 1. Processor 1 2. Processor/PCI Board 3. I/O Legacy Board
00019702 (Processor 2 failed BIST)	<ol style="list-style-type: none"> 1. Processor 2 2. Processor/PCI Board 3. I/O Legacy Board
00019703 (Processor 3 failed BIST)	<ol style="list-style-type: none"> 1. Processor 3 2. Processor/PCI Board 3. I/O Legacy Board
00019704 (Processor 4 failed BIST)	<ol style="list-style-type: none"> 1. Processor 4 2. Processor/PCI Board
00180100 (No room for PCI option ROM)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
00180200 (No more I/O space available for PCI adapter)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
00180300 (No more memory (above 1MB for PCI adapter)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
00180400 (No more memory (below 1MB for PCI adapter)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
00180500 (PCI option ROM checksum error)	<ol style="list-style-type: none"> 1. Remove Failing PCI Card 2. I/O Legacy Board
00180600 (PCI device built-in self test failure)	<ol style="list-style-type: none"> 1. Run Configuration/Setup 2. Failing Adapter 3. I/O Legacy Board
00180700, 00180800 (General PCI error)	<ol style="list-style-type: none"> 1. I/O Legacy Board 2. PCI Card
01295085 (ECC checking hardware test error)	<ol style="list-style-type: none"> 1. Processor/PCI Board 2. Processor
01298001 (No update data for processor 1)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 1
01298002 (No update data for processor 2)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 2

Error Code/Symptom	FRU/Action
01298003 (No update data for processor 3)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 3
01298004 (No update data for processor 4)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 4
01298101 (Bad update data for processor 1)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 1
01298102 (Bad update data for processor 2)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 2
01298103 (Bad update data for processor 3)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 3
01298104 (Bad update data for processor 4)	<ol style="list-style-type: none"> 1. Ensure all processors are the same stepping level and cache size. 2. Processor 4
I9990301 (Fixed boot sector error)	<ol style="list-style-type: none"> 1. Hard Disk Drive 2. If RAID system, refer to the ServeRAID Hardware Maintenance Manual for more information. 3. SCSI Backplane 4. Cable 5. I/O Legacy Board
I9990305 (Fixed boot sector error, no operating system installed)	<ol style="list-style-type: none"> 1. Install operating system to hard disk drive.
I9990650 (AC power has been restored)	<ol style="list-style-type: none"> 1. Check cable 2. Check for interruption of power supply 3. Power Cable

ServeRAID POST (ISPR) error codes

The ISPR (Interrupt Status Port Register), BCS (Basic Configuration Status), and ECS (Extended Configuration Status) codes identify the controller state.

Note: Do not replace a system board containing a ServeRAID adapter unless such a replacement is a specifically recommended Action.

ServeRAID POST (ISPR) error procedures

The 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.

EF10 (Default ISPR)

1. No ISPR Error Present.

1XXX (Microcode Checksum Error)

1. Replace the ServeRAID controller.

2XXX thru 5XXX (Code DRAM Error)

1. Install two download jumpers parallel to the PCI slots. For jumper locations, see "Processor board component locations" on page 55.

2. Flash the controller with the latest IBM ServeRAID BIOS/Firmware from the IBM Website.
3. Remove the jumpers.
4. If the error persists, replace ServeRAID controller.

6XXX (Cache DRAM Error)

1. Reseat Cache Memory SIMM.
2. Install two download jumpers parallel to the PCI slots. For jumper locations, see “Processor board component locations” on page 55.
3. Flash the controller with the latest IBM ServeRAID BIOS/Firmware from the IBM Website.
4. Remove the jumpers.
5. If the error persists, replace ServeRAID controller.

7XXX thru 8XXX (Host/Local PCI Bus Interface Error)

1. Install two download jumpers parallel to the PCI slots. For jumper locations, “Processor board component locations” on page 55.
2. Flash the controller with the latest IBM ServeRAID BIOS/Firmware from the IBM Website.
3. Remove the jumpers.
4. If the error persists, replace ServeRAID controller.

9XXX thru BXXX (SCSI bus error caused either by defective drives, termination, etc.)

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

CAUTION:

Do not press F5. Doing so changes the customer’s configuration.

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

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

Notes:

- a. The controller detects a configuration change. **Do not choose Save Changes.** Instead, press **F10** to bypass any options to this effect.
2. If ISPR error is **EF10** after disconnecting cables:
 - a. Identify which channel is causing the error by the second digit of the original ISPR code:
 - ISPR = B1xx = Channel 1
 - ISPR = B2xx = Channel 2
 - ISPR = B3xx = Channel 1 and 2
 - ISPR = B4xx = Channel 3
 - ISPR = B5xx = Channel 1 and 3
 - ISPR = B6xx = Channel 2 and 3
 - ISPR = B7xx = Channel 1, 2 and 3
 - ISPR = BFxx = Channel not identified
 - b. Confirm that the channel(s) identified from the error in step 2 is (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 proper backplane jumper configuration.
 - e. Check for proper cabling configuration in systems that use DASD status cables. Reconnect all cables removed in step 1 above.

- f. Disconnect one drive at a time attached to the channel identified in step 2a, then reboot to determine which drive is causing the error.
- g. Replace SCSI cable.
- h. Replace SCSI backplane.

EF10 (Default ISPR)

1. No ISPR error present.
2. Controller is probably functioning properly. **Do not** replace system board unless you have run the controller's diagnostics and you get an error message. If you do not get an error message, assume it is functioning properly.
3. Refer to "Chapter . Installing and configuring ServeRAID controllers," on page 139. Note the resulting BCS and or ECS Error codes, and see the FRU actions respective to those codes. (EF10 is a default code for ISPR indicating that there is no ISPR error present.)

EFFE (Firmware code corrupted or download jumpers are in place.)

1. Verify download jumpers are in their default locations. See "Processor board component locations" on page 55 for jumper locations.
2. If download jumpers are **not** in place and error still persists, then flash the controller firmware **with** the jumpers in place; then remove the jumpers.
3. If error persists after step 2, replace the controller or the system board with integrated controller.

FFFF or other code not listed

1. Isolate between SCSI subsystem and controller by disconnecting all SCSI cables attached to the suspect controller and reboot. If 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 termination of identified channel in step a..
 - c. Disconnect one drive at a time attached to channel identified in step a. and reboot each time to determine which drive is causing the problem.
 - d. Replace SCSI Cable attached to channel identified in step a..
 - e. Replace Backplane attached to channel identified in step a..
2. If original ISPR code is still present after disconnecting all SCSI cables and rebooting, perform the following actions until the error is no longer present:
 - Reseat the controller.
 - Replace the controller.

ServeRAID

This index supports ServeRAID 3HB Adapters and Controllers. It lists symptoms, errors, and possible causes.

Note: Do not replace any FRU until you have followed the POST (ISPR) error procedures (see "ServeRAID POST (ISPR) error procedures" on page 232). Only replace a ServeRAID 3HB Adapter or controller if indicated to do so in the POST (ISPR) error procedures.

Error Code/Symptom	Action
1xxx (flash checksum error)	1. ServeRAID 3HB Adapter/Controller
2xxx (code DRAM error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
2601 to 260B (POST detected error with ServeRAID subsystem)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
2610 (POST detected error with ServeRAID controller hardware)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
2620 (POST detected ServeRAID configuration or hard disk error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
3xxx (NVRAM error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
4xxx (timer/cache memory controller error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
5xxx (cache memory controller error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
6xxx (cache DRAM error)	1. Reseat Cache Memory SIMM 2. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 3. ServeRAID 3HB Adapter/Controller
7xxx (host/local PCI bus interface error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
8xxx (SCSI I/O port error)	1. Install download jumpers, flash latest level BIOS and firmware for adapter. Remove jumpers. 2. ServeRAID 3HB Adapter/Controller
9xxx (SCSI termination error)	1. Refer to "ServeRAID POST (ISPR) error procedures" on page 232. 2. SCSI cable 3. SCSI backplane 4. Hard drive 5. ServeRAID 3HB Adapter/Controller
Axxx (SCSI I/O port error)	1. Refer to "ServeRAID POST (ISPR) error procedures" on page 232.

Error Code/Symptom	Action
Bxxx (SCSI bus interface error)	<ol style="list-style-type: none"> 1. Refer to "ServeRAID POST (ISPR) error procedures" on page 232. 2. SCSI cable 3. SCSI backplane 4. Hard drive 5. ServeRAID 3HB Adapter/Controller

SCSI error codes

Error Code	FRU/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 improper SCSI configuration or SCSI termination jumper setting • Duplicate SCSI IDs in the same SCSI chain • A missing or improperly installed SCSI terminator • A defective SCSI terminator • An improperly installed cable • A defective cable 	<ol style="list-style-type: none"> 1. External SCSI devices must be powered-on before you power-on the server. 2. The cables for all external SCSI devices are connected correctly. 3. If you have attached an external SCSI device to the server, make sure the external SCSI termination is set to automatic. 4. The last device in each SCSI chain is terminated correctly. 5. The SCSI devices are configured correctly.

Temperature error messages

Message	Action
DASD "X" Over Temperature (level-critical; Direct Access Storage Device bay "X" was over temperature)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled; see "Temperature checkout" on page 31.
DASD Over recommended Temperature (sensor X) (level-warning; the DASD backplane had an over temperature condition)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled; see "Temperature checkout" on page 31.
DASD under recommended temperature (sensor X) level-warning; the DASD backplane had an under temperature condition)	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications; (see "Features and specifications" on page 3).
Power Supply "X" Temperature Fault (level-critical; power supply "x" had over temperature condition)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled; see "Temperature checkout" on page 31. 2. Replace Power Supply "X"
System board is over recommended temperature (level-warning; system board is over recommended temperature)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled; see "Temperature checkout" on page 31. 2. Replace system board
System board is under recommended temperature (level-warning; system board is under recommended temperature)	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications; (see "Features and specifications" on page 3).

Message	Action
System over temperature for CPU "X" (level-warning; CPU "X" reporting over temperature condition)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled; see "Temperature checkout" on page 31. 2. Replace CPU "X". 3. Replace Processor/PCI Board.
System under recommended CPU "X" temperature (level-warning; system reporting under temperature condition for CPU "X")	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications; (see "Features and specifications" on page 3). 2. Replace CPU "X". 3. Replace Processor/PCI Board.

Fan error messages

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"
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"

Power error messages

Message	Action
Power supply "X" current fault (level-critical; excessive current demand on power supply "X")	1. See "Power checkout" on page 31.
Power supply "X" DC good fault (level-critical; power good signal not detected for power supply "X")	1. Replace power supply "X"
Power supply "X" fan fault (level-critical; fan fault in power supply "X")	1. Replace power supply "X"
Power supply "X" fault (level-critical; overcurrent condition exists)	1. See "Power checkout" on page 31.
Power supply "X" 12V fault (level-critical; overcurrent condition detected)	1. See "Power checkout" on page 31.
Power supply "X" 3.3V fault (level-critical; 3.3V power supply "X" had an error)	1. See "Power checkout" on page 31.
Power supply "X" 5V fault (level-critical; 5V power supply "X" had an error)	1. See "Power checkout" on page 31.
System over recommended "X" current (level-non-critical; system running too much current on that voltage)	1. See "Power checkout" on page 31.
System running non-redundant power (level-non-critical; system does not have redundant power)	<ol style="list-style-type: none"> 1. Add another power supply 2. Remove options from system 3. System can continue to operate without redundancy protection if 1 and 2 above are not followed.

Message	Action
System under recommended voltage for "X" v (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 power subsystem 2. Replace power supply 3. Replace power backplane
System under recommended voltage on 3.3 v (level-warning; 3.3 volt supply under nominal value)	<ol style="list-style-type: none"> 1. Check connections to power subsystem 2. Replace power supply 3. Replace power backplane
System under recommended X current (level-non-critical; system drawing less current than recommended on voltage "X")	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
"X" V bus fault (level-critical; overcurrent condition on "X" voltage bus)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
12V "X" bus fault (level-critical; overcurrent condition on 12 volt "X" voltage bus)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
5V fault (level-critical; overcurrent condition on 5 V subsystem)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
240 VA bus fault (level-critical; overcurrent or overvoltage condition in power subsystem)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.

System shutdown

Refer to the following tables when experiencing system shutdown related to voltage or temperature problems.

Power related system shutdown

Message	Action
System powered off due to "X" current over max value (level-critical; system drawing too much current on voltage "X" bus)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
System shutoff due to "X" current under min value (level-critical; current on voltage bus "X" under minimum value)	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.
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 power supply connectors 2. Replace power supply 3. Replace power backplane
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 power supply connectors 2. Replace power supply 3. Replace power backplane
System powered off due to faults on each power supply.	<ol style="list-style-type: none"> 1. See "Power checkout" on page 31.

Temperature related system shutdown

Message	Action
System shutoff due to board over temperature (level-critical; processor board is over temperature)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled, see "Temperature checkout" on page 31. 2. Replace processor board
System shutoff due to CPU "X" over temperature (level-critical; CPU "X" is over temperature)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled, see "Temperature checkout" on page 31. 2. Replace CPU "X"
System shutoff due to CPU "X" under temperature (level-critical; CPU "X" is under temperature)	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications (see "Features and specifications" on page 3). 2.
System shutoff due to DASD temperature (sensor X) (level-critical; DASD area reported temperature outside recommended operating range)	<ol style="list-style-type: none"> 1. Ensure system is being properly cooled, see "Temperature checkout" on page 31.
System shutoff due to high ambient temperature (level-critical; high ambient temperature)	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications (see "Features and specifications" on page 3).
System shutoff due to system board under temperature (level-critical; system board is under temperature)	<ol style="list-style-type: none"> 1. Ambient temperature must be within normal operating specifications (see "Features and specifications" on page 3).

DASD checkout

Message	Action
Hard drive (SCSI ID "X") removal detected (level-critical; hard drive "X" has been removed)	<ol style="list-style-type: none"> 1. Information only, take action as appropriate.
Hard drive (SCSI ID "X") fault	<ol style="list-style-type: none"> 1. Replace hard drive (SCSI ID "X").

Host Built-In Self Test (BIST) checkout

Message	Action
Host BIST fail (level-informational; host's built-in self test failed)	<ol style="list-style-type: none"> 1. Reseat CPU 2. Reseat VRM 3. Replace CPU

I2C bus fault messages

Message	Action
Failure reading I2C device. Check devices on bus 0.	<ol style="list-style-type: none"> 1. Replace I/O Legacy Board

Message	Action
Failure reading I2C device. Check devices on bus 1.	<ol style="list-style-type: none"> 1. Reseat I/O Legacy Board 2. Reseat power supplies 3. Replace power supply 4. Replace Power Backplane 5. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 2.	<ol style="list-style-type: none"> 1. Reseat front panel connector 2. Reseat diagnostics panel connector 3. Reseat I/O Legacy Board 4. Replace front panel 5. Replace diagnostics panel 6. Replace Power Backplane 7. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 3.	<ol style="list-style-type: none"> 1. Reseat VRMs 2. Reseat Processor/PCI Board 3. Replace VRMs 4. Replace Processor/PCI Board 5. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 4.	<ol style="list-style-type: none"> 1. Reseat Power Backplane/DASD power cable 2. Reseat I/O Legacy Board 3. Replace Power Backplane/DASD power cable 4. Replace DASD Backplane 5. Replace Power Backplane 6. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 5.	<ol style="list-style-type: none"> 1. Reseat CPUs 2. Reseat Processor/PCI Board 3. Replace CPUs 4. Replace Processor/PCI Board 5. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 6.	<ol style="list-style-type: none"> 1. Reseat memory card 2. Reseat Processor/PCI Board 3. Replace memory card 4. Replace Processor/PCI Board 5. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 7.	<ol style="list-style-type: none"> 1. Reseat Processor/PCI Board 2. Replace Processor/PCI Board 3. Replace I/O Legacy Board
Failure reading I2C device. Check devices on bus 8.	<ol style="list-style-type: none"> 1. Replace I/O Legacy Board

Undetermined problems

You are here because the diagnostic tests did not identify the failure, the Devices List is incorrect, or the system is inoperative.

Notes:

1. A corrupt CMOS can cause undetermined problems.
2. A faulty I2C Bus can cause undetermined problems. Check the system error log for any I2C Bus errors; see "I2C bus fault messages" on page 239.

Check the LEDs on all the power supplies, see "Power supply LED errors" on page 225. If the LEDs indicate the power supplies are working correctly, return here and do the following:

1. Power-off the computer.
2. Be sure the system is cabled correctly.
3. Remove or disconnect the following (one at a time) until you find the failure (power-on the computer and reconfigure each time).

Any external devices

Surge suppressor device (on the computer)

Modem, printer, mouse, or non-IBM devices

Each adapter

Hard disk drives

Memory-Modules (Minimum requirement = 512 MB (4x128 MB DIMMs))

Note: Minimum operating requirements are:

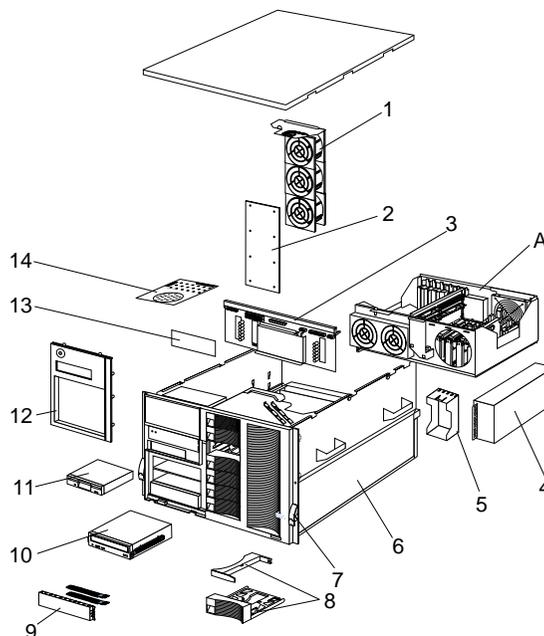
- a. 1 Power Supply
 - b. Power Backplane
 - c. Processor/PCI Board (with pins 2 and 3 on J23 connected together to bypass the power switch; default is pins 1 and 2)
 - d. I/O Legacy Board (Verify that connection to Processor/PCI Board is secure.)
 - e. 1 Microprocessor and VRM
 - f. 3 Terminator Cards
 - g. Memory Modules (with a minimum of 1 bank of four 128 MB DIMMs (4x128))
4. Power-on the computer. If the problem remains, suspect the following FRUs in the order listed:
 - Power Supply
 - Power Backplane
 - Processor/PCI Board
 - I/O Legacy 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 Processor/PCI Board, then the I/O Legacy Board.
2. If you suspect a networking problem and all the system tests pass, suspect a network cabling problem external to the system.

Parts listing (Type 8665)

Part A



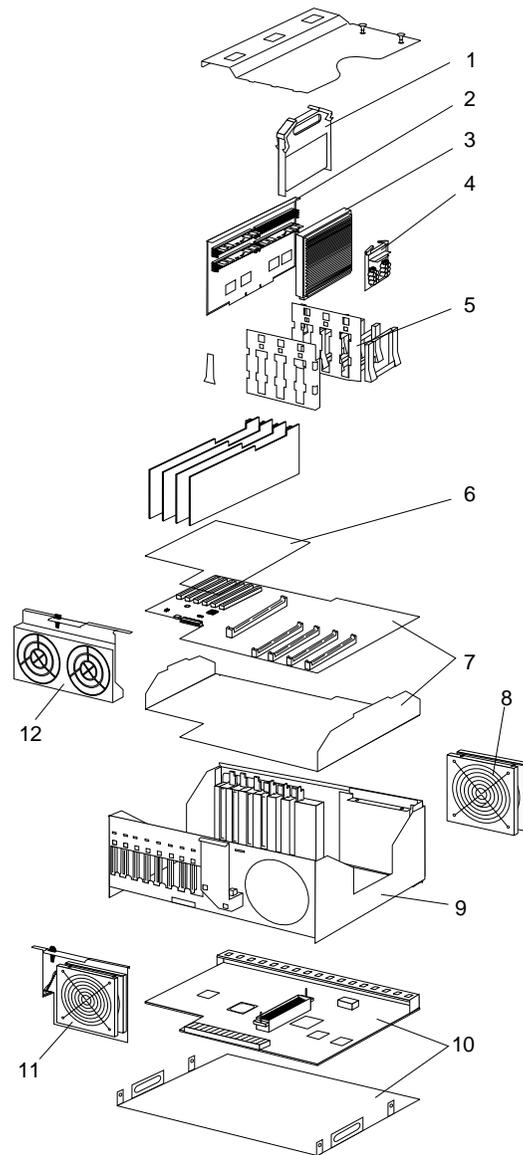
System

Note: Components of the shuttle (A) are shown in “Part B” on page 244.

Index	System (Netfinity 7600 – Type 8665) Models 1RY, 2RY, 3RY, 4RY, 5RY	FRU No.
1	DASD fan assembly w/bracket (all models)	37L6314
2	SCSI backplane assembly w/backerplate (all models)	37L6330
3	Power supply backplane assembly (all models)	37L6329
4	Hot swap power supply 250W (all models)	36L8819
5	Power supply filler assembly (2) (all models)	00N6405
6	Chassis (all models)	37L6316
7	Front bezel (all models)	37L6335
8	Hard disk drive bezel filler assembly (all models)	37L0198
9	Blank 5.25 bezel assembly (all models)	00N6407
10	40X CD-ROM (all models)	19K1517
11	1.44MB diskette drive (all models)	76H4091
12	Trim bezel (all models)	37L0260

Index	System (Netfinity 7600 – Type 8665) Models 1RY, 2RY, 3RY, 4RY, 5RY	FRU No.
13	Front LED card assembly (all models)	37L6328
14	Diagnostic switch card (all models)	37L6327

Part B



System

Index	System (Netfinity 7600 – Type 8665) Models 1RY, 2RY	FRU No.
1	Terminator card (all models)	94H0598
2	Memory card (all models)	37L6341
3	550MHZ/1MB cache (Model 1RY)	37L6371
3	550MHZ/2MB cache (Model 2RY)	37L6372
3	700 MHz/1MB cache (model 4RY)	19K0982
3	700 MHz/2MB cache (Models 3RY, 5RY)	19K0983
4	Voltage regulator module assembly (all models)	36L8847
5	Misc. processor kit (all models) (contains processor guide (2), VRM guide (8), VRM guide retainer (4), memory card guide (2))	37L6340
6	I/O legacy label (all models)	37L6318
7	CPU Backplane (all models)	37L6337
8	Rear fan assembly w/bracket (all models)	37L6325
9	Shuttle (all models)	37L6320
10	I/O Legacy board assembly w/backerplate (all models)	06P4117
11	Front fan assembly w/bracket (all models)	37L6324
12	I/O fan assembly w/bracket (all models)	37L6326
	Processor terminator case (all models)	10L6936
	Processor retention bracket (all models)	37L6319
	40X CD-ROM (2nd source) (all models)	36L8791
	CD-ROM 5.25 rail (all models)	00N6412
	Misc. hot swap kit #2 (all models) (contains PCI handles (4), blank fillers (4), PCI clamps (4), M3x5 screw (5), insulator (5), switch housing (1), card guide (2), guide retainers)	00N6776
	Top cover (all models)	12J3063
	Left EIA side flange assembly (all models)	00N6794
	Right EIA side flange assembly (all models)	00N6795
	Cam handle lever (all models)	03K9083
	Shuttle eject lever (all models)	37L6317
	PCI handle (all models)	37L6322
	EMI shield (all models)	37L6323
	128MB DIMM (all models)	33L3114
	PCI switch card (all models)	37L0178
	256MB DIMM (all models)	33L3116
	512MB DIMM (all models)	33L3118
	1GB DRAM (all models)	33L3120
	Shuttle power cable (all models)	37L0126
	Power cable-power backplane to SCSI backplane (all models)	37L0132

Index	System (Netfinity 7600 – Type 8665) Models 1RY, 2RY	FRU No.
	Power cable-power backplane to CD (all models)	37L0130
	Signal cable-power backplane to SCSI backplane (all models)	37L0147
	Signal cable-power backplane to 5.25 bays (all models)	37L0149
	Signal cable-power backplane to hard disk drive (all models)	37L0144
	Signal cable-power backplane to CD-ROM (all models)	37L0146
	Power cable-processor to rear processor (all models)	37L0134
	Power cable-processor to front fans (all models)	37L0136
	Power cable-power backplane to hard disk drive fans (all models)	37L0131
	Single PCI switch (all models)	00N6830
	Slide assembly (all models)	00N6839
	Power switch cover (all models)	09N7764
	Floppy disk drive bracket (all models)	12J3065
	Misc hot plug kit #3 (all models) (includes I/O bracket, Guide, Insulator, Guidance module, Retainer, and Hot swap PCI card retainer)	33L3707
	Status lens cover (all models)	36L9783
	Processor backplane	37L6337
	ServeRAID 4M (Japan) (models 4RY, 5RY)	00N9543
	ServeRAID 4M (Non-Japan) (models 4RY, 5RY)	37L7258

Keyboards

	Keyboard	FRU No.
	US English	37L2551
	French Canadian	37L2552
	LA Spanish	37L2553
	Arabic	37L2555
	Belgium/French	37L2556
	Belgium/UK	37L2557
	Bulgarian	37L2558
	Czech	37L2559
	Danish	37L2560
	Dutch	37L2561
	French	37L2562
	German	37L2563
	Greek	37L2564
	Hebrew	37L2565
	Hungarian	37L2566

Keyboard	FRU No.
Korean	02K0901
Iceland	37L2567
Italy	37L2568
Norwegian	37L2569
Polish	37L2570
Portuguese	37L2571
Romanian	37L2572
Russian	37L2573
Serbian/Cyrillic	37L2574
Slavic	37L2575
Spanish	37L2576
Swedish/Finn	37L2577
Swiss, F/G	37L2578
Turkish	37L2579
Turkish	37L2580
UK English	37L2581
Yugosl/Lat	37L2582
US English-EMEA	37L2583
Chinese/US	37L2585
Thailand	37L2587
French Canadian	37L0913

Power cords

Power cord	FRU No.
China (PRC)	01K9851
Japan	01K9853
Thailand	12J5120
Israel	12J5122
Bangladesh, Burma, India, Pakistan, South Africa, Sri Lanka	12J5124
Chile, Ethiopia, Italy, Libya, Somalia	12J5126
Argentina, Australia, New Zealand, Papua New Guinea, Paraguay, Uruguay, Western Samoa	12J5128
Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia	12J5987

Power cord

FRU No.

Afghanistan, Algeria, Andorra, Angola, Austria, Belgium, Benin, Bulgaria, Burkina Faso, Burundi, Cameroon, Central African Rep., Chad, Czech Republic, Egypt, Finland, France, French Guiana, Germany, Greece, Guinea, Hungary, Iceland, Indonesia, Iran, Ivory Coast, Jordan, Lebanon, Luxembourg, Macau, Malagasy, Mali, Martinique, Mauritania, Mauritius, Monaco, Morocco, Mozambique, Netherlands, New Caledonia, Niger, Norway, Poland, Portugal, Romania, Senegal, Slovakia, Spain, Sudan, Sweden, Syria, Togo, Tunisia, Turkey, former USSR, Vietnam, former Yugoslavia, Zaire, Zimbabwe

55H6643

Denmark, Switzerland, Liechtenstein

55H6646

Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), Venezuela

76H4865

United States of America

6952301 (110) 1838574 (220)
36L8886 (220V/15A)

Related service information

Note: The service procedures are designed to help you isolate problems. They are written with the assumption that you have model-specific training on all computers, or that are familiar with the computers, functions, terminology, and service information provided in this manual.

Safety information

The following section contains the safety information that you need to be familiar with before servicing an IBM mobile computer.

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 server 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 generatorsand 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 requirements

Electrical grounding 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.

Safety notices (multi-lingual translations)

The caution and danger safety notices in this section are provided in the following languages:

- English
- Brazilian/Portuguese
- Chinese
- French
- German
- Italian
- Korean
- Spanish

Important: All caution and danger statements in this *Netfinity Server Library* begin with a number. This number is used to cross reference an English caution or danger statement with translated versions of the caution or danger statement in this section.

For example, if a caution statement begins with a number 1, translations for that caution statement appear in this section under statement 1.

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

- Statement 1



DANGER

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

To avoid a shock hazard:

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

- **Connect and disconnect cables as described in the following table when installing, moving, or opening covers on this product or attached devices.**

To Connect	To Disconnect
<ol style="list-style-type: none"> 1. Turn everything OFF. 2. First, attach all cables to devices. 3. Attach signal cables to connectors. 4. Attach power cords to outlet. 5. Turn device ON. 	<ol style="list-style-type: none"> 1. Turn everything OFF. 2. First, remove power cords from outlet. 3. Remove signal cables from connectors. 4. Remove all cables from devices.

- Statement 2



CAUTION:

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

Do not:

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

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

- Statement 3



CAUTION:

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

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



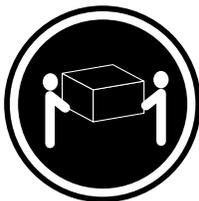
DANGER

Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following.
Laser radiation when open. Do not stare into the beam, do not view directly with optical instruments, and avoid direct exposure to the beam.

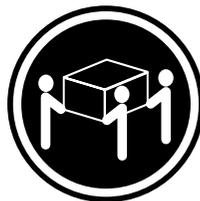
Some laser products contain an embedded Class 3A or Class 3B laser diode. Note the following:

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

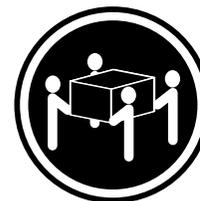
- Statement 4



≥18 kg (37 lbs)



≥32 kg (70.5 lbs)



≥55 kg (121.2 lbs)

CAUTION:
Use safe practices when lifting.

- Statement 5



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



- Statement 10



CAUTION:

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



Importante:

Todas as instruções de cuidado e perigo da :cit.Netfinity Server Library:ecit. começam com um número. Este número é utilizado para fazer referência cruzada de uma instrução de cuidado ou perigo no idioma inglês com as versões traduzidas das instruções de cuidado ou perigo encontradas nesta seção.

Por exemplo, se uma instrução de cuidado é iniciada com o número 1, as traduções para aquela instrução de cuidado aparecem nesta seção sob a instrução 1.

Certifique-se de ler todas as instruções de cuidado e perigo antes de executar qualquer operação.

Instrução 1



PERIGO

A corrente elétrica proveniente de cabos de alimentação, de telefone e de comunicações é perigosa.

Para evitar risco de choque:

- Não conecte ou desconecte cabos e não realize instalação, manutenção ou reconfiguração deste produto durante uma tempestade com raios.
- Conecte todos os cabos de alimentação a tomadas elétricas corretamente instaladas e aterradas.
- Conecte todos os equipamentos ao qual esse produto será conectado a tomadas corretamente instaladas.
- Sempre que possível, utilize apenas uma das mãos para conectar ou desconectar cabos de sinal.
- Nunca ligue qualquer equipamento quando existir evidência de danos por fogo, água ou na estrutura.
- Desconecte cabos de alimentação, sistemas de telecomunicação, redes e modems antes de abrir as tampas dos dispositivos, a menos que especificado de maneira diferente nos procedimentos de instalação e configuração.
- Conecte e desconecte cabos conforme descrito na seguinte tabela, ao instalar ou movimentar este produto ou os dispositivos conectados, ou ao abrir suas tampas.

Para Conectar:	Para Desconectar:
<ol style="list-style-type: none"> 1. DESLIGUE Tudo. 2. Primeiramente, conecte todos os cabos aos dispositivos. 3. Conecte os cabos de sinal aos conectores. 4. Conecte os cabos de alimentação às tomadas. 5. LIGUE os dispositivos. 	<ol style="list-style-type: none"> 1. DESLIGUE Tudo. 2. Primeiramente, remova os cabos de alimentação das tomadas. 3. Remova os cabos de sinal dos conectores. 4. Remova todos os cabos dos dispositivos.

Instrução 2



CUIDADO:

Ao substituir a bateria de lítio, utilize apenas uma bateria IBM, Número de Peça 33F8354 ou uma bateria de tipo equivalente, recomendada pelo fabricante. Se o seu sistema possui um módulo com uma bateria de lítio, substitua-o apenas pelo mesmo tipo de módulo, do mesmo fabricante. A bateria contém lítio e pode explodir se não for utilizada, manuseada e descartada de maneira correta.

.Não:

- Jogue ou coloque na água
- Aqueça a mais de 100°C (212°F)
- Conserte nem desmonte

Para descartar a bateria, entre em contato com a área de atendimento a clientes IBM, pelo telefone (011) 889-8986, para obter informações sobre como enviar a bateria pelo correio para a IBM.

Instrução 3



PRECAUCIÓN:

Quando produtos a laser (unidades de CD-ROM, unidades de DVD, dispositivos de fibra ótica, transmissores, etc.) estiverem instalados, observe o seguinte:

- Não remova as tampas. A remoção das tampas de um produto a laser pode resultar em exposição prejudicial à radiação de laser. Nenhuma peça localizada no interior do dispositivo pode ser consertada.
- A utilização de controles ou ajustes ou a execução de procedimentos diferentes dos especificados aqui pode resultar em exposição prejudicial à radiação.

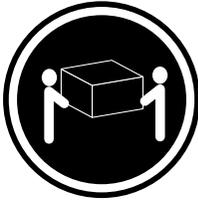


PERIGO

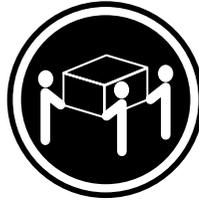
Alguns produtos a laser contêm um diodo laser da Classe 3A ou Classe 3B embutido. Observe o seguinte:

Radiação de laser quando aberto. Não olhe diretamente para o raio a olho nu ou com instrumentos óticos, e evite exposição direta ao raio.

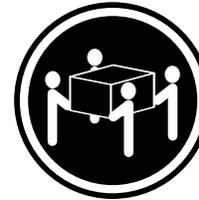
Instrução 4



≥18 kg (37 lbs)



≥32 kg (70,5 lbs)



≥55 kg (121,2 lbs)

CUIDADO:

Ao levantar a máquina, faça-o com segurança.

Instrução 5



CUIDADO:

Os botões Liga/Desliga localizados no dispositivo e na fonte de alimentação não desligam a corrente elétrica fornecida ao dispositivo. O dispositivo também pode ter mais de um cabo de alimentação. Para remover toda a corrente elétrica do dispositivo, assegure que todos os cabos de alimentação estejam desconectados da fonte de energia elétrica.



CUIDADO:

Instrução 10



CUIDADO:



Não coloque nenhum objeto com peso superior a 82 kg (180 lbs.) sobre dispositivos montados em rack.

重要:

Netfinity Server Library 中的所有提醒和危险条款前都有一个数字标识。该数字是用来交叉引用一个英文的提醒和危险条款及本部分中的与之对应的已翻译成其它文字的提醒和危险条款。

例如，如果一个提醒条款前的数字为 1，则本部分中相应的译文也带有标号 1。

在执行任何指示的操作之前，请确保您已经阅读了全部提醒和危险条款。

声明 1



危险

电源、电话和通信电缆中带有危险电流。

为避免电击：

雷电期间不要拆接电缆或安装、维修及重新配置本产品。

将所有电源线连接至正确布线并已安全接地的电源插座上。

将与本产品连接的所有设备连接至正确布线的插座上。

尽量只使用单手拆接信号电缆。

有水、火及结构损坏迹象时，请勿打开任何设备。

除非在安装配置过程中有明确指示，否则，打开设备机盖前应先断开与电源线、远程通信系统、网络和调制解调器的所有连接。

安装、移动或打开本产品及其附带设备的机盖时，应按下表所述连接和断开电缆。

连接时：

1. 关闭所有设备。
2. 首先将所有电缆连接至设备。
3. 将信号电缆连接至接口。
4. 将电源线连接至插座。

断开连接时：

1. 关闭所有设备。
2. 首先从插座中拔出电源线。
3. 从接口上拔下信号电缆。

声明 2



警告:

更换锂电池时，只能使用 IBM 产品号 33F8354 或者是厂商推荐的等同类型的电池。

如果系统模块中含有锂电池，则只能使用同一厂商制造的同类型的模块进行更换。电池中含有锂，如果使用、拿放或处理不当，可能会发生爆炸。

请勿对电池进行下列操作：
扔入或浸入水中。
加热超过 100 (212 F)
进行修理或分解
请按本地法规要求处理电池。

声明 3



警告:

安装激光产品（如 CD-ROM、DVD 驱动器、光纤设备或送话器）时，应注意以下事项：

不要拆除外盖。拆除激光产品的外盖可能会导致激光辐射的危险，本设备中没有用户可维修的部件。

非此处指定的其它控制、调整或与性能有关的操作都有可能产生激光辐射的危险。



危险

某些激光产品中包含内嵌的 3A 级或 3B 级激光二极管。请注意以下事项。
打开时会产生激光辐射。不要直视光束，不要使用光学仪器直接观看光束，避免直接暴露于光束之下。

声明 4



≥18 kg (37 磅)



≥32 kg (70.5 磅)



≥55 kg (121.2 磅)

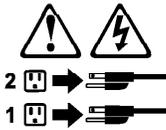
警告：
抬起时请采用安全操作方法。

声明 5



警告：

使用设备上的电源控制按钮和电源上的开关都不能断开本设备上的电流。
另外，本设备可能带有多条电源线。如要断开设备上的所有电流，请确保所有电源线均已与电源断开连接。



声明 6



警告：

如果在电源线连接设备的一端安装了固定松紧夹，则必须将电源线的另一端连接至使用方便的电源。

声明 7



警告:

如果设备带有外门，则在移动或抬起设备前应将其拆除或固定以避免造成人员伤害。外门支撑不了设备的重量。

声明 8



警告:

不要拆除电源外盖或贴有下列标签的任何部件。



贴有此标签的组件内部存在高电压、高电流的危险。这些组件中没有用户可维修的部件。如果怀疑其中的部件存在问题，应与服务技术人员联系。

声明 9



警告:

为避免人员伤害，拆除设备上的风扇前应拨下热插拔风扇电缆。

声明 10



警告:

机柜安装的设备上面不能放置重于 82kg (180 磅) 的物品。



> 82 kg (180 磅)

声明 11



警告：

下面的标签表明附近有锋利的边、角或接头。



声明 12



警告：

下面的标签表明附近有高热表面。



重要資訊：

Nefinity Server Library 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」聲明可在本節中找到相同內容的「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本節的「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。

聲明 1



危險

電源、電話及通信電纜上所產生的電流均有危險性。

欲避免電擊危險：

- 在雷雨期間，請勿連接或切斷本產品上的任何電纜線，或安裝、維修及重新架構本產品。
- 請將電源線接至接線及接地正確的電源插座。
- 請將本產品隨附的設備連接至接線正確的插座。
- 儘可能使用單手來連接或切斷信號電纜線。
- 當設備有火燒或泡水的痕跡，或有結構性損害時，請勿開啓該設備的電源。
- 在安裝及架構之時，若非常熟悉，在開啓裝置蓋子之前，請切斷電源線、電信系統、網路及數據機。
- 在安裝、移動本產品或附加裝置，或開啓其蓋子時，請依照下表中「連接」及「切斷」電纜線的步驟執行。

連接：

1. 關閉所有開關。
2. 先將所有電纜線接上裝置。
3. 將信號電纜接上接頭。
4. 再將電源線接上電源插座。
5. 開啓裝置的電源。

切斷：

1. 關閉所有開關。
2. 先自電源插座拔掉電源線。
3. 拔掉接頭上的所有信號電纜。
4. 再拔掉裝置上的所有電纜線。

聲明 2



注意：

更換鋰電池時，只可使用 IBM 零件編號 33F8354 的電池，或製造商建議之相當類型的電池。若系統中具有包含鋰電池的模組，在更換此模組時，請使用相同廠商製造的相同模組類型。如未正確使用、處理或丟棄含有鋰的電池時，可能會引發爆炸。

請勿將電池：

- 丟入或浸入水中
- 加熱超過 100 °C (212 °F)
- 修理或拆開

請遵照當地法令規章處理廢棄電池。

聲明 3



注意：

安裝雷射產品(如 CD-ROM、DVD 光碟機、光纖裝置或發射器)時，請注意下列事項：

- 請勿移開蓋子。移開雷射產品的蓋子，您可能會暴露於危險的雷射輻射之下。裝置中沒有需要維修的組件。
- 不依此處所指示的控制、調整或處理步驟，您可能會暴露於危險的輻射之下。



危險

有些雷射產品含有內嵌式 Class 3A 或 Class 3B 雷射二極體。請注意下列事項：

開啓時會產生雷射輻射。請勿凝視光束，不要使用光學儀器直接觀察，且應避免直接暴露在光束下。

聲明 4



≥ 18 公斤 (37 磅) ≥ 32 公斤 (70.5 磅) ≥ 55 公斤 (121.2 磅)

注意：

抬起裝置時，請注意安全措施。

聲明 6



注意：

若您在電源線與裝置連接的一端安裝了鬆緊托架選用配備，您必須將電源線的另一端接至容易插上或拔掉電源上。

聲明 10



注意：

請勿將任何重量超過 82 公斤 (180 磅) 的物品置於已安裝機架的裝置上方。



>82 公斤 (180 磅)

Important:

Toutes les consignes Attention et Danger indiquées dans la bibliothèque :cit.Netfinity Server:ecit. sont précédées d'un numéro. Ce dernier permet de mettre en correspondance la consigne en anglais avec ses versions traduites dans la présente section.

Par exemple, si une consigne de type Attention est précédée du chiffre 1, ses traductions sont également précédées du chiffre 1 dans la présente section.

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

Notice n° 1



DANGER

Le courant électrique passant dans les câbles de communication, ou les cordons téléphoniques et d'alimentation peut être dangereux.

Pour éviter tout risque de choc électrique:

- Ne manipulez aucun câble et n'effectuez aucune opération d'installation, d'entretien ou de reconfiguration de ce produit au cours d'un orage.
- Branchez tous les cordons d'alimentation sur un socle de prise de courant correctement câblé et mis à la terre.
- Branchez sur des socles de prise de courant correctement câblés tout équipement connecté à ce produit.
- Lorsque cela est possible, n'utilisez qu'une seule main pour connecter ou déconnecter les câbles d'interface.
- Ne mettez jamais un équipement sous tension en cas d'incendie ou d'inondation, ou en présence de dommages matériels.
- Avant de retirer les carters de l'unité, mettez celle-ci hors tension et déconnectez ses cordons d'alimentation, ainsi que les câbles qui la relient aux réseaux, aux systèmes de télécommunication et aux modems (sauf instruction contraire mentionnée dans les procédures d'installation et de configuration).
- Lorsque vous installez ou que vous déplacez le présent produit ou des périphériques qui lui sont raccordés, reportez-vous aux instructions ci-dessous pour connecter et déconnecter les différents cordons.

Connexion	Déconnexion
<ol style="list-style-type: none"> 1. Mettez les unités hors tension. 2. Commencez par brancher tous les cordons sur les unités. 3. Branchez les câbles d'interface sur des connecteurs. 4. Branchez les cordons d'alimentation sur des prises. 5. Mettez les unités sous tension. 	<ol style="list-style-type: none"> 1. Mettez les unités hors tension. 2. Débranchez les cordons d'alimentation des prises. 3. Débranchez les câbles d'interface des connecteurs. 4. Débranchez tous les câbles des unités.



Notice n° 2

ATTENTION:

Remplacez la pile au lithium usagée par une pile de référence identique exclusivement - voir la référence IBM - ou par une pile équivalente recommandée par le fabricant. Si votre système est doté d'un module contenant une pile au lithium, vous devez le remplacer uniquement par un module identique, produit par le même fabricant. La pile contient du lithium et présente donc un risque d'explosion en cas de mauvaise manipulation ou utilisation.

- Ne la jetez pas à l'eau.
- Ne l'exposez pas à une température supérieure à 100 °C.
- Ne cherchez pas à la réparer ou à la démonter.

Pour la mise au rebut, reportez-vous à la réglementation en vigueur.



Notice n° 3

ATTENTION:

Si des produits laser sont installés (tels que des unités de CD-ROM ou de DVD, des périphériques contenant des fibres optiques ou des émetteurs-récepteurs), prenez connaissance des informations suivantes:

- **N'ouvrez pas ces produits pour éviter une exposition directe au rayon laser. Vous ne pouvez effectuer aucune opération de maintenance à l'intérieur.**
- **Pour éviter tout risque d'exposition au rayon laser, respectez les consignes de réglage et d'utilisation des commandes, ainsi que les procédures décrites dans le présent document.**

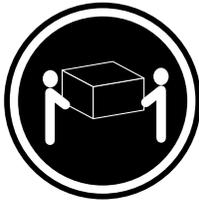


DANGER

Certains produits laser contiennent une diode laser de classe 3A ou 3B. Prenez connaissance des informations suivantes:

Rayonnement laser lorsque le carter est ouvert. évitez de regarder fixement le faisceau ou de l'observer à l'aide d'instruments optiques. évitez une exposition directe au rayon.

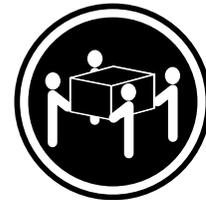
Notice n° 4



≥18 kg



≥32 kg



≥55 kg

ATTENTION:

Faites-vous aider pour soulever ce produit.

Notice n° 5



ATTENTION:

Le bouton de mise sous tension/hors tension de l'unité et l'interrupteur d'alimentation du bloc d'alimentation ne coupent pas l'arrivée de courant électrique à l'intérieur de la machine. Il se peut que votre unité dispose de plusieurs cordons d'alimentation. Pour isoler totalement l'unité du réseau électrique, débranchez tous les cordons d'alimentation des socles de prise de courant.



Notice n° 10



ATTENTION:



Wichtig:

Alle Sicherheitshinweise in dieser :cit.Netfinity Server-Bibliothek:ecit. beginnen mit einer Nummer. Diese Nummer verweist auf einen englischen Sicherheitshinweis mit den übersetzten Versionen dieses Hinweises in diesem Abschnitt.

Wenn z. B. ein Sicherheitshinweis mit der Nummer 1 beginnt, so erscheint die Übersetzung für diesen Sicherheitshinweis in diesem Abschnitt unter dem Hinweis 1.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Hinweis 1



VORSICHT

Elektrische Spannungen von Netz-, Telefon- und Datenübertragungsleitungen sind gefährlich.

Aus Sicherheitsgründen:

- Bei Gewitter an diesem Gerät keine Kabel anschließen oder lösen. Ferner keine Installations-, Wartungs- oder Rekonfigurationsarbeiten durchführen.
- Gerät nur an eine Schutzkontaktsteckdose mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Alle angeschlossenen Geräte ebenfalls an Schutzkontaktsteckdosen mit ordnungsgemäß geerdetem Schutzkontakt anschließen.
- Signalkabel möglichst einhändig anschließen oder lösen.
- Keine Geräte einschalten, wenn die Gefahr einer Beschädigung durch Feuer, Wasser oder andere Einflüsse besteht.
- Die Verbindung zu den angeschlossenen Netzkabeln, Telekommunikationssystemen, Netzwerken und Modems ist vor dem Öffnen des Gehäuses zu unterbrechen. Es sei denn, dies ist in den zugehörigen Installations- und Konfigurationsprozeduren anders angegeben.
- Nur nach den nachfolgend aufgeführten Anweisungen arbeiten, die für Installation, Transport oder Öffnen von Gehäusen von Personal Computern oder angeschlossenen Einheiten gelten.

Kabel anschließen:	Kabel lösen:
1. Alle Geräte ausschalten und Netzstecker ziehen.	1. Alle Geräte ausschalten.
2. Zuerst alle Kabel an Einheiten anschließen.	2. Zuerst Netzstecker von Steckdose lösen.
3. Signalkabel an Anschlußbuchsen anschließen.	3. Signalkabel von Anschlußbuchsen lösen.
4. Netzstecker an Steckdose anschließen.	4. Alle Kabel von Einheiten lösen.
5. Gerät einschalten.	

Hinweis 2



ACHTUNG:

Eine verbrauchte Batterie nur durch eine Batterie mit der IBM Teilenummer 33F8354 oder durch eine vom Hersteller empfohlene Batterie ersetzen. Wenn Ihr System ein Modul mit einer Lithium-Batterie enthält, ersetzen Sie es immer mit dem selben Modultyp vom selben Hersteller. Die Batterie enthält Lithium und kann bei unsachgemäßer Verwendung, Handhabung oder Entsorgung explodieren.

Die Batterie nicht:

- mit Wasser in Berührung bringen.
- über 100 C erhitzen.
- reparieren oder zerlegen.

Die örtlichen Bestimmungen für die Entsorgung von Sondermüll beachten.

Hinweis 3



ACHTUNG:

Wenn ein Laserprodukt (z. B. CD-ROM-Laufwerke, DVD-Laufwerke, Einheiten mit Glasfaserkabeln oder Transmitter) installiert ist, beachten Sie folgendes.

- Das Entfernen der Abdeckungen des CD-ROM-Laufwerks kann zu gefährlicher Laserstrahlung führen. Es befinden sich keine Teile innerhalb des CD-ROM-Laufwerks, die vom Benutzer gewartet werden müssen. Die Verkleidung des CD-ROM-Laufwerks nicht öffnen.
- Steuer- und Einstellelemente sowie Verfahren nur entsprechend den Anweisungen im vorliegenden Handbuch einsetzen. Andernfalls kann gefährliche Laserstrahlung auftreten.



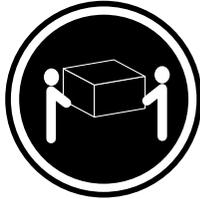
VORSICHT

Manche CD-ROM-Laufwerke enthalten eine eingebaute Laserdiode der Klasse 3A oder 3B. Die nachfolgend aufgeführten Punkte beachten.

Laserstrahlung bei geöffneter Tür. Niemals direkt in den Laserstrahl sehen, nicht direkt mit optischen Instrumenten betrachten und den Strahlungsbereich meiden.

Hinweis 4

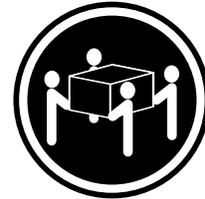




≥18 kg



≥32 kg



≥55 kg

ACHTUNG:

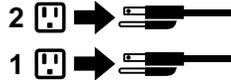
Beim Anheben der Maschine die vorgeschriebenen Sicherheitsbestimmungen beachten.

Hinweis 5



ACHTUNG:

Mit dem Betriebsspannungsschalter an der Vorderseite des Servers und dem Betriebsspannungsschalter am Netzteil wird die Stromversorgung für den Server nicht unterbrochen. Der Server könnte auch mehr als ein Netzkabel aufweisen. Um die gesamte Stromversorgung des Servers auszuschalten, muß sichergestellt werden, daß alle Netzkabel aus den Netzsteckdosen herausgezogen wurden.



Hinweis 10



ACHTUNG:



Keine Gegenstände, die mehr als 82 kg wiegen, auf Rack-Einheiten ablegen.

Importante:

Tutti gli avvisi di attenzione e di pericolo riportati nella pubblicazione :cit.Netfinity Server Library:ecit. iniziano con un numero. Questo numero viene utilizzato per

confrontare avvisi di attenzione o di pericolo in inglese con le versioni tradotte riportate in questa sezione.

Ad esempio, se un avviso di attenzione inizia con il numero 1, la relativa versione tradotta è presente in questa sezione con la stessa numerazione.

Prima di eseguire una qualsiasi istruzione, accertarsi di leggere tutti gli avvisi di attenzione e di pericolo.

Avviso 1



PERICOLO

La corrente elettrica circolante nei cavi di alimentazione, del telefono e di segnale è pericolosa.

Per evitare il pericolo di scosse elettriche:

- Non collegare o scollegare i cavi, non effettuare l'installazione, la manutenzione o la riconfigurazione di questo prodotto durante i temporali.
- Collegare tutti i cavi di alimentazione ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Collegare qualsiasi apparecchiatura collegata a questo prodotto ad una presa elettrica correttamente cablata e munita di terra di sicurezza.
- Quando possibile, collegare o scollegare i cavi di segnale con una sola mano.
- Non accendere qualsiasi apparecchiatura in presenza di fuoco, acqua o se sono presenti danni all'apparecchiatura stessa.
- Scollegare i cavi di alimentazione, i sistemi di telecomunicazioni, le reti e i modem prima di aprire i coperchi delle unità, se non diversamente indicato nelle procedure di installazione e configurazione.
- Collegare e scollegare i cavi come descritto nella seguente tabella quando si effettuano l'installazione, la rimozione o l'apertura dei coperchi di questo prodotto o delle unità collegate.

Per collegare:	Per scollegare:
1. SPEGNERE tutti i dispositivi.	1. SPEGNERE tutti i dispositivi.
2. Collegare prima tutti i cavi alle unità.	2. Rimuovere prima i cavi di alimentazione dalle prese elettriche.
3. Collegare i cavi di segnale ai connettori.	3. Rimuovere i cavi di segnale dai connettori.
4. Collegare i cavi di alimentazione alle prese elettriche.	4. Rimuovere tutti i cavi dalle unità.
5. ACCENDERE le unità.	

Avviso 2



ATTENZIONE:

Quando si sostituisce la batteria al litio, utilizzare solo una batteria IBM con numero parte 33F8354 o batterie dello stesso tipo o :rev refid=a. di tipo equivalente consigliate dal produttore. Se il sistema di cui si dispone è provvisto di un modulo contenente una batteria al litio, sostituire tale batteria solo con un tipo di modulo uguale a quello fornito dal produttore. La batteria contiene litio e può esplodere se utilizzata, maneggiata o smaltita impropriamente.

Evitare di:

- Gettarla o immergerla in acqua
- Riscaldarla ad una temperatura superiore ai 100°C
- Cercare di ripararla o smontarla

Smaltire secondo la normativa in vigore (D.Lgs 22 del 5/2/9) e successive disposizioni nazionali e locali.

Avviso 3



ATTENZIONE:

Quando si installano prodotti laser come, ad esempio, le unità DVD, CD-ROM, a fibre ottiche o trasmettitori, prestare attenzione a quanto segue:

- Non rimuovere i coperchi. L'apertura dei coperchi di prodotti laser può determinare l'esposizione a radiazioni laser pericolose. All'interno delle unità non vi sono parti su cui effettuare l'assistenza tecnica.
- L'utilizzo di controlli, regolazioni o l'esecuzione di procedure non descritti nel presente manuale possono provocare l'esposizione a radiazioni pericolose.

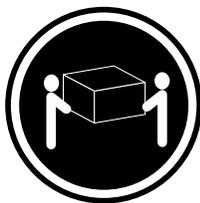


PERICOLO

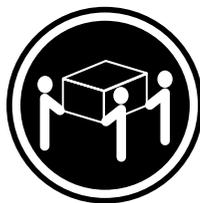
Alcuni prodotti laser contengono all'interno un diodo laser di Classe 3A o Classe 3B. Prestare attenzione a quanto segue:

Aperto l'unità vengono emesse radiazioni laser. Non fissare il fascio, non guardarlo direttamente con strumenti ottici ed evitare l'esposizione diretta al fascio.

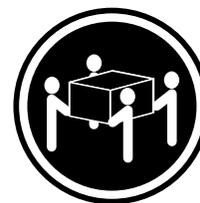
Avviso 4



≥18 kg



≥32 kg



≥55 kg

ATTENZIONE:

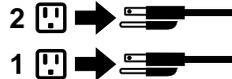
Durante il sollevamento della macchina seguire delle norme di sicurezza.

Avviso 5



ATTENZIONE:

Il pulsante del controllo dell'alimentazione situato sull'unità e l'interruttore di alimentazione posto sull'alimentatore :erev refid=a. non disattiva la corrente elettrica fornita all'unità. L'unità potrebbe disporre di più di un cavo di alimentazione. Per disattivare la corrente elettrica dall'unità, accertarsi che tutti i cavi di alimentazione siano scollegati dalla sorgente di alimentazione.



Avviso 10



ATTENZIONE:



Non poggiare oggetti che pesano più di 82 kg sulla parte superiore delle unità montate in rack.

경고문 1



위험

전원, 전하 및 통신 케이블로부터 흘러 나오는 전류는 위험합니다.

전기 충격을 피하려면:

- 뇌우를 동반할 때는 케이블의 연결이나 철수, 이 제품의 설치, 유지보수 또는 재구성을 하지 마십시오.
- 모든 전원 코드를 적절히 배선 및 접지해야 합니다.
- 이 제품에 연결될 모든 장비를 적절하게 배선된 콘센트에 연결하십시오.
- 가능한 한 신호 케이블을 한 손으로 연결하거나 끊으십시오.
- 화재, 수해 또는 구조상의 손상이 있을 경우 장비를 켜지 마십시오.
- 설치 및 구성 프로시저에 다른 설명이 없는 한, 장치 덮개를 열기 전에 연결된 전원 코드, 원격 통신 시스템, 네트워크 및 모뎀을 끊어 주십시오.
- 제품 또는 접속된 장치를 설치, 이동 및 덮개를 열 때 다음 설명에 따라 케이블을 연결하거나 끊도록 하십시오.

연결하려면:

1. 모든 스위치를 끕니다.
2. 먼저 모든 케이블을 장치에 연결합니다.
3. 신호 케이블을 커넥터에 연결합니다.
4. 콘센트에 전원 코드를 연결합니다.
5. 장치 스위치를 켭니다.

연결을 끊으려면:

1. 모든 스위치를 끕니다.
2. 먼저 콘센트에서 전원 코드를 뽑습니다.
3. 신호 케이블을 커넥터에서 제거합니다.
4. 장치에서 모든 케이블을 제거합니다.

경고문 2



주의:

리튬 배터리를 교체할 때는 IBM 부품 번호 33F8354 또는 제조업체에서 권장하는 동등한 유형의 배터리를 사용하십시오. 시스템에 리튬 배터리를 갖고 있는 모듈이 있으면 동일한 제조업체에서 생산된 동일한 모듈 유형으로 교체하십시오. 배터리에 리튬이 있을 경우 제대로 사용, 처리 또는 처분하지 않으면 폭발할 수 있습니다.

다음은 주의하십시오.

- 던지거나 물에 담그지 않도록 하십시오.
- 100°C(212°F) 이상으로 가열하지 마십시오.
- 수리하거나 분해하지 마십시오.

지역 법령이나 규정의 요구에 따라 배터리를 처분하십시오.

경고문 3



주의:

레이저 제품(CD-ROMs, DVD 드라이브, 광 장치 또는 트랜스미터 등과 같은)이 설치되어 있을 경우 다음을 유의하십시오.

- 덮개를 제거하지 마십시오. 레이저 제품의 덮개를 제거했을 경우 위험한 레이저 광선에 노출될 수 있습니다. 이 장치 안에는 서비스를 받을 수 있는 부품이 없습니다.

- 여기에서 지정하지 않은 방식의 제어, 조절 또는 실행으로 인해 위험한 레이저 광선에 노출될 수 있습니다.



위험

일부 레이저 제품에는 클래스 3A 또는 클래스 3B 레이저 다이오드가 들어 있습니다. 다음을 주의하십시오.

열면 레이저 광선에 노출됩니다. 광선을 주시하거나 광학 기계를 직접 쳐다보지 않도록 하고 광선에 노출되지 않도록 하십시오.

경고문 4



≥18 kg (37 lbs)



≥ 32 kg (70.5 lbs)



≥ 55 kg (121.2 lbs)

주의:

기계를 들 때는 안전하게 들어 올리십시오.

경고문 5



주의:

장치의 전원 제어 버튼 및 전원 공급기의 전원 스위치는 장치에 공급되는 전류를 차단하지 않습니다. 장치에 둘 이상의 전원 코드가 연결되어 있을 수도 있습니다. 장치에서 모든 전류를 차단하려면 모든 전원 코드가 전원으로부터 차단되어 있는지 확인하십시오.





주의:

서랍형 모델의 장치 상단에 82 kg(180 lbs.)이 넘는 물체를 올려 놓지 마십시오.



> 82 kg (180 lbs)

Importante:

Todas las declaraciones de precaución de esta :cit.Biblioteca del servidor Netfinity:ecit. empiezan con un número. Dicho número se emplea para establecer una referencia cruzada de una declaración de precaución o peligro en inglés con las versiones traducidas que de dichas declaraciones pueden encontrarse en esta sección.

Por ejemplo, si una declaración de peligro empieza con el número 1, las traducciones de esta declaración de precaución aparecen en esta sección bajo Declaración 1.

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

Declaración 1



PELIGRO

La corriente eléctrica de los cables telefónicos, de alimentación y de comunicaciones es perjudicial.

Para evitar una descarga eléctrica:

- No conecte ni desconecte ningún cable ni realice las operaciones de instalación, mantenimiento o reconfiguración de este producto durante una tormenta.
- Conecte cada cable de alimentación a una toma de alimentación eléctrica con conexión a tierra y cableado correctos.
- Conecte a tomas de alimentación con un cableado correcto cualquier equipo que vaya a estar conectado a este producto.
- Si es posible, utilice una sola mano cuando conecte o desconecte los cables de señal.
- No encienda nunca un equipo cuando haya riesgos de incendio, de inundación o de daños estructurales.
- Desconecte los cables de alimentación, sistemas de telecomunicaciones, redes y módems conectados antes de abrir las cubiertas del dispositivo a menos que se indique lo contrario en los procedimientos de instalación y configuración.
- Conecte y desconecte los cables tal como se describe en la tabla siguiente cuando desee realizar una operación de instalación, de traslado o de apertura de las cubiertas para este producto o para los dispositivos conectados.

Para la conexin	Para la desconexin
<ol style="list-style-type: none"> 1. APÁGUELO todo. 2. En primer lugar, conecte los cables a los dispositivos. 3. Conecte los cables de señal a los conectores. 4. Conecte cada cable de alimentaciin a la toma de alimentaciin. 5. ENCIENDA el dispositivo. 	<ol style="list-style-type: none"> 1. APÁGUELO todo. 2. En primer lugar, retire cada cable de alimentaciin de la toma de alimentaciin. 3. Retire los cables de señal de los conectores. 4. Retire los cables de los dispositivos.

Declaración 2



PRECAUCIÓN:

Cuando desee sustituir la batería de litio, utilice únicamente el número de pieza 33F8354 de IBM o cualquier tipo de batería equivalente que recomiende el fabricante. Si el sistema tiene un módulo que contiene una batería de litio, sustitúyalo únicamente por el mismo tipo de módulo, que ha de estar creado por el mismo fabricante. La batería contiene litio y puede explotar si el usuario no la utiliza ni la maneja de forma adecuada o si no se desprende de la misma como corresponde.

No realice las acciones siguientes:

- Arrojarla al agua o sumergirla
- Calentarla a una temperatura que supere los 100°C (212°F)
- Repararla o desmontarla

Despréndase de la batería siguiendo los requisitos que exija el reglamento o la legislación local.

Declaración 3



PRECAUCIÓN:

Cuando instale productos láser (como, por ejemplo, CD-ROM, unidades DVD, dispositivos de fibra óptica o transmisores), tenga en cuenta las advertencias siguientes:

- No retire las cubiertas. Si retira las cubiertas del producto láser, puede quedar expuesto a radiación láser perjudicial. Dentro del dispositivo no existe ninguna pieza que requiera mantenimiento.
- El uso de controles o ajustes o la realización de procedimientos que no sean los que se han especificado aquí pueden dar como resultado una exposición perjudicial a las radiaciones.

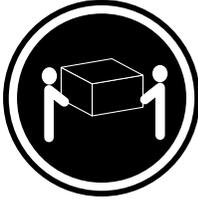


PELIGRO

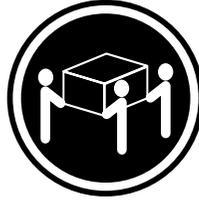
Algunos productos láser contienen un diodo de láser incorporado de Clase 3A o de Clase 3B. Tenga en cuenta la advertencia siguiente.

Cuando se abre, hay radiación láser. No mire fijamente el rayo ni lleve a cabo ningún examen directamente con instrumentos ópticos; evite la exposición directa al rayo.

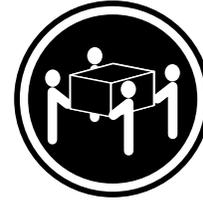
Declaración 4



≥18 kg (37 libras)



≥32 kg (70,5 libras)



≥55 kg (121,2 libras)

PRECAUCIÓN:

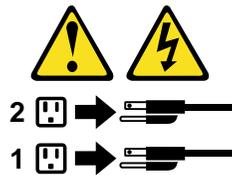
Tome medidas de seguridad al levantar el producto.

Declaración 5



PRECAUCIÓN:

El botón de control de alimentación del dispositivo y el interruptor de alimentación de la fuente de alimentación no apagan la corriente eléctrica suministrada al dispositivo. Es posible también que el dispositivo tenga más de un cable de alimentación. Para eliminar la corriente eléctrica del dispositivo, asegúrese de desconectar todos los cables de alimentación de la fuente de alimentación.



Declaración 10



PRECAUCIÓN:



No coloque ningún objeto que pese más de 82 kg (180 libras) encima de los dispositivos montados en bastidor.

Send us your comments!

We want to know your opinion about this manual (part number 09N1030). Your input will help us to improve our publications.

Please photocopy this survey, complete it, and then fax it to **IBM HMM Survey at 919-543-8167 (USA)**.

Name: _____

Phone number: _____

1. Do you like this manual?

Yes No

2. What would you like to see added, changed, or deleted in this manual?

3. What is your service experience level?

Less than five years

More than five years

4. Which Servers to you service most?

Thank you for your response!

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 and model
- Processor or hard disk upgrades
- Failure symptom
 - Do 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?
- Reference/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 Reference/Diagnostics Diskette (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 set-up between "working and non-working" systems will often lead to problem resolution.

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