Netfinity 5500

User's Handbook

Netfinity 5500

User's Handbook

IBM

Note

Before using this information and the product it supports, be sure to read the general information under Appendix C, "Product Warranties and Notices" on page 441.

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DANGER

> **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.**
>
> **To avoid shock hazard:**
>
> – **The power cord must be connected to a properly wired and earthed receptacle.**
>
> – **Any equipment to which this product will be attached must also be connected to properly wired receptacles.**
>
> **When possible, use one hand to connect or disconnect signal cables to prevent a possible shock from touching two surfaces with different electrical potentials.**
>
> **Electrical current from power, telephone, and communications cables is hazardous. To avoid shock hazard, connect and disconnect cables as described following when installing, moving, or opening covers of this product or attached devices.**

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To Connect	To Disconnect
1. Turn Everything OFF.	1. Turn Everything OFF.
2. First, attach all cables to devices.	2. First, remove power cord(s) from outlet.
3. Attach signal cables to receptacles.	3. Remove signal cables from receptacles.
4. Attach power cord(s) to outlet.	4. Remove all cables from devices.
5. Turn device ON.	

NOTE: In the UK, by law, the telephone cable must be connected after the power cord.	NOTE: In the UK, the power cord must be disconnected after the telephone cable.

Lithium Battery Notice

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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.**

Laser Compliance Statements

Some IBM PC Server and Netfinity models are equipped from the factory with a CD-ROM drive. CD-ROM drives are also sold separately as options. The CD-ROM drive is a laser product. The CD-ROM drive is certified in the U.S. to conform to the requirements of the Department of Health and Human Services 21 Code of Federal Regulations (DHHS 21 CFR) Subchapter J for Class 1 laser products. Elsewhere, the drive is certified to conform to the requirements of the International Electrotechnical Commission (IEC) 825 and CENELEC EN 60 825 for Class 1 laser products.

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CAUTION:
When a CD-ROM drive is installed, note the following.

Use of controls or adjustments or performance of procedures other than those specified herein might result in hazardous radiation exposure.

Removing the covers of the CD-ROM drive could result in exposure to hazardous laser radiation. There are no serviceable parts inside the CD-ROM drive. Do not remove the CD-ROM drive covers.

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DANGER

> **Some CD-ROM drives 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.**

Caution and Danger Statements

![Warning triangle symbol]

Important:

> All caution and danger statements in this book 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 that can be found in the *Safety Information* book.

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

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

Instruções de Cuidado e Perigo (Português do Brasil)
Importante:

> Todas as instruções de cuidado e perigo deste manual são iniciadas por um número. Este número é utilizado para fazer a referência cruzada de uma instrução de cuidado ou perigo no idioma inglês com as versões traduzidas das instruções de cuidado e perigo que podem ser encontradas na publicação *Safety Information* (Informações sobre Segurança).

> Por exemplo, se uma instrução de cuidado é iniciada pelo número 1, as traduções para aquela instrução de cuidado aparecem na publicação *Safety Information* sob a instrução 1.

> 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。

Napomene opasnosti i upozorenja (hrvatski)

Važno

Sva napomene upozorenja i opasnosti u ovoj knjizi zapocinju brojem. Taj se koristi za usporedbu izvornih napomena na engleskom jeziku s prijevodom koji se nalazi u *Sigurnosnim Uputama (Safety Information)*.

Na pr. ako napomena upozorenja počinje s brojem 1, prijevod tog teksta se nalazi u *Sigurnosnim Uputama (Safety Information)* kao napomena br. 1

Obavezno pročitajte sve napomene upozorenja i opasnosti prije nego započnete s radovima prema ovim uputama.

Instrukce Nebezpečí a Pozor (Česky)

Pozor:

Všechny bezpečnostní instrukce v této knize začínají číslem. Tato čísla jsou používána pro nalezení odpovídajícího překladu anglické bezpečnostní instrukce v knize *Safety Information*.

Například pokud bezpečnostní instrukce začíná číslem 1, naleznete odpovídající překlad v knize *Safety Information* pod číslem 1.

Ujistěte se, že jste si před začátkem provádění jakékoli instrukce nejdříve přečetli všechny bezpečnostní instrukce.

Sikkerhedsforskrifter mærket Pas på! og Fare! (dansk)
Vigtigt:

Alle sikkerhedsforskrifter i dette hæfte begynder med et tal. Dette tal bruges som krydshenvisning fra en engelsk sikkerhedsforskrift mærket CAUTION (Pas på!) eller DANGER (Fare!) til de oversatte forskrifter, der findes i dette hæfte (*Safety Information*).

Hvis f.eks. en sikkerhedsforskrift mærket Pas på! hedder Forskrift 1, er denne en oversættelse af den engelske forskrift nummer 1 i hæftet.

Læs alle sikkerhedsforskrifter mærket Pas på! og Fare!, før du følger nogen af instruktionerne.

Turvaohjeet (suomi)

Tärkeää:

> Kaikkien tämän *Safety Information* -kirjan turvaohjeiden alussa on numero, jonka avulla englanninkielistä VAARA-ilmoitusta (DANGER) tai varoitusta (CAUTION) vastaava suomenkielinen turvaohje löytyy kätevästi.

> Jos varoitus alkaa esimerkiksi numerolla 1, vastaavalla suomenkielisellä käännöksellä on sama numero, ja se löytyy jäljempänä tästä kirjasta.

> Lue kaikki turvaohjeet, ennen kuin aloitat ohjeissa kuvatut toimet.

Consignes Attention et Danger (Français)

Important:

> Toutes les consignes Attention et Danger indiquées dans ce document sont précédées d'un numéro. Ce dernier permet de mettre en correspondance la consigne en anglais avec ses versions traduites situées dans le livret *Safety Information*.

> Par exemple, si une consigne de type Attention est précédée du chiffre 1, ses traductions sont également précédées du chiffre 1 dans le livret *Safety Information*.

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

Sicherheitshinweise (Deutsch)

Wichtig:

Alle Sicherheitshinweise in dieser Broschüre beginnen mit einer Nummer. Diese Nummer verweist auf einen englischen Sicherheitshinweis mit den übersetzten Versionen dieses Hinweises, die in der Broschüre mit den Sicherheitshinweisen (*Safety Information*) enthalten sind.

Wenn z. B. ein Sicherheitshinweis mit der Nummer 1 beginnt, so erscheint die Übersetzung für diesen Sicherheitshinweis in der Broschüre *Safety Information* unter dem Hinweis 1.

Lesen Sie alle Sicherheitshinweise, bevor Sie eine Anweisung ausführen.

Δηλώσεις προσοχής και κινδύνου (Ελληνικά)

Σημαντικό:

Όλες οι δηλώσεις προσοχής και κινδύνου στο παρόν εγχειρίδιο αρχίζουν με έναν αριθμό. Ο αριθμός αυτός χρησιμοποιείται για την παραπομπή μεταξύ αγγλικών και μεταφρασμένων δηλώσεων προσοχής και κινδύνου που βρίσκονται στο εγχειρίδιο *Safety Information*.

Για παράδειγμα, αν μια δήλωση προσοχής αρχίζει με τον αριθμό 1, οι μεταφράσεις για τη συγκεκριμένη δήλωση προσοχής βρίσκονται στο εγχειρίδιο *Safety Information* κάτω από τον τίτλο Δήλωση 1.

Βεβαιωθείτε ότι διαβάσατε όλες τις δηλώσεις προσοχής και κινδύνου πριν πραγματοποιήσετε τις εργασίες που περιγράφονται στις οδηγίες.

Figyelmeztetések és veszély ismertetések (Magyar)

Fontos:

A könyvben szereplő mindegyik figyelmeztetés és veszély ismertető egy számmal kezdődik. Ez egy hivatkozási szám, mely összeköti a Biztonsági információk (Safety Information) című kötetben található ismertetők angol nyelvű verzióit a fordított verziókkal.

Például ha egy figyelmeztetés 1-essel kezdődik, a fordítása a Biztonsági információk (Safety Information) című kötetben az 1. ismertető alatt található.

Feltétlenül olvassa végig a figyelmeztetéseket és veszély ismertetőket, mielőtt nekikezd bármelyik útmutató végrehajtásához.

Avvisi di attenzione e di pericolo (Italiano)

Importante:

Tutti gli avvisi di attenzione e di pericolo riportati in questo manuale iniziano con un numero. Tale numero contrassegna gli avvisi in lingua inglese e le corrispondenti versioni tradotte che sono riportate nella nelle informazioni di sicurezza (*Safety information*).

Ad esempio, se un avviso di attenzione inizia con il numero 1, la corrispondente versione tradotta è riportata nella pubblicazione *Safety Information* come l'avviso numero 1.

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

注意と危険に関する記述（日本語）

重要：

> この本では、番号の後に注意と危険に関する記述が掲載されて
> います。この番号は英語の注意と危険に関する記述と小冊子
> 「Safety Information」に記載されている翻訳版の記述との
> 相互参照のために使用します。
>
> たとえば、もし注意の記述が番号 1 で始まる場合は、この注意
> の記述は小冊子「Safety Information」の記述 1 にあります。
>
> 作業を始める前に、すべての注意と危険に関する記述をお読み
> ください。

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 사용됩
> 니다.
>
> 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 읽
> 도록 하십시오.

Изјави за предупредување и опасност (македонски)

Важно:

Сите изјави за предупредување и опасност во оваа книга почнуваат со број. Овој број е употребен за поврзување на англиските изјави за предупредување и опасност со преведените верзии на изјавите за предупредување и опасност кои може да се најдат во книгата *Безбедносни информации (Safety Information).*

На пример, ако изјавата за предупредување почнува со бројот 1, преводот на таа изјава за предупредување се појавува во книгата Safety Information под изјава 1.

Прочитајте ги сите изјави за предупредување и опасност пред да изведете било која инструкција

Veiligheidsinstructies (Nederlands)
Belangrijk:

Alle veiligheidsinstructies in dit boekje beginnen met een nummer. Met dit nummer wordt verwezen naar de Engelse instructie en alle vertalingen in dit boekje *Safety Information.*

Als een instructie bijvoorbeeld begint met nummer 1, kunt u de Engelse versie en alle vertalingen in dit boekje *Safety Information* eveneens vinden onder instructie 1.

Lees alle instructies in dit boekje voordat u installatie- of onderhoudsprocedures uitvoert.

Advarsels- og faremerknader (norsk)

Viktig:

Alle advarsels- og faremerknader i denne boken begynner med et nummer. Dette nummeret brukes som kryssreferanse mellom en engelsk advarsels- eller faremerknad og den oversatte versjonen av merknaden som du kan finne i boken om sikkerhetsinformasjon (*Safety Information*).

Hvis for eksempel en advarselsmerknad begynner med nummeret 1, finner du oversettelsen av advarselsmerknaden i boken *Safety Information* under merknad 1.

Pass på at du leser alle advarsels- og faremerknader før du utfører noen av instruksjonene.

Ostrzeżenia i uwagi o niebezpieczeństwie (polski)

Ważne:

Wszystkie uwagi o niebezpieczeństwie i ostrzeżenia przed niebezpieczeństwem w tej książce zaczynają się numerem. Numer ten jest używany do porównania angielskiej wersji uwag i ostrzeżeń z ich tłumaczeniem, które można znaleźć w książce *Uwagi dotyczące bezpieczeństwa (Safety Information)*.

Na przykład, jeśli uwaga zaczyna się numerem 1, to w książce *Uwagi dotyczące bezpieczeństwa (Safety Information)*, znajduje się jej tłumaczenie zaczynające się też numerem 1.

Należy przeczytać wszystkie uwagi i ostrzeżenia przed wykonaniem jakiejkolwiek instrukcji.

Notas de Cuidado e de Perigo (Português)

Importante:

Todas as notas de cuidado e de perigo, incluídas neste manual, começam por um número. Este número é utilizado para, a partir de uma nota de cuidado ou perigo, em Inglês, identificar a respectiva tradução, a qual pode ser encontrada no manual *Safety Information* (Informações sobre Segurança).

Por exemplo, se uma nota de cuidado começa pelo número 1, a respectiva tradução é apresentada no manual *Safety Information*, identificada como nota número 1.

Não deixe de ler todas as notas de cuidado e perigo, antes de executar qualquer das instruções.

Замечания "Осторожно" и "Опасно" (Русский)

Важное замечание:

Все замечания, помеченные в этой книге словами "Осторожно" ("Caution") и "Опасно" ("Danger"), пронумерованы. По этим номерам вы сможете найти перевод замечаний "Осторожно" или "Опасно" в брошюре *Safety Information* (Информация по технике безопасности).

Так, если вам нужен перевод замечания "Caution" ("Осторожно") под номером 1, то вы найдете его в брошюре *Safety Information* (Информация по технике безопасности) тоже под номером 1.

Перед тем, как выполнять какие-либо инструкции, обязательно прочтите все замечания, помеченные в этой книге словами "Осторожно" ("Caution") и "Опасно" ("Danger").

Inštrukcie Nebezpe enstvo a Pozor (Slovensky)

Pozor:

Všetky bezpe nostné inštrukcie v tejto knižke za ínajú íslom. Tieto ísla sú používané pre h adanie zodpovedajúceho prekladu anglickej bezpe nostnej inštrukcie v knižke *Safety Information*.

Napíklad ak bezpe nostné inštrukcie za ínajú íslom 1, nájdete zodpovedajúci perklad v knižke*Safety Information* pod íslom 1.

Uistite sa, že ste si pre za iatkom vykonávania akejko vek inštrukcie najprv pre ítali všetky bezpe nostné inštrukcie.

Navedbe svaril in nevarnosti (slovensko)

Važno:

Vse navedbe svaril in nevarnosti v tej knjigi se začenjajo s številko. To številko uporabljamo za navzkrižno povezavo angleške navedbe svarila ali nevarnosti s prevedenimi verzijami navedbe svarila ali nevarnosti, ki jo lahko najdemo v knjigi *Informacije o varnosti (Safety Information)*.

Na primer, če se navedba svarila začenja s številko 1, se prevod za to navedbo svarila pojavi v knjigi *Informacije o varnosti (Safety Information)* pod navedbo 1.

Obvezno preberite vse navedbe svaril in nevarnosti, preden začnete izvajati katerokoli navodilo.

Declaraciones sobre precauciones y peligros (español)

Importante:

Todas las declaraciones de precaución y peligro contenidas en este manual empiezan por un número. Dicho número se emplea para establecer una referencia cruzada entre de una declaración de precaución o peligro en inglés con las versiones traducidas que de dichas declaraciones pueden encontrarse en el manual *Información de seguridad (Safety Information).*

Por ejemplo, si una declaración de peligro empieza con el número 1, las traducciones de esta declaración de precaución aparecen en el manual *Información de seguridad (Safety Information)* bajo Declaración 1.

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

Varningsmeddelanden (Svenska)

Viktigt:

Alla varningsmeddelanden i den här boken inleds med ett nummer. Med hjälp av numren kan du identifiera meddelandenas översättningar, som finns i boken Safety Information.

Om t ex ett varningsmeddelande har nummer 1 hittar du översättningen av det i Safety Information också som meddelande nummer 1.

Läs alla varningsmeddelanden innan du börjar utföra några åtgärder.

注意及危險聲明（中文）

重要資訊：

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

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

執行任何指示之前，請詳讀所有「注意」及「危險」的聲明。

This book provides instructions on how to set up, install, and configure your Netfinity 5500. It includes information about how to install and remove options. This book also provides information to help you solve many problems that might occur.

How This Book is Organized

Chapter 1, "Introducing the IBM Netfinity 5500," describes the Netfinity 5500 and provides an overview of the server's features. This chapter also provides the steps necessary to unpack, set up, and install your server.

Chapter 2, "Setting Up Your Server," provides a general introduction to using your server.

Chapter 3, "Configuring and Monitoring Your Disk Arrays," provides step-by-step instructions to perform the tasks necessary to configure, add, change, or delete one or more disk arrays. This chapter also describes how to install and use the server utility programs that are required by some of the supported operating systems, and how to install and use the Administration and Monitoring program.

Chapter 4, "Configuring Your Server," describes how to use the Configuration/Setup utility program to configure your server. This chapter also provides instructions for using various utility programs.

Chapter 5, "Netfinity System Management Processor," provides information about the integrated system management processor in your server.

Chapter 6, "Installing Options," contains instructions for installing and removing options, such as memory, adapters, and internal drives. Instructions for connecting external options are also included in this chapter.

Chapter 7, "Rack Installation," contains information about installing your server in a rack.

Chapter 8, "Solving Problems," includes an overview of the diagnostic tools, instructions for testing the server, lists of error messages, and troubleshooting charts. This chapter also contains information about checking the server for damage, and resolving configuration conflicts.

Chapter 9, "Getting Help, Service, and Information," provides instructions on how to obtain service and technical assistance for your Netfinity 5500 and other IBM products that you might plan to use. This chapter also contains information about other publications, products, warranties, and services that IBM offers. Also included are fax numbers, toll-free telephone numbers, and access information for electronic bulletin boards, online services, and the World Wide Web.

Chapter 10, "Server Records and Specifications," provides a section to record and update important information about your server, including serial numbers, key number, and device records. Whenever you add options to your server, be sure to update the information in these records. In addition to server records, this chapter contains specifications. These specifications include product dimensions, environmental operating requirements, system and processor board layouts, and jumper settings. This chapter also describes jumper locations and contains instructions for changing jumpers.

Appendix A, "Installing Devices in the NetBAY3," contains information about installing devices in the NetBAY3.

Appendix B, "Year-2000-Ready, I2O-Ready, S3 Video Modes," contains the year-2000-ready statement, the I2O-ready statement, and information about unsupported S3 video modes.

Appendix C, "Product Warranties and Notices," contains product warranty information, notices, and trademarks.

A glossary and an index follow the appendixes.

Notices Used in This Book

This book contains notices to highlight information or provide safety information:

- **Notes**

  These notices provide important tips, guidance, or advice.

- **Attention**

  These notices indicate possible damage to programs, devices, or data. An attention notice is placed just *before* the instruction or situation in which damage could occur.

- **Caution**

  These notices indicate situations that can be potentially hazardous to you. A caution notice is placed just *before* descriptions of potentially hazardous procedure steps or situations.

Related Publications

In addition to this handbook, the following publications come with your Netfinity 5500:

The *IBM Service and Support* pamphlet contains important information and phone numbers to call for different types of support for your server.

The *Safety Information* book contains translated versions of the caution and danger statements in this book. All caution and danger statements in this book 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 that can be found in the *Safety Information* book.

The IBM ServerGuide documentation describes the advantages of ServerGuide and describes how to use the ServerGuide software.

The *IBM Hardware Maintenance Manual* is available for purchase. It contains a parts catalog, error codes, and advanced diagnostic procedures. This manual is intended for trained service technicians. (Diagnostic programs are not included.)

Related Publications

The following publications pertain to the server's Ethernet controller. They are available for purchase from IBM.

- *IBM LAN Technical Reference IEEE 802.2 and NETBIOS API,* SC30-3587

- *IBM LAN Server Command and Utilities,* S10H-9686

- *Guide to LAN Server Books,* S10H-9688

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.

- In all other countries, contact the IBM support organization that services your area, your IBM marketing representative, or your IBM reseller.

Chapter 1. Introducing the IBM Netfinity 5500

We appreciate your decision to purchase an IBM Netfinity 5500. Your server is a high-performance, 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 your 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.

Your server comes with a three-year limited warranty, IBM ServerGuide, and IBM Start Up Support. For more information about IBM ServerGuide, refer to your ServerGuide package. For more information about IBM Start Up Support, see Chapter 9, "Getting Help, Service, and Information." Chapter 9, "Getting Help, Service, and Information" also lists addresses on the World Wide Web where you can obtain information about your server model and other IBM products.

Note: The information label containing the serial number, machine type, model number, and agencies marks for your server is located at the front of the server behind the media-bay trim bezel. See "Removing the Server Door and Trim Bezels" on page 209 for instructions on removing the trim bezel.

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≥32 kg (70.5 lbs)   ≥55 kg (121.2 lbs)

CAUTION:
Use safe lifting practices when lifting your machine.

1

Note: Most of the illustrations in this publication show the tower model of the Netfinity 5500 with the IBM Netfinity NetBAY3; the rack model does not come with a NetBAY3.

This chapter contains:

Features at a Glance

The following table summarizes the features of the Netfinity 5500.

Microprocessor

- Intel® Pentium® II microprocessor with MMX™ technology
- 16 KB of level-1 cache
- 512 KB of level-2 cache
- Expandable to two microprocessors

Memory

- Standard: 128 MB (min.), expandable to 1 GB
- 100 MHz synchronous dynamic random access memory (SDRAM), error correcting code (ECC)
- Four dual inline memory-module (DIMM) sockets

Diskette Drive

- Standard: One 3.5-inch, 1.44 MB

Hard Disk Drives

- Up to six hot-swappable hard disk drives supported

CD-ROM Drive

- Standard: 32X IDE

Keyboard and Auxiliary Device (some models)

- Keyboard
- Mouse

Expansion Bays

- Six slim (1-inch) or three half-high (1.6-inch) hot-swap drive bays
- Three 5.25-inch removable-media bays (one used by CD-ROM drive)
- The IBM Netfinity NetBAY3 (tower model only) allows installation of options to provide extra expansion bays

Expansion Slots

Up to seven adapters can be installed.

- Four 32-bit hot-plug PCI slots
- Two standard (non-hot-plug) 32-bit PCI slots
- One 16-bit ISA slot

Upgradable Firmware

- BIOS, diagnostics, system management processor, and ServeRAID II upgrades (when available) can update EEPROMs on the system board

Security Features

- Door and top cover lock (tower model only)
- NetBAY3 bezel lock
- Power-on and administrator passwords
- Selectable drive-startup
- Keyboard password
- Systems management security
  - User log-in password
  - Read-only or read/write access
  - Dial back

Predictive Failure Analysis (PFA) Alerts

- Power supplies
- Fans
- Memory
- Hard disk drives
- Microprocessors

Integrated Functions

- Two serial ports
- Two universal serial bus (USB) ports
- One parallel port
- Mouse port
- Keyboard port
- Video port
- IBM ServeRAID II controller (two channels) on system board
- 10BASE-T/100BASE-TX Ethernet port (controller on system board)
- For redundant Ethernet capability, an optional network interface card (NIC) is available
- System management processor on system board
- Dedicated systems management I/O port
- Video controller (with 1 MB video memory) compatible with:
  - Super video graphics array (SVGA)
  - Video graphics adapter (VGA)

Power Supply

- 400 W (115–230 V ac)
- Automatic voltage range selection
- Built-in overload and surge protection
- Automatic restart after a loss of power
- For redundant power, an optional 400 W power supply is available

Redundant Cooling

- Three hot-swap fans

What Your IBM Netfinity 5500 Offers

The unique design of your server takes advantage of advancements in symmetric multiprocessing (SMP), data storage, disk-array technologies, and memory management. Your server combines:

- Impressive performance using an innovative approach to SMP

  Your server supports up to two Pentium II microprocessors. You can install a second microprocessor in your server 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 II controller is a standard feature. It provides two channels and supports RAID levels 0, 1, and 5.

  For details about the IBM ServeRAID II controller, see Chapter 3, "Configuring and Monitoring Your Disk Arrays."

- Large data-storage and hot-swap capabilities

  All models of the server support up to six 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

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

- IBM Netfinity NetBAY3

  The tower model of the Netfinity 5500 comes with a NetBAY3 attached. You can install devices, such as the IBM EXP10 or a power distribution unit, in the NetBAY3. Refer to Appendix A, "Installing Devices in the NetBAY3" for more information.

- Redundant cooling and power capabilities

  The redundant cooling and hot-swap capabilities of the fans in your server allows continued operation if one of the fans fails. You can also replace a failing fan without turning off the server.

  The addition of a second, optional power supply provides redundant power for the server. You can install the second power supply, or if you already have the second power supply installed, replace a failing power supply, without turning off the server.

- Large system memory

  The memory bus in your server supports up to 1 GB of system memory. The memory controller provides error correcting code (ECC) support for up to four industry standard (Intel PC100 SDRAM specification, revision 1.0 or later), 3.3 V, 168-pin, 8-byte, dual in-line memory modules.

- Systems management capabilities

  Your server is shipped with a system management processor on the system board. This controller, in conjunction with the Netfinity Manager provided in your ServerGuide package, allows you to manage the functions of the server locally and remotely. It also provides system monitoring, event recording, and dial-out alert capability.

  Note: The system management processor is sometimes referred to as the service processor.

  See Chapter 5, "Netfinity System Management Processor" for more information.

- Integrated network environment support

  Your server comes with an Ethernet controller on the system board. This Ethernet controller has an interface for connecting 10-Mbps or 100-Mbps tranceivers. The server automatically selects between 10BASE-T and 100BASE-TX. The controller provides full-duplex (FDX) operation, which allows 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

  ServerGuide provides compact disc (CD) based programs to help simplify your server setup and network operating system installation. In addition, all of the included application programs are yours to install, and no software activation keys are required. You can use ServerGuide to:

  - Install a separately-purchased copy of a network operating system. Device drivers are provided as needed.

  - Replicate an installation for five or more Microsoft Windows NT Server 4.0 systems.

  - Install the application programs that come with ServerGuide.

  - Dial-in to IBM at any time[1] using IBM Update Connector, a dial-up program that automatically updates your server Basic Input/Output System (BIOS) level, device drivers, and various programs.

  - Create service and support diskettes for most IBM servers.

  - View or print various online technical publications.

  For more information, refer to the ServerGuide package that comes with your server.

Your server is designed to be cost-effective, powerful, and flexible. It uses both peripheral component interconnect (PCI) and industry standard architecture (ISA) bus architectures to provide

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[1] Response time will vary, depending on the number and nature of calls received.

compatibility with a wide range of existing hardware devices and software applications.

As always, your IBM server meets stringent worldwide certifications for power, electromagnetic compatibility (EMC), and safety. See Appendix C, "Product Warranties and Notices" for additional information.

Reliability, Availability, and Serviceability Features

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 your server; that your 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 of your server. Many of these features are explained in later chapters of this book.

- Menu-driven setup, system configuration, RAID configuration, and diagnostic programs
- Power-on self-test (POST)
- Integrated system management processor
- Predictive failure alerts
- System auto-configuring from configuration menu
- Remote system problem determination support
- Power and temperature monitoring
- Fault-resilient startup
- Hot-swap drive bays
- RAID level 1 and RAID level 5 disk arrays
- Support for hot-plug PCI adapters
- Error codes and messages
- System error logging
- Upgradable BIOS, diagnostics, system management processor, and ServeRAID II code
- Automatic restart after a power failure
- Parity checking on the SCSI bus and the PCI bus

RAS Features

- Error checking and correcting (ECC) memory
- Redundant hot-swap power supply option
- Redundant hot-swap cooling
- Redundant Ethernet capabilities (with optional adapter)
- Vital Product Data (VPD) on processor complex, system board, power supply, and hot-swap RAID subsystem
- Information and diagnostic LED panels
- Customer support center 24 hours per day 7 days a week[2]

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[2] Service availability will vary by country. Response time will vary depending on the number and nature of incoming calls.

Controls and Indicators

The most commonly used controls and indicators on the front of the server appear in the following illustration.

Information LED Panel

Power Control Button

Reset Button

Diskette Drive In-Use Light

Diskette Drive Eject Button

CD-ROM In-Use Light

CD-ROM Eject/Load Button

Door Lock (On Side Cover)

Hard Disk Activity Light

Hard Disk Status Light
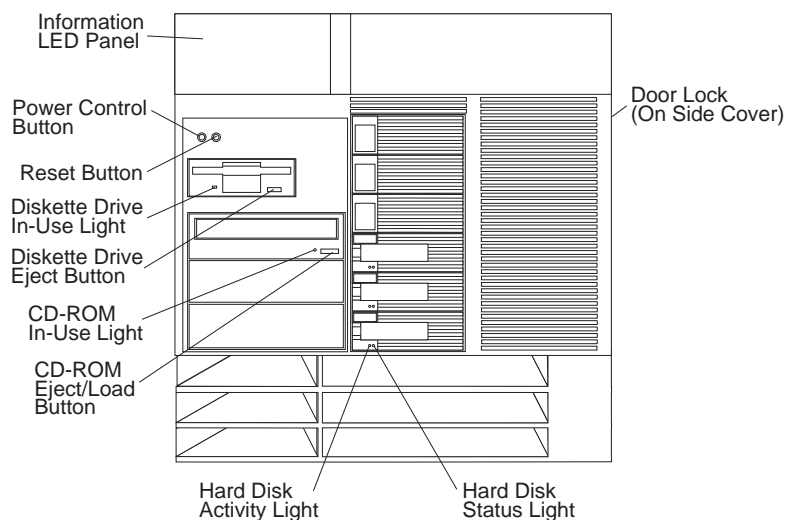
Door Lock (Tower Model Only): You can lock the door on your server to deter tampering with the internal components. This same lock also locks the top cover in place.

Power Control Button: Press this button to manually turn the server on or off.

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CAUTION:
The Power Control button on the front of the server does not turn off the electrical current supplied to the server. The server also might have more than one power cord. To remove all electrical current from the server, ensure that all power cords are disconnected from the power source.

The server can be activated in several ways:

- You can turn the server on by pressing the Power Control button on the front of the server.

    Note: If you have just plugged the power cord of your server into an electrical outlet, you will have to wait approximately 20 seconds before pressing the Power Control button.

- If the server is activated and a power failure occurs, the server will start automatically.

- The server can also be powered on by the system management processor.

The server can be deactivated as follows:

- You can turn the server off by pressing the Power Control button on the front of the server. Pressing the Power Control button starts a graceful 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.

- Pressing and holding the Power Control button for more than 4 seconds causes an immediate shutdown of the server and places the server in standby mode. This feature can be used if the operating system hangs.

- Disconnecting the server power cords from the electrical outlets will shut off all power to the server.

  Note: Wait about 15 seconds after disconnecting the power cord for your system to stop running. Watch for the System Power light on the information LED panel to stop blinking.

Reset Button: Press this button to reset the system and run the power-on self-test (POST).

Information LED Panel: The lights on this panel give status information for your server. See "Information LED Panel" on page 12 for more information.

Diskette-Eject Button: Press this button to eject a diskette from the drive.

CD-ROM Eject/Load Button: Press this button to eject or retract the CD-ROM tray so that you can insert or remove a CD.

CD-ROM Drive In-Use Light: When this light is lit, the CD-ROM drive is being accessed.

Diskette Drive In-Use Light: When this light is lit, the diskette drive is being accessed.

Hard Disk Lights: Each of the six hot-swap drive bays has a set of two lights, which indicate the following:

- **Hard Disk Status Light:** When the amber light for a hard disk drive is lit 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.

- **Hard Disk Activity Light:** When the green light for a hard disk drive is flashing, the drive is being accessed.

Information LED Panel

The information LED panel on the front of the server contains status lights.
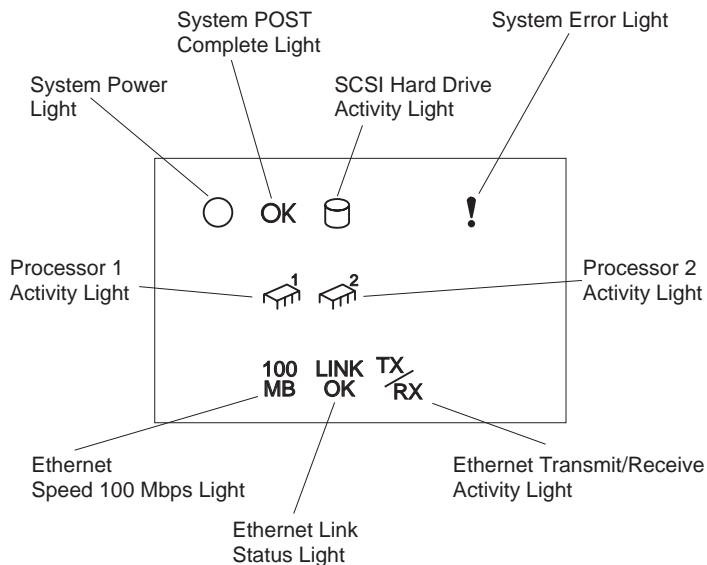
System Power Light: When this green light is lit, system power is present in the server. When this light flashes, the server is in standby mode (the system power supply is turned off and AC current is present). When this light is off, it indicates either power supply failure, an AC power failure, or a light failure.

Note: If this 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.

System POST Complete Light: This green light is lit when the power-on self-test (POST) completes without any errors.

SCSI Hard Drive Activity Light: This green light is lit when there is activity on a hard drive.

System Error Light: This amber light is lit when a system error occurs. A light on the diagnostics LED panel will also be lit to further isolate the error. (For more information, see "Identifying Problems Using Status LEDs" on page 377)

Processor 1 Activity Light: This green light is lit when there is activity on microprocessor 1 (the primary microprocessor).

Processor 2 Activity Light: This green light is lit when there is activity on microprocessor 2 (the secondary microprocessor).

Ethernet Speed 100 Mbps: When this green light is lit, the Ethernet speed is 100 Mbps.

Ethernet Link Status Light: When this green light is lit, there is an active connection on the Ethernet port.

Ethernet Transmit/Receive Activity Light: When this green light is lit, it indicates transmit or receive activity to or from the server.

Input/Output Connectors and Expansion Slots

The following illustration shows the expansion slots and the input∕output connectors (ports) on the rear of the server.
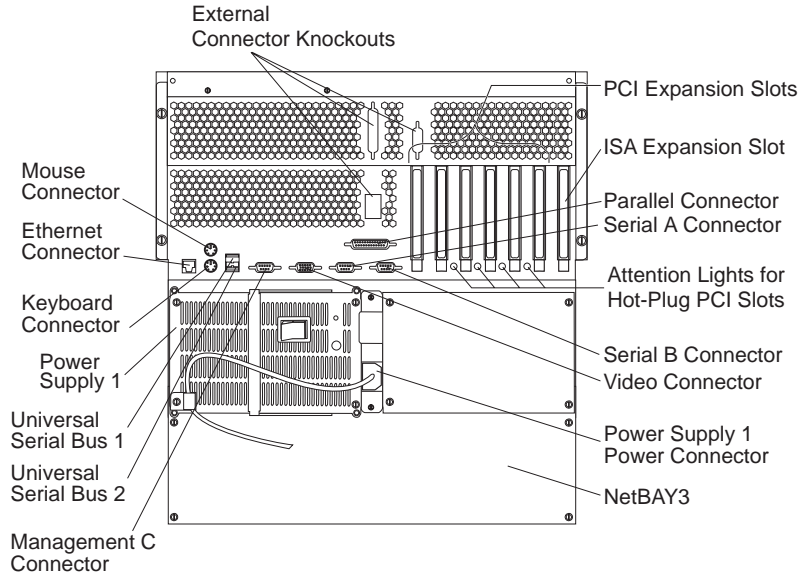
Keyboard Connector: The keyboard cable connects here.

Mouse Connector: The mouse cable connects here. This port sometimes is called an auxiliary-device or pointing-device port.

Serial Connectors: Serial signal cables for modems and other serial devices connect here to the two 9-pin serial connectors, ports A and B. See "Devices and I/O Ports" on page 163 for port assignment information. If you are using a 25-pin signal cable, you need a 9-pin-to-25-pin adapter cable.

Video Connector: The monitor signal cable connects here.

NetBAY3: The tower model of the Netfinity 5500 comes with a NetBAY3 attached. You can install devices, such as the IBM EXP10 or a power distribution unit, in the NetBAY3. Refer to Appendix A, "Installing Devices in the NetBAY3" for more information.

Management C Connector: This connector is used to attach a modem that is dedicated to communication with the system management processor.

Parallel Connector: A signal cable for a parallel device, such as a printer connects here.

Universal Serial Bus Connectors: You can attach I/O devices to these two universal serial bus (USB) connectors. You need a 4-pin cable to connect devices to USB 1 or 2.

Note: If a standard (non-USB) keyboard is attached to the keyboard port, the USB ports are disabled while the power-on self-test (POST) is running and no USB devices will work during POST.

Ethernet Connector: Your server has one RJ-45 Ethernet connector. This connector is for attachment of the network to the integrated 10BASE-T or 100BASE-TX, twisted-pair transceiver.

Expansion Slots: Your server has one industry standard architecture (ISA) expansion slot and six peripheral component interconnect (PCI) expansion slots. Four of the PCI slots support hot-plug PCI adapters.

You can install PCI or ISA adapters. Many adapters provide bus-master capabilities, which enable the adapters to perform operations without interrupting the system microprocessors.

Attention Lights for Hot-Plug PCI Slots: Each hot-plug PCI slot has an Attention light that is visible from the rear of the server. An Attention light flashes approximately once per second when it is on. The meaning of the Attention lights is defined by your operating system. Refer to your operating system documentation to determine if it supports hot-plug PCI adapters and, if so, what the Attention lights indicate.

Power Connector: The power cord for power supply 1 connects here. (The power connector for the additional optional power supply is covered by the filler panel.)

External Connector Knockout: Your server has three external connector knockouts that can be used when you install options, such as the external SCSI cable option.

Note: For pin assignments and other details about these connectors, see "Connecting External Options" on page 263.

Power Supplies

The following illustration shows the power supplies on your server.

AC Power Light

Power Supply 1

Power Supply
Power Switch

DC Power Light

Power Supply 1
Power Connector

Filler Panel
for Power Supply
Bay 2
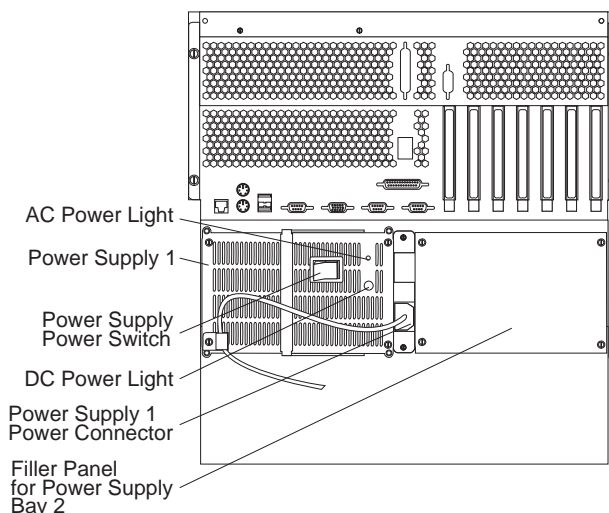
Hot-Swap Power Supplies: Your server comes with one hot-swap power supply installed. You can install a second hot-swap power supply to provide redundant power. You cannot hot swap a power supply if your server has only one power supply installed. (See "Installing a Hot-Swap Power Supply" on page 249 for instructions.)

Power Switch: This switch turns the power supply on and off.

AC and DC Power Lights: These lights provide status information about the power supply. For normal operation, both lights should be on. For any other combination of lights, see "Power Supply LEDs" on page 377 for more information.

Power Supplies

Chapter 2. Setting Up Your Server

This chapter describes how to set up, start, and use your server. It also contains information about arranging your workspace and using the CD-ROM drive.

If you have a rack model, you can install your options and operating system before you install the system in the rack.

Installation Overview

This chapter provides the steps necessary to set up and install your server.

Questions or Problems?

- **World Wide Web**

  You can obtain up-to-date information about your server model, a complete listing of the options that are supported on your model, and information about other IBM server products by accessing the home page for the Netfinity 5500 at the following address: http://www.pc.ibm.com/us/server/

  You can obtain a listing of products compatible with your server and related configuration information by accessing the following address: http://www.pc.ibm.com/us/compat/

- **IBM Start Up Support**

  The IBM Start Up Support program provides comprehensive telephone assistance 24 hours a day, seven days a week during your first 90 days after installation[3]. Assistance is available for selected IBM and non-IBM network operating systems, network-interface adapters, and other optional peripherals.

  For more information about this exceptional program or for assistance with the installation of your server:

  – In the U.S. and Puerto Rico, call 1-800-772-2227.
  – In Canada, call 1-800-565-3344.
  – In the U.K., call 01475-555047

  In all other countries, contact your IBM reseller or your IBM marketing representative.

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[3] Service availability will vary by country. Response time will vary depending on the number and nature of calls received.

Installing the NetBAY3 Bezel

The NetBAY3 bezel is shipped, unattached, inside the NetBAY3.
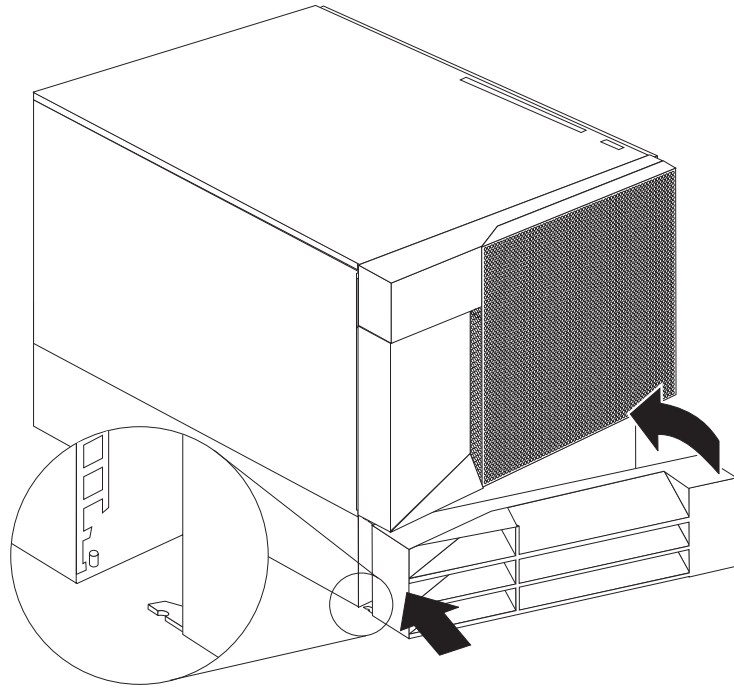
To install the NetBAY3 bezel:

1. Remove the package containing the NetBAY3 bezel and unpack the bezel.

2. Hook the tabs on the left side of the NetBAY3 bezel around the posts on the NetBAY3.

3. Gently push the right side of the bezel toward the server until the bezel snaps into place.

4. Lock the NetBAY3 bezel.

Cabling the Server

Make sure you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you installed. Place your server in a location that is dry. Rain or spilled liquids might damage your server. Leave about 50 mm (2 inches) of space at the right and left sides of your server to allow the server's cooling system to work properly. Leave about 100 mm (4 inches) clearance at the rear for cables.

1. Use the illustration in "Input/Output Connectors and Expansion Slots" on page 14 to cable your server.

2. Remove any shipping screws **2** from the power supply.

3. Connect the power cord **1** to the server.

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CAUTION:

When the power-cord strain-relief bracket option is installed on the power cord, the server must be plugged to a power source that is easily accessible.

4. Install the power-cord strain-relief bracket **3** (if desired).
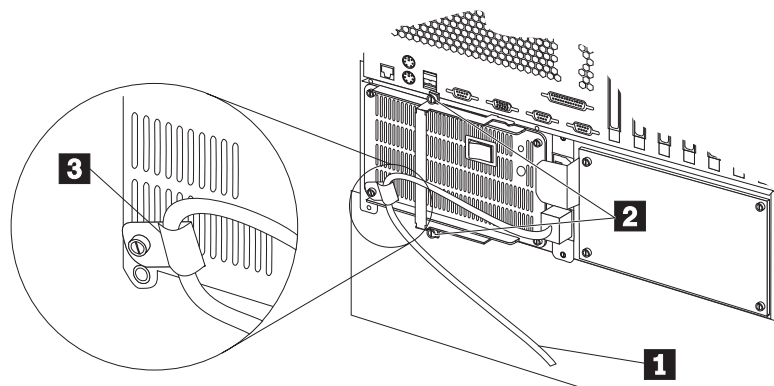
5. Plug the power cord into a properly grounded electrical outlet.

6. Continue with "Starting the Server."

Starting the Server

To start the server:

1. If you installed any external devices, such as monitors, printers, or modems, turn them on now.

2. After you turn on your monitor, adjust the Brightness and Contrast controls to the approximate midpoint.

   You can readjust these controls and the monitor location for personal viewing comfort after you turn on your server.
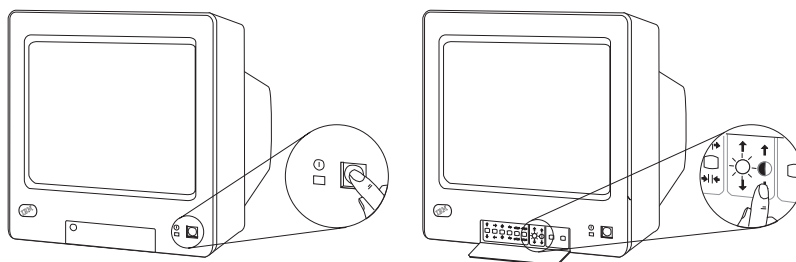
   Note: The locations of the Power switch and the Brightness and Contrast controls on your monitor might be different from those shown above.

3. Adjust the keyboard feet and position the keyboard for personal typing comfort. (Your keyboard might be different from the one shown.)
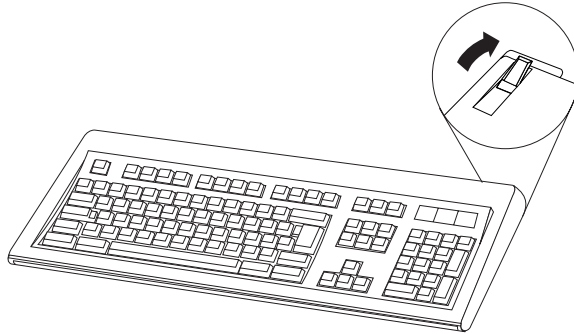
4. Locate the keys; then, unlock and open the server door.

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CAUTION:
When unlocked, the server door will not support the weight of the server. To avoid personal injury, be sure to remove or lock the server door before moving or lifting the server.

5. If the diskette or CD-ROM drives contain packing material, a CD, or a diskette, remove them from the drive.

6. Turn on the server.

   a. Make sure that the Power switches on the power supplies
      are ON. (See the illustration in "Power Supplies" on
      page 17 for the location of the Power Supply Power switch.)

   b. Press the Power Control button on the front of the server.

      Note: If you have just plugged the power cord for your
              server into an electrical outlet, wait approximately 20
              seconds before you press the Power Control button.

      The System Power light comes on. The *power-on self-test
      (POST)* begins.

   # 6

   CAUTION:

   **The Power Control button on the front of the server
   does not turn off the electrical current supplied to the
   server. The server also might have more than one
   power cord. To remove all electrical current from the
   server, ensure that all power cords are disconnected
   from the power source.**

7. Watch your monitor during POST:

   - The screen displays the IBM logo and a number that
     represents the amount of available server memory in MB.

   - The server beeps once at the end of POST to indicate that it
     is working properly.

   - If no operating system is installed, the system prompts you
     to insert bootable media in the appropriate drive. Refer to
     the information provided with your ServerGuide package
     and with your operating system for more information.

   - If you have set a power-on password, a prompt appears on
     the screen. If you have set both the power-on and
     administrator passwords, you can type either password at
     the password prompt. (See "System Security" on page 165

for information about setting and using passwords.) Type your password at the prompt; then, press **Enter.**

Notes:

a. If you hear more than one beep, or no beeps, check to see if an error message appears or if your screen is blank; see Chapter 8, "Solving Problems."

b. If your server stops running during testing or normal operation, see Chapter 8, "Solving Problems" for more information. Describe the problem to the service technician. After the problem is resolved, continue with the next step.

8. Continue with "Using the CD-ROM Drive."

Using the CD-ROM Drive

An IDE CD-ROM drive is a standard feature on your server. CD-ROM drives can play back or read from a CD, but cannot write information to it. CD-ROM drives use industry standard, 12 cm (4.75-inch) CDs.

Follow these guidelines when using a CD-ROM drive:

- Do not place the server where the following conditions exist:
  - High temperature
  - High humidity
  - Excessive dust
  - Excessive vibration or sudden shock
  - An inclined surface
  - Direct sunlight
- Do not insert any object other than a CD into the drive.
- Before moving the server, remove the CD from the drive.

The following illustration shows the front of the CD-ROM drive.

CD-ROM Drive   Emergency-Eject   Eject/Load
In-Use Light   Hole   Button
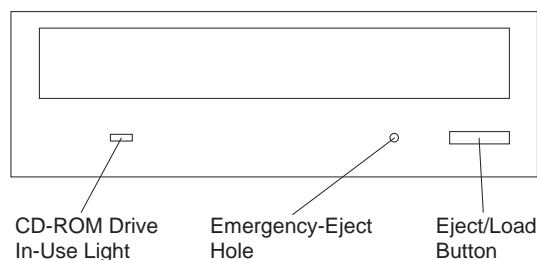
Handling a CD

When handling a CD, follow these guidelines:

- Hold the CD by its edges. Do not touch the surface.

- To remove dust or fingerprints, wipe the CD from the center to the outside with a soft, nonabrasive cloth. Wiping the CD in a circular direction might cause loss of data.

- Do not write or stick paper on the CD.

- Do not scratch or mark the CD.

- Do not place or store the CD in direct sunlight.

- Do not use benzene, thinners, or other cleaners to clean the CD.

- Do not drop or bend the CD.

Loading a CD

To load a CD into a CD-ROM drive:

1. Press the Eject/Load button. The tray slides out of the drive. (Do not manually force the tray open.)

2. Place the CD in the tray with the label facing up.

3. Close the tray by pressing the Eject/Load button, or by gently pushing the tray forward. When the tray is closed, the CD-ROM drive In-Use light on the front of the drive will activate to indicate that the drive is in use.

4. To eject the CD, press the Eject/Load button. When the tray slides out, carefully remove the CD.

5. Close the tray by pressing the Eject/Load button, or by gently pushing the tray forward.

Notes:

1. If the tray does not slide out of the drive when you press the Eject/Load button, insert the pointed end of a large paper clip into the emergency-eject hole located on the front of the CD-ROM drive.

2. In some models, you might have to remove the front bezel that houses the CD-ROM drive so that you can access the emergency-eject hole.

Before You Install Software

Use ServerGuide to verify that you have the proper working environment for the specific operating system you are installing.

1. Follow the instructions provided in your ServerGuide package to install your operating system.

   See "What Your IBM Netfinity 5500 Offers" on page 4 for information on the ServerGuide package.

2. Use the tables provided in Chapter 10, "Server Records and Specifications" to record the server serial number, model number, type number, and key serial number. If you installed options, also update the device-records tables.

What to do next?

- To get help with your installation, refer to the *IBM Service and Support* pamphlet.

- To install application programs, refer to the application program documentation.

- To learn more about your server, see Chapter 1, "Introducing the IBM Netfinity 5500."

- To register your server, see "Registering Your Server."

Registering Your Server

After you have completed your server installation, please take time to register your server. After you have registered, we can e-mail you information about updates, performance tips, and compatibility.

The registration takes only a few minutes, and you will need to know the model and serial number of your server.

To register your server, visit our Web site at:

http://www.pc.ibm.com/register

Arranging Your Workspace

To get the most from your server, arrange both the equipment you use and your work area to suit your needs and the kind of work you do. Your comfort is of foremost importance, but light sources, air circulation, and the location of electrical outlets also can affect the way you arrange your workspace.

Comfort

Although no single working position is ideal for everyone, here are a few guidelines to help you find a position that suits you best.

Sitting in the same position for a long time can cause fatigue. A good chair can make a big difference. The backrest and seat should adjust independently and provide good support. The seat should have a curved front to relieve pressure on the thighs. Adjust the seat so that your thighs are parallel to the floor and your feet are either flat on the floor or on a footrest.

When using the keyboard, keep your forearms parallel to the floor and your wrists in a neutral, comfortable position. Try to keep a light touch on the keyboard and your hands and fingers relaxed. You can change the angle of the keyboard for maximum comfort by adjusting the position of the keyboard feet.
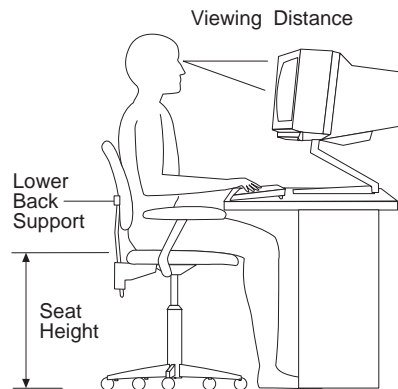
Adjust the monitor so the top of the screen is at, or slightly below, eye level. Place the monitor at a comfortable viewing distance,

usually 51 to 61 cm (20 to 24 in.), and position it so you can view it without having to twist your body. Also position other equipment you use regularly, such as the telephone or a mouse, within easy reach.

Glare and Lighting

Position the monitor to minimize glare and reflections from overhead lights, windows, and other light sources. Even reflected light from shiny surfaces can cause annoying reflections on your monitor screen. Place the monitor at right angles to windows and other light sources, when possible. Reduce overhead lighting, if necessary, by turning off lights or using lower wattage bulbs. If you install the monitor near a window, use curtains or blinds to block the sunlight. You might have to adjust the Brightness and Contrast controls on the monitor as the room lighting changes throughout the day.

Where it is impossible to avoid reflections or to adjust the lighting, an antiglare filter placed over the screen might be helpful. However, these filters might affect the clarity of the image on the screen; try them only after you have exhausted other methods of reducing glare.

Dust buildup compounds problems associated with glare. Remember to clean your monitor screen periodically using a soft cloth moistened with a nonabrasive liquid glass cleaner.

Air Circulation

Your server and monitor produce heat. Your server has one or more fans that pull in fresh air and force out hot air. The monitor lets hot air escape through vents. Blocking the air vents can cause overheating, which might result in a malfunction or damage. Place the server and monitor so that nothing blocks the air vents; usually, 15 cm (6 inches) of air space is sufficient. Also, make sure the vented air is not blowing on someone else.

Electrical Outlets and Cable Lengths

The location of electrical outlets and the length of power cords and cables that connect to the monitor, printer, and other devices might determine the final placement of your server.

When arranging your workspace:

- Avoid the use of extension cords. When possible, plug the server power cords directly into electrical outlets.

- Keep power cords and cables neatly routed away from walkways and other areas where they might get kicked accidentally.

For more information about power cords, see "Power Cords" on page 452.

Chapter 3. Configuring and Monitoring Your Disk Arrays

Your Netfinity 5500 comes with an integrated ServeRAID II controller. This redundant array of independent disks (RAID) controller supports RAID levels 0, 1, and 5.

You must use the IBM ServeRAID Configuration program to configure your disk arrays *before* you partition your hard disk drives and install your operating system. (See "The ServeRAID Configuration Program" on page 46 for more information.) If you are not familiar with disk-array technology or the ServeRAID Configuration program, be sure to review the information in "Understanding Disk Array Technology" on page 35.

After you configure your disk arrays, use the information provided in the ServerGuide package to install your operating system. Then, return to this manual for information about installing and using the ServeRAID Administration and Monitoring utility program.

Understanding Disk Array Technology

When you connect several hard disks together and configure the RAID controller to access them in a predetermined pattern, you create a *disk array.* The ServeRAID II controller on your system board supports up to eight independent arrays.

Disk arrays are used to improve security, 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 in your arrays. The ServeRAID II controller supports RAID levels 0, 1, and 5.

Your server has space for up to six hot-swap hard disk drives.

Hard Disk Drive Capacities

Hard disk drive capacities influence the way you create arrays. Drives in the array can be of different capacities (1 GB[4] or 2 GB, for example), but the ServeRAID II controller treats them as if they all have the capacity of the *smallest* disk drive.

For example, if you group three 1 GB drives and one 2 GB drive into an array, the total capacity of the array is 1 GB times 4, or 4 GB, not the 5 GB physically available. Conversely, if you add a smaller drive to an array of larger drives, such as a 1 GB drive to a group containing three 2 GB drives, the total capacity of that array is 4 GB, not the 7 GB physically available. Therefore, the optimal way to create arrays is to use hard disk drives that have the same capacity.

---

[4] When referring to hard-disk-drive capacity, GB means 1 000 000 000 bytes; total user-accessible capacity may vary depending on operating environment.

Logical Drives

When you create an array, you group hard disk drives into one storage area. You can define this storage area as a single *logical* drive, or you can subdivide it into several logical drives. Each logical drive appears to the operating system as a single physical hard disk drive.

The ServeRAID II controller on your system board supports up to eight logical drives. If you have only one array, you can define it as a single logical drive, or you can divide it into several logical drives. The first logical drive that you define will be your startup (boot) drive. If you have two or more arrays, each array can be one logical drive, or you can divide each array into multiple logical drives, as long as the total number of logical drives for all of the arrays does not exceed eight.

RAID Classifications

With RAID technology, data is *striped* across an array of hard disk drives. This data-distribution technique complements the way the operating system requests data.

The six basic RAID classifications are RAID level 0 through RAID level 5. The ServeRAID II controller on your system board supports three, industry-recognized RAID levels: 0, 1, and 5.

RAID Level 0

RAID level 0 stripes the data across all the drives in the array. This offers substantial speed enhancement, but provides for no data redundancy. The ServeRAID II controller automatically assigns RAID level 0 to all logical drives in an array containing only one hard disk drive.

A hard disk failure within the array results in loss of data in the logical drive assigned level 0, but *only in that logical drive.* If you have logical drives assigned RAID level 1 or 5 in the same array, they will not lose data.

When you replace the failed drive, the ServeRAID II controller automatically rebuilds all the logical drives assigned RAID levels 5 and 1 onto the replacement hard disk drive and defines the level 0 logical drive. However, the data that was in the failed level 0 logical drive is lost.

Though 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 offered with this RAID level. You could use this logical drive to enter 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 level 0 logical drive when the work you are doing requires maximum capacity. RAID level 0 provides the largest capacity of the three RAID levels offered, because no room is taken up for redundant data or data parity storage.

RAID Level 1

RAID level 1 provides 100% data redundancy and requires two hard disk drives. With RAID level 1, the first stripe is the data stripe; the second stripe is the *mirror* (copy) of the first stripe, but written to another drive. If one of the hard disk drives fails, the ServeRAID II controller switches read and write requests to the remaining functional drive in the array.

Because the 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 level 1 requires two drives. When you group more than two drives into a RAID level 1 array, the ServeRAID II controller automatically assigns the Enhanced RAID level 1.

The Enhanced RAID level 1 stripes data and copies of the data across all 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% of the physical capacity of the grouping of hard disk drives in the array.

The following illustration shows data arranged in an array with three hard disk drives. The logical drive is assigned the Enhanced level 1. Notice that the mirror of the first data stripe (XXX YYY ZZZ) is shifted one drive. The other data stripes in level 1 follow the same pattern.
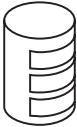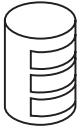
Stripe	XXX	YYY	ZZZ
Mirrored stripe	ZZZ	XXX	YYY
Stripe	AAA	BBB	CCC
Mirrored stripe	CCC	AAA	BBB

Table 1. Enhanced RAID Level 1

If you have only two drives available, the second drive is a mirror copy of the first drive.

RAID Level 5

RAID level 5 stripes data and parity across all drives in the array. When an array is assigned level 5, the capacity of the logical drive is reduced by one drive (for data parity storage).

RAID level 5 is generally the most desirable choice, because it offers both data protection and increased throughput. RAID level 5 gives you higher capacity than level 1, but level 1 offers better performance.

If you want to have a hot-spare drive (that is, a drive that can be automatically used to replace a similar drive that fails) and also assign RAID level 5, you must have at least four hard disk drives in your server.

ServeRAID Menus, Screens, and Drive States

This section contains information about the Main Menu, the ServeRAID screens and pop-up windows, the physical device states, and the logical drive states.

Main Menu

The following illustration shows the Main Menu of the IBM ServeRAID Configuration program.
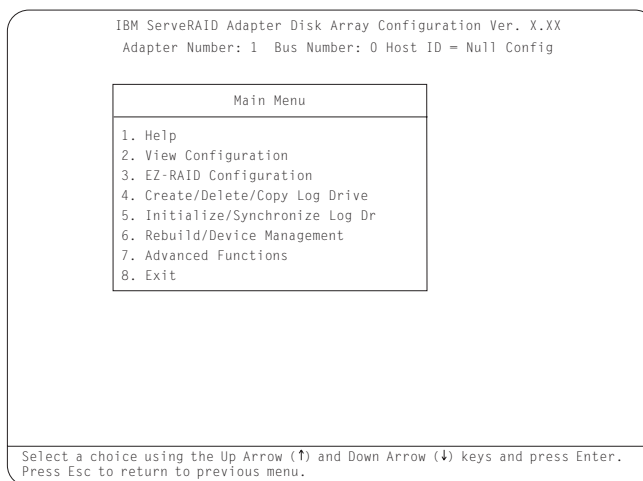
```
         IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
          Adapter Number: 1  Bus Number: O Host ID = Null Config


                          Main Menu

            1. Help
            2. View Configuration
            3. EZ-RAID Configuration
            4. Create/Delete/Copy Log Drive
            5. Initialize/Synchronize Log Dr
            6. Rebuild/Device Management
            7. Advanced Functions
            8. Exit








    Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter.
    Press Esc to return to previous menu.
```

Descriptions of the choices available from the Main Menu are as follows:

1. Help provides information about the choices available on the menu. You also can press F1 from any screen to obtain online Help.

2. View Configuration displays the existing disk-array configuration information. See "Viewing or Changing the Configuration" on page 64 for more information.

3. EZ-RAID Configuration automatically creates a configuration based on the number of physical drives installed in your system. See "Using the EZ-RAID Configuration Feature" on page 51 for more information.

4. Create/Delete/Copy Log Drive lets you manually create your disk arrays. You can select the drives that you want to include in an array. (See "Creating Disk Arrays Manually" on page 52 for more information.) You also can select this choice to define, delete, or copy logical drives and to define hot-spare drives.

5. Initialize/Synchronize Log Dr prepares the drives for data storage. RAID level 5 logical drives are automatically synchronized when you initialize them. See "Initializing/Synchronizing Logical Drives at the Same Time" on page 58 for more information.

6. Rebuild/Device Management rebuilds RAID level 1 and RAID level 5 logical drives. You also can select this choice to define or change the state of a physical drive, view drive information, and clear the Device Event Log. (See "Maintaining the Disk-Array Configuration" on page 81 for more information.)

7. Advanced Functions lets you change the write policy (the way data is written to the drive), save your configuration information to a diskette, restore your configuration from a diskette, or change the ServeRAID II controller parameters. You also can select this choice to run the RAID subsystems diagnostics, initialize the controller configuration, reset the configuration values to the factory defaults, and select a source (hard disk, NVRAM, Flash) from which to synchronize the ServeRAID II controller configuration.

8. Exit lets you exit from the Main Menu of the ServeRAID Configuration program.

Screens and Pop-Up Windows

The following illustration is a compilation of several configuration screens that appear when you use the IBM ServeRAID Configuration program.

```
                 1                        2                    3

 ┌─────────────────────────────────────────────────────────────────────┐
 │          IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX     │
 │            Adapter Number: 1  Bus Number: 0 Host ID = Null Config     │
 │                                                                        │
 │ ┌───────┬─────────────────────────────┐  ┌─ Ch  1 ─┐  ┌─ Ch  2 ─┐    │
 │ │Enter Size│ Create/Delete/Copy Log Drive │ │ ─Array─ │  │ ─Array─ │    │
 │ │of Logical│                             │ │ ─Bay─   │  │ ─Bay─   │    │
 │ │Drive,(MB)│ 1. Help                     │ 1 └ ONL ┘ A  1 └ HSP ┘     │
 │ │ :   3840 │ 2. Delete Disk Array        │ 2 └ ONL ┘ A  2 └ ONL ┘ B   │
 │ │          │ 3. Create Disk Array        │ 3 └ ONL ┘ A  3 └     ┘     │
 │ │          │ 4. Define Logical Drive     │ 4 └     ┘    4 └     ┘     │
 │ │          │ 5. Copy Logical Drive       │ 5 └     ┘    5 └ ONL ┘ B   │
 │ │          │ 6. Define/Undefine Hot-spare Drive │ 6 └  ┘    6 └ ONL ┘ B   │
 │ │          │ 7. Delete Logical Drive     │ 7 └     ┘    7 └ CDR ┘     │
 │ │          └─────────────────────────────┘ 8 └ INI ┘    8 └ INI ┘     │
 │ │                                        │ 9 └     ┘    9 └     ┘     │
 │ │                                        │10 └     ┘   10 └     ┘     │
 │ ├──────────┬─────────────────────────────┤11 └     ┘   11 └     ┘     │
 │ │Array     │ Log  Size  RAID         Wrt │12 └     ┘   12 └     ┘     │
 │ │ID Size(MB)│ Drv  (MB)  Level  Status Pol│13 └     ┘   13 └     ┘     │
 │ │A  5760   │ A0   1500  RAID-5  OKY   WT │14 └     ┘   14 └     ┘     │
 │ │B  5760   │ A1   1500  RAID-0  OKY   WT │15 └     ┘   15 └     ┘     │
 │ │          │ A2   1005  RAID-1  OKY   WT │16 └     ┘   16 └     ┘     │
 │ │          │ B0   1500  RAID-5  OKY   WT │                             │
 │ │          │ B1   3510  RAID-0  OKY   WT │                             │
 │ └──────────┴─────────────────────────────┴─────────────────────────────┤
 │ Enter a value greater than 2 and less than the default value shown or 32X1024│
 │ whichever is lesser, and press Enter. ESC to quit.                    │
 └─────────────────────────────────────────────────────────────────────┘

          4                        5                    6
```

Descriptions of the labeled areas in this illustration are as follows:

1 Pop-up windows that apply to the current menu appear in this area of the screen. For example, when you need to confirm an action, the Confirm pop-up window appears in this area.

2 You can select any of the choices that appear on the menu. To make a selection from a menu, type the highlighted number of the menu item, or use the Up Arrow (↑) or Down Arrow (↓) key to highlight your choice; then, press **Enter.** You can press the **Esc** key to return to a previous menu, to a previous work area of a screen, or to the Main Menu.

3 The Array/Bay selection list shows the bays for the ServeRAID II controller. For each bay that contains a drive, the list indicates the array in which the drive is grouped and the physical device state. (See "Physical Device States" on page 44 for more information.) For example, in the illustration, the drive in Channel 1, Bay 1 has a drive state of online (ONL) and is part of Array A.

Notes:

a. The Array/Bay selection list does not reflect the physical configuration of the server. (See "Internal Drive Bays" on page 233 for the physical location of the hard disk drives.)

b. The SCSI IDs for the hot-swap hard disk drives is set by the backplane. The backplane allows you to define the IDs as low (0 to 5) or high (8 to 13). See "SCSI Backplane Option Jumpers" on page 427 for more information about setting jumpers on the backplane.

c. The bay number corresponds to the SCSI ID of the device plus 1. For example, the ServeRAID II controller (INI) uses SCSI ID 7 and its bay number is 8 (7 + 1).

d. Bay Number 8 (SCSI ID 7) is reserved for the ServeRAID II controller (also known as the initiator, INI); therefore do not set the SCSI ID of non-hot-swap device, such as a tape drive, to 7.

4 The Array list indicates the array IDs and the sizes (in megabytes) of the arrays. When a drive is being rebuilt, this list and the Logical Drive list show the progression of the rebuild process.

5 The Logical Drive list shows the size, RAID level, status, and write policy for each logical drive. (See "Logical Drive States" on page 45 for more information.)

6 This area provides information and instructions about the actions you can perform on the current screen or pop-up window.

Physical Device States

Descriptions of the physical device states, which appear in the Array/Bay selection list, are as follows:

State	Meaning
CDR	A CD-ROM drive is installed.

DDD The physical hard disk drive is defunct (DDD). A drive in the Online (ONL) or Rebuild (RBL) state has become defunct (DDD). It does not respond to commands, which means that the ServeRAID II controller cannot communicate properly with the drive. (See "ServeRAID II Status and Messages" on page 349 for more information.)

A hard disk drive in the DDD state does not necessarily mean that you need to replace the drive. Before you replace the drive, ensure that:

1. All cables are connected correctly to the backplane and to the hard disk drive. Also, check to ensure that all cables inside the server are connected correctly.

2. The hot-swap drive tray is seated properly in the drive bay.

3. See "ServeRAID II POST and Setup Messages" on page 345.

DHS A drive enters the Defunct Hot-spare (DHS) state if:

1. A defunct (DDD) drive has been rebuilt to another drive, such as a hot-spare drive.

2. A hot-spare (HSP) or standby hot-spare (SHS) drive fails to respond to commands from the ServeRAID II controller.

EMP No device is present in the bay. This state appears as dashes (– – –) on the ServeRAID configuration screen, or as a blank space on the Administration and Monitor utility screen.

HSP   A hot-spare (HSP) drive is a hard disk drive that is defined for automatic use when a similar drive fails. (See "Defining Hot-Spare Drives" on page 61 for more information.)

INI   The INI represents the initiator for the ServeRAID II controller.

ONL   The drive is online (ONL). It is functioning properly and is part of an array.

PRC   The device is a generic SCSI controller (for example, a hot-swap backplane that has onboard systems-management support).

RBL   The drive is being rebuilt. (See "Understanding the Drive Rebuild Process" on page 88 for more information.)

RDY   The ServeRAID II controller recognizes a ready (RDY) drive as being available for definition. The ready drive state changes to empty (EMP) when the drive is physically removed from the bay.

SBY   A standby (SBY) drive is a hard disk drive that the ServeRAID II controller has spun down.

SHS   A standby hot-spare (SHS) is a hot-spare drive that the ServeRAID II controller has spun down. If an online (ONL) drive becomes defunct and no suitable hot-spare drive is available, a standby hot-spare of the appropriate size automatically spins up, and enters the rebuild (RBL) state.

TAP   A tape drive is installed.

Logical Drive States
Descriptions of the logical drive states, which appear in the Logical Drive list, are as follows:

State   **Meaning**

CRM   A logical drive undergoing a logical-drive migration (LDM) is in the critical state.

CRS   The ServeRAID II controller uses this reserved state
during a logical-drive migration (LDM).

CRT   A RAID level 1 or 5 logical drive that contains a defunct
physical drive is in the critical state. A critical (CRT)
logical drive is accessible, despite a physical drive failure.

FRE   The drive is in a free (FRE) state. It is not defined.

LDM   The logical drive is undergoing a logical-drive migration
(LDM); that is, a change in RAID levels, a change in
logical drive size, or an increase in free space.

OFL   The logical drive is offline (OFL) and not accessible. This
state occurs if one or more physical drives in a RAID
level 0 logical drive are defunct. This state also occurs
when two or more physical drives in a RAID level 1 or
RAID level 5 logical drive are defunct.

OKY   The drive is okay (OKY). It is in a good, functional state.

SYS   The ServeRAID II controller uses this reserved state
during logical-drive migration (LDM).

If the state of the logical drive is critical (CRT), you must replace
and rebuild the defunct drive. See "Understanding the Drive
Rebuild Process" on page 88 for more information.

The ServeRAID Configuration Program

You can use the IBM ServeRAID Configuration program to view the
current disk-array configuration, change or delete existing arrays,
create and initialize new disk arrays, and perform many other
configuration and maintenance tasks.

You must use the ServeRAID Configuration program or the
EZ-RAID configuration feature to configure your disk arrays *before*
you partition your hard disk drives and install your operating
system. After you configure your disk arrays, use the information
provided in the ServerGuide package to install your operating
system. Then, return to this manual for information about installing
and using the ServeRAID Administration and Monitoring utility
program.

Starting the ServeRAID Configuration Program

You can start the ServeRAID Configuration program in one of three ways. Choose one of these startup methods, and follow the appropriate instructions.

- During the initial startup of your server using ServerGuide (see "During the Initial Startup of Your Server").

- After an operating system is installed using ServerGuide (see "After an Operating System is Installed").

- Using diskettes (see "Using Diskettes to Start the ServeRAID Configuration Program" on page 48).

During the Initial Startup of Your Server

Using ServerGuide, insert the *HardwareGuide* CD in the CD-ROM drive and start the server. Follow the instructions in your ServerGuide package to start the ServeRAID Configuration program.

When the ServeRAID Configuration program starts, go to "Using the ServeRAID Configuration Program" on page 48 for more information.

After an Operating System is Installed

Notes:

1. Ensure that the CD-ROM is enabled as the startup drive. (See "Start Options" on page 170 for additional information.)

2. If a screen appears asking you to select an operating system, select the operating system that you have installed. This does not reinstall the operating system. This is for information only.

Insert the *HardwareGuide* CD in the CD-ROM drive and start the server. Follow the instructions in your ServerGuide package to start the ServeRAID Configuration Program.

When the ServeRAID Configuration Program starts, go to "Using the ServeRAID Configuration Program" on page 48 for more information.

Using Diskettes to Start the ServeRAID Configuration Program

If you choose to use diskettes to configure your ServeRAID II controller, you must first make the ServeRAID diskettes. You can make the diskettes using the Diskette Factory feature of ServerGuide. Refer to your ServerGuide documentation for instructions. You can also download the diskette images from the World Wide Web. See Chapter 9, "Getting Help, Service, and Information" for information about pages IBM maintains on the World Wide Web.

Once you have made the ServeRAID diskettes, do the following to start the ServeRAID Configuration program.

Insert the ServeRAID Configuration Diskette into the primary diskette drive; then, turn on the system. If the system is already turned on, press **Ctrl+Alt+Del.**

Each time your system starts, the ServeRAID II controller performs a power-on self-test (POST). The POST checks the configuration information for the ServeRAID II controller and for the configured hard disk drives. When POST detects a problem, an error message appears on the screen. If this occurs, see "ServeRAID II POST and Setup Messages" on page 345.

When the ServeRAID Configuration program starts, go to "Using the ServeRAID Configuration Program" for more information.

Using the ServeRAID Configuration Program

After the ServeRAID Configuration program starts, one of the following screens will appear:

- If you have more than one ServeRAID II controller in your system, a screen similar to the following appears.
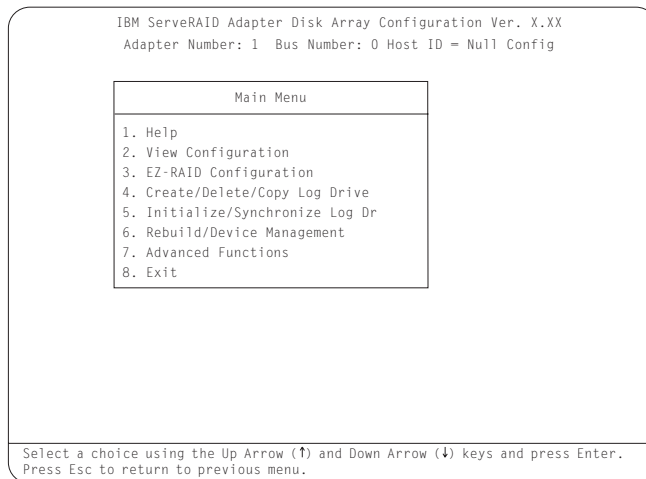
    Note: You can install multiple ServeRAID adapters in your server, but you must configure each adapter separately.

```
┌─────────────────────────────────────────────────────────────────────┐
│         IBM ServeRAID Adapter Disk Array Configuration Utility Ver. X.XX │
│                                                                         │
│                                                                         │
│              ┌──────────────────────────────────────┐                   │
│              │            Select Adapter            │                   │
│              ├──────────────────────────────────────┤                   │
│              │ 1. Help                              │                   │
│              │ 2. ServeRAID Adapter 1               │                   │
│              │ 3. ServeRAID Adapter 2               │                   │
│              │ 4. Exit                              │                   │
│              └──────────────────────────────────────┘                   │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│ Multiple IBM ServeRAID Adapter found in the system. Select a choice using the Up │
│ Arrow (↑) and Down Arrow (↓) keys and press Enter.                      │
└─────────────────────────────────────────────────────────────────────┘
```
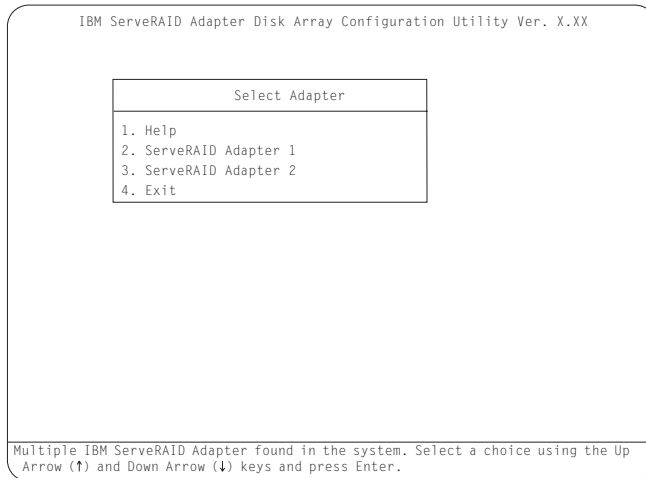
Note: In the upper-right corner of the screen, you will see Ver.
x.xx. On your screen, the x.xx is replaced by the version
number of the configuration program.

Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your
choice; then, press **Enter.** The Main Menu appears.

- If you have only one ServeRAID II controller installed in your
  server, the Main Menu appears.

```
┌─────────────────────────────────────────────────────────────────────┐
│           IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX    │
│           Adapter Number: 1  Bus Number: 0 Host ID = Null Config      │
│                                                                         │
│              ┌──────────────────────────────────────┐                   │
│              │              Main Menu               │                   │
│              ├──────────────────────────────────────┤                   │
│              │ 1. Help                              │                   │
│              │ 2. View Configuration                │                   │
│              │ 3. EZ-RAID Configuration             │                   │
│              │ 4. Create/Delete/Copy Log Drive      │                   │
│              │ 5. Initialize/Synchronize Log Dr     │                   │
│              │ 6. Rebuild/Device Management          │                   │
│              │ 7. Advanced Functions                │                   │
│              │ 8. Exit                              │                   │
│              └──────────────────────────────────────┘                   │
│                                                                         │
│                                                                         │
│                                                                         │
│                                                                         │
│ Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter. │
│ Press Esc to return to previous menu.                                   │
└─────────────────────────────────────────────────────────────────────┘
```

Type the highlighted number of the menu item, or use the Up Arrow (↑) or Down Arrow (↓) key to highlight your choice; then, press **Enter.** You can also press **Esc** to return to the previous menu, the previous work area of a screen, or to the beginning of the Main Menu.

If you are not familiar with the ServeRAID Configuration program, review the information in "ServeRAID Menus, Screens, and Drive States" on page 40.

Creating Disk Arrays

The ServeRAID II controller on your system board supports up to eight independent arrays. You must use the EZ-RAID configuration feature or the Create/Delete/Copy Log Drive menu to configure your disk arrays *before* you partition your hard disk drives and install your operating system.

The EZ-RAID configuration feature provides an easy way for you to quickly configure your disk arrays. This feature automatically creates a disk array, based on the number of RDY physical drives in your system. The EZ-RAID feature defines, initializes, and synchronizes the logical drive for you. If four or more RDY physical drives are available, this feature also will define a hot-spare drive. (See "Using the EZ-RAID Configuration Feature" on page 51 for more information.)

The Create/Delete/Copy Log Drive menu enables you to configure your arrays manually. You can use this menu to select the physical drives that you want to include in your disk arrays. You also can use this menu to define the logical and hot-spare drives for your arrays. (See "Creating Disk Arrays Manually" on page 52 for more information.)

For Advanced Users

If you want to change the stripe-unit size to maximize performance, see to "Changing the RAID Parameters" on page 71.

Using the EZ-RAID Configuration Feature

The EZ-RAID configuration feature groups up to eight ready (RDY) drives into one disk array and defines one logical drive. The size of the logical drive depends on the amount of free space available, and the RAID level assigned to the logical drive depends on the number of physical drives available.

The following table provides information about how EZ-RAID configuration defines a logical drive, based on the number of ready (RDY) drives available.

Physical RDY Drives Available	Logical Drive RAID Level	Hot-Spare Available
1	0	No
2	1	No
3	5	No
4-9	5	Yes

For example, if your server contains six drives that are in the RDY state, the EZ-RAID configuration feature will use five drives to create one disk array and define it as one RAID level 5 logical drive. The remaining drive is defined as a hot-spare drive.

If you want to use the EZ-RAID configuration feature to create multiple disk arrays, you might need to change the device states of some of your drives to prevent them from being included in the first array.

To create a disk array using the EZ-RAID configuration feature:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. If you want to include all RDY drives in the array, continue with step 3. Otherwise, change the device states of the RDY drives that you do not want to include in the array to SBY. To do this:

   a. Select **Rebuild/Device Management** from the Main Menu; then, press **Enter.**

b. Select **Set Device State** from the next menu; then, press **Enter.**

c. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the drive that you do not want to include in the array; then, press **Enter.**

d. When the drive states pop-up window appears, select **SBY**; then, press **Enter.**

e. Repeat steps 2b through 2d for each RDY drive that you do not want to include in the array; then, press **Esc** to return to the Main Menu.

   Note: After you run EZ-RAID configuration, you can change the device states back to RDY.

3. Select **EZ-RAID Configuration** from the Main Menu; then, press **Enter.** Information about the disk-array configuration appears on the screen.

4. When the Confirm pop-up window appears, select **Yes**; then, press **Enter**. The drives are automatically initialized. RAID level 5 drives are synchronized in the background.

5. If you are creating multiple arrays and you set some of your devices to another state using the procedure in step 2 on page 51, use that procedure to set the devices for your next array to RDY. Then, return to step 3 to create the next array. If you have finished creating your arrays, continue with step 6.

6. When the initialization process completes, you have completed the required steps for creating a ServeRAID disk-array configuration.

7. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

8. You are now ready to install your operating system. Refer to the information provided in the ServerGuide package.
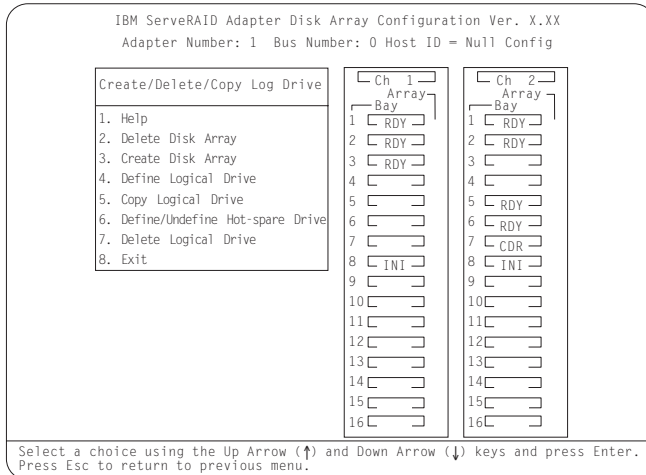
Creating Disk Arrays Manually

You can use the Create/Delete/Copy Log Drive menu to create your disk arrays manually. You also can use this menu to define

the logical and hot-spare drives for your arrays. You must define at least one logical drive for each array.

To create a disk array manually:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Create/Delete/Copy Log Drive** from the Main Menu; then, press **Enter.**

   A screen similar to the following appears.

```
┌──────────────────────────────────────────────────────────────────────┐
│         IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX       │
│         Adapter Number: 1  Bus Number: 0 Host ID = Null Config         │
│                                      ┌─ Ch 1 ─┐      ┌─ Ch 2 ─┐        │
│ ┌────────────────────────────────┐   │  Array │      │  Array │        │
│ │ Create/Delete/Copy Log Drive   │   ┌─ Bay ─┐      ┌─ Bay ─┐          │
│ │                                │   1 └ RDY ┘      1 └ RDY ┘          │
│ │ 1. Help                        │   2 └ RDY ┘      2 └ RDY ┘          │
│ │ 2. Delete Disk Array           │   3 └ RDY ┘      3 └     ┘          │
│ │ 3. Create Disk Array           │   4 └     ┘      4 └     ┘          │
│ │ 4. Define Logical Drive        │   5 └     ┘      5 └ RDY ┘          │
│ │ 5. Copy Logical Drive          │   6 └     ┘      6 └ RDY ┘          │
│ │ 6. Define/Undefine Hot-spare Drive│ 7 └     ┘      7 └ CDR ┘          │
│ │ 7. Delete Logical Drive        │   8 └ INI ┘      8 └ INI ┘          │
│ │ 8. Exit                        │   9 └     ┘      9 └     ┘          │
│ │                                │  10 └     ┘     10 └     ┘          │
│ │                                │  11 └     ┘     11 └     ┘          │
│ │                                │  12 └     ┘     12 └     ┘          │
│ │                                │  13 └     ┘     13 └     ┘          │
│ │                                │  14 └     ┘     14 └     ┘          │
│ │                                │  15 └     ┘     15 └     ┘          │
│ └────────────────────────────────┘  16 └     ┘     16 └     ┘          │
│ Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter. │
│ Press Esc to return to previous menu.                                  │
└──────────────────────────────────────────────────────────────────────┘
```

3. Select **Create Disk Array;** then, press **Enter.**

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight each drive that you want to include in the array; then, press **Enter.** The cursor is active in the Array/Bay selection list. (You must press **Enter** to select each drive. As you select each drive, the state of that drive changes from ready (RDY) to online (ONL).)

Notes:

   a. Hard disk drive capacities influence the way you create arrays. Drives in the array can be of different capacities, but the ServeRAID II controller treats them as if they all have the capacity of the *smallest* disk drive. (See "Hard Disk Drive Capacities" on page 35 for more information.)

   b. If you change your mind after selecting the drives for an array, you can delete the array (by selecting **Delete Disk Array** from the Create/Delete Copy Log Drive menu); then, begin again.

5. After you select all of the drives that you want to include in the array, press **Esc** to return to the Create/Delete Copy Log Drive menu.

   Note: When the stripe-unit size is 8 K (the default setting) or 16 K (a manual setting), the maximum number of physical drives in an array is 16. When the stripe-unit size is 32 K or 64 K (both are manual settings), the maximum number of physical drives in an array is eight.

6. If you want to create another array, return to step 3 on page 53. Otherwise, continue with step 7.

7. You must define at least one logical drive for each new array. Continue with "Defining Logical Drives."

Defining Logical Drives

You must define at least one logical drive for each array. The ServeRAID II controller supports up to eight logical drives. If you have only one array, you can define it as a single logical drive, or you can divide it into several logical drives. If you have two or more arrays, each array can be one logical drive, or you can divide each array into multiple logical drives, as long as the total number of logical drives for all of the arrays does not exceed eight.

Note: Refer to the documentation provided with your operating system for information about the recommended logical drive size.

To define a logical drive:

1. Select **Define Logical Drive** from the Create/Delete/Copy Log Drive menu; then, press **Enter.**

2. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the array for which you want to define a logical drive; then, press **Enter.**

   The Select RAID Level pop-up window appears.

   Notes:

   a. Typically, the first logical drive that you define will be your startup (boot) drive.

   b. The ServeRAID Configuration program automatically assigns RAID level 0 to any logical drives defined in an array containing only one hard disk drive. When this is the case, the Select RAID Level pop-up window will not appear.

   c. If you have two hard disk drives in the array, the Select RAID Level pop-up window appears, but RAID level 5 is not available. You need at least three hard disk drives in an array to assign RAID level 5 to the logical drives.

   d. The RAID level that you assign to a logical drive can influence the amount of space that the drive requires; therefore, you must assign a RAID level before you enter the size of the logical drive.

   e. For a description of RAID levels 0, 1, and 5, see "RAID Classifications" on page 36.

   f. You can define up to eight logical drives for your array. If you plan to use the logical-drive migration (LDM) procedure, do not define more than seven logical drives. The LDM procedure requires one free logical drive. (See "Logical Drive Migration Administration" on page 134 for more information.)

   g. If you plan to use the Change RAID Level feature of the LDM, you must assign the same RAID level to all of the logical drives in the array. (See "Changing RAID Levels" on page 135 for more information.)

3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the RAID level that you want to assign to the logical drive; then, press **Enter.** The Logical Drive Size pop-up window appears.

If this is the first logical drive you are defining, the Logical Drive Size pop-up window will show the amount of free space available in the array.

Note: Typically, the first logical drive that you define will be your startup (boot) drive.

If you already defined other logical drives for this array, the Allocation Table appears showing the existing logical drive sizes and the amount of free space available.

The size of a logical drive is determined by several factors, but the size must be divisible by the number of data drives in the array. A logical drive in an array can be any size you choose within the size limitations of the array. Consider the following examples:

Example 1. The array consists of three 1 GB drives.[5] You assign RAID level 0, which uses all the drives in the array with no redundant or parity storage; then, you type `1000.` The number 999 will appear in the Size (MB) field because it is the number closest to and lower than 1000 that is divisible by 3.

Example 2. The array consists of three 1 GB drives. You assign RAID level 1, which provides disk mirroring and stripes data across all drives in the array. Because the data is mirrored, the capacity of the logical drive is 50% of the physical capacity of the hard disk drives grouped in the array. If you type `1000,` the number 999 will appear in the Size (MB) field. The physical capacity used is 2000 MB, twice that of the logical drive size. The number that is closest to and lower than 2000 that is divisible by 3 is 1998. The logical drive size is 999 MB, which is 50% of the physical capacity.

---

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

Example 3. The array consists of three 1 GB drives and you assign RAID level 5. Data is striped across all three drives in the array, but the space equivalent to that of one drive is used for redundant storage. Therefore, if you type `1000`, the number 1000 remains in the Size (MB) field because it is divisible by 2 (drives), which is the space available for data. The physical capacity used is 1500 MB.

4. Type the size, in megabytes, that you want for the logical drive; then, press **Enter.**

5. When the Confirm pop-up window appears, select **Yes**; then, press **Enter.**

   Information about the new logical drive appears in the Logical Drive list. If you did not use all of the available free space, you can create another logical drive. You can assign the same or a different RAID level to additional logical drives.

6. When a message appears, stating that all logical drives must be initialized, press any key to continue.

   Note: To ensure that your server operates correctly, you *must* initialize the new logical drive. A quick initialization of a logical drive erases the first 1024 sectors on the drive.

7. When the Confirm pop-up window appears, you have two choices:

   - Select **Yes** to perform a quick initialization; then, press **Enter.** When the quick initialization is complete, go to step **8**.

   - Select **No** and if the drive is a RAID level 5 drive, it will be automatically synchronized in the background. Go to "Initializing Logical Drives" on page 59 to perform a complete initialization.

8. If you just performed a quick initialization of a RAID level 5 logical drive, a message appears, stating that the logical drive that you just created is being synchronized in the background and is ready for data storage. You have now completed the required steps for creating a ServeRAID configuration. Continue with the next step in this procedure.

9. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

   If you have not already done so, use the information provided in the ServerGuide package to install your operating system.

Initializing/Synchronizing Logical Drives at the Same Time

Initializing a logical drive sets the drive to a predetermined state. The initialization process overwrites any data on the drive with zeros, and all existing data is lost. The purpose of synchronizing logical drives is to compute and, if necessary, write the parity data on the selected RAID level 5 logical drive. If you did not initialize your logical drives when you defined them, you can now initialize multiple logical drives at the same time. However you can still initialize and synchronize multiple logical drives in separate steps (see "Initializing Logical Drives" on page 59 and "Synchronizing Logical Drives" on page 60 for instructions).

To initialize/synchronize logical drives:

1. Select **Initialize/Synchronize Log Drive** from the Main Menu; then, press **Enter.**

2. Select **Initialize/Synchronize Log Drive** from the next menu; then, press **Enter.**

3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the logical drive that you want to initialize/synchronize; then, press the **Spacebar** to select the drive. Continue doing this until you have selected all of the drives that you want to initialize/synchronize; then, press **Enter**.

4. When the Confirm pop-up window appears, select **Yes** to initialize/synchronize the logical drive or drives; then, press **Enter**.

   The initialization/synchronization process begins. You can see the progress in the **Pct. I/S.** (percent initialized/synchronized) column of the Logical Drive list.

   Note: Once the synchronization process begins, it cannot be interrupted.

5. Once you have completed initializing/synchronizing your logical drives, then you have completed the required steps for creating a ServeRAID configuration.

6. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

   If you have not already done so, use the information provided in the ServerGuide package to install your operating system. then you have completed the required steps for creating a ServeRAID configuration.

Initializing Logical Drives

Initializing a logical drive sets the drive to a predetermined state. You can initialize multiple logical drives at the same time.

Note: The initialization process overwrites any data on the drive with zeros, and all existing data is lost.

If you did not initialize your logical drives when you defined them, you must use the following instructions to initialize the drives *before* storing data.

To initialize logical drives:

1. Select **Initialize/Synchronize Log Drive** from the Main Menu; then, press **Enter.**

2. Select **Initialize Logical Drive** from the next menu; then, press **Enter.**

3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the logical drive that you want to initialize; then, press the **Spacebar** to select the drive. Continue doing this until you have selected all of the drives that you want to initialize; then, press **Enter**.

The Confirm pop-up window appears.

Attention:
When you select **Yes** in the Confirm pop-up window, information in the logical drive will be overwritten with zeros. All existing data is lost.

4. Select **Yes** to initialize the logical drive or drives; then, press **Enter.**

   The initialization process begins. You can see the progress in the **Pct. Int.** (percent initialized) column of the Logical Drive list.

   You can pause the initialization at any time by pressing **Esc.** Press **Esc** to stop the initialization and return to the previous menu. Press **Enter** to continue initializing the drive.

   Note: You do not need to synchronize RAID level 0 or 1 logical drives before storing data.

5. You *must* synchronize all RAID level 5 logical drives before storing data. If you just initialized RAID level 5 logical drives, continue with "Synchronizing Logical Drives." Otherwise, continue with step 6.

6. If you have completed initializing your logical drives and do not have to synchronize any RAID level 5 logical drives, then you have completed the required steps for creating a ServeRAID configuration.

7. When the initialization process completes, back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

   If you have not already done so, use the information provided in the ServerGuide package to install your operating system.

Synchronizing Logical Drives
The purpose of synchronizing logical drives is to compute and, if necessary, write the parity data on the selected RAID level 5 logical drive. Synchronizing a RAID level 1 logical drive copies the data from the primary disk to the mirrored disk.

RAID level 5 logical drives are automatically synchronized when you define them. You do not need to synchronize RAID level 0 or 1

logical drives before storing data. Also, the *data scrubbing* feature of the ServeRAID II controller continuously reads all sections of RAID level 1 and RAID level 5 logical drives "in the background" while your system is running. If a defective sector is found, it is automatically repaired. As a result, you no longer have to synchronize RAID level 1 and RAID level 5 logical drives on a weekly basis.

To synchronize logical drives:

1. Select **Initialize/Synchronize Log Drive** from the Main Menu of the ServeRAID Configuration program; then, press **Enter.**

2. Select **Synchronize Logical Drive** from the next menu; then, press **Enter.**

3. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the logical drive that you want to synchronize; then, press the **Spacebar** to select the drive. Continue doing this until you have selected all of the drives that you want to synchronize; then, press **Enter**.

4. When the Confirm pop-up window appears, select **Yes** to synchronize the logical drive or drives; then, press **Enter.**

   The synchronization progress appears in the **Pct. Syn.** (percent synchronized) column of the Logical Drive list.

   Note: Once the synchronization process begins, it cannot be interrupted.

5. Once you have completed synchronizing your logical drives, then you have completed the required steps for creating a ServeRAID configuration.

6. When the synchronization process completes, back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

   If you have not already done so, use the information provided in the ServerGuide package to install your operating system.

Defining Hot-Spare Drives

A hot-spare (HSP) drive is a hard disk drive that is defined for automatic use when a similar drive fails. The drive capacity of the

HSP drive must be equal to or greater than the capacity of the drive being replaced.

Notes:

1. If you want to have a hot-spare drive (HSP) or a standby hot-spare drive (SHS) and also assign RAID level 5 to one of your logical drives, you must have at least four hard disk drives.

2. In the event of a drive failure in an array that contains a logical drive assigned RAID level 0, the ServeRAID II controller will not activate a hot-spare drive.

You can use the Create/Delete/Copy/Log menu to define a RDY drive as a hot-spare drive. Or, you can change the state of a SBY, DHS, SHS, or RDY drive to HSP (see "Changing Device States" on page 70).

To define a RDY drive as a hot-spare drive:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Create/Delete/Copy Log Drive** from the Main Menu; then, press **Enter.**

3. Select **Define/Undefine Hot Spare Drive** from the next menu; then, press **Enter.**

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the RDY drive that you want to define as the hot spare (HSP); then, press **Enter.**

   The drive state changes from RDY to HSP. You can press **Enter** to toggle between the HSP and RDY states.

5. Press **Esc** to make the change; then, press **Esc** again to return to the Main Menu.

6. To enable or disable the hot-swap rebuild parameter, continue with "Enabling or Disabling Hot-Swap Rebuild" on page 63.

7. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Enabling or Disabling Hot-Swap Rebuild

The default setting for the hot-swap rebuild parameter is Disable. When you set the hot-swap rebuild parameter to Enable, the ServeRAID II controller can automatically rebuild a defunct (DDD) drive when you replace it.

The ServeRAID II controller will rebuild a defunct drive automatically when all of the following conditions exist:

- The hot-swap rebuild parameter is set to Enable.

- The defunct drive is part of a RAID level 1 or RAID level 5 logical drive.

- The capacity of the replacement drive is equal to or greater than the capacity of the defunct drive.

- No rebuild, synchronization, or RAID level change operation is in progress.

When these requirements are met, the ServeRAID II controller automatically initiates a rebuild of the drive without user intervention.

To enable or disable hot-swap rebuild:

1. Start the ServeRAID configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **Display/Change Adapter Parameters** from the next menu; then, press **Enter.**

4. Select **Enable/Disable Hot Swap Rebuild**; then, press **Enter.**

A screen similar to the following appears:

```
╭─────────────────────────────────────────────────────────────────────╮
│        IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX       │
│         Adapter Number: 1  Bus Number: O  Host ID = BIOSNull Cfg      │
│                                          ┌─Ch 1─┐   ┌─Ch 2─┐          │
│  ┌──────────────────────────────────┐   │ Array│   │ Array│          │
│  │   Display/Change Adapter Parameter│   ┌─Bay─┐   ┌─Bay─┐            │
│  │                                   │  1 └────┘  1 └ONL─┘ A          │
│  │  1. Help                          │  2 ┌────┐  2 └RDY─┘            │
│  │  2. Display Adapter Status        │  3 └────┘  3 └RDY─┘            │
│  │  3. Change Adapter Host/SCSI ID   │  4 └────┘  4 └RDY─┘            │
│  │  4. Set BIOS Compatability Mapping│  5 └────┘  5 └RDY─┘            │
│  │  5. Set Channel -> Bank Mapping   │  6 └────┘  6 └RDY─┘            │
│  │  6. Enable/Disable Hot Swap Rebuild│ 7 └────┘  7 └CDR─┘            │
│  │  7. Exit                          │  8 └INI─┘  8 └INI─┘            │
│  └──────────────────────────────────┘  9 └────┘  9 └────┘            │
│  ┌──────────────────────────────────┐ 10 └────┘ 10 └────┘            │
│  │      Hot Swap Rebuild State       │ 11 └────┘ 11 └────┘            │
│  │           Disabled                │ 12 └────┘ 12 └────┘            │
│  │                                   │ 13 └────┘ 13 └────┘            │
│  │  1. Enable Hot Swap Rebuild       │ 14 └────┘ 14 └────┘            │
│  │  2. Disable Hot Swap Rebuild      │ 15 └────┘ 15 └────┘            │
│  └──────────────────────────────────┘ 16 └────┘ 16 └────┘            │
│                                                                       │
│  Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and   │
│  press Enter. Press Esc to return to previous menu.                   │
╰─────────────────────────────────────────────────────────────────────╯
```

5. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your selection - enable or disable; then, press **Enter.**

6. Press **Esc** to return to the Advanced Functions menu.

7. Back up the disk-array configuration information to diskette. See to "Backing Up the Disk-Array Configuration" on page 82 for more information.

Viewing or Changing the Configuration

This section contains the following information and instructions for using the ServeRAID Configuration program to view or change your existing configuration.

- "Viewing the Disk-Array Configuration" on page 65

- "Viewing the Drive Information" on page 66

- "Viewing or Changing the ServeRAID Controller Parameters" on page 68

- "Changing Device States" on page 70

- "Changing the RAID Parameters" on page 71

- "Changing the Write Policy" on page 74

You also can use the Administration and Monitoring utility program to view or change your existing configuration. (See "Using the Administration and Monitoring Utility Program" on page 117 for more information.)

Viewing the Disk-Array Configuration
To view the current configuration:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **View Configuration** from the Main Menu; then, press **Enter.** The current disk-array configuration information appears on the screen.

3. To see the stripe order (the channel and bay numbers of the physical drives that make up the logical drives):

   a. Press **Enter.** The stripe order will appear in a separate window.

   b. Press any key to return to the View Configuration screen.

4. Press **Esc** to return to the Main Menu.

Viewing the Drive Information
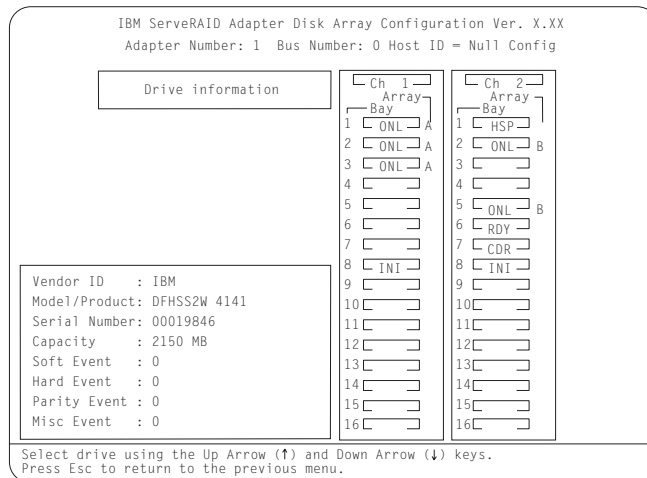
You can use the ServeRAID Configuration program to view the vendor ID, model number, serial number, and capacity of each hard disk drive attached to the ServeRAID II controller.

You also can use this program to view information about the number and types of events that occurred. The Device Event Log, in nonvolatile random-access memory (NVRAM), collects event information for each hard disk drive attached to the ServeRAID II controller.

To view the drive information:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Rebuild/Device Management** from the Main Menu; then, press **Enter.**

3. Select **Display Drive Information** from the next menu; then, press **Enter.**

   A screen similar to the following appears.

```
   IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
      Adapter Number: 1  Bus Number: 0 Host ID = Null Config

   ┌─ Ch 1 ─┐  ┌─ Ch 2 ─┐
      Drive information            ┌─Array─┐  ┌─Array─┐
                                   ┌─Bay─┐   ┌─Bay─┐
                                1 └ ONL ┘ A  1 └ HSP ┘
                                2 └ ONL ┘ A  2 └ ONL ┘ B
                                3 └ ONL ┘ A  3 └     ┘
                                4 └     ┘    4 └     ┘
                                5 └     ┘    5 └ ONL ┘ B
                                6 └     ┘    6 └ RDY ┘
                                7 └     ┘    7 └ CDR ┘
                                8 └ INI ┘    8 └ INI ┘
   Vendor ID    : IBM           9 └     ┘    9 └     ┘
   Model/Product: DFHSS2W 4141  10└     ┘    10└     ┘
   Serial Number: 00019846      11└     ┘    11└     ┘
   Capacity     : 2150 MB       12└     ┘    12└     ┘
   Soft Event   : 0             13└     ┘    13└     ┘
   Hard Event   : 0             14└     ┘    14└     ┘
   Parity Event : 0             15└     ┘    15└     ┘
   Misc Event   : 0             16└     ┘    16└     ┘

   Select drive using the Up Arrow (↑) and Down Arrow (↓) keys.
   Press Esc to return to the previous menu.
```

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the drives in the Array/Bay selection list.

When you highlight the drive, the drive information appears as follows:

- **Vendor ID** displays the name of the manufacturer or vendor.

- **Model/Product** displays the 4-digit model number, the 4-digit product number, the 2-digit ROM code revision level, and the 2-digit RAM code revision level.

- **Serial Number** displays the unit serial number of the device.

- **Capacity** displays the size of the device.

- **Soft Event** displays the number of SCSI Check Condition status messages returned from the drive (except Unit Attention and SCSI parity events) since the Device Event Log was last cleared.

- **Hard Event** displays the number of SCSI I/O processor events that occurred on the drive since the Device Event Log was last cleared. It also indicates if the drive exceeded the Predictive Failure Analysis (PFA) threshold.

    Notes:

    a. If a PFA event is detected, it appears beside the hard event information.

    b. If the drive exceeded the PFA threshold, continue with the operation and call for service within 24 hours. As a precaution, back up your RAID level 0 logical drives.

- **Parity Event** displays the number of parity events that occurred on the SCSI bus since the Device Event Log was last cleared.

- **Misc Event** displays the number of other events (such as selection timeout, unexpected bus free, or SCSI phase event) that occurred on the drive since the Device Event Log was last cleared.

5. Press **Esc** to return to the Main Menu.

Viewing or Changing the ServeRAID Controller Parameters
You can use the ServeRAID Configuration program to view or
change the ServeRAID II controller parameters.

To view or change the ServeRAID II controller parameters:

1. Start the ServeRAID Configuration program (see "Starting the
   ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press
   Enter.

3. Select **Display/Change Adapter Params** from the next menu;
   then, press **Enter.**
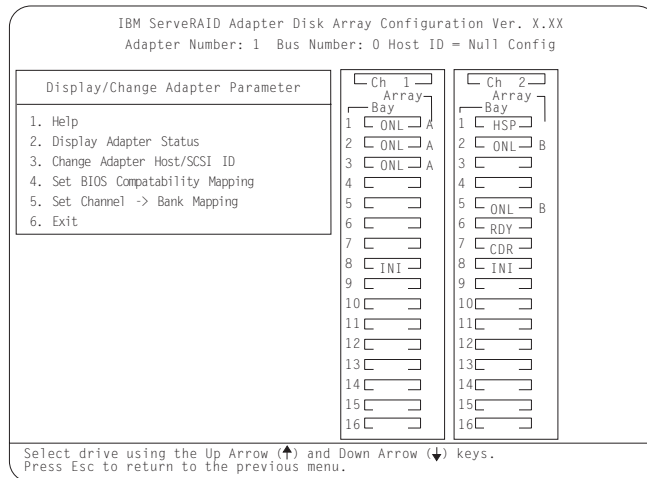
   A screen similar to the following appears.

```
╭──────────────────────────────────────────────────────────────────╮
│            IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX│
│            Adapter Number: 1  Bus Number: 0 Host ID = Null Config  │
│  ┌─────────────────────────────────┐  ┌─ Ch  1 ─┐ ┌─ Ch  2 ─┐     │
│  │    Display/Change Adapter Parameter│     Array      Array      │
│  │                                 │  ┌─Bay─┐   ┌─Bay─┐            │
│  │ 1. Help                         │  1 └ ONL ┘ A  1 └ HSP ┘       │
│  │ 2. Display Adapter Status       │  2 └ ONL ┘ A  2 └ ONL ┘ B     │
│  │ 3. Change Adapter Host/SCSI ID  │  3 └ ONL ┘ A  3 └     ┘       │
│  │ 4. Set BIOS Compatability Mapping│ 4 └     ┘    4 └     ┘       │
│  │ 5. Set Channel -> Bank Mapping  │  5 └     ┘    5 └ ONL ┘ B     │
│  │ 6. Exit                         │  6 └     ┘    6 └ RDY ┘       │
│  │                                 │  7 └     ┘    7 └ CDR ┘       │
│  │                                 │  8 └ INI ┘    8 └ INI ┘       │
│  │                                 │  9 └     ┘    9 └     ┘       │
│  │                                 │ 10 └     ┘   10 └     ┘       │
│  │                                 │ 11 └     ┘   11 └     ┘       │
│  │                                 │ 12 └     ┘   12 └     ┘       │
│  │                                 │ 13 └     ┘   13 └     ┘       │
│  │                                 │ 14 └     ┘   14 └     ┘       │
│  │                                 │ 15 └     ┘   15 └     ┘       │
│  │                                 │ 16 └     ┘   16 └     ┘       │
│  Select drive using the Up Arrow (↑) and Down Arrow (↓) keys.      │
│  Press Esc to return to the previous menu.                         │
╰──────────────────────────────────────────────────────────────────╯
```

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

   1. Help provides information about the choices available on
   the menu. You also can press F1 from any screen to obtain
   online Help.

   2. Display Adapter Status lets you view the current settings
   (On or Off) for Unattended Mode, CD-ROM Boot, and Read
   Ahead. You also can select this choice to view information
   about BIOS Compatibility Mapping, logical drive sizes, and

logical drives that are blocked or have a bad stripe. (See "Changing the RAID Parameters" on page 71 for more information.)

3. Change Adapter Host/SCSI ID lets you change the SCSI configuration ID or the SCSI transfer rate for the ServeRAID II controller. You can change the ServeRAID II controller host configuration ID to any 12 characters. If you are using Ultra Fast/Wide SCSI-3 drives, you can change the default SCSI transfer rate from 10 MHz to a maximum of 20 MHz. When the transfer rate is set to 20 MHz, the SCSI bus for the ServeRAID II controller provides a data-transfer rate of up to 40 MB per second. In addition, this choice lets you change the number of hard disk drives in a group that will start up simultaneously, and set the start-up delay (in seconds) between groups of drives.

4. Set BIOS Compatibility Mapping lets you change the basic input/output system (BIOS) mapping from 8 GB (default setting) to 2 GB. (For your server, use the default setting.)

5. Set Channel → Bank Mapping lets you specify which direct access storage device (DASD) bank is connected to the ServeRAID II controller. This mapping is critical for the correct operation of the Administration and Monitoring utility program, which uses the settings to identify drives, to control power to specific drives, and to operate the SCSI LEDs.

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your choice; then, press **Enter.**

5. Press **Esc** to return to the Advanced Functions menu.

6. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Changing Device States

You can use the ServeRAID Configuration program to change the state of a physical hard disk drive attached to the ServeRAID II controller.

To change the state of a physical hard disk drive:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Rebuild/Device Management** from the Main Menu; then, press **Enter.**

3. Select **Set Device State** from the next menu; then, press **Enter.**

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the appropriate drive; then, press **Enter.**

   A screen similar to the following appears.

```
 ┌─────────────────────────────────────────────────────────────────┐
 │          IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX │
 │          Adapter Number: 1  Bus Number: 0 Host ID = Null Config   │
 │                                     ┌─ Ch  1 ─┐  ┌─ Ch  2 ─┐      │
 │  ┌──────────────────────────────┐   │ ─Array─ │  │ ─Array─ │      │
 │  │   Rebuild/Device Management   │  ┌─Bay─┐     ┌─Bay─┐            │
 │  │                              │   1│ ONL │A  1│ HSP │           │
 │  │ 1. Help                      │   2│ ONL │A  2│ ONL │B          │
 │  │ 2. Set Device State          │   3│ ONL │A  3│     │           │
 │  │ 3. Rebuild Drive             │   4│     │   4│     │           │
 │  │ 4. Display Drive Information  │   5│     │   5│ ONL │B          │
 │  │ 5. Erase Device Event Log    │   6│     │   6│ RDY │           │
 │  │ 6. Exit     ┌─Device States─┐│   7│     │   7│ CDR │           │
 │  │             │               ││   8│ INI │   8│ INI │           │
 │  │             │ 1. EMP        ││   9│     │   9│     │           │
 │  │             │ 2. SBY        ││  10│     │  10│     │           │
 │  │             │ 3. DHS        ││  11│     │  11│     │           │
 │  │             │ 4. SHS        ││  12│     │  12│     │           │
 │  │             │ 5. DDD        ││  13│     │  13│     │           │
 │  │             │ 6. RDY        ││  14│     │  14│     │           │
 │  │             │ 7. HSP        ││  15│     │  15│     │           │
 │  │             │ 8. ONL        ││  16│     │  16│     │           │
 │  │             │ 9. RBL        ││                                 │
 │  └─────────────┴───────────────┘└─────────────────────────────────│
 │ Select the state to change the drive to and press Enter.  Please wait.│
 └─────────────────────────────────────────────────────────────────┘
```

   The Drive States pop-up window lists all hard disk drive states. (See "Physical Device States" on page 44 for more information.) The following table shows the current device states and the valid alternate device states that you can assign. For example, you can change the state of a standby hot-spare drive from SHS to HSP or DHS.

Note: Setting a DDD drive that is part of a CRT logical drive to ONL without performing the rebuild process might result in loss of data. (See "Understanding the Drive Rebuild Process" on page 88 for more information.)

Device States	Alternate States
EMP	RDY SBY
SBY	RDY EMP HSP SHS
DHS	EMP HSP SHS
SHS	HSP DHS
DDD	ONL RBL
RDY	EMP HSP SHS SBY
HSP	RDY SHS DHS
ONL	DDD
RBL	DDD ONL

5. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight a valid alternate drive state; then, press **Enter.** The new state appears in the Array/Bay selection list.

6. If you want to change the state of another drive, return to step 4 on page 70. Otherwise, continue with step 7.

7. Press **Esc** to return to the Main Menu.

8. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Changing the RAID Parameters

You can use the ServeRAID Configuration program to set the stripe-unit size, to set the rebuild priority, to turn Unattended Mode On or Off, or to turn Read Ahead On or Off.

To change the RAID parameters:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **Change RAID parameters** from the next menu; then, press **Enter.**

A screen similar to the following appears.

```
          IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
           Adapter Number: 1  Bus Number: 0  Host ID = Null Config

    ┌─────────────────────────────┐  ┌─Ch 1─┐   ┌─Ch 2─┐
    │     Advanced Functions       │  ┌Array┐    ┌Array┐
    │                              │  ┌Bay┐      ┌Bay┐
    │ 1. Help                      │  1 ┌ONL┐ A  1 ┌   ┐
    │ 2. Backup IPS ServeRaid Config│ 2 ┌ONL┐ A  2 ┌ONL┐ B
    │ 3. Restore/Convert Saved Config│3 ┌ONL┐ A  3 ┌   ┐
    │ 4. Logical Drive Params Management│4┌  ┐    4 ┌   ┐
    │ 5. Change RAID Parameters    │  5 ┌   ┐    5 ┌ONL┐ B
    │ 6. IBM RAID Subsystem Diagnostic│6 ┌   ┐   6 ┌RDY┐
    │ 7. Init/View/Synchronize Config│ 7 ┌   ┐   7 ┌CDR┐
    │ 8. Display/Change Adapter Params│ 8 ┌   ┐   8 ┌   ┐
    ┌──────────┐┌──────────┐┌──────────┐┌──────────┐
    │  Stripe  ││ Rebuild  ││Unattended││  Read    │
    │Unit Size ││ Priority ││  Mode    ││ Ahead    │
    │   8K     ││  High    ││  Off     ││   On     │
    │          ││          ││          ││          │
    │ 1.  8K   ││ 1. Medium││ 1. On    ││ 1. On    │
    │ 2. 16K   ││ 2. High  ││ 2. Off   ││ 2. Off   │
    │ 3. 32K   ││ 3. Low   │└──────────┘└──────────┘
    │ 4. 64K   │└──────────┘  14 ┌   ┐   14 ┌   ┐
    └──────────┘              15 ┌   ┐   15 ┌   ┐
                              16 ┌   ┐   16 ┌   ┐

  Select a choice using the Up Arrow, Down Arrow, Left Arrow and Right Arrow keys.
  Press Enter to change parameter.  Press Esc to return to menu.
```

Descriptions of the RAID parameters that you can change are as follows:

- **Stripe Unit Size:** The default setting is 8 K data bytes.

  The stripe-unit size is the amount of data written on a given disk before writing on the next disk. To maximize the overall performance, choose a size that is close to the size of the system I/O request.

  Note: The size of the system I/O request depends on your operating system. If you are not sure of the size, use the default setting.

  Attention:
  After you set a stripe-unit size and store data in the logical drives, you cannot change the size without destroying data in the logical drives.

  You can set the stripe-unit size to 8 K, 16 K, 32 K, or 64 K.

  - When the stripe-unit size is 8 K or 16 K, the maximum number of physical drives in an array is 16.

  - When the stripe-unit size is 32 K or 64 K, the maximum number of physical drives in an array is eight.

- **Rebuild Priority:** The default setting is High.

  The rebuild priority can be set to High, Medium, or Low.

  – When the rebuild priority is set to High, the rebuild I/O request gets highest priority in the execution order.

  – When the rebuild request is set from High to Medium in a heavily loaded system, it can increase the disk rebuild time, but provide better system performance.

  – When the rebuild request is set from High or Medium to Low in a moderate to heavily loaded system, it can increase the disk rebuild time, but provide better system performance.

- **Unattended Mode:** The default setting is Off.

  You can enable the ServeRAID II controller to accept changes in the configuration without user input.

  When unattended mode is set to Off, the program waits for user input when an event is detected.

  When unattended mode is set to On, the ServeRAID II controller pauses briefly to permit a user to override the default action; then, the controller makes the necessary changes. Unattended mode also clears any blocked drives. This mode is useful when the server operates remotely.

  When unattended mode is set to On, the ServeRAID II controller "chooses" an action that is equivalent to pressing one of the function keys.

  Note: When F5 is selected, non-responding ONL and RBL drives become DDD, RDY and SBY drives become EMP, and HSP drives become DHS.

    F5: The server continues the startup operation after identifying a defunct drive. For example, an HSP drive failed to respond during POST. Startup continues, but the ServeRAID II controller changes the state of the HSP drive to DHS.

    F6: When a drive is removed from the server (for example, for maintenance or security), but is returned to

a different bay, the ServeRAID II controller adjusts the configuration to the drive's new location.

F7: A ServeRAID II controller, with stored configuration information that does not match that of the configured drives present, imports the configuration information from the drives.

- **Read Ahead:** The default setting is On.

  Normally, the ServeRAID II controller transfers data from disk to its local cache in increments equal to the stripe-unit size. This provides excellent overall performance when workloads are steady and sequential. However, if the workload is random or the system I/O requests are smaller than the stripe-unit size, reading ahead to the end of the stripe might degrade performance.

  When read ahead is set to Off, the ServeRAID II controller transfers data from disk to its local cache in increments equal to the system I/O request size, without reading ahead to the end of the stripe.

  You can change the read-ahead setting without destroying data in a logical drive.

4. Use the Up Arrow (↑), Down Arrow (↓), Right Arrow (→), or Left Arrow (←) key to highlight the parameter that you want to change; then, press **Enter.**

5. Press **Esc** to return to the Advanced Functions menu.

6. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions. (The backup procedure also saves the RAID parameters to diskette.)

Changing the Write Policy

When you configure a logical drive, the ServeRAID II controller sets the write policy to *write-through* (WT) mode, where the completion status of a write command is sent *after* the data is written to the hard disk drive. Under certain workloads, you can improve performance by changing the write policy to *write-back* (WB) mode,

where the completion status is sent *after* the data is copied to cache memory, but *before* the data is actually written to the storage device.

Although you might gain performance with write-back mode, it creates a greater risk of losing data due to a power failure. If a ServeRAID II controller failure occurs while data is in the cache the data is lost. This is because the system gets a completion status message when the data reaches cache memory, but *before* data is actually written to the hard disk drive.

To change the write policy:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **Logical Drive Parms Management** from the Advanced Functions menu; then, press **Enter.**

4. Select **Change Write Policy** from the next menu; then, press **Enter.**

   A screen similar to the following appears.

```
        IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
          Adapter Number: 1  Bus Number: 0 Host ID = Null Config

  ┌─────────────────────────────────┐   ┌─ Ch  1 ─┐    ┌─ Ch  2 ─┐
  │                                 │   │  Array  │    │  Array  │
  │   Logical Drive Params Management│   ├─ Bay ─┐ │    ├─ Bay ─┐ │
  │                                 │   1 │ ONL │ A  1 │ HSP │
  │  1. Help                        │   2 │ ONL │ A  2 │ ONL │ B
  │  2. Change Write Policy         │   3 │ ONL │ A  3 │     │
  │  3. Set NVRAM Cache Controller  │   4 │     │    4 │     │
  │  4. Exit                        │   5 │     │    5 │ ONL │ B
  ├─────────┬───────────────────────┤   6 │     │    6 │ RDY │
  │ Array   │Log  Size  RAID    Wrt │   7 │     │    7 │ CDR │
  │ ID Size │Drv  (MB)  Level Status Pol  8 │ INI │    8 │ INI │
  │ A  1920 │A0   100   RAID-0  OKY  WT  9 │     │    9 │     │
  │ B  2006 │B0   100   RAID-0  OKY  WT 10 │     │   10 │     │
  │         │A1   200   RAID-0  OKY  WT 11 │     │   11 │     │
  │         │B1   200   RAID-1  OKY  WT 12 │     │   12 │     │
  │         │                       │  13 │     │   13 │     │
  │         │                       │  14 │     │   14 │     │
  │         │                       │  15 │     │   15 │     │
  │         │                       │  16 │     │   16 │     │
  └─────────┴───────────────────────┘
   Select logical drive and press Enter to toggle the write policy. Press the ESC
   key to make the change.
```

5. Locate the **Wrt Pol** field in the Logical Drive list.

The write policy is shown as either write through (WT), which is the default setting, or write back (WB).

6. Select the logical drive whose write policy you want to change.

   Attention:
   If you change the write policy to WB, wait at least 10 seconds after your last operation before you turn off your system. It takes that long for the system to move the data from the cache memory to the storage device. Failure to follow this practice can result in lost data.

7. Press **Enter** to change the write policy. (You can press **Enter** to toggle between WT and WB.)

8. Press **Esc.** The Confirm pop-up window appears.

9. Select **Yes** to save the changes, or select **No** to return the setting to its original state; then, press **Enter.**

10. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for more information.

Copying Logical Drives and Disk Arrays

You can use the ServeRAID Configuration program to make backup copies of the logical drives and disk arrays in your server. You also might want to use this program to create a duplicate copy of a logical drive or array for use in another system.

Copying Logical Drives

You can use this feature to create a backup copy of the data on an existing logical drive, or to duplicate data for use in another system.

The copy logical drive feature does not copy the RAID configuration information. If you want to copy an existing array for use in another system, use the instructions provided in "Copying an Existing Disk Array" on page 78.

Note: If you have a RAID level 5 logical drive, make sure that your target drive is synchronized *before* starting this procedure.

To copy a logical drive:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Create/Delete/Copy Log Drive** from the Main Menu; then, press **Enter.**

3. Select **Copy Logical Drive** from the next menu; then, press **Enter.**

4. Select the source and target drives:

   Notes:

   - The size of the target logical drive must be equal to or greater than the size of the source logical drive.

   - You can select up to four source/target pairs at a time.

   a. From the Logical Drive list, use the Up Arrow (↑) or Down Arrow (↓) key to highlight the source logical drive that you want to copy from; then, press the **Spacebar** to select the drive.

   b. From the Logical Drive list, use the Up Arrow (↑) or Down Arrow (↓) key to highlight the target logical drive that you want to copy to; then, press the **Spacebar** to select the drive.

   c. Select another source and target drive, if desired.

5. To start the copy process, press **Enter.**

   The Confirm pop-up window appears.

   Attention:
   When you select **Yes** in the Confirm pop-up window, information in the target logical drive will be overwritten with information from the source logical drive. All existing data on the target logical drive is lost.

6. Select **Yes** to copy the logical drive; then, press **Enter.**

```
                    IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
                    Adapter Number: 1  Bus Number: 0 Host ID = Null Config

   Confirm  Create/Delete/Copy Log Drive        ┌─ Ch  1 ─┐      ┌─ Ch  2 ─┐
   1. No                                         ┌─Array─┐       ┌─Array─┐
   2. Yes   1. Help                               ─Bay─          ─Bay─
                                                1 └ ONL ┘A      1 └ HSP ┘
            Source   0  1  2  3  4  5  6  7     2 └ ONL ┘A      2 └ ONL ┘B
            Target   1                          3 └ ONL ┘A      3 └     ┘
                                                4 └     ┘       4 └     ┘
                                                5 └     ┘       5 └ ONL ┘B
   Array  Log  Size  RAID           Pct         6 └     ┘       6 └ RDY ┘
   ID Size Drv  (MB) Level  Status  R/W         7 └     ┘       7 └ CDR ┘
   A  3009  A0  100   RAID-5  OKY               8 └ INI ┘       8 └ INI ┘
   B  4126  B0  100   RAID-1  OKY               9 └     ┘       9 └     ┘
                                               10 └     ┘      10 └     ┘
                                               11 └     ┘      11 └     ┘
                                               12 └     ┘      12 └     ┘
                                               13 └     ┘      13 └     ┘
                                               14 └     ┘      14 └     ┘
                                               15 └     ┘      15 └     ┘
                                               16 └     ┘      16 └     ┘

   Copy operation will destroy data on target logical drive.  Confirm start.
```

The copy progress appears in the percent Read/Write (Pct. R/W) column as a percentage of the total number of sectors read and written.

7. When the copy process completes, back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Copying an Existing Disk Array

You can use the following instructions to create a complete copy (including the RAID configuration information) of an existing array. You can use this procedure to duplicate your current disk-array configuration for use on another system.

To copy an existing disk array:

1. Back up the configuration of the source system to a diskette. (See "Backing Up the Disk-Array Configuration" on page 82.)

2. On the source system, create a copy of the disk array that you want to use on another system.

   For example, if you want a copy of Array A to use on another system, create an Array B that is identical to Array A. (See "Creating Disk Arrays Manually" on page 52.)

3. Copy all logical drives from the source array to the target array.

For example, if you made an identical copy of Array A and that copy is Array B, you would copy all logical drives in Array A to Array B. (See "Copying Logical Drives" on page 76.)

4. Physically remove the hard disk drives that contain the copy from the source system; then, install them in the same bays on the target system.

   Note: Ensure that you install the drives in the same bays on the target system that the drives of the source array occupy in the source system. (Remember, the bay number is equal to the SCSI ID of the device +1.)

5. Using ServerGuide, insert the *HardwareGuide* CD in the CD-ROM drive and start the server.

6. Using the diskette that contains the backup copy of the source configuration (you created this diskette in step 1 on page 78), *restore* the configuration to the target system. (See "Restoring the Disk-Array Configuration" on page 83.)

Deleting Logical Drives and Disk Arrays

This section contains instructions for deleting logical drives and disk arrays. In all cases, when you delete an array or its associated logical drives, all the data and programs in the array are lost. Before proceeding, back up any data and programs that you want to save. You might want to use a high-speed back up device, such as a tape drive, to back up large amounts of data.

Deleting Logical Drives

In some operating systems, deleting a logical drive might change the drive letters assigned to the existing logical drives.

To delete a logical drive:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Create/Delete/Copy Log Drive** from the Main Menu; then, press **Enter.**

3. Select **Delete Logical Drive** from the next menu; then, press **Enter.**

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the logical drive that you want to delete; then, press the **Del** key. The Confirm pop-up window appears.

   Attention:
   All data and programs in the logical drive are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

5. Select **Yes** to delete the logical drive, or select **No** if you do not want to delete the drive; then, press **Enter.**

6. Select **Exit** or press **Esc** to return to the Main Menu.

7. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Deleting Disk Arrays

Deleting a disk array deletes all logical drives that are defined in that disk array. All data and programs are lost once you perform the procedure.

To delete a disk array:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Create/Delete/Copy Log Drive** from the Main Menu; then, press **Enter.**

3. Select **Delete Disk Array** from the next menu; then, press **Enter.**

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the array that you want to delete; then, press the **Del** key. The Confirm pop-up window appears.

   Attention:
   All data and programs in the array are lost during this procedure. Before proceeding, back up any data and programs that you want to save.

5. Select **Yes** to delete the array, or select **No** if you do not want to delete the array; then, press **Enter.**

If you delete an array of Online (ONL) drives, the state of the ONL drives changes to Ready (RDY). If the array contains a defunct drive (DDD), the state of the DDD drive changes to defunct hot spare (DHS). You can reset the drive state as follows:

- If the drive is good, change the device state from DHS to HSP; then, select the drive again and change the device state from HSP to RDY. (See "Changing Device States" on page 70 for instructions.)

- If the drive is defective, physically replace it with a good drive; then, set the state for the new drive to RDY. (See "Installing Internal Drives" on page 233 and "Changing Device States" on page 70 for instructions.)

6. Select **Exit** or press **Esc** to return to the Main Menu.

7. Back up the disk-array configuration information to diskette. See "Backing Up the Disk-Array Configuration" on page 82 for instructions.

Maintaining the Disk-Array Configuration

This section contains the following information and instructions for using the ServeRAID Configuration program to maintain your existing disk-array configuration.

- "Backing Up the Disk-Array Configuration" on page 82
- "Restoring the Disk-Array Configuration" on page 83
- "Testing the RAID Subsystem" on page 84
- "Formatting Drives" on page 84
- "Clearing the Device Event Log" on page 85
- "Replacing a Faulty Drive" on page 86
- "Understanding the Drive Rebuild Process" on page 88
- "Initializing, Viewing, or Synchronizing the ServeRAID II Controller Configuration" on page 91

Backing Up the Disk-Array Configuration

The disk-array configuration is *vital information.* To protect this information, back up the information to diskette as soon as you complete your tasks.

The ServeRAID II controller maintains a record of the disk-array configuration information in its NVRAM, in an electrically erasable programmable read-only memory (EEPROM) module, and on each ONL and RBL drive.

Attention:
Dynamic changes in the configuration of your disk arrays can occur due to hot-spare drive replacement or other drive maintenance activity. It is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

You need a blank, 3.5-inch, 2 MB, formatted diskette to create a backup copy.

To back up the disk-array configuration information:

 1. Label a blank diskette "Disk-Array Configuration Backup" and date it.

 2. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

 3. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

 4. Select **Backup IPS ServeRAID Config** from the next menu; then, press **Enter.** (The disk-array configuration is also known as the *IBM ServeRAID (IPS) configuration.*)

 5. Insert the blank *Disk-Array Configuration Backup* diskette into the diskette drive.

 6. A pop-up window appears with a default file name of CONFIG; change the file name by typing over the default; then, press **Enter.** The Backup program assigns a file-name extension of *.ips.*

 7. The Confirm pop-up window appears.

Select **Yes** to confirm that you want to copy the file to the backup diskette, or select **No** to return to the previous menu; then press **Enter.**

8. Remove the backup diskette from the drive and store it in a safe place.

9. Press **Esc** to return to the Main Menu.

Restoring the Disk-Array Configuration
To restore the disk-array configuration information for the ServeRAID II controller, use the *ServeRAID II Configuration CD* and an up-to-date disk-array configuration backup diskette.

Attention:
Dynamic changes in the configuration of your disk arrays occur due to hot-spare drive replacement or other drive maintenance activity. Because of this, the configuration backup information on the diskette might be different from the information stored in NVRAM for the ServeRAID II controller. Therefore, it is important that you back up the disk-array configuration information frequently, to keep the backup information on the diskette current.

To restore the ServeRAID configuration information:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **Restore/Convert Saved Configuration** from the next menu; then, press **Enter.**

4. Insert your Disk-Array Configuration Backup diskette into the diskette drive; then, press **Enter.**

5. A list of backup file names appears. Use the Up Arrow (↑) or Down Arrow (↓) key to select the file name that you want to restore; then, press **Enter.**

6. The Confirm pop-up window appears.

   Select **Yes** to restore the configuration information, or select **No** to return to the previous menu; then, press **Enter.**

7. Press **Esc** to return to the Main Menu.

Testing the RAID Subsystem

You can use the RAID Subsystem Diagnostic program to test the ServeRAID II controller and the devices connected to the controller.

To test the RAID subsystem:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **IBM RAID Subsystem Diagnostic** from the next menu; then, press **Enter.**

4. Select the diagnostic test that you want to run; then, press **Enter.**

   Descriptions of the diagnostic tests available are as follows:

   • **Run Adapter Self-tests** tests the ServeRAID II controller. Restart your server after the self-test completes.

   • **SCSI Device Self-test** runs diagnostic tests on the SCSI devices attached to the ServeRAID II controller.

   • **Drive Media Test** verifies that all sectors on the hard disk drive are accessible. The drive must be in the RDY or HSP state.

   • **Format Drive** performs a low-level format on a hard disk drive. For more information, see "Formatting Drives."

5. Follow the instructions that appear on the screen.

Formatting Drives

The Format Drive feature provides a low-level format on a hard disk drive. If you install a new hard disk drive that requires a standard format, use your operating system Format command to format the drive. You can use the Format Drive feature to low-level format hard disk drives that are in the Ready (RDY), Empty (EMP), Standby (SBY), Standby Hot-Spare (SHS), or Hot-Spare (HSP) states. This feature can low-level format multiple drives simultaneously.

To perform a low-level format:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **IBM RAID Subsystem Diagnostic** from the next menu; then, press **Enter.**

   You can perform a low-level format on more than one drive at a time.

   Attention:
   A low-level format erases all data and programs from the hard disk drive. Before proceeding, back up any data and programs that you want to save.

4. Select **Format Drive**; then, press **Enter.**

   Note: If formatting is interrupted, the state of the drive being formatted might appear as Empty (EMP) in the Array/Bay selection list. If this occurs, select the drive and format it again.

5. Follow the instructions that appear on the screen. When a message similar to `Formatting Complete` appears, press **Esc** to return to the Main Menu.

Clearing the Device Event Log

The Device Event Log, located in the ServeRAID II controller, collects statistics on the number and type of events that occur on all of the hard disk drives attached to the ServeRAID II controller.

After you correct a disk-array problem, you might want to clear the Device Event Log so that you can quickly identify any subsequent errors.

To clear the Device Event Log:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Rebuild/Device Management** from the Main Menu; then, press **Enter.**

3. Select **Erase Device Event Log** from the next menu; then, press **Enter** to clear the log.

Replacing a Faulty Drive

To avoid the loss of critical data, it is important that you replace and rebuild a defunct (DDD) drive promptly.

The results of hard disk drive failures depend on the configuration of your disk arrays and the number of drives that fail. Before you remove or replace a DDD drive, review the following examples.

Example 1. One hard disk drive becomes defunct, but a hot-spare (HSP) drive of the same size exists.

- If the failing drive is part of a redundant (RAID level 1 or RAID level 5) logical drive, the hot-spare drive takes over immediately.

- RAID level 1 and RAID level 5 logical drives within the array change to the critical (CRT) state and remain in the CRT state until the rebuild process completes.

- The RAID level 0 logical drives within the array change to the offline (OFL) state.

- All data in the RAID level 0 logical drives within the array is lost.

Example 2. One hard disk drive becomes defunct, and an appropriate hot-spare (HSP) drive is not available.

- The RAID level 1 and RAID level 5 logical drives change to the CRT state and remain in the CRT state until the rebuild process completes. Data is not lost from logical drives in the CRT state, but you must replace the DDD hard disk drive promptly to avoid the loss of data. (If two drives within the same array become DDD, all data within the array is lost.)

- The RAID level 0 logical drives change to the OFL state.

- All data in the RAID level 0 logical drives within the array is lost.

Example 3. Multiple drives within an array become defunct.

- All logical drives in the array change to the offline (OFL) state.

- All data from the array is lost, regardless of the RAID levels assigned to the logical drives.

To replace a faulty drive:

1. Before you remove or replace a drive that you suspect to be defective, verify that the drive is defective. To do this:

   a. Check the drive for damage.

   b. Verify that the drive is positioned correctly. If the drive is not installed correctly, reposition the drive.

   c. Check the lights on the drive tray. (See the following information for a description of the lights.) Verify that you can remove the drive safely.

   The lights on the hot-swap drive tray provide drive status information, as follows:

   - **Hard Disk Activity Light:** When this green light is flashing, it indicates that the server is accessing the drive.

   - **Hard Disk Status Light:** When this amber light is lit continuously, it indicates that the drive has failed. When the light flashes slowly (one flash per second), it indicates that the hard disk drive is part of a disk array and is being rebuilt. When the light flashes rapidly (three flashes per second), it indicates that the controller is identifying the drive. The drive *should not* be replaced if this light is blinking; the drive has just been replaced and the disk array is being rebuilt.

2. Physically replace the defective drive or use an existing RDY drive that has a capacity equal to or greater than the drive that you are replacing as a hot-spare replacement drive.

   Attention:
   Removing the wrong hard disk drive might cause loss of all data in the array.

   a. To physically replace the defective hard disk drive, follow the instructions in "Installing Internal Drives" on page 233 and "Installing a Drive in a Hot-Swap Bay" on page 241; then, follow the instructions in "Understanding the Drive Rebuild Process."

   b. To rebuild the defunct drive to an existing RDY drive, follow the instructions in "Understanding the Drive Rebuild Process."

      Note: You can use the Administration and Monitoring utility program to identify a defunct drive and designate a replacement drive without restarting the server. Review the information in "Understanding the Drive Rebuild Process"; then, see "Using the Administration and Monitoring Utility Program" on page 117 for more information.

Understanding the Drive Rebuild Process
This section contains guidelines and instructions for rebuilding a defunct (DDD) drive using the ServeRAID Configuration program.

If you are using the Administration and Monitoring utility program, review the guidelines and information in this section; then, see "Physical Device Administration" on page 139 for instructions.

Automatic Rebuild Process: The ServeRAID II controller will rebuild a defunct drive automatically when all of the following conditions exist:

- The physical drive that failed is part of a RAID level 1 or 5 logical drive.

- A HSP or SHS drive with a capacity equal to or greater than the original drive is available the moment that the drive fails.

- No rebuild, synchronization, or RAID level change operation is in progress.

If multiple hot-spare drives are available, the ServeRAID II controller searches all bays for a hot-spare drive of the appropriate size. The first drive that meets this requirement enters the rebuild state.

A physical hard disk drive can enter the rebuild (RBL) state if:

- You physically replace a defunct drive that is part of the critical (CRT) logical drive.

  When you physically replace a defunct drive in a critical (CRT) logical drive, the ServeRAID II controller rebuilds the data on the new physical drive *before* it changes the logical drive state back to Okay (OKY).

- The ServeRAID II controller adds a hot-spare or a standby hot-spare drive to the array and changes its state from HSP or SHS to RBL.

- A ready or standby drive replaces a defunct drive that is part of the critical (CRT) logical drive.

Guidelines for Rebuilding a Drive: Before you rebuild a drive, review the following guidelines:

- If the state of the logical drive is critical (CRT), you must rebuild the defunct hard disk drive promptly.

- The replacement hard disk drive must be the same size or larger than the failed drive.

- If the hard disk drive being rebuilt is part of a RAID level 0 logical drive, the RAID level 0 drive is blocked to external access during the rebuild process.

  – If you use the ServeRAID Configuration program to initiate the rebuild process, the program unblocks the RAID level 0 logical drive when the rebuild process completes. If the rebuild process is interrupted, you must restart the server to unblock the blocked RAID level 0 logical drive.

- If you use the Administration and Monitoring utility program to initiate the rebuild process, you must unblock the RAID level 0 logical drive when the rebuild process completes. (See "Unblocking Logical Drives" on page 133 for more information.)

- Data that was stored in a RAID level 0 logical drive is lost during the rebuild process. If you backed up your data before the drive failed, you can restore the data to the new drive.

Rebuilding a Drive: **To rebuild a physical drive:**

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Rebuild/Device Management** from the Main Menu; then, press **Enter.**

3. Select **Rebuild Drive** from the next menu; then, press **Enter.** The cursor is active in the Array/Bay list.

4. A pop-up window appears. Select one of the following:

   - Select **Same Location** if you physically replaced a hard disk drive in the same bay; then, press **Enter.** A Confirm pop-up window appears. Select **Yes** and continue with step 5.

   - Select **New Location** to assign a hard disk drive in a new location. Use the Up Arrow (↑) or Down Arrow (↓) key to select the replacement drive that you want to use for the rebuild operation; then, press **Enter.**

   Information and status messages about each stage of the rebuild process appear on the screen.

5. When the rebuild process completes, press **Esc** to return to the Main Menu. The new configuration is saved.

6. Back up the new configuration to diskette (see "Backing Up the Disk-Array Configuration" on page 82).

7. Select **Exit** to leave the ServeRAID Configuration program.

8. Remove the *HardwareGuide CD* and press **Ctrl+Alt+Del** to restart the server.

Initializing, Viewing, or Synchronizing the ServeRAID II Controller Configuration

The ServeRAID configuration information stored in nonvolatile random-access memory (NVRAM) is critical to the reliable operation of the disk array. To protect the integrity of the configuration information, the configuration information is also stored in an EEPROM and on each RBL and ONL hard disk drive. Each time you change the configuration information, all corresponding copies are updated automatically.

During POST, if the NVRAM configuration information does not match the configuration information stored in the EEPROM or on the hard disk drives, an error message appears.

You can use the Init/View/Synchronize Config menu to initialize, view, or synchronize the ServeRAID II controller configuration information.

To initialize, view, or synchronize the configuration information:

1. Start the ServeRAID Configuration program (see "Starting the ServeRAID Configuration Program" on page 47).

2. Select **Advanced Functions** from the Main Menu; then, press **Enter.**

3. Select **Init/View/Synchronize Config** from the next menu; then, press **Enter.**

A screen similar to the following appears.

```
      IBM ServeRAID Adapter Disk Array Configuration Ver. X.XX
         Adapter Number: 1  Bus Number: 0 Host ID = Null Config

                                      ┌─ Ch  1─┐    ┌─ Ch  2─┐
                                      ┌─Array─┐     ┌─Array─┐
   Init/View/Synchronize Config       ┌─Bay─┐       ┌─Bay─┐
                                     1 └ ONL ┘ A   1 └ HSP ┘
   1. Help                           2 └ ONL ┘ A   2 └ ONL ┘ B
   2. Initialize Configuration       3 └ ONL ┘ A   3 └     ┘
   3. View NVRAM Configuration       4 └     ┘     4 └     ┘
   4. View EEPROM Configuration      5 └     ┘     5 └ ONL ┘ B
   5. View Hard Drive Configuration  6 └     ┘     6 └ RDY ┘
   6. View Change List               7 └     ┘     7 └ CDR ┘
   7. Configuration Synchronization  8 └ INI ┘     8 └ INI ┘
   8. Exit                           9 └     ┘     9 └     ┘
                                    10 └     ┘    10 └     ┘
                                    11 └     ┘    11 └     ┘
                                    12 └     ┘    12 └     ┘
                                    13 └     ┘    13 └     ┘
                                    14 └     ┘    14 └     ┘
                                    15 └     ┘    15 └     ┘
                                    16 └     ┘    16 └     ┘

 Select a choice using the Up Arrow (↑) and Down Arrow (↓) keys and press Enter.
 Press Esc to return to previous menu.
```

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

- **Help** provides information about the choices available on
  the menu. You also can press F1 from any screen to obtain
  online Help.

- **Initialize Configuration** lets you set the configuration of the
  ServeRAID II controller to its default settings. This choice
  sets the states for all powered-on hard disk drives to RDY,
  all CD-ROM drives to CDR, and all tape drives to TAP.
  This choice also deletes all previously defined arrays and
  logical drives. This choice writes a "Null Configuration" for
  the ServeRAID II controller.

  You must select this choice if a message appears stating that
  you have an unrecoverable configuration error, because
  valid configuration information does not exist.

- **View NVRAM Configuration** displays the current
  configuration settings stored in the controller's NVRAM.

- **View EEPROM Configuration** displays the current
  configuration settings stored in the the controller's
  EEPROM.

- **View Hard Drive Configuration** displays the configuration settings for the selected ONL or RBL hard disk drive. To view the stripe order, press **Enter.**

- **View Change List** displays the device state configuration changes that the ServeRAID II controller reported since you restarted or turned on the server.

  - **View Power-on Change List** displays the hard disk drive device state changes since the last time that you restarted or turned on the server.

  - **View Wrong SCSI ID List** provides a list of hard disk drives that were found at a different SCSI ID location (bay) when you restarted or turned on the server.

  - **View Unidentified Drive List** provides a list of hard disk drives that have identifiers that do not match the stored configuration information.

    The identifier consists of both the configuration host ID and a time stamp. You can define the host ID (for example, a host ID can be the serial number of the server) as any string up to 12 characters. (See "Viewing or Changing the ServeRAID Controller Parameters" on page 68 for more information.)

- **Configuration Synchronization**. See "Configuration Synchronization" for a description of this choice.

4. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight your choice from the menu; then, press **Enter.**

5. Follow the instructions that appear on the screen.

Configuration Synchronization: When the configuration information stored in NVRAM, in the EEPROM, and on the hard disk drives does not match, you can select one source; then, copy the selected configuration information to the other locations.

You can view the individual configurations to determine if they are valid, and then select the configuration that you want to use.

If a message appears stating that you have a recoverable configuration error, one of the following conditions exists:

- The configuration information in NVRAM is valid, but the configuration information in the EEPROM is invalid.

- The configuration information in the EEPROM is valid, but the configuration information in NVRAM is invalid.

- The configuration information in NVRAM is valid and the configuration information in the EEPROM is valid, but they do not match.

If a message appears stating that you have an unrecoverable configuration error, valid configuration information does not exist. If this occurs, you must initialize the configuration immediately. See "Initializing, Viewing, or Synchronizing the ServeRAID II Controller Configuration" on page 91 for instructions.

Descriptions of the choices available from the Configuration Synchronization menu are as follows:

- **EEPROM as Source** copies configuration information from the the controller's EEPROM to NVRAM and to all configured RBL and ONL hard disk drives defined in the the controller's EEPROM configuration.

- **NVRAM as Source** copies configuration information from NVRAM to the EEPROM and to all configured RBL and ONL hard disk drives defined in the NVRAM configuration.

- **NVRAM and POCL as Source** updates information from the power-on change list (drive state changes at power-on time) with the information in NVRAM, then copies this updated configuration information to the EEPROM and to all configured RBL and ONL hard disk drives defined in the NVRAM configuration.

- **Hard Disk Drive as Source** retrieves configuration information from the most common hard disk drive configuration, then copies the configuration information to NVRAM and to the EEPROM.

- **Identified HDD as Source** updates the configuration information with configuration information from hard disk drive that matches the identifiers stored in NVRAM. The updated configuration information is then copied to NVRAM, to the EEPROM, and to the configured hard disk drives in the array.

- **Specific HDD as Source** retrieves the configuration information from the hard disk drive that you select. The updated configuration information is then copied to NVRAM, to the EEPROM, and to the configured hard disk drives.

Using the ServeRAID Mini-Configuration Program

The ServeRAID Mini-Configuration program is a quick way to view the ServeRAID II controller settings and to perform a limited set of the configuration functions. The ServeRAID Mini Configuration program is stored in read-only memory (ROM).

To access the ServeRAID Mini-Configuration program:

1. Start the server. If the system is already turned on, press **Ctrl**+**Alt**+**Del** to restart the server.

   Each time your system starts, the ServeRAID II controller performs a power-on self-test (POST). The POST checks the configuration information for the ServeRAID II controller and for the configured hard disk drives, to see if any changes have occurred.

   - If POST does not detect changes in the configuration or encounter any hardware problems, continue with step 2.

   - If POST detects changes in the configuration or encounters a hardware problem, messages appear on the screen. If this occurs, see "ServeRAID II POST and Setup Messages" on page 345 and correct the problem; then, return here and continue with step 2.

2. Press **Ctrl**+**I** immediately when a screen similar to the following Mini-Configuration screen appears.

```
    IBM ServeRAID Adapter Disk Array Mini-Configuration Utility Ver. X.XX



                        IBM ServeRAID Adapter BIOS
                        Copyright IBM Corp. 1995, 1997

                        Ver: X.XX.X      MM/DD/YY



                   Press <Ctrl+I> for Mini-Config Utility




    Initializing Adapter Number 1. Please wait Starting drives.
    Firmware Version: NNNNN
    NvRAM cache controller was found.
    4 logical drives are installed.
    NonDisk SCSI Devices Found : CDROM: 0  Tape: 0  Removable Disk:  1  Other: 0
```

> *Note:* In the preceding figure, the version number will be
> replaced by the version number of your
> Mini-Configuration program, the MM/DD/YY will be
> replaced by the date of the version of your
> Mini-Configuration program, and NNNNN will be
> replaced by the version number of the firmware.

3. If you have more than one ServeRAID II controller installed, a
   selection screen appears. Use the Up Arrow (↑) or Down Arrow
   (↓) key to select your choice; then, press **Enter.** Otherwise, the
   Main Menu of the Mini-Configuration program appears, similar
   to the following screen.

Using the Mini-Configuration Program

```
            IBM ServeRAID Controller Disk Array Mini-Configuration Ver. X.XX

                    ┌─────────────────────────────────────────┐
                    │               Main Menu                  │
                    ├─────────────────────────────────────────┤
                    │  View Adapter Status                     │
                    │  View Configuration                      │
                    │  Advanced Functions                      │
                    │  Exit                                    │
                    └─────────────────────────────────────────┘




            Select the choice using the Up Arrow (↑) & Down Arrow (↓) keys, then press Enter.
```
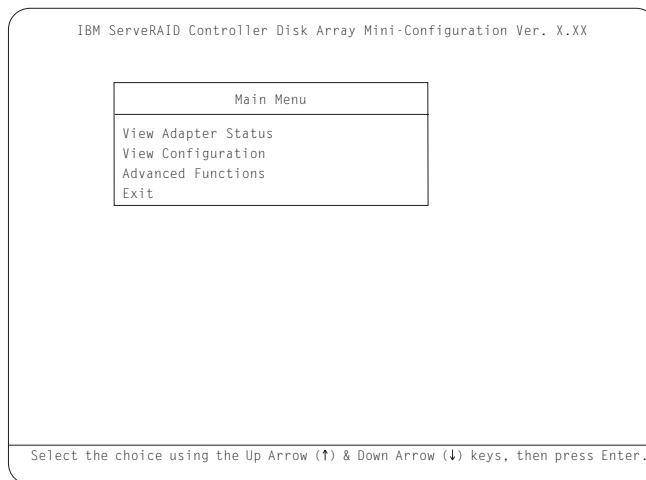
Descriptions of the choices available from the Main Menu are as follows:

- **View Adapter Status** displays the current status of the ServeRAID II controller. (See "Viewing the ServeRAID II Controller Status" on page 99.)

- **View Configuration** displays the current configuration information for the ServeRAID II controller. (See "Viewing the Configuration" on page 101.)

- **Advanced Functions** lets you initialize the configuration (that is, reset the ServeRAID II controller settings to their factory defaults), import the configuration from drives, enable and disable the Boot CD-ROM and INT13 extensions, and view the controller and PCI information. (See "Using the Advanced Configuration Functions" on page 102.)

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. Select **Exit** to leave the Main Menu.

Viewing the ServeRAID II Controller Status

When you select View Adapter Status from the Main Menu, a screen similar to the following appears.

```
┌─────────────────────────────────────────────────────────────────────┐
│                                                                       │
│     IBM ServeRAID Adapter Disk Array Mini-Configuration Utility Ver. X.XX │
│                                                                       │
│                                         ┌─ Ch  1 ─┐   ┌─ Ch 2─┐        │
│      ┌─────────────────────────┐        │  Array  │   │  Array │       │
│      │  Status for Adapter: 1  │        ┌─ Bay ─┐  ┌─ Bay ─┐            │
│      └─────────────────────────┘       1 ┌──────┐ 1 ┌ ONL ─┐ A         │
│                                        2 ┌──────┐ 2 ┌ ONL ─┐ A         │
│   ┌─────────────────────────────────┐  3 ┌──────┐ 3 ┌ ONL ─┐ A        │
│   │ Hdwr: ISPR-EF10h BCS-OFh ESC-OOh │ 4 ┌ OPT ─┐ 4 ┌ ONL ─┐ A         │
│   │ Unattended: Off ReadAhead: On BootCd:On│ 5 ┌──────┐ 5 ┌ ONL ─┐ A   │
│   │ CompMode: On Clustered: Off      │  6 ┌──────┐ 6 ┌ ONL ─┐ A        │
│   │ Boot Bk : 97115 Code Bk 97115    │  7 ┌──────┐ 7 ┌ CDR ─┐          │
│   │ Rebuild Rate    : High           │  8 ┌ INI ─┐ 8 ┌ INI ─┐          │
│   │ No. Of DDD Drv.  : 0             │  9 ┌──────┐ 9 ┌──────┐          │
│   │ No. Of OFL Drv.  : 0             │ 10 ┌──────┐10 ┌──────┐          │
│   │ No. Of CRT Drv.  : 0             │ 11 ┌──────┐11 ┌──────┐          │
│   │ Cfg. Updates: 1     Flash Pgms.: 10│12 ┌──────┐12 ┌──────┐         │
│   ├─────────────────────────────────┤ 13 ┌──────┐13 ┌──────┐          │
│   │ Locked, Bad Stripe, or Blocked Drive│14 ┌──────┐14 ┌──────┐        │
│   │ Bad Stripe    : None             │ 15 ┌──────┐15 ┌──────┐          │
│   │ Locked Drive  : None             │ 16 ┌──────┐16 ┌──────┐          │
│   │ Blocked Drive  : None            │                                 │
│   └─────────────────────────────────┘                                 │
│                                                                       │
│                    Press any key to continue.                         │
└─────────────────────────────────────────────────────────────────────┘
```

The screen contains the following fields:

- **Unattended** shows the current state of the Unattended Mode, On or Off. (See "Changing the RAID Parameters" on page 71.)

- **Read Ahead** shows the current state of the Read Ahead Cache Mode, On or Off. (See "Changing the RAID Parameters" on page 71.)

- **BootCd** shows the current state of the BootCd function, On or Off. (See "Setting the BootCd Feature" on page 104.)

- **CompMode** shows the BIOS compatibility mode. **On** indicates 8 GB Extended; **Off** indicates 2 GB Limited.

- **Boot Bk** shows the current version number of the startable code stored in the Boot Block.

- **Code Bk** shows the current version number of the firmware (microcode) for the ServeRAID II controller.

- **Rebuild Rate** shows the current speed of the rebuild process: High (default), Medium, or Low. (See "Changing the RAID Parameters" on page 71.)

- **No. of DDD Drv.** shows the current number of defunct drives.

- **No. of OFL Drv.** shows the current number of offline logical drives.

- **No. of CRT Drv.** shows the current number of critical logical drives.

- **Cfg. Updates** shows the current number of times that the configuration has been updated. When you initialize the configuration, the Cfg. Update is reset to zero.

- **Flash Pgms** shows the current number of times that the firmware EEPROM has been updated.

- **Locked, Bad Stripe, or Blocked Drive** identifies the logical drives that are affected, and contains the following fields:

  - **Bad Stripe** indicates the logical drives that contain bad stripes.

  - **Locked Stripe** is a reserved field.

  - **Blocked Drive** indicates the logical drives that are blocked. The drives that are blocked cannot be used until they are unblocked. (See "Unblocking Logical Drives" on page 133.)

Viewing the Configuration

The View Configuration choice provides configuration and status information about your logical drives.

When you select View Configuration from the Main Menu, a screen similar to the following appears. You can view the number and size of logical drives installed, RAID level, current state, stripe unit size, write policy, read-ahead status, and the date that the logical drive was created.

```
       IBM ServeRAID Adapter Disk Array Mini-Configuration Ver. X.XX

              ┌────────────────────────────────────────┐
              │  Adapter  1  Logical Drive Configuration │
              └────────────────────────────────────────┘


    ┌────────┬──────────────────────────────────────────────────────┐
    │Logical │ Size  RAID   Current Stripe  Wrt  Read   Date Created │
    │Drive   │ (MB)  Level  State   Size    Pol  Ahead  mm/dd/xx     │
    │        │                                                       │
    │   0    │ 100    5     OKY     8K      WT   NO     10/31/97     │
    │   1    │ 100    5     OKY     8K      WT   NO     10/31/97     │
    │   2    │ 100    5     OKY     8K      WT   NO     10/31/97     │
    │   3    │ 100    5     OKY     8K      WB   NO     10/31/97     │
    │   4    │ 100    5     OKY     8K      WB   NO     10/31/97     │
    │   5    │  99    1     OKY     8K      WT   NO     10/31/97     │
    │   6    │ 200    5     OKY     8K      WT   NO     10/31/97     │
    │   7    │ 300    1     OKY     8K      WT   NO     10/31/97     │
    └────────┴──────────────────────────────────────────────────────┘


                    Press any key to continue
```

Using the Advanced Configuration Functions

The Advanced Functions choice allows you to initialize the configuration (reset the ServeRAID II controller settings), import the configuration information from the drives, enable and disable the Boot CD-ROM and INT13 extensions, and view the controller and PCI information.

When you select Advanced Functions from the Main Menu, a screen similar to the following appears.

```
 IBM ServeRAID Adapter Disk Array Mini-Configuration Ver. X.XX


                     Advanced Functions

        Initialize Configuration
        Import Configuration from Drive(s)
        Configure BIOS Settings
        Adapter and PCI Information
        Exit









 Select a choice using the Up and Down Arrow keys, then press Enter.
```
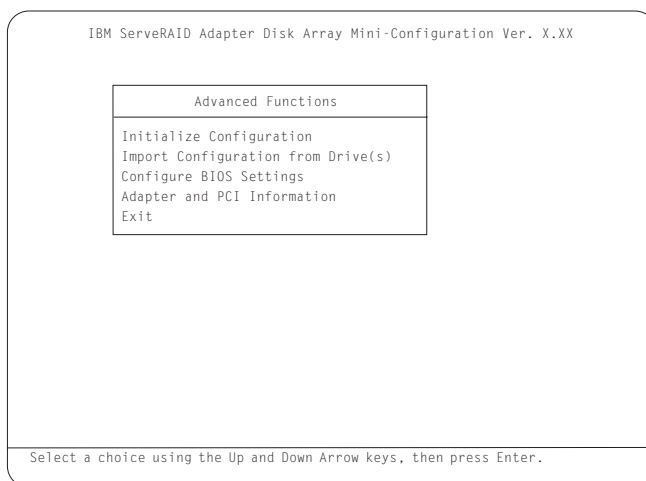
Descriptions of the choices available from the Advanced Functions menu are as follows:

> **Attention:**
> The following choices might result in loss of data due to changes in the configuration.

- **Initialize Configuration** resets the ServeRAID II controller settings to their factory defaults and sets all functional hard disk drives to the RDY state.

- **Import Configuration from Drive(s)** reads the most common configuration information from the drives in the server and copies it to the controller's NVRAM and to the controller's EEPROM module.

- **Boot CD-ROM and INT13 Extensions** is used to configure the **BootCd** feature. When **BootCd** is enabled, the ServeRAID II controller attempts to start (boot) from a CD, if the CD-ROM drive contains a startable (boot-enabled) CD, and no other controller is currently using INT13 extensions.

  Attention:
  Only one controller can support INT13 extensions.

- **Adapter and PCI Information** displays the ServeRAID II controller hardware and PCI register information, as shown in the following example screen.

```
IBM ServeRAID Adapter Disk Array Mini-Configuration Utility Ver. X.XX

Adapter Information                    PCI Reg Information

Code Seg.(Cs): CB80h        Dev, Ven Id (00h):  002Eh 1014h
Data Seg.(Ds): 9A00h         Status, Cmd(04h):  0200h 0107h
  Adapter No: 1             Class, Rev Id(08h):  010000h 04h
     Intr No: 0009h    Bist,Hdr,Lat,Cach (0Ch): 00h 00h 40h 08h
     I/O Adr: F400h      Base Adr Reg0(10h):  0000F401h
     Mem Adr: FDFFE000h   Base Adr Reg1(14h):  FDFFE000h
      Bus No: 00h         Base Adr Reg2(18h):  00000000h
   Device No: 0Eh         Base Adr Reg3(1Ch):  00000000h
StatusQ Start: 0009E814h   Base Adr Reg4(20h):  00000000h
  StatusQ End: 0009E82Ch   Base Adr Reg5(24h):  00000000h
 StatusQ Head: 0009E818h      Reserved(28h):  00000000h
 Status Tail: 0009E814h        Reserved(2Ch):  00000000h
  OS/2 Table: 4800h         Exp ROM Adr(30h):  00000000h
 Part Number: 01K8562          Reserved (34h):  00000000h
                                Reserved(38h):  00000000h
                    MaxLat,MinG,IntP,Intl(3Ch): 00h 00h 00h 00h

                  Press any key to continue.
```

Setting the BootCd Feature

When you select **Boot CD-ROM and INT13 Extensions**, a screen similar to the following appears.

```
    IBM PC ServeRAID Adapter Disk Array MiniConfiguration Utility Ver. X.XX



           Boot CD-ROM Configuration

           BIOS Support for Bootable CD-ROM            No
           Display Boot CD-ROM Menu                    No
           BIOS Support for Int13 Extensions           No
           BIOS Support for reading Partition tables   Yes
           BIOS Support for Service Processor          No
           Save Configuration in Adapter
           Exit




  Select a choice using the Up and Down Arrow keys, then press Enter.
```
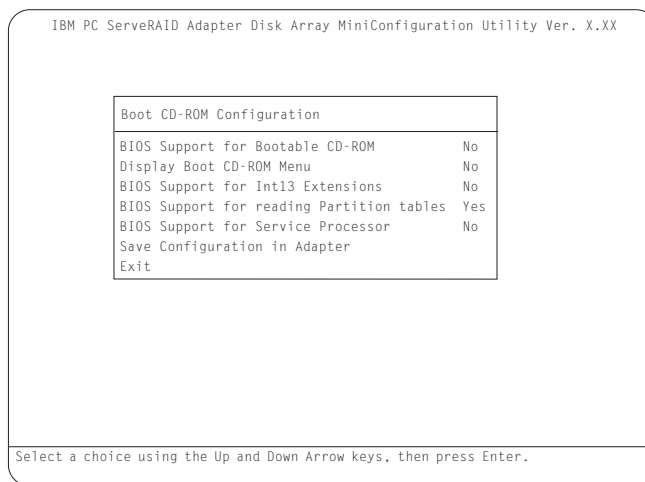
To enable the BootCd feature:

1. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight **BIOS Support for Bootable CD-ROM**. Press **Enter** to change No to Yes. This also changes No to Yes next to **Display Boot CD-ROM Menu** and **BIOS Support for INT13 Extensions**.

2. Ensure that the screen displays Yes next to **BIOS Support for reading Partition tables**. If not, use the Up Arrow (↑) or Down Arrow (↓) key to highlight **BIOS Support for reading Partition tables**; then, press **Enter** to change No to Yes.

3. Highlight **Save Configuration for Adapter**; then, press **Enter**. A Configuration Saved message appears. The Main Menu of the Mini-Configuration program returns.

   Note: Highlighting **Exit**, instead of **Save Configuration for Adapter**, and pressing **Enter** causes any changes you made **not** to be saved.

4. Press **Ctrl+Alt+Del** to restart the server.

Administration and Monitoring Utility Program

The IBM ServeRAID Administration and Monitoring utility program monitors your ServeRAID II controller while your network operating system is up and running.

The Administration and Monitoring utility program comes in three versions:

- IBM OS/2
- Novell NetWare/IntraNetware
- Microsoft Windows NT and Windows 95

The OS/2 and NetWare/IntraNetware utility programs run on the server in the stand-alone mode only.

The Windows NT/Windows 95 Administration and Monitoring utility program runs on the server in the stand-alone mode, or in a client/server environment in the client/server mode. You can use the stand-alone mode to administer and configure your ServeRAID II controller while at the server.

You can use the client/server mode to administer and configure ServeRAID controllers and adapters that are in servers anywhere on your network. The TCP/IP networking protocol supports the client/server mode and allows connections to IBM OS/2, Microsoft Windows NT, Novell NetWare/IntraNetware and SCO OpenServer operating systems.

Note: The Windows NT and Windows 95 utility programs are required to use the logical-drive migration feature. See "Logical Drive Migration Administration" on page 134.
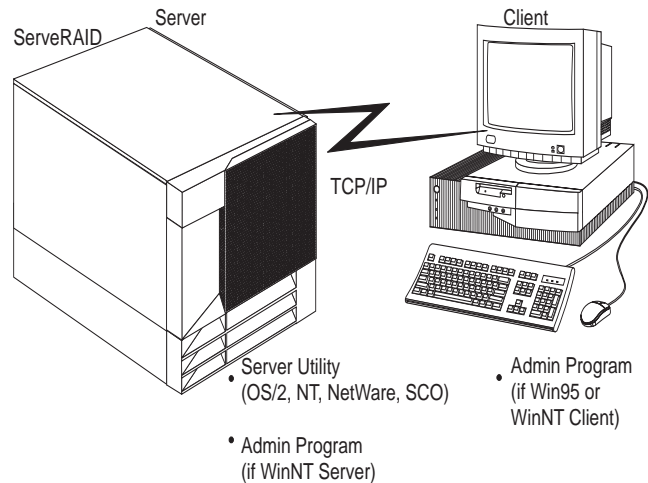
This section provides installation instructions for the following ServeRAID utility programs.

- The Administration and Monitoring utility program runs on a Windows-based system (Windows 95, Windows NT workstation, or Windows NT server).

- Server Utilities

    - OS/2 Server Utility
    - Microsoft Windows NT Server Utility
    - Novell NetWare/Intranetware Server Utility
    - SCO OpenServer Utility

You can obtain updates to the installation instructions for the ServeRAID utility programs from the World Wide Web. See Chapter 9, "Getting Help, Service, and Information" for more information.

Before You Begin

- Be sure that your ServeRAID II controller is configured properly.

- Be sure that your network operating system is installed and functional.

- If you are using Microsoft Windows NT, you can use the Administration and Monitoring utility program in the client/server mode (across the network) or in the stand-alone mode (at the server).

  – See "Installing the Server Utility Programs" on page 109 for client/server mode instructions.

  – See "Installing the Administration and Monitoring Utility Programs Using Diskettes" on page 116 for stand-alone mode instructions.

- If you are using OS/2, NetWare/IntraNetware, or SCO OpenServer, you must use the Administration and Monitoring utility program in the client/server mode. Requirements for this environment include:

  – A Windows NT or Windows 95 client running the IBM ServeRAID Administration and Monitoring utility program

  – A network adapter or controller with proper cabling for access to the client system

  – The TCP/IP networking protocol installed on both the server and client systems

  – The IBM ServeRAID Administration and Monitoring Server utility program installed on the client system

    - See "Installing the Server Utility Programs Using Diskettes" on page 109 to install your server utility program.

    - See "Installing the Administration and Monitoring Utility Programs Using Diskettes" on page 116 to install the Administration and Monitoring utility program on a Windows 95 or Windows NT system.

Installing the Server Utility Programs

Note: If you are installing the OS/2, Novell NetWare/Intranetware, or SCO OpenServer versions of the server utility programs, you must use diskettes. Go to "Installing the Server Utility Programs Using Diskettes" for instructions.

You can install the server utility programs in one of two ways:

- Using ServerGuide (see "Installing the Server Utility Programs Using ServerGuide")

- Using diskettes (see "Installing the Server Utility Programs Using Diskettes")

Installing the Server Utility Programs Using ServerGuide

You can install the server utility programs using the CoPilot feature of ServerGuide. Refer to your ServerGuide package for more information.

Once you have installed the server utility programs, go to "Using the Server Utility Programs" on page 114 for information on how to use them.

Installing the Server Utility Programs Using Diskettes

This section contains installation instructions and information about using the IBM OS/2 server utility, Microsoft Windows NT server utility, Novell NetWare/IntraNetware server utility, and SCO OpenServer utility.

Note: You must first make the ServeRAID diskettes using the Diskette Factory feature of ServerGuide. Refer to your ServerGuide package for instructions.

IBM OS/2 Server Utility Programs: **To install the IBM OS/2 server utility program using diskettes:**

1. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.

2. Create an IPSRAID directory on the hard disk. Type:

   ```
   md d:\ipsraid
   ```

(where *d:* is the hard disk drive letter)

3. Copy the following file to the target directory. Type:

   `copy a:\remote\servers\os2\ipsadm.exe d:\ipsraid`

   (where *a:* is the diskette drive letter and *d:* is the hard disk drive letter)

4. Copy the icon file to the target directory. Type:

   `copy a:\remote\servers\os2\ipsadm.ico d:\ipsraid\ipsadm.ico`

   (where *a:* is the diskette drive letter and *d:* is the hard disk drive letter)

5. Create an icon for the application:

   a. Open the template folder from the OS/2 Systems folder on the Desktop.

   b. Drag a program template onto the Desktop.

   c. At the Program Tab, type the following path and file name:

      `d:\ipsraid\ipsadm.exe`

      (where *d:* is the hard disk drive letter)

   d. At the General Tab, type the following as the title:

      `IPSRAID Admin/Monitor`

   e. Find the current icon,

      `d:\ipsraid\ipsadm.ico`

      (where *d*: is the hard disk drive letter)

6. Double-click on the new icon to access the server utilities.

7. Continue with "Using the Server Utility Programs" on page 114.

Microsoft Windows NT Server 4.x Utility Program: **To install the Microsoft Windows NT 4.x server utility program :**

1. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.

2. Create an IPSRAID directory on the hard disk. Type:

   `md d:\ipsraid`

(where *d:* is the hard disk drive letter)

3. Copy the following file to the target directory. Type:

   `copy a:\remote\servers\nt\ipsadm.exe d:\ipsraid\ipsadm.exe`

   (where *a:* is the diskette drive letter and *d:* is the hard disk drive letter)

4. Copy the icon file to the target directory. Type:

   `copy a:\remote\servers\nt\ipsadm.ico d:\ipsraid\ipsadm.ico`

   (where *a:* is the diskette drive letter and *d:* is the hard disk drive letter)

5. To create a new shortcut for the utility:

   a. Using the right mouse button, click on the Desktop and select **New;** then, select **Shortcut.**

   b. In the **Create Shortcut** window, type:

      `d:\ipsraid\ipsadm.exe`

      (where *d:* is the hard disk drive letter)

      or

      If you are not sure of the path and file name, click on the **Browse** button; then, find and select the file:

      `d:\ipsraid\ipsadm.ext`

      (where *d:* is the drive letter)

   c. Click on **Next.**

   d. In the Select a Title for the Program window, type:

      `ipsraid admin/monitor server`

   e. Click on **Finish** and an icon appears on your desktop.

6. To create a customized icon for the shortcut you just created:

   a. Using the right mouse button, click on the icon that you created for your shortcut; then, select **Properties.**

   b. Click on the **Shortcut** notetab.

   c. Click on **Change Icon.**

d. Click on **OK** in the information window.

e. In the **Change Icon window,** type:

    d:\ipsadm\ipsadm.ico

    (where *d:* is the hard disk drive letter)

    > *or*

    If you are not sure of the path and file name, click on the **Browse** button; then, find and select the file:

    d:\ipsadm\ipsadm.ico

    (where *d:* is the hard disk drive letter)

f. Click on **OK** for the icon.

g. Click on **OK** for the program properties.

h. Double-click on the new icon to access the server utilities.

7. Continue with "Using the Server Utility Programs" on page 114.

Novell NetWare/Intranetware Server Utility Program: **To install the Novell Netware 3.x/IntraNetware 1.0 server utility program, do** *one* **of the following:**

- From a DOS prompt:

    1. Insert the *IBM ServeRAID Device Driver Diskette* into the diskette drive.

    2. Type:

        copy a:\remote\servers\netware\ipsadm.nlm d:\nwserver\ipsadm.nlm

        (where *a:* is the diskette drive letter and *d:\nwserver* is the hard disk drive and directory where NetWare/IntraNetware is installed)

    3. Load the NLM from the system console, type:

        load d:\nwserver\ipsadm.nlm

        (where *d:\nwserver* is the hard disk drive and directory where NetWare/IntraNetware is installed)

    4. Continue with "Using the Server Utility Programs" on page 114.

- From a client workstation on the network:

  1. Insert the *IBM ServeRAID Device Driver Diskette* into a diskette drive, such as drive a:.

  2. Type:

     ```
     copy a:\remote\servers\netware\ipsadm.nlm f:\system\ipsadm.nlm
     ```

     (where *a:* is the diskette drive letter and *f* is the SYS volume)

  3. Load the NLM from the system console. Type:

     ```
     load ipsadm.nlm
     ```

  4. Continue with "Using the Server Utility Programs" on page 114.

SCO OpenServer Server Utility Program: The SCO OpenServer Server utility program is installed from the *SCO Open Server Boot-Time Loadable (BTLD) Diskette* during the installation of the IBM ServeRAID device driver. The file is installed in the **/usr/bin** directory.

To run the program, type **ipsadm &** at the command prompt.

If the program does not run, use the following instructions to manually install the SCO OpenServer 5.X utility program.

1. Insert the *IBM ServeRAID SCO Open Server Boot-Time Loadable (BTLD) Diskette* into a diskette drive.

2. Create a directory for the server utility. Type:

   ```
   mkdir /ipsraid
   ```

3. Mount the diskette drive. Type:

   ```
   mount /dev/fd0 /mnt
   ```

4. Copy the following file. Type:

   ```
   cp /mnt/ipsraid/new/usr/bin/ipsadm /ipsraid/ipsadm
   ```

5. Unmount the diskette drive. Type:

   ```
   umount /mnt
   ```

6. To start the server utility to run in the background, type:

   `./ipsadm &`

7. Continue with "Using the Server Utility Programs."

Using the Server Utility Programs

You can use command-line parameters to customize your ServeRAID programs.

To use command-line parameters, issue the IPSADM command in the following format:

`IPSADM <parameter 1> <parameter 2> ... <parameter n>`

Descriptions of the optional command-line parameters are as follows:

Command	Description
-?	The -? command displays the help for the valid parameters.
-p:number	The -p:*number* command specifies the port number on which the server will check for client connections.
	The *port number* is a parameter used in TCP/IP to distinguish between different services on a single server. The default for the ServeRAID utilities is port number 1087. You can change the port number on the command line if another service on the system is using 1087.
-d	The -d command disables logging of messages to the display.
-f	The -f command specifies to log messages to the default file, IPSADM.LOG
-f:filename	The -f:*filename* command specifies the name of a file in which to log messages.
	Messages can be logged to the screen or to a text file on the system. The default setting logs messages to the standard output (usually the display), but you can disable this by using the -d parameter. The -f

parameter enables logging messages to a file. Messages consist of startup information, connecting and disconnecting clients, and error messages.

-**s:filename**   The -s:*filename* command specifies the name of the file that contains security information. For more information about server security, see "Server Security File."

Server Security File

Security information is maintained in an optional text file on the server system. The file stores unencrypted user names and unencrypted passwords; therefore, the file must be kept in a secure directory.

When user names and passwords are entered on the Administration and Monitoring utility program (the client), they are encrypted for delivery to the server. The server decrypts the user names and passwords to verify authorized access to the ServeRAID II controller. If the verification is successful, the ServeRAID II controller accepts commands from the client. If no security file is present in the default directory or the directory specified by the -s parameter, the ServeRAID II controller disables security and accepts commands from any client connection.

The security file contains one user name and password combination per line. The user name and password strings are separated by a colon (:), and each string can have a maximum of eight characters.

Server Utility Name Resolution

The server utility program relies on name resolution to determine the host name from the client that is trying to connect. When a client is trying to access a remote server, the server tries to look up the name of the connecting client. The method used to look up the name is determined by the configuration of the server. Some possible methods for this are Domain Name Servers (DNS) or *HOSTS* files. With certain configurations, some timing delays might occur due to misconfiguration or inability to access the DNS. If problems occur, check your network configuration.

Installing the Administration and Monitoring Utility Program

You can install the Administration and Monitoring utility program in one of two ways:

- Using ServerGuide (see "Installing the Administration and Monitoring Utility Program Using ServerGuide")

- Using diskettes (see "Installing the Administration and Monitoring Utility Programs Using Diskettes")

  Note: If you are installing the OS/2, Novell NetWare/IntraNetware, or SCO OpenServer versions of the Administration and Monitoring program, you must use diskettes. Go to "Installing the Administration and Monitoring Utility Programs Using Diskettes" for instructions.

Installing the Administration and Monitoring Utility Program Using ServerGuide

You can install the Administration and Monitoring utility program using the CoPilot feature of ServerGuide. Refer to your ServerGuide package for more information.

Once you have installed the Administration and Monitoring utility program, go to "Using the Administration and Monitoring Utility Program" on page 117 for information on how to use it.

Installing the Administration and Monitoring Utility Programs Using Diskettes

Note: You must first make the ServeRAID diskettes using the Diskette Factory feature of ServerGuide. Refer to your ServerGuide package for instructions. Also, if you are using OS/2, Novell NetWare/IntraNetware, or SCO OpenServer, you must use the Administration and Monitoring utility program in the client/server mode.

To install the Administration and Monitoring utility program using diskettes:

1. Ensure that your system is turned on and Windows NT or Windows 95 is installed. Refer to the documentation that comes with your operating system for installation instructions.

2. Insert the *Administration and Monitoring Utility Program Diskette* that you created into the diskette drive.

3. At the **Run** prompt, type:

   ```
   a:setup
   ```

4. Press **Enter**; then, follow the instructions that appear on the screen.

For instructions on how to use the Administration and Monitoring utility program, see "Using the Administration and Monitoring Utility Program."

Using the Administration and Monitoring Utility Program

You can use the Administration and Monitoring utility program to monitor your ServeRAID controllers, view the ServeRAID configuration and associated devices, rebuild an array, reassign a drive to replace a defunct drive, rebuild a logical drive, create a logical drive, create an array, delete an array, dynamically increase the logical drive size, change RAID levels, and much more.

To start the Administration and Monitoring utility program:

- Double-click on the IBM ServeRAID Administration icon.

     or

- Select **IBM ServeRAID Administration** from the start menu.

  The Administration and Monitoring utility program starts in stand-alone mode.

The following illustration is an example of the screen that appears.
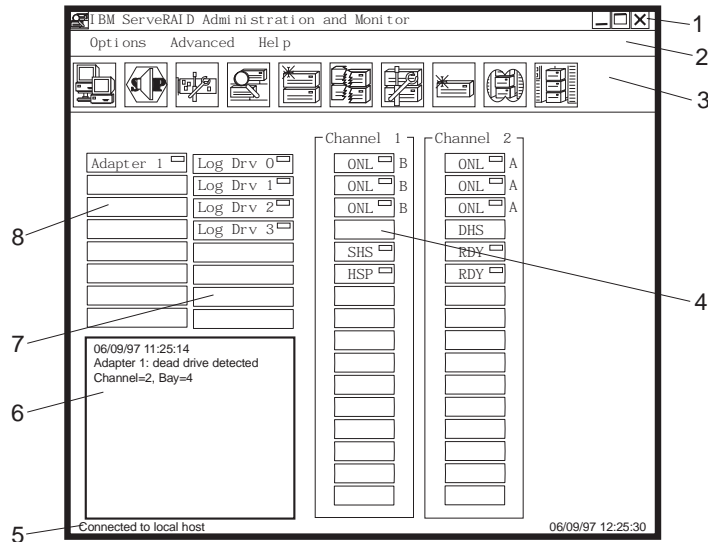
Descriptions of the labeled areas are as follows:

1. Title Bar	Displays the title of the application, along with the minimize icon, the maximize icon, and the close icon.
2. Menu Bar	Displays the pull-down menus for all supported functions.
3. Tool Bar	Displays the icons for the commonly used functions.
4. Device Area	Displays information for each device connected to the physical channel of the ServeRAID controller. This includes the device states and the array identifiers, if applicable.
5. Status Bar	Displays help for the area where the cursor is currently pointing. The date and time are also displayed.

6. Status Window	Displays messages regarding the operational status of each ServeRAID controller.
7. Logical Drive Area	Displays the number of logical drives that you created and the status of each logical drive.
8. Adapter Area	Displays the number of ServeRAID controllers installed in the server and the status of each ServeRAID controller.

Options Pull-Down Menu

This section provides information about the following three choices available from the Options pull-down menu on the main screen of the Administration and Monitoring utility:

- Network Settings
- General Options
- Alert Options

Network Settings: If you want to monitor ServeRAID controllers across a network, you must switch to the client/server mode.

You can use the Network Settings dialog box to select and connect to servers in your network that have an IBM ServeRAID controller installed.

To select and connect to a server:

1. Click on the icon on the tool bar or select **Network Settings** from the **Options** pull-down menu.

A screen similar to the following appears.

```
┌─────────────────────────────────────────────┐
│  Network Settings                      ┌───┐ │
│                                        │ ✕ │ │
│                                        └───┘ │
│   ○    Stand-alone              ┌─────────┐  │
│                                 │ Connect │  │
│                                 └─────────┘  │
│   ◉    Client/Server            ┌─────────┐  │
│                                 │ Cancel  │  │
│   ┌─ Client/Server Settings ─────────────┐  │
│   │ User Name:        Password           │  │
│   │ ┌─────────────┐   ┌────────────────┐ │  │
│   │ │ ServeRAID   │   │ * * * * * * *  │ │  │
│   │ └─────────────┘   └────────────────┘ │  │
│   │ ◉ TCP/IP  ┌───────┐   ┌──────────┐   │  │
│   │           │  Add  │   │  Delete  │   │  │
│   │           └───────┘   └──────────┘   │  │
│   │ Host Name: Port Number (Optional)    │  │
│   │ ┌──────────────────────────────┐┌──┐ │  │
│   │ │ ips: 1087                    ││▼ │ │  │
│   │ └──────────────────────────────┘└──┘ │  │
│   │                                      │  │
│   └──────────────────────────────────────┘  │
│                                              │
└─────────────────────────────────────────────┘
```

2. Select the **Client/Server** radio button.

3. If security is enabled on the server to which you are connecting, type in your **User Name** and **Password** as defined by the security file on the server to which you are connecting. (See "Server Security File" on page 115 for information about the security file).

4. Type in either the **Hostname** or the TCP/IP **Address** of the system, or select them from the pull-down list.

   Note: If your server was started on any port other than the default (1087), type in a colon and the correct port number for your configuration (for example: ServeRAID:1088) after the Hostname or TCP/IP Address that you just entered.

5. Click on **Connect** to initiate a connection with the remote system.

General Options: You can use the General Options screen to enable, disable, or reset the alarm; or to set the polling options.

When you select General Options from the Options pull-down menu, a screen similar to the following appears.

```
┌──────────────────────────────────────────────────┐
│ General Options                              ╳     │
│  ┌─ Alarm Options ───────────────────────────┐    │
│  │                                            │    │
│  │        ┌──┐                                │    │
│  │        │✓ │ Disable Alarm    ┌──────────┐  │    │
│  │        └──┘                  │Reset Alarm│ │    │
│  │                              └──────────┘  │    │
│  │                                            │    │
│  └────────────────────────────────────────────┘   │
│  ┌─ Polling Options ─────────────────────────┐    │
│  │                                            │    │
│  │                         ┌─┐┌─┐             │    │
│  │   Poll Adapter Every    │5││▲│ Seconds     │    │
│  │                         └─┘│▼│             │    │
│  │                            └─┘             │    │
│  └────────────────────────────────────────────┘   │
│                    ┌────────┐  ┌────────┐          │
│                    │ Cancel │  │   OK   │          │
│                    └────────┘  └────────┘          │
└──────────────────────────────────────────────────┘
```
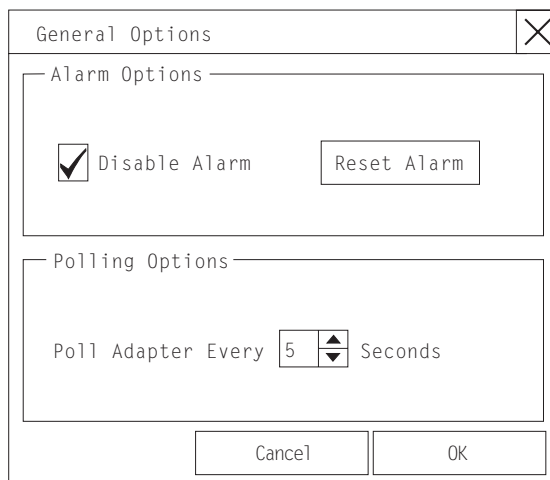
Enabling, Disabling, or Resetting the Alarm: The alarm alerts you if any of the following conditions occur:

- A DDD hard disk drive has been detected
- A Predictive Failure Analysis (PFA) event has occurred
- A ServeRAID controller is not responding

To enable or disable the alarm, click on the box for **Disable Alarm** on the General Options screen. Placing a check in the box disables the alarm; removing the check enables the alarm.

To reset the alarm, click on the icon or click on **Reset Alarm** on the General Options menu. Resetting the alarm turns off the alarm for the current failure. It does not disable the feature.

Polling Options: You can use the General Options screen to define how often the ServeRAID II controller will *poll*, or check your server for any changes that might have occurred in the server (such as a rebuild or a drive entering the defunct (DDD) state). You can set a time interval of from five to 60 seconds. The default time interval setting is five seconds.

The following events are polled for:

- Rebuild started
- Rebuild completed
- Synchronization started
- Synchronization completed
- Migration started
- Migration completed
- PFA event detected
- Dead drive detected
- ServeRAID controller not responding to commands
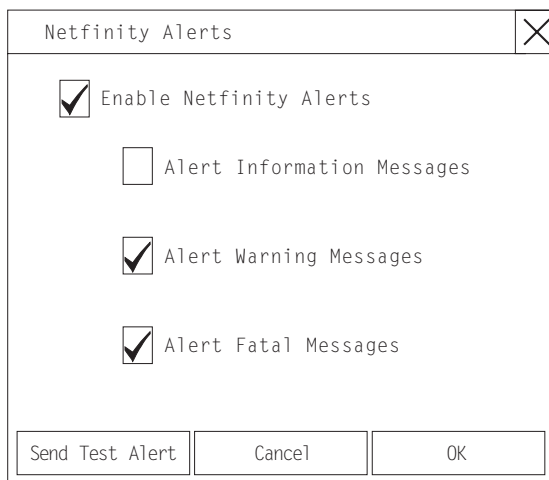
Netfinity Alert Options: Netfinity alerts allow system administrators who are using the Netfinity Manager to configure the ServeRAID Administration and Monitoring utility program, to notify the Netfinity Alert Manager of various activities occurring on the server.

To configure the settings for the Netfinity alerts:

1. Open the Options pull-down menu.

2. Click on **Alert Options.**

3. Click on **Netfinity Alerts.**

   A screen similar to the following appears.

```
┌──────────────────────────────────────────────────┐
│  Netfinity Alerts                            ✕     │
│                                                    │
│      ☑  Enable Netfinity Alerts                    │
│                                                    │
│           ☐  Alert Information Messages            │
│                                                    │
│           ☑  Alert Warning Messages                │
│                                                    │
│           ☑  Alert Fatal Messages                  │
│                                                    │
│  ┌───────────────┐ ┌──────────┐ ┌──────────┐       │
│  │Send Test Alert│ │  Cancel  │ │    OK    │       │
│  └───────────────┘ └──────────┘ └──────────┘       │
└──────────────────────────────────────────────────┘
```

4. To enable all of the Netfinity alerts, click on the check box next to Enable Netfinity Alerts.

5. To disable any of the Netfinity alerts:

   a. Verify that there is a check in the check box next to Enable Netfinity Alerts.

   b. Click on the check box next to the specific alert or alerts that you want to disable.

6. To test the Netfinity alerts, click on the **Send Test Alert** button. This will send a Netfinity alert and test message to the Netfinity Alert Manager.

If Netfinity alerts are enabled, the ServeRAID II controller relays three types of messages to the Netfinity Alert Manager:

- Information messages
  - Rebuild started
  - Rebuild completed
  - Synchronization started
  - Synchronization completed
  - Migration started
  - Migration completed
- Warning messages
  - PFA event detected
- Critical messages
  - Dead drive detected
  - ServeRAID controller not responding to commands

By knowing what these types of messages are, the system administrator can then configure Netfinity Manager with instructions for monitoring the server configuration and specifying the appropriate action to take if an alert is issued. For example, the system administrator can program Netfinity Manager to dial out through a modem to a specified phone number if a defunct drive is detected on any server across the network.

Using the ServeRAID Administration Functions

This section describes how to administer your ServeRAID controller using the following functions:

- "Array Administration"
- "Logical Drive Administration" on page 128
- "Logical Drive Migration Administration" on page 134
- "Physical Device Administration" on page 139
- "ServeRAID Controller Administration" on page 143

Array Administration

This section contains instructions for creating a disk array and deleting a disk array using the ServeRAID Administration and Monitoring utility program.

Creating Disk Arrays:

Disk arrays provide access to hard disk drives in a logical manner. Hard disk drives are grouped in a disk array, and divided into logical drives for access by the operating system.

To create a disk array:

1. Click on the [icon] icon on the tool bar or select **Manage Disk Arrays** from the **Advanced** pull-down menu; then, select **Create Disk Array.**

   A screen similar to the following appears.

   ```
   Select Ready Drives                    [X]

   Select 1 or more RDY (Ready)
   drives that will be used to
   create the new array

   [ Cancel ]          [  OK  ]
   ```
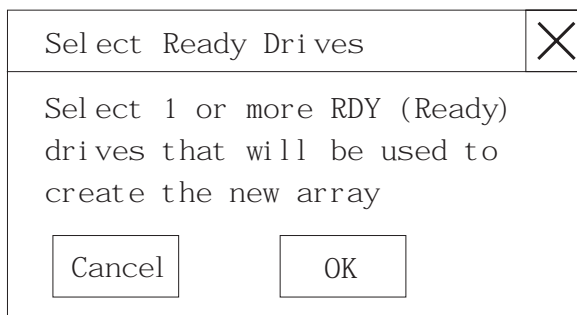
2. Select one or more Ready (RDY) drives for the new disk array.

    To select a RDY drive, click on the desired RDY button from the device area. A disk array identifier appears beside each RDY drive added to the disk array.

    If you change your mind about a selected drive, select the button again to remove the selected drive from the disk array.

3. Click on **OK** to define a logical drive for the new array.

    A screen similar to the following appears.

```
┌──────────────────────────────────────────────────────────┬───┐
│  Create Logical Drive                                     │ X │
├──────────────────────────────────────────────────────────┴───┤
│                                                               │
│  Array  Free          Raid          Requested      ┌───────┐  │
│  ID     Space MB)     Level         Space          │  OK   │  │
│  ┌──┬───────────┬──┐  ┌───┬──┐      ┌──────────┐   └───────┘  │
│  │C │   2150    │▼ │  │ 0 │▼ │      │   2150   │   ┌───────┐  │
│  └──┴───────────┴──┘  └───┴──┘      └──────────┘   │Cancel │  │
│                                                    └───────┘  │
│                                                               │
└───────────────────────────────────────────────────────────────┘
```

4. Select the RAID level that you want to assign to the logical drive from the pull-down list.

    The RAID levels available depend on the number of hard disk drives that you select for the disk array.

    -   If you have one hard disk drive, the logical drive can be only RAID level 0.

    -   If you have two or more hard disk drives, the logical drive can be RAID level 0 or 1.

    -   If you have three or more hard disk drives, the logical drive can be RAID level 0, 1, or 5.

5. Type the size, in megabytes, that you want to assign to the logical drive in the **Requested Space** entry field.

Notes:

a. The Requested Space default value is calculated as the maximum logical drive size available for the RAID level assigned.

b. The Requested Space must be between 2 MB and the maximum available.

c. The actual logical drive size that appears might be slightly different from what you type in the **Space Requested** field.

   The size of a logical drive is determined by the RAID level and the number of hard disk drives. For example, a disk array consisting of three, 1 GB hard disk drives with a requested RAID level 0 logical drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

6. Click on **OK** to create the disk array.

7. You *must* initialize all new logical drives before storing data in them. See "Initializing Logical Drives" on page 130.

   Note: All new RAID level 5 logical drives are automatically synchronized when you initialize them.

Deleting Disk Arrays:

Deleting a disk array deletes all logical drives that are defined in that array. All data and programs in the disk array are lost during this procedure.

Note: For some operating systems, deleting a disk array and its associated logical drives will change the drive letters that are assigned to the remaining drives when you restart the system.

Attention:
Before proceeding, ensure that you have backed up any data and programs that you want to save.

To delete a disk array:

1. Click on the [icon] icon on the tool bar or select **Manage Disk Arrays** from the **Advanced** pull-down menu; then, select **Delete Disk Array.**

   A screen similar to the following appears.

```
┌──────────────────────────────────┐
│ Delete Disk Array          [ X ] │
│                                  │
│    Array ID          ┌────────┐  │
│                      │   OK   │  │
│   ┌──────┬───┐       └────────┘  │
│   │ B    │ ▼ │       ┌────────┐  │
│   ├──────┴───┤       │ Cancel │  │
│   │ A        │       └────────┘  │
│   │ B        │                   │
│   └──────────┘                   │
│                                  │
└──────────────────────────────────┘
```
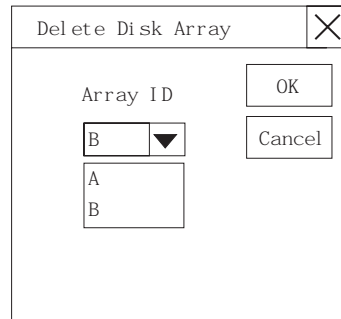
2. Select the disk array ID that you want to delete from the pull-down list.

3. Click on **OK** to delete the disk array.

Logical Drive Administration

This section contains instructions for creating a logical drive, initializing and synchronizing a logical drive, and accessing blocked logical drives using the ServeRAID Administration and Monitoring utility program.

Creating Logical Drives:

You *must* create at least one logical drive for each disk array. You can create up to eight logical drives.

If you plan to use the logical-drive migration (LDM) feature, do not create more than seven logical drives. The LDM procedure requires one free logical drive to perform the migration. See "Logical Drive Migration Administration" on page 134 for more information.

To create a logical drive:

1. Click on the [icon] icon on the tool bar or select **Manage Logical Drive** from the **Advanced** pull-down menu; then, select **Create Logical Drive.**

   A screen similar to the following appears.

   ```
   ┌──────────────────────────────────────────────────────────┬───┐
   │  Create Logical Drive                                     │ X │
   ├──────────────────────────────────────────────────────────┴───┤
   │  Array  Free          Raid          Requested                 │
   │  ID     Space MB)     Level         Space          ┌────────┐ │
   │                                                    │   OK   │ │
   │  ┌────────────────▼┐  ┌──────▼┐     ┌──────────┐   └────────┘ │
   │  │A     1762       │  │  0    │     │   881    │   ┌────────┐ │
   │  ├─────────────────┤  └───────┘     └──────────┘   │ Cancel │ │
   │  │A     1762       │                               └────────┘ │
   │  │B     1906       │                                          │
   │  └─────────────────┘                                          │
   │                                                               │
   └───────────────────────────────────────────────────────────────┘
   ```

2. Select the disk array ID for which you want to create a logical drive.

3. Select the RAID level that you want to assign to the logical drive from the pull-down list.

   The RAID levels available depend on the number of hard disk drives that you select for the disk array.

   Notes:

   a. If you have one hard disk drive, the logical drive can be only RAID level 0.

   b. If you have two or more hard disk drives, the logical drive can be RAID level 0 or 1.

   c. If you have three or more hard disk drives, the logical drive can be RAID level 0, 1, or 5.

   d. If you plan to use the Change RAID Level feature of logical drive migration, you must assign the same RAID level to all of the logical drives in the array. See "Changing RAID Levels" on page 135 for more information.

4. Type the size, in megabytes, that you want to assign to the logical drive in the **Requested Space** entry field.

   Notes:

   a. The Requested Space default value is calculated as the maximum logical drive size available for the RAID level assigned.

   b. The Requested Space must be between 2 MB and the maximum available.

   c. The actual logical drive size that appears might be slightly different from what you type in the Requested Space field.

      The size of a logical drive is determined by the RAID level and the number of hard disk drives. For example, a disk array consisting of three, 1 GB hard disk drives with a requested RAID level 0 drive of 1000 MB will actually contain only 999 MB because the data is striped across all three drives, with 333 MB on each drive.

5. Click on **OK** to create the logical drive.

6. You *must* initialize all new logical drives before storing data in them. Continue with "Initializing Logical Drives."

   Note: All new RAID level 5 logical drives are automatically synchronized when you initialize them.

Initializing Logical Drives: Initializing a logical drive erases the first 1024 sectors on the drive and prevents access to any data previously stored on that drive. You must initialize all new logical drives before storing data in them.

To initialize a logical drive:

1. Select the logical drive that you want to initialize from the Main Screen of the Administration and Monitoring utility program.

A screen similar to the following appears.

```
┌─────────────────────────────────────────────────┬───┐
│ Logical Drive Information                        │ ✕ │
├─────────────────────────────────────────────────┴───┤
│ ┌─────────────────────────────────────────────────┐ │
│ │ Logical Drive Number    1                       │ │
│ │ Blocked                 No                      │ │
│ │ Part of Array           A                       │ │
│ │ Part of Merge Group     1                       │ │
│ │ Date Created            05/19/97                │ │
│ │ State                   OKY                     │ │
│ │ Size                    100MB                   │ │
│ │ RAID Level              0                       │ │
│ │ Write Policy            WT                      │ │
│ │ Read Ahead              On                      │ │
│ │ Strip Unit Size         8 KB                    │ │
│ │ Number of Chunks        3                       │ │
│ │ Stripe Order            1,1 1,2 1,4             │ │
│ └─────────────────────────────────────────────────┘ │
│ ┌────────┐ ┌──────────┐ ┌───────────┐ ┌──────────┐  │
│ │ Unblock│ │Initialize│ │Synchronize│ │    OK    │  │
│ └────────┘ └──────────┘ └───────────┘ └──────────┘  │
└─────────────────────────────────────────────────────┘
```
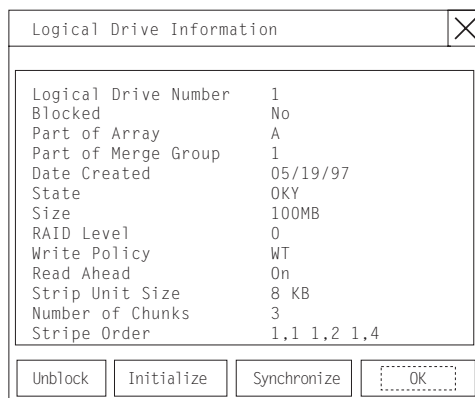
2. Click on **Initialize** to initialize the drive.

   Note: RAID level 5 logical drives are automatically
   synchronized when you initialize them. You do not need
   to synchronize RAID level 0 or 1 logical drives before
   storing data.

Synchronizing Logical Drives: The purpose of synchronizing
logical drives is to compute and write the parity data on the
selected RAID level 5 logical drives. Synchronizing a RAID level 1
logical drive copies the data from the primary disk to the mirrored
disk.

RAID level 5 logical drives are automatically synchronized when
you initialize them. You do not need to synchronize RAID level 0 or
1 logical drives before storing data. Also, the *data scrubbing* feature
of the ServeRAID II controller continuously reads all sections of
RAID level 1 and RAID level 5 logical drives "in the background"
while your system is running. If a defective sector is found, it is
automatically repaired. As a result, you no longer have to
synchronize RAID level 1 and RAID level 5 logical drives on a
weekly basis.

Synchronizing a logical drive verifies that the data redundancy for
the logical drive is correct. For RAID level 5, the parity bit is
computed and then written to the parity drive.

To synchronize a logical drive:

1. Select the logical drive that you want to synchronize from the Main Screen of the Administration and Monitoring utility program.

   A screen similar to the following appears.

```
┌─────────────────────────────────────────────────┬────┐
│  Logical Drive Information                       │ ✕  │
├─────────────────────────────────────────────────┴────┤
│ ┌───────────────────────────────────────────────────┐│
│ │ Logical Drive Number     1                        ││
│ │ Blocked                  No                       ││
│ │ Part of Array            A                        ││
│ │ Part of Merge Group      1                        ││
│ │ Date Created             05/19/97                 ││
│ │ State                    OKY                       ││
│ │ Size                     100MB                     ││
│ │ RAID Level               0                        ││
│ │ Write Policy             WT                        ││
│ │ Read Ahead               On                       ││
│ │ Strip Unit Size          8 KB                      ││
│ │ Number of Chunks         3                        ││
│ │ Stripe Order             1,1 1,2 1,4              ││
│ └───────────────────────────────────────────────────┘│
│ ┌─────────┐ ┌──────────┐ ┌───────────┐ ┌──────────┐ │
│ │ Unblock │ │Initialize│ │Synchronize│ │    OK    │ │
│ └─────────┘ └──────────┘ └───────────┘ └──────────┘ │
└───────────────────────────────────────────────────────┘
```
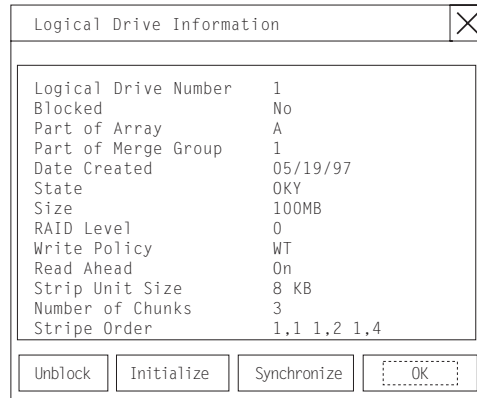
2. Click on **Synchronize** to synchronize the drive.

   The synchronization process begins and reports progress information on the screen.

```
┌──────────────────────────────────────────────┐
│    Adapter 1 Synchronization Progress         │
├──────────────────────────────────────────────┤
│ Log Drv 0  ┌█████████████──────────┐ 53%      │
│            └───────────────────────┘          │
│ Log Drv 1  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 2  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 3  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 4  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 5  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 6  ┌───────────────────────┐          │
│            └───────────────────────┘          │
│ Log Drv 7  ┌───────────────────────┐          │
│            └───────────────────────┘          │
└──────────────────────────────────────────────┘
```
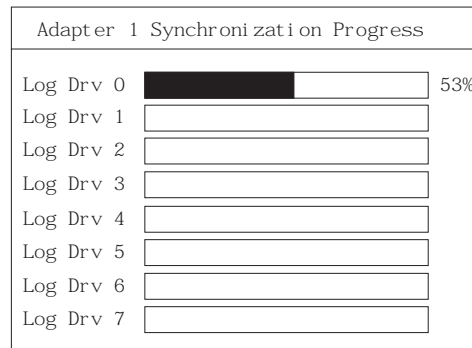
Note: Only one synchronization command can be active at a time.

Unblocking Logical Drives: Whenever the ServeRAID II controller performs a rebuild operation on an array, the data stored in any RAID level 1 and RAID level 5 logical drives in the array is reconstructed. However, the data stored in RAID level 0 logical drives in that array cannot be reconstructed. The data in the RAID level 0 logical drives is blocked when the ServeRAID II controller detects that the array is valid, but the data might be damaged.

After the rebuild process completes, you can unblock the RAID level 0 logical drives; this redefines their state as OKY and allows access to them once again. But remember, the RAID level 0 logical drive might contain damaged data. You must re-create, install, or restore the data for the RAID level 0 logical drive from the most recent backup disk or tape.

To unblock a blocked drive:

1. Select the logical drive that is blocked from the Main Menu of the Administration and Monitoring utility program.

   A screen similar to the following appears.

```
┌─────────────────────────────────────────────┬───┐
│ Logical Drive Information                    │ X │
├─────────────────────────────────────────────┴───┤
│                                                  │
│  ┌────────────────────────────────────────────┐  │
│  │ Logical Drive Number    1                  │  │
│  │ Blocked                 No                 │  │
│  │ Part of Array           A                  │  │
│  │ Part of Merge Group     1                  │  │
│  │ Date Created            05/19/97           │  │
│  │ State                   OKY                │  │
│  │ Size                    100MB              │  │
│  │ RAID Level              0                  │  │
│  │ Write Policy            WT                 │  │
│  │ Read Ahead              On                 │  │
│  │ Strip Unit Size         8 KB              │  │
│  │ Number of Chunks        3                  │  │
│  │ Stripe Order            1,1 1,2 1,4        │  │
│  └────────────────────────────────────────────┘  │
│  ┌────────┐ ┌──────────┐ ┌───────────┐ ┌──────┐  │
│  │Unblock │ │Initialize│ │Synchronize│ │  OK  │  │
│  └────────┘ └──────────┘ └───────────┘ └──────┘  │
└──────────────────────────────────────────────────┘
```
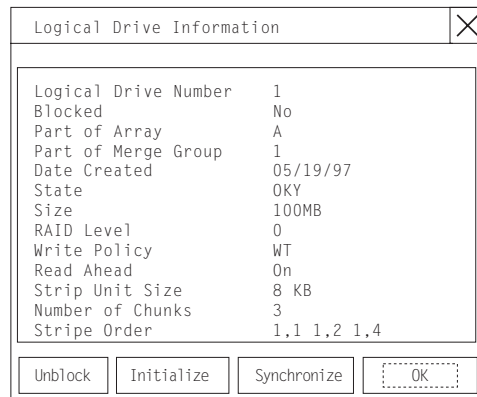
2. Click on **Unblock** to unblock the drive.

3. You *must* initialize all new logical drives before storing data in them. See with "Initializing Logical Drives" on page 130.

4. Restore the data to the drive from your most recent backup disk or tape.

Logical Drive Migration Administration

The logical drive migration (LDM) feature dynamically changes the current logical drive structure. You can use this feature to change the RAID level, increase the free space in a disk array, or change the size of a logical drive.

To use the LDM feature, you must have two logical drives available: one free (FRE) logical drive and one source logical drive that is in the okay (OKY) state. During the LDM procedure, the ServeRAID II controller changes the state of the FRE logical drive to SYS; then, temporarily uses the SYS drive to perform the migration. When the migration procedure completes, the ServeRAID II controller changes the state of the SYS drive back to FRE.

Changing RAID Levels:

You can change (migrate) the RAID levels of currently defined logical drives. Depending upon the current RAID level, you might need to add or remove a hard disk drive before you can change the RAID level.

To use the Change RAID Level feature, all of the logical drives within the array must be the same RAID level.

The ServeRAID II controller supports changing RAID levels as follows:

- Change two RAID level 0 logical drives to RAID level 5 by adding one hard disk drive

- Change two RAID level 1 logical drives to RAID level 5 by adding one hard disk drive

- Change from RAID level 5 to RAID level 0 by removing one hard disk drive

To change the RAID level:

1. Click on the ⬚ icon on the tool bar or select **Manage Disk Arrays** from the **Advanced** pull-down menu; then, select **Logical Drive Migration.**

   A screen similar to the following appears.

   ```
   ┌─────────────────────────────────────┬───┐
   │ Logical Drive Migration             │ ╳ │
   ├─────────────────────────────────────┴───┤
   │ ┌Logical Drive Migration Options┐ ┌────┐ │
   │ ⦿  │ Change RAID Level │         │ OK │ │
   │                                   └────┘ │
   │ ○   Add Physical Drive(s)        ┌──────┐│
   │                                  │Cancel││
   │                                  └──────┘│
   └──────────────────────────────────────────┘
   ```
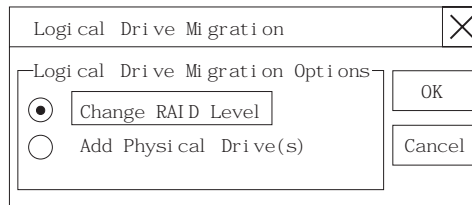
2. Select **Change RAID Level;** then, click on **OK.**

```
┌─────────────────────────────────────────────┬───┐
│  Change RAID Level                           │ ✕ │
├─────────────────────────────────────────────┴───┤
│  Options:                           ┌────────┐   │
│  ┌─────────────────────────────┬─┐  │   OK   │   │
│  │Change array B from Raid 5 to Raid 0│▼│  └────────┘   │
│  └─────────────────────────────┴─┘  ┌────────┐   │
│                                     │ Cancel │   │
│   Logical      Raid       Size      └────────┘   │
│   Drive        Level      (MB)                   │
│  ┌──────────────────────────────────┐            │
│  │ 0            5           1000     │            │
│  │ 1            5           1000     │            │
│  │                                   │            │
│  │                                   │            │
│  │                                   │            │
│  │                                   │            │
│  └──────────────────────────────────┘            │
└──────────────────────────────────────────────────┘
```
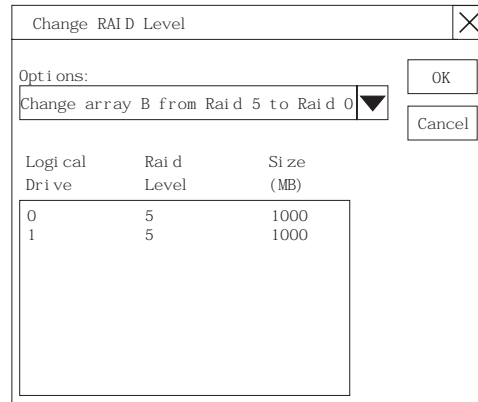
3. Select a migrating option from the pull-down list.

   Note: The affected logical drives appear based on the migrating option selected.

4. Click on **OK** to proceed; then, click on **OK** to verify the operation.

5. Select a Ready (RDY) drive to add to the array if you are migrating to RAID level 5.

   Note: If you are migrating to RAID level 0, the last drive defined in the array becomes RDY.

Adding a Physical Drive:

You can expand currently defined arrays to new sizes by adding one to three new hard disk drives.

The ServeRAID II controller supports adding new space to a disk array as follows:

- You can increase the free space in a disk array without adjusting the size of the logical drives. This is useful when you need to add logical drives to your existing disk arrays. Refer to the following illustration.
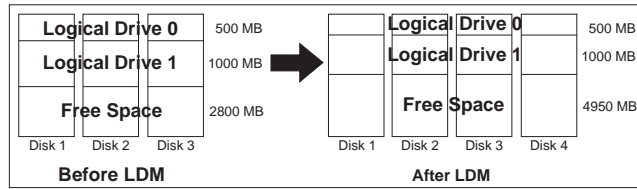
For example, an existing disk array uses three, 2150 MB hard
disk drives that are configured as two RAID level 5 logical
drives (one 500 MB and one 1000 MB) and 2800 MB of free space.
If you use the logical-drive migration procedure and add a
2150 MB hard disk drive to increase the amount of free space,
the end result will be two RAID level 5 logical drives (one
500 MB and one 1000 MB) and 4950 MB of free space.

- You can increase the size of all the logical drives proportionally
  in a disk array. This is useful when you want to increase the
  size of the currently defined logical drives. Refer to the
  following illustration.
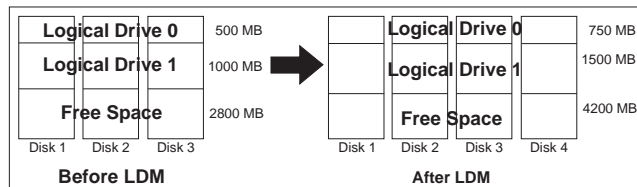
For example, an existing array uses three 2150 MB hard disk
drives that are configured as two RAID level 5 logical drives
(one 500 MB and one 1000 MB) and 2800 MB of free space. If
you use the logical-drive migration procedure and add a
2150 MB hard disk drive to proportionally increase the size of
the disk array, the end result will be two RAID level 5 logical
drives (one 750 MB and one 1500 MB) and 4200 MB of free space.

To add a physical drive:

1. Click on the [icon] icon on the tool bar or select **Manage Disk
   Arrays** from the **Advanced** pull-down menu; then, select **Logical
   Drive Migration.**

A screen similar to the following appears.

```
┌─────────────────────────────────────────────────┬──────┐
│   Logical  Drive Migration                       │  ✕   │
├─────────────────────────────────────────────────┴──────┤
│ ┌─Logical  Drive Migration Options─┐   ┌────────────┐   │
│ │                                  │   │     OK     │   │
│ │   ◯    Change RAID Level         │   └────────────┘   │
│ │  ◉  ┌──────────────────────────┐ │   ┌────────────┐   │
│ │     │ Add  Physical  Drive(s)  │ │   │   Cancel   │   │
│ │     └──────────────────────────┘ │   └────────────┘   │
│ └──────────────────────────────────┘                    │
│                                                         │
└─────────────────────────────────────────────────────────┘
```
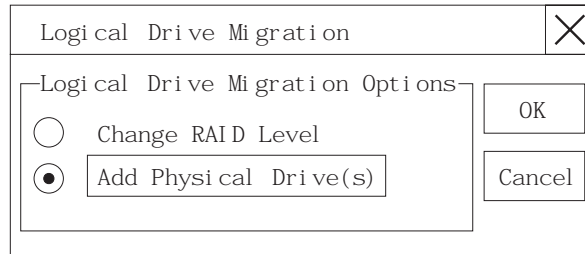
2. Select **Add Physical Drive(s);** then, click on **OK.**

   A prompt appears requesting that you select from 1 to 3 Ready (RDY) drives to add to the existing array.

3. Click on the appropriate RDY drives. An **X** appears beside the selected drive.

4. Click on **OK.**

   A screen similar to the following appears.

```
┌────────────────────────────────────────────────────┬─────┐
│  Add Physical Drive(s) to Array                     │  ✕  │
├────────────────────────────────────────────────────┴─────┤
│ Options:                                 ┌─────────┐      │
│ ┌──────────────────────────────────────┐▼│   OK    │      │
│ │Increase the capacity of all logical drives in array B│  └─────────┘      │
│                                          ┌─────────┐      │
│                                          │ Cancel  │      │
│ Logical        Raid           Size       └─────────┘      │
│ Drive          Level          (MB)       New Size         │
│ ┌────────────────────────────────────┐  (MB)             │
│ │ 0              5              1000  │ ┌───────┐         │
│ │ 1              0              498   │ │ 1500  │         │
│ │ 2              5              300   │ │ 664   │         │
│ │                                    │ │ 450   │         │
│ │                                    │ │       │         │
│ │                                    │ │       │         │
│ └────────────────────────────────────┘ └───────┘         │
└───────────────────────────────────────────────────────────┘
```
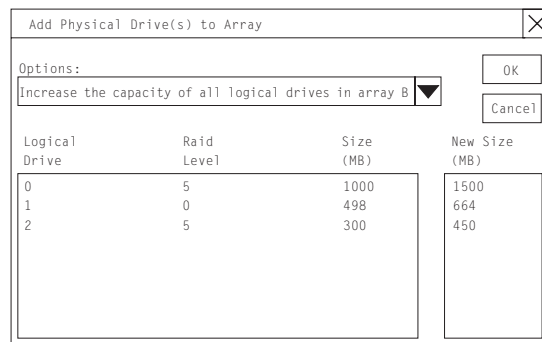
5. Select one of the available options for expansion from the pull-down list.

   The screen shows a list of the affected logical drives with their new sizes.

6. Click on **OK.**

Physical Device Administration

This section contains instructions for setting physical device states and rebuilding drives using the ServeRAID Administration and Monitoring utility program.

Setting Physical Device States: Physical devices always appear in one of the following defined states, but you can easily redefine them into another state.

The following table shows the valid device states and valid alternative states.

Device States	Alternate States
EMP	RDY SBY
SBY	RDY EMP HSP SHS
DHS	EMP HSP SHS
SHS	HSP DHS
DDD	ONL RBL
RDY	EMP HSP SHS SBY
HSP	RDY SHS DHS
ONL	DDD
RBL	DDD ONL

To change the physical device state:

1. Select the device from the Main Screen of the Administration and Monitoring utility program. A screen similar to the following appears.

```
┌─────────────────────────────────────────────┬───┐
│  Device Management                           │ ✕ │
│                                              └───┤
│  ┌─Drive State─┐ ┌─ Drive Information ──────────┐│
│  │  ◯ EMP      │ │  Channel        1            ││
│  │  ◯ SBY      │ │  Bay            2            ││
│  │  ◯ RDY      │ │  SCSI ID        1            ││
│  │  ◯ DHS      │ │  Vendor         IBM          ││
│  │  ◯ SHS      │ │  Serial Number  003056669    ││
│  │  ◯ HSP      │ │  Size           1003 MB      ││
│  │  ◯ DDD      │ │  State          ONL          ││
│  │  ◉ ONL      │ │  Soft Event     0            ││
│  │  ◯ RBL      │ │  Hard Event     0            ││
│  │             │ │  Misc Event     0            ││
│  │             │ │  Parity Event   0            ││
│  │             │ │  PFA            No           ││
│  └─────────────┘ └─────────────────────────────┘│
│  ┌──────────────┬──────────────┬──────────────┐ │
│  │ Set Device State │ Rebuild Drive │    OK    │ │
│  └──────────────┴──────────────┴──────────────┘ │
└──────────────────────────────────────────────────┘
```

2. Click on the radio button that indicates the desired state.

   Note: If you set a DDD drive to ONL without performing a Rebuild (RBL) operation and that drive is part of a critical (CRT) logical drive, your server might lose data.

3. Click on **Set Device State.**

Rebuilding Drives: When a hard disk drives goes defunct (DDD), a Rebuild operation is required to reconstruct the data for the device in its respective disk array. You can rebuild only RAID level 1 and RAID level 5 logical drives. The data stored in stored in RAID level 0 logical drives cannot be reconstructed; therefore, RAID level 0 logical drives are blocked.

After the rebuild process completes, you can unblock the RAID level 0 logical drives, which redefines their state as OKY and allows access to them once again. But remember, the RAID level 0 logical drive might contain damaged data. You must re-create, install, or restore the data for the RAID level 0 logical drive from the most recent backup disk or tape. (See "Unblocking Logical Drives" on page 133 for more information.)

To rebuild a drive:

1. Click on the DDD device on the Main Screen of the Administration and Monitoring utility program.

2. Click on **Rebuild Device.**

   A screen similar to the following appears.

```
┌─────────────────────────────────────┬───┐
│ Rebuild Physical Drive              │ ✕ │
├─────────────────────────────────────┴───┤
│ Select OK to make the drive in          │
│ channel 1 bay 5 the destination of      │
│ the rebuild, or select another drive    │
│ for the destination of the build        │
│                                         │
│   ┌───────────────┐   ┌───────────────┐ │
│   │    Cancel     │   │      OK       │ │
│   └───────────────┘   └───────────────┘ │
└─────────────────────────────────────────┘
```
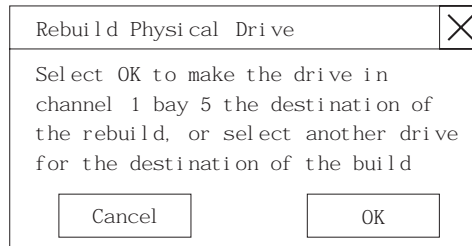
3. Select a RDY drive on which to store the reconstructed data, or click on **OK** to use the same bay if you have physically replaced the drive.

   Note: The replacement hard disk drive must be the same size or larger than the failed drive.

4. The rebuild process begins and reports progress information on the screen.

```
┌─────────────────────────────────────────────┐
│   Adapter 1 Rebuild Progress                 │
├─────────────────────────────────────────────┤
│ Log Drv 0  ┌████████████        ┐  53%      │
│ Log Drv 1  ┌                    ┐            │
│ Log Drv 2  ┌                    ┐            │
│ Log Drv 3  ┌                    ┐            │
│ Log Drv 4  ┌                    ┐            │
│ Log Drv 5  ┌                    ┐            │
│ Log Drv 6  ┌                    ┐            │
│ Log Drv 7  ┌                    ┐            │
└─────────────────────────────────────────────┘
```
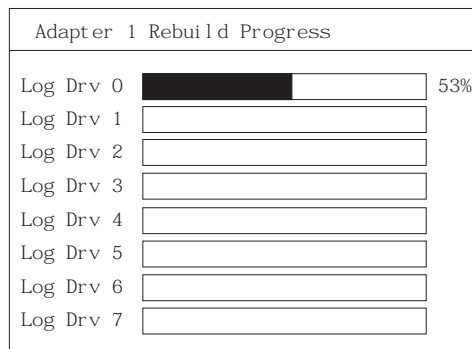
Notes:

1. Only one Rebuild operation can take place at a time.

2. The Rebuild operation changes the hard disk drive state from DDD to RBL if the array contains a CRT logical drive. After the Rebuild operation completes, the hard disk drive state changes from RBL to ONL. (When you rebuild to a RDY drive, the DDD drive is removed from the array and the state of the DDD drive is changed to defunct hot-spare (DHS).)

3. If multiple hot-spare (HSP) drives are available, the ServeRAID II controller searches all the bays on each channel for a hot-spare drive of the appropriate size and the first appropriate hot-spare drive found enters the Rebuild (RBL) state.

4. If a hot-spare (HSP) drive is available, a Rebuild operation starts automatically.

ServeRAID Controller Administration
This section provides instructions for copying the drive configuration to the ServeRAID II controller, copying the ServeRAID II controller configuration to the drives, initializing the ServeRAID II controller configuration, and scanning for new drives.

Copying the Drive Configuration to the ServeRAID Controller:
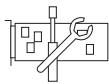
You can copy the configuration information stored on the hard disk drives to the ServeRAID II controller. This procedure is useful when you install drives from other systems.

During the copy procedure, the ServeRAID II controller automatically performs any necessary rearrangement of the configuration; then, the controller writes the new configuration information back to the reserved area on the configured hard disk drives.

To copy the drive configuration information to the ServeRAID II controller:

1. Click on the ⌨ icon on the tool bar or select **Adapter Configuration** from the **Advanced** pull-down menu.

   A screen similar to the following appears.

   ```
   ┌──────────────────────────────────────────────┬───┐
   │ Adapter Configuration                        │ X │
   ├──────────────────────────────────────────────┴───┤
   │ ┌─Adapter Configuration Options ─────┐  ┌──────┐ │
   │ │                                    │  │  OK  │ │
   │ │ ◯   Copy Drive Configuration To Adapter │ └──────┘ │
   │ │ ◯   Copy Adapter Configuration To Drives│ ┌──────┐ │
   │ │ ◯   Initialize Adapter Configuration │  │Cancel│ │
   │ │                                    │  └──────┘ │
   │ └────────────────────────────────────┘           │
   │                                                  │
   └──────────────────────────────────────────────────┘
   ```
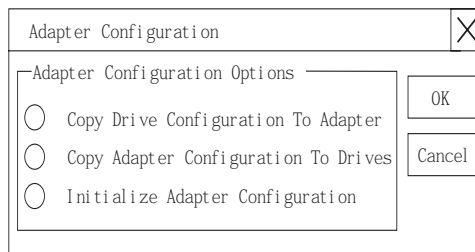
2. Select **Copy Drive Configuration to Adapter;** then, click on **OK.**

Copying the ServeRAID Controller Configuration to the Drives:
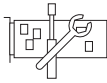
You can copy the configuration information stored in the ServeRAID II controller to all configured hard disk drives.

To copy the ServeRAID II controller configuration information to the drives:

1. Click on the icon on the tool bar or select **Adapter Configuration** from the **Advanced** pull-down menu.

   A screen similar to the following appears.

```
┌──────────────────────────────────────────┬───┐
│ Adapter Configuration                    │ X │
├──────────────────────────────────────────┴───┤
│ ┌─Adapter Configuration Options─┐  ┌──────┐  │
│ │                               │  │  OK  │  │
│ │ ◯  Copy Drive Configuration To Adapter  │  └──────┘  │
│ │ ◯  Copy Adapter Configuration To Drives │  ┌──────┐  │
│ │ ◯  Initialize Adapter Configuration     │  │Cancel│  │
│ │                               │  └──────┘  │
│ └───────────────────────────────┘         │
└───────────────────────────────────────────────┘
```
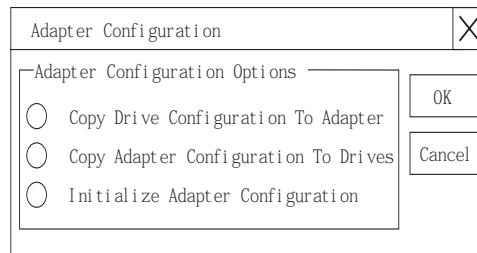
2. Select **Copy Adapter Configuration to Drives;** then, click on **OK.**

Initializing the ServeRAID II Controller:

This procedure initializes the ServeRAID II controller configuration by clearing all the logical drives and resetting all functional hard disk drives to RDY. This procedure is useful when you want to start over and create a new configuration.

Attention:
All the data and programs in the array are lost during this procedure.

To initialize the ServeRAID II controller:

1. Click on the [icon] icon on the tool bar or select **Adapter Configuration** from the **Advanced** pull-down menu.

   A screen similar to the following appears.

Adapter Configuration	✕

   ┌─Adapter Configuration Options ─────┐
   ○   Copy Drive Configuration To Adapter   [OK]
   ○   Copy Adapter Configuration To Drives   [Cancel]
   ○   Initialize Adapter Configuration
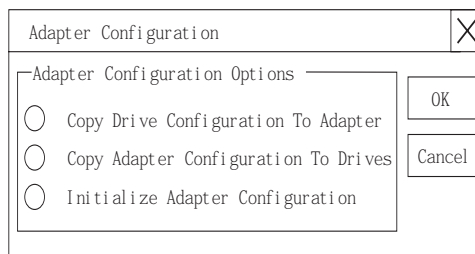
2. Select **Initialize Adapter Configuration;** then, click on **OK.**

Scanning for New Drives: This option enables you to locate new drives attached to the ServeRAID II controller.

To scan for new drives:

Click on the [icon] icon on the tool bar or select **Scan For New Drives** from the **Advanced** pull-down menu.

Using the ServeRAID Monitoring Functions

This section contains instructions for using the ServeRAID Administration and Monitoring utility program to monitor the ServeRAID II controller status information, event logs, logical drive information, and physical device information.

Monitoring Status Information

You can monitor the ServeRAID II controller status by clicking on the active ServeRAID controller button on the Main Screen of the Administration and Monitoring utility program. The currently active ServeRAID controller button is indicated by a green or red light. (Green indicates an active controller; red indicates that the controller is not responding.)

If there is more than one ServeRAID II controller in the system, click on the appropriate button to make it active.

A screen similar to the following appears.

```
┌────────────────────────────────────────────────┬───┐
│ Adapter Information                             │ ✕ │
├────────────────────────────────────────────┬───┼───┤
│                                             │ ▲ │   │
│  ┌────────────────────────────────────────┐ │   │   │
│  │ Adapter Number               1         │ │   │   │
│  │ Number of Logical Drives     6         │ │   │   │
│  │ Unattended Mode              Off       │ │   │   │
│  │ Code Block Version           97125     │ │   │   │
│  │ Boot Block Version           96340     │ │   │   │
│  │ Concurrent Commands          64        │ │   │   │
│  │ Maximum Devices Supported    45        │ │   │   │
│  │ Flash Program Count          2650      │ │   │   │
│  │ Defunct Disk Count           0         │ │   │   │
│  │ Rebuild Rate                 High      │ │   │   │
│  │ Hot-Swap Rebuild             Disabled  │ │   │   │
│  │ Offline Logical Drive Count  0         │ │ ▼ │   │
│  └────────────────────────────────────────┘ │   │   │
├──────────────┬──────────────┬──────────────┬──┴───┤
│Device Event Log│ Hard Event Log │ Soft Event Log │ OK │
└──────────────┴──────────────┴──────────────┴────┘
```
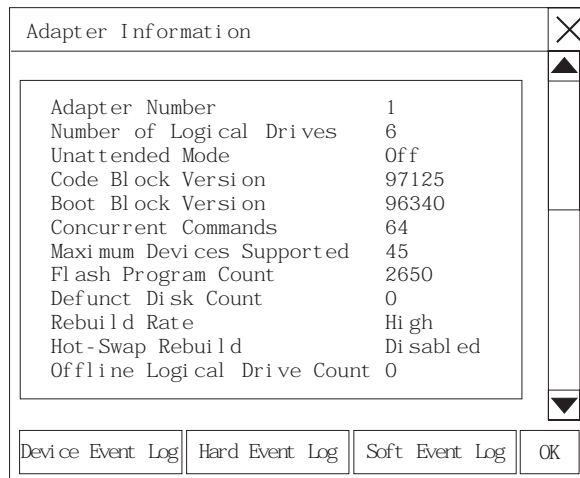
Descriptions of the information that appears on the screen are as follows.

Note: You might have to scroll down, using the scroll bar, to see all of the items that appear on this screen.

Adapter Number   The active ServeRAID II controller (1 to 8).

Number of Logical Drives   The number of defined logical drives (0 to 8).

Unattended Mode   **Off** - The user chooses the recovery method when there is a ServeRAID II controller startup error.
On - The ServeRAID II controller chooses the recovery method when there is a startup error.

Code Block Version   The current version level of the firmware microcode for the ServeRAID II controller.

Boot Block Version   The current version level of the microcode loaded in the boot block for the ServeRAID II controller.

Concurrent Commands   The maximum numbers of concurrent commands supported.

Maximum Devices Supported   The maximum number of devices supported.

Flash Program Count   The number of times that the ServeRAID II controller microcode (Flash EEPROM) has been *flashed* or updated.

Defunct Disk Count   The current number of defunct hard disk drives.

Rebuild Rate   The setting for the rebuild rate can be low, medium, or high priority. (The default setting is high.)

Hot-Swap Rebuild	If hot-swap rebuild is set to enable, the ServeRAID II controller will rebuild a defunct drive automatically when all of the following conditions exist: • The hot-swap rebuild parameter is set to Enable • The defunct drive is part of a RAID level 1 or RAID level 5 logical drive • The capacity of the replacement drive is equal to or greater than the capacity of the defunct drive • No rebuild, synchronization, or RAID level change operation is in progress When you replace the drive and these requirements are met, the ServeRAID II controller automatically initiates a rebuild of the drive without user intervention.
Offline Logical Drive Count	The current number of offline logical drives.
Configuration Update Count	The number of times that the ServeRAID II controller configuration information has been updated.

Monitoring Event Logs

The ServeRAID II controller stores, in the event logs, information concerning various unexpected events. There are three types of event logs: a device event log, a hard event log, and a soft event log.

To view the event logs:

1. Click on the **adapter** (or controller) on the Main Screen of the Administration and Monitoring utility program.

A screen similar to the following appears.

```
┌─────────────────────────────────────────────────┬───┐
│ Adapter Information                              │ X │
│                                                  ├───┤
│                                                  │ ▲ │
│  ┌────────────────────────────────────────────┐ │   │
│  │ Adapter Number               1             │ │   │
│  │ Number of Logical Drives     6             │ │   │
│  │ Unattended Mode              Off           │ │   │
│  │ Code Block Version           97125         │ │   │
│  │ Boot Block Version           96340         │ │   │
│  │ Concurrent Commands          64            │ │   │
│  │ Maximum Devices Supported    45            │ │   │
│  │ Flash Program Count          2650          │ │   │
│  │ Defunct Disk Count           0             │ │   │
│  │ Rebuild Rate                 High          │ │   │
│  │ Hot-Swap Rebuild             Disabled      │ │   │
│  │ Offline Logical Drive Count  0             │ │   │
│  └────────────────────────────────────────────┘ │ ▼ │
│                                                  ├───┤
│ ┌──────────────┬──────────────┬──────────────┬──────┐│
│ │Device Event Log│Hard Event Log│Soft Event Log│ OK ││
└─┴──────────────┴──────────────┴──────────────┴──────┘
```
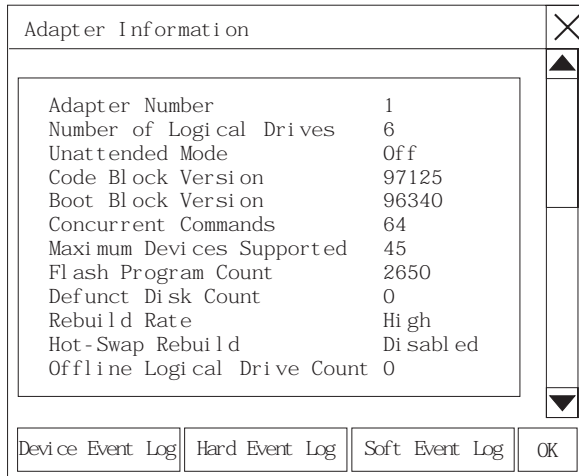
2. Select the appropriate button at the bottom of the screen for the event log you want to view.

Device Event Log: The Device Event Log contains event counters for each attached physical device.

```
┌─────────────────────────────────────────────────────────────┬───┐
│ View ServeRAID Device Event Log                             │ ✕ │
├─────────────────────────────────────────────────────────────┴───┤
│ ┌─────────────────────────────────────────────────────────┬───┐ │
│ │ 10/27/97  14:10:48                                      │ ▲ │ │
│ │ ServeRAID Device Event Log for Adapter 1                │   │ │
│ │ Chn Bay Parity Evt Soft Evt PFA Hard Evt Misc Evt       │   │ │
│ │  1   1      0        1      No    1        0            │   │ │
│ │  1   2      0        0      No    0        0            │   │ │
│ │  1   3      0        0      No    4        0            │   │ │
│ │  1   4      0        0      No    0        0            │   │ │
│ │  1   5      0        0      No    0        0            │   │ │
│ │  1   6      0        1      No    0        0            │   │ │
│ │  1   7      0        0      No    0        0            │   │ │
│ │  1   8      0        0      No    0        0            │   │ │
│ │  1   9      0        0      No    0        0            │   │ │
│ │  1   10     0        0      No    0        0            │   │ │
│ │  1   11     0        0      No    0        0            │   │ │
│ │  1   12     0        0      No    0        0            │   │ │
│ │  1   13     0        0      No    0        0            │ ▼ │ │
│ └─────────────────────────────────────────────────────────┴───┘ │
│                                                                  │
│                        ┌────────┐    ┌────────┐                  │
│                        │ Erase  │    │   OK   │                  │
│                        └────────┘    └────────┘                  │
└──────────────────────────────────────────────────────────────────┘
```

Descriptions of the events logged in the Device Event Log are as follows:

- Parity Event

  The ServeRAID II controller detects parity events while transferring data on the SCSI bus. A large number of parity events might indicate a problem with the SCSI cable, connectors, or terminators attached to the devices.

- Soft Event

  SCSI devices detect these events and reports them to the ServeRAID II controller through Check Condition status.

- Predictive Failure Analysis (PFA)

  A device has signaled the ServeRAID II controller that it might fail in the near future.

- Hard Event

  The ServeRAID II controller detects these events. Most likely, these events are caused by the ServeRAID II controller.

- Misc Event

  The ServeRAID II controller detects these events. Most likely, these events are caused by the SCSI device, such as selection timeout, unexpected bus free, or SCSI phase event.

Note: Under normal operating conditions, the event logs will contain entries that are not errors.

Hard Event Log: You can view the Hard Event Log, which is used by your IBM service technician.

```
┌─────────────────────────────────────────────────────┬───┐
│ View ServeRAID Hard Event Log                        │ ✕ │
├─────────────────────────────────────────────────────┴───┤
│ ┌──────────────────────────────────────────────────────┐ │
│ │ 10/27/97  14:10:48                                   │ │
│ │ ServeRAID Hard Event Log for Adapter 1               │ │
│ │ 30 Event Log Entries follow:                         │ │
│ │ 0000: 1002001A 100000F0 0044210F 1002001A            │ │
│ │ 0004: 100000F0 005E9DAB 1002001A 100000F0            │ │
│ │ 0008: 0A6ED1F0 1002001A 100000F0 00B2FEE7            │ │
│ │ 0012: 1002001A 100000F0 0029A180 1002001A            │ │
│ │ 0016: 100000F0 0281568D 1002001A 100000F0            │ │
│ │ 0020: 0008C22E 1002001A 100000F0 0008E05A            │ │
│ │ 0024: 1002001A 100000F0 034CB715 1002001A            │ │
│ │ 0028: 100000F0 000AEF3F 00000000 00980000            │ │
│ └──────────────────────────────────────────────────────┘ │
│                                                          │
│                          ┌─────────┐    ┌─────────┐      │
│                          │  Erase  │    │   OK    │      │
│                          └─────────┘    └─────────┘      │
└──────────────────────────────────────────────────────────┘
```

Soft Event Log: You can view the Soft Event Log, which is used
by your IBM service technician.

```
┌─────────────────────────────────────────────────────┬───┐
│ View ServRAID Soft Event Log                         │ X │
├─────────────────────────────────────────────────────┴─┬─┤
│ 06/27/97  14:10:26                                   │▲│
│ ServeRAID Soft Event Log for Adapter 1               │ │
│ 195 Error Log Entries follow:                        │ │
│                                                      │ │
│ 0000:  10F15D00 10200002 168A3063 10F15D00           │ │
│ 0004:  10010002 178410AC 012B000E 01014000           │ │
│ 0008:  002OBB38 012B000E 01004000 00213AB7           │ │
│ 0012:  010A000E 01014000 00215C34 0101A00E           │ │
│ 0016:  01004000 0021DBB3 0132000E 01014000           │ │
│ 0020:  0021FC33 1002001A 100000F0 0044210F           │ │
│ 0024:  10F15D00 10110102 0093861B 10F15D00           │ │
│ 0028:  10110102 00938A7E 1002001A 100000F0           │ │
│ 0032:  005E9DAE 1002001A 100000F0 0A6ED1F0           │ │
│ 0036:  10F15D00 10280102 1F78DAC3 10F15D00           │ │
│ 0040:  10280102 1F78E00C 10F15D00 103B0002           │ │
│ 0044:  22193F15 10F31100 10300102 274E7B75           │▼│
├──────────────────────────────┬──────────────┬───────┴─┤
│                              │  Erase   │   OK   │     │
└──────────────────────────────┴──────────┴────────┘─────┘
```

Monitoring the Logical Drive Information
You can monitor the logical drive information by clicking on the
desired logical drive button on the Main Screen of the
Administration and Monitoring utility program.

When you click on the logical drive button, a screen similar to the
following appears.

```
┌─────────────────────────────────────────────────┬───┐
│ Logical Drive Information                        │ X │
├─────────────────────────────────────────────────┴───┤
│ ┌───────────────────────────────────────────────┐   │
│ │ Logical Drive Number    1                     │   │
│ │ Blocked                 No                    │   │
│ │ Part of Array           A                     │   │
│ │ Part of Merge Group     1                     │   │
│ │ Date Created            05/19/97              │   │
│ │ State                   OKY                   │   │
│ │ Size                    100MB                 │   │
│ │ RAID Level              0                     │   │
│ │ Write Policy            WT                    │   │
│ │ Read Ahead              On                    │   │
│ │ Strip Unit Size         8 KB                  │   │
│ │ Number of Chunks        3                     │   │
│ │ Stripe Order            1,1 1,2 1,4           │   │
│ └───────────────────────────────────────────────┘   │
│ ┌─────────┐┌───────────┐┌─────────────┐ ┌ ─ ─ ─ ┐   │
│ │ Unblock ││ Initialize ││ Synchronize │   OK       │
│ └─────────┘└───────────┘└─────────────┘ └ ─ ─ ─ ┘   │
└─────────────────────────────────────────────────────┘
```
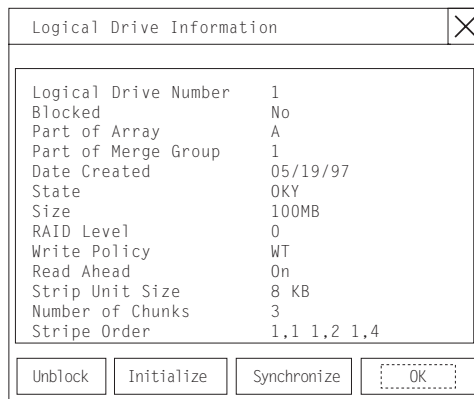
Descriptions of the information that appears on this screen are as follows:

Logical Drive Number	The number of the logical drive.
Blocked	**No** - The logical drive is accessible. **Yes** - The logical drive is not accessible.
Part of Array	The identifier of the logical drive's disk array (A, B, C, D, E, F, G, H).
Part of Merge Group	The identifier of the logical drive's merge group (1 through 254).
Date Created	The date that the logical drive was created.
State	The current drive state (see "Logical Drive States" on page 45 for more information).
Size	The size in megabytes.
RAID Level	RAID level (0, 1, or 5).
Write Policy	**WT** - Write-through. **WB** - Write-back.
Read Ahead	**Off** - Disk Read-Ahead is inactive. **On** - Disk Read-Ahead is active.
Stripe Unit Size	The size of each stripe unit per hard disk (8, 16, 32, 64).
Number of Chunks	The number of hard disk drives that make up the logical drive.
Stripe Order	The channel and bay number of the physical drives that make up the logical drive.

Monitoring the Physical Device Information
You can monitor the physical device information by clicking on the desired device button on the Main Screen of the Administration and Monitoring utility program.

When you click on the device button, a screen similar to the following appears.

```
┌────────────────────────────────────────────────────┐
│  Device Management                            ✕     │
│ ┌─Drive State─┐ ┌─Drive Information──────────────┐  │
│ │ ◯ EMP       │ │ Channel          1             │  │
│ │ ◯ SBY       │ │ Bay              2             │  │
│ │ ◯ RDY       │ │ SCSI ID          1             │  │
│ │ ◯ DHS       │ │ Vendor           IBM           │  │
│ │ ◯ SHS       │ │ Serial Number    003056669     │  │
│ │ ◯ HSP       │ │ Size             1003 MB       │  │
│ │ ◯ DDD       │ │ State            ONL           │  │
│ │ ◉ ONL       │ │ Soft Event       0             │  │
│ │ ◯ RBL       │ │ Hard Event       0             │  │
│ │             │ │ Misc Event       0             │  │
│ │             │ │ Parity Event     0             │  │
│ │             │ │ PFA              No            │  │
│ └─────────────┘ └────────────────────────────────┘  │
│ ┌──────────────┐ ┌──────────────┐ ┌─────────────┐   │
│ │Set Device State│ │ Rebuild Drive│ │     OK      │   │
│ └──────────────┘ └──────────────┘ └─────────────┘   │
└────────────────────────────────────────────────────┘
```

Descriptions of the information that appears on this screen are as follows:

Channel   The channel to which the device is connected.

Bay   The bay number of the device on a channel (1 to 16).

SCSI ID   The SCSI ID (0 to 15).

Vendor   The drive manufacturer.

Serial Number   The drive manufacturer's identifier.

Size   The size of the drive in megabytes.

State   The current drive state (see "Physical Device States" on page 44 and "Logical Drive States" on page 45 for more information.)

Soft Event   The number of soft events reported from the device event log.

Hard Event   The number of hard events reported from the device event log.

Misc Event   The number of miscellaneous events reported from the device event log.

Parity Event   The number of parity events reported from the device event log.

PFA   **Yes** - Device indicates predictive failure analysis event.
                        No - Device does not indicate predictive failure analysis event.

Administration and Monitoring Utility Program

Chapter 4. Configuring Your Server

This chapter provides information about the Configuration/Setup utility programs that come with your server.

The Configuration/Setup utility programs are part of the *basic input/output system* (*BIOS*) that comes with your server. Using these programs, you can set the system date and time, define input and output device parameters, and define system security.

The ROM-based diagnostic program that comes with the server provides diagnostic support for the system board, disk drives, and other system components.

This chapter contains:

Configuration Overview

You play a key role in how your server allocates resources to organize and interconnect hardware devices and software programs. This allocation process is referred to as *configuration.* The steps required to configure your server depend on the number and types of devices and programs that you install.

Your server supports several types of adapters and SCSI devices. Because of this flexibility, you can choose from among many adapters and devices that comply with any of the following standards:

- Peripheral Component Interconnect (PCI)
- Industry Standard Architecture (ISA)
- Small Computer System Interface (SCSI)

In general, the greater the number and variety of hardware devices and software programs that you install in your server, the more you will have to interact with your server and your devices to correctly configure your system.

Your server comes with the following hardware configuration utility programs:

- Configuration/Setup Utility

  With the built-in Configuration/Setup Utility program, you can configure system board functions, such as serial and parallel port assignments; change interrupt request (IRQ) settings; and change the startup sequence for drives that you install. You also can use this utility program to set passwords for starting up the server and accessing the Configuration/Setup Utility program.

- ServeRAID

  You can use ServeRAID programs to define and maintain your disk arrays. You can also use these programs to configure SCSI devices (such as hot-swap drives) that are attached to the ServeRAID controller on the system board. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" for complete instructions.

Before installing a new device or program, read the documentation that comes with it. Reading the instructions helps you to determine the steps required for installation and configuration. The following actions are typically, but not always, required to configure your server.

1. Run the Configuration/Setup Utility program and record the current configuration settings.

2. Set jumpers or switches on the server system board.

   See "Changing Jumper Positions" on page 415 and "System Board Jumpers" on page 420.

3. Set jumpers or switches on the device.

   See the device installation instructions.

4. Install the device in the server.

   See Chapter 6, "Installing Options."

   If you install an ISA adapter that is not a Plug and Play device, select the **Plug and Play** choice on the main menu of the Configuration/Setup Utility program to assign the ISA legacy resources. See "Plug and Play" on page 172 for more information.

5. Install software programs.

   See the installation instructions that come with the software.

6. Resolve configuration conflicts.

   See "Resolving Configuration Conflicts" on page 176.

The Configuration/Setup Utility Program

For most configurations, the server will operate using the default system settings. You need to change the settings only to resolve configuration conflicts or to enable or change device functions (for example, defining diskette types, and so on).

When you want or need to change the default settings, the Configuration/Setup Utility program provides a convenient way to display and change the settings.

After you run and exit from the Configuration/Setup Utility program, configuration information is stored in nonvolatile random-access memory (NVRAM). While the server is off, the configuration information remains available for the next system startup.

Always run the Configuration/Setup Utility program if you add, remove, or relocate any hardware option, or if you receive an error message instructing you to do so. Review this chapter and the information that comes with the option before making changes. Also, record the current settings (see Chapter 10, "Server Records and Specifications") before making any changes.

To start the Configuration/Setup Utility program:

1. Turn on the server and watch the screen.

2. When the message `Press F1 for Configuration/Setup` appears, press **F1.**

   Note: If you enter the power-on password and an administrator (supervisor-level) password is also set, a limited version of the menu appears. To see the full menu, you must restart the server and enter the administrator password when you are prompted to enter a password. See "System Security" on page 165 for additional information.

   The Configuration/Setup Utility main menu appears. For information about the menu, see "Using the Configuration/Setup Utility Main Menu" on page 161.

Using the Configuration/Setup Utility 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 screen:

```
┌─────────────────────────────────────────────────────────────┐
│          IBM SurePath Setup - © IBM Corporation              │
│   ┌──────────────────────────────────────────────────┐       │
│   │  Configuration/Setup Utility                     │       │
│   │  • System Summary                                │       │
│   │  • System Information                            │       │
│   │  • Devices and I/O Ports                         │       │
│   │  • Date and Time                                 │       │
│   │  • System Security                               │       │
│   │  • Start Options                                 │       │
│   │  • Advanced Setup                                │       │
│   │  • Plug and Play                                 │       │
│   │  • Error Logs                                    │       │
│   │                                                  │       │
│   │    Save Settings                                 │       │
│   │    Restore Settings                              │       │
│   │    Load Default Settings                         │       │
│   │                                                  │       │
│   │    Exit Setup                                    │       │
│   └──────────────────────────────────────────────────┘       │
│                                                               │
│     <F1>  Help                   < ↑ > < ↓ >  Move            │
│     <Esc> Exit                    <Enter> Select             │
└─────────────────────────────────────────────────────────────┘
```
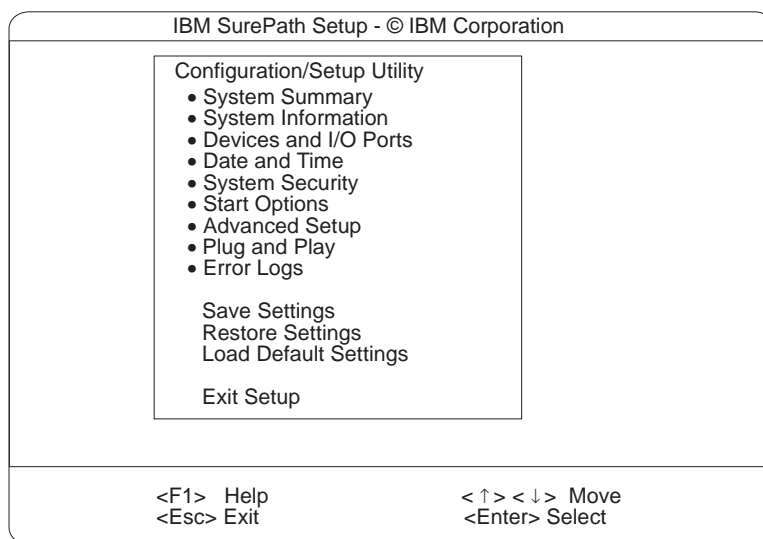
Pressing **F1** displays Help information for a selected menu item.

Note: The choices on some menus might differ slightly, depending on the BIOS version that comes with your server.

To change configuration settings:

1. Use the Up Arrow (↑) or Down Arrow (↓) key to highlight the menu item for the configuration setting that you want to change; then, press **Enter.**

2. Use the Up Arrow (↑) or Down Arrow (↓) key to choose the appropriate setting for the selected menu item; then, press **Enter.**

3. Repeat step 1 through step 2 for each setting that you want to change. Press **Esc** to return to the Configuration/Setup Utility main menu.

4. After making changes, you can select:

   - **Save Settings** to save the selected changes.

   - **Restore Settings** to delete the changes and restore the previous settings.

   - **Load Default Settings** to cancel the changes and restore the factory settings.

5. To exit from the Configuration/Setup Utility main menu, select **Exit Setup.** If you made any changes and did not save them with the **Save Settings** choice, the system prompts you to save or discard the changes when you attempt to exit from the Configuration/Setup Utility main menu.

System Summary

Select this choice to display configuration information, including the type and speed of the microprocessor and amount of memory.

Changes that you make to configuration settings appear on this summary screen. You cannot edit the fields.

The **System Summary** choice appears on the full Configuration/Setup Utility menu and on the limited Configuration/Setup Utility menu.

System Information

Select this choice to display information about your Netfinity 5500, and to view the IRQ settings for the RAID and Ethernet controllers on the system board, and other PCI adapters that you purchase and install.

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 menu.

Product Data
Select this choice to view system information, such as the machine
type and model, the system serial number, the system board
identifier, and the revision level or issue date of the flash
electronically erasable programmable ROM (EEPROM) for the
system management processor, diagnostics, and BIOS.

System Card Data
Select this choice to view information for the system board and
processor board.

PCI Routing
Select this choice to view the IRQ settings for PCI adapters and for
the Ethernet, SCSI, and other controllers on the system board. See
"PCI Bus Control" on page 171 for information about changing the
PCI IRQ settings.

Devices and I/O Ports

Software recognizes ports through their port assignments. Each port
must have a unique port assignment. The Configuration/Setup
Utility program normally handles this, but you might have special
hardware or software that requires you to change these assignments.

Note: Serial port A can be shared by the system management
processor and operating system. Serial port B is used by the
operating system only. Management port C is controlled
exclusively by the system management processor, cannot be
used by the operating system, and cannot be configured
using the Configuration/Setup utility program.

Select the **Devices and I/O Ports** choice to view or change the
assignments for devices and input/output ports.

You can add serial ports by installing a serial adapter in an
expansion slot. See the documentation that comes with the serial
adapter for information about port assignments.

You can 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 Extended Capabilities Port (ECP) and Enhanced Parallel Port (EPP).

To display or change the assignments for devices, serial ports, or the parallel port:

1. Select **Devices and I/O Ports.**

2. Select a device or port; use the Left Arrow (←) or Right Arrow (→) key to advance through the settings available.

   The Devices and I/O Ports choice appears only on the full Configuration/Setup Utility menu.

Notes:

1. 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).

2. The universal serial bus (USB) is configured automatically. For further details about Plug and Play devices, see "Plug and Play" on page 172.

3. 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 setting in the Configuration/Setup Utility.

Date and Time

Select this choice to set the system date and time.

The system time is in a 24-hour format: hour:minute:second.

The system date is in standard format for your country. For example, in the United States, the format is **MM/DD/YYYY** (Month/Day/Year).

Select **Date and Time**; then, use the Left Arrow (←) or Right Arrow (→) key to advance through each data field. Type the new information; the system saves the information as you type it.

The **Date and Time** choice appears only on the full Configuration/Setup Utility menu.

System Security

To control access to the information in your server databases, you can implement two levels of password protection. Implementing these security measures helps you to ensure the integrity of the data and programs that are stored in your server.

Note: The default values for all security-related data fields are given in Table 11 on page 405.

After you set a power-on password, you can enable the unattended-start mode. This locks the keyboard and mouse, but allows the system to start the operating system. The keyboard and mouse remain locked until you enter the correct password.

The **System Security** choice appears only on the full Configuration/Setup menu.

To set, change, or delete a password:

1. Select **System Security.**

2. Select the password that you want to change.

3. Follow the instructions on the screen.

After you set a power-on or administrator password, you must enter the password when you turn on the server. (The passwords do not appear on the screen as you type them.)

Using the Configuration/Setup Utility Main Menu

Type of Password	Results
No password set	• No password required to start system. • You can access all choices on the Configuration/Setup Utility main menu.
Power-on password only	• You must enter the password to complete the system startup. • You can access all the choices on the Configuration/Setup Utility main menu.
Administrator password only	• You must enter the password to complete the system startup. • Administrator password provides access to all choices on the Configuration/Setup Utility main menu.

Administrator *and* power-on password	• You can enter either password to complete the system startup.
	
	   – 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.
	
	   – Power-on password provides access to a limited set of choices on the Configuration/Setup Utility main menu. This might include changing or deleting the power-on password.
	
	   – If you forget the power-on password, and the administrator password has been set, use the administrator password at the power-on password prompt; then, start the Configuration/Setup Utility program and change the power-on password.

Using the Power-On Password Menu

When a power-on password is set, you must enter a password each time that you start the system.

To set a power-on password:

1. Select **Power-on Password** from the System Security menu; then, press **Enter.**

   The Power-on Password menu appears.

2. Type the password in the **Enter Power-on Password** data field.

   You can use any combination of up to seven characters (A–Z, a–z, and 0–9) for your power-on password. Keep a record of your password in a secure place.

3. Move the cursor to the **Enter Power-on Password Again** data field and type the password again.

   Note: A message appears if the two passwords do not match. If this happens, press **Esc** to cancel the request and return to the System Security menu.

4. Select **Change Power-on Password** to save the new password; then, press **Enter.**

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 one of the following methods:

- If an administrator password has been set, enter the administrator password at the power-on prompt. (See "Using the Administrator Password Menu" on page 169 for details.) Start the Configuration/Setup Utility program and change the power-on password as previously described in this section (see steps 1 through 4).

- You can change the position of the Power-On Password Override jumper, as described in "Bypassing an Unknown Power-on Password" on page 421.

- You can remove the battery as described in "Replacing the Battery" on page 387 and then reinstall the battery.

To delete a power-on password:

1. Select **Power-on Password** from the System Security menu; then, press **Enter.**

   The Power-on Password menu appears.

2. Select **Delete Power-on Password**; then, press **Enter.**

3. A confirmation window appears. Press **Enter** to delete the power-on password. Press **Esc** to cancel the request and return to the System Security menu.

To allow the system to start in unattended mode when a power-on password is set:

1. Select **Power-on Password** from the System Security menu; then, press **Enter.**

   The Power-on Password screen appears.

2. Select **Allow for unattended boot with password.** Press the Left Arrow (←) key or Right Arrow (→) key to toggle the entry to **On.**

Using the Administrator Password Menu

The administrator password (sometimes called a supervisor-level password) controls access to some features of the server, including the Configuration/Setup Utility program.

Important

Attention:
If an administrator password is set and then forgotten, it cannot be overridden or removed. You must replace the system board.

To set an administrator password:

1. Select **Administrator Password** from the System Security menu: then, press **Enter.**

   The Administrator Password menu appears.

2. Type the password in the **Enter Administrator Password** data field.

   A password can contain any combination of up to seven alphanumeric characters (A–Z, a–z, and 0–9). Keep a record of your password in a secure place.

3. Move the cursor to the **Enter Administrator Password Again** data field and type the password again.

   Note: A message appears if the two passwords do not match. If this happens, press **Esc** to cancel the request and return to the System Security menu.

4. Select **Change Administrator Password** to save the new password; then, press **Enter.** The password becomes effective immediately.

To delete an administrator password:

1. Select **Administrator Password** from the System Security menu; then, press **Enter.**

   The Administrator Password menu appears.

2. Select **Delete Administrator Password**; then, press **Enter.**

3. A confirmation window appears. Press **Enter** to delete the administrator password. Press **Esc** to return to the System Security menu.

To enable a user to change the power-on password:

1. Select **Administrator Password** from the System Security menu; then, press **Enter.**

   The Administrator Password screen appears.

2. Select **Power-on password changeable by user.** Press the Left Arrow (←) or Right Arrow (→) key to toggle the entry to **Yes.**

When this choice is enabled, **System Security** appears on the limited Configuration/Setup Utility menu. The System Security menu contains the **Power-on Password** choice.

Start Options

Start options take effect when you start your 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 in disketteless and monitorless operation.

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 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.

Select **Start Options**; then, use the Left Arrow (←) or Right Arrow (→) key to advance through each data field.

The **Start Options** choice appears only on the full Configuration/Setup Utility menu.

Advanced Setup

Select **Advanced Setup** to change values for advanced hardware features, such as cache control, ROM shadowing, and PCI bus control.

A warning message displays 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.

Use the Left Arrow (←) or Right Arrow (→) key to scroll through each data field after you select one of the setup options.

The **Advanced Setup** choice appears only on the full Configuration/Setup Utility menu.

ACPI Control

Select this choice to enable or disable the advanced configuration and power management interface (ACPI) in the BIOS. You can choose to change the ACPI hardware signature or select an IRQ for ACPI.

Cache Control

Select this choice to enable or disable the microprocessor cache. In addition, you can define the microprocessor cache mode as write-back (WB) or write-through (WT).

Selecting write-back mode will provide the maximum system performance.

Note: If the system does not start (boot) successfully after three attempts, the default configuration is loaded, disabling the cache.

PCI Bus Control

Select **PCI Bus Control** to get the following choices:

- PCI-PCI Bridge Pre-fetching: Set **PCI-PCI bridge pre-fetching** to **Enabled** for maximum performance. If you experience problems running peer-to-peer adapters, disable this function.

- PCI Primary Bus MLT: This setting is for the primary master latency timer (MLT). It can be used to help tune performance of the server.

- PCI Secondary BUS MLT: This setting is for the secondary master latency timer (MLT). It can be used to help tune performance of the server.

- PCI Interrupt Routing: This choice can be used to manually override the interrupts for PCI devices. Any changes that you make in PCI Interrupt Routing will not be reflected in the IRQ settings displayed in the PCI Routing selection of the System Information menu until you restart the server.

Memory Settings
Select this choice to manually disable or enable a row of memory.

If a memory error is detected during POST or memory configuration, the server can automatically disable the failing row of memory and continue operating with reduced memory capacity. If this occurs, you must manually enable the row of memory after the problem is corrected. Choose **Memory Settings** from the Advanced Setup menu; then use the the Up Arrow (↑) or Down Arrow (↓) key to highlight the row that you want to enable. Use the Left Arrow (←) or Right Arrow (→) key to select **Enable**.

Advanced ISA Settings
Select this choice to select the I/O recovery timer settings.

System Service Processor Settings
Select this choice to change the system management processor IRQ.

Plug and Play
Before you can install Plug and Play adapters, you must configure ISA legacy adapters (if applicable) and assign the resources that are used by these adapters. When you install an ISA legacy adapter, you must allocate the system resources that the adapter will use. Select **Plug and Play** to view and identify these resources, which include:

- Memory

- I/O ports
- Direct memory access (DMA)
- Interrupt

Note: These menus do not display the resources that are required for the system or by Plug and Play devices.

Select **Plug and Play**; then, use the Up Arrow (↑) or Down Arrow (↓) key to highlight the assignment that you want to change. Use the Left Arrow (←) or Right Arrow (→) key to select from the list of available choices.

Enter the appropriate values in the **Interrupt Resources** data fields. These values range from 0 through 15.

The **Plug and Play** choice appears only on the full Configuration/Setup Utility main menu.

Note: For further details about Plug and Play devices, see "Plug and Play Technology" on page 214.

Error Logs
Select **Error Logs** to choose to view either the POST error log or the system error log.

POST Error Log
Select **POST Error Log** to view the three most recent error errors detected and logged during POST. You can clear the Post error log from this screen by selecting **Clear error logs**.

System Error Log
Select **System Error Log** to view the system error log. The system error log contains all of the error and warning messages generated during POST and all system status messages from the system management processor. The most recent error is displayed first. Use the Up Arrow (↑) and Down Arrow (↓) keys to move through the system error log. You can clear the system error log by selecting **Clear error logs**.

Save Settings

After you make configuration changes, review them to be sure that they contain the correct information. If the information is correct, select **Save Settings** to save the selected changes.

Restore Settings

After you make configuration changes, review them to be sure that they contain the correct information. If the information is incorrect, or if you do not want to save these changes, select **Restore Settings** to delete the changes and restore the previous settings.

Load Default Settings

If you make configuration changes and then decide that you want to use default values instead, select **Load Default Settings** to cancel the changes and restore the factory settings.

Exit Setup

Select to exit from the Configuration/Setup utility program. If you have made any changes, you will be asked if you want to make the changes or exit without making the changes.

Configuring Options

Before installing a new device or program, read the documentation that comes with it. Reading the instructions helps you to determine the steps that are required for installation and configuration. The following list provides a preview of the actions that might be required to configure your server.

1. Run the Configuration/Setup Utility program and record the current configuration settings.

   See "The Configuration/Setup Utility Program" on page 160.

2. Set jumpers or switches on the server system board.

   See "Changing Jumper Positions" on page 415 and "System Board Jumpers" on page 420.

3. Set jumpers or switches on the device.

   See the instructions that came with the adapter.

4. Install the adapter in the server.

   See "Working with Adapters" on page 211.

5. Install software programs.

   See the installation instructions that came with the software.

6. Resolve configuration conflicts.

   See "Resolving Configuration Conflicts" on page 176.

Configuring ISA and PCI Adapters

You cannot assign an ISA adapter to the same interrupt that you have assigned to a PCI adapter. This is because the Netfinity 5500 does not support interrupt sharing among PCI and ISA adapters.

If a situation occurs where you need an additional interrupt, you can use an interrupt from another function that you might not need, such as COM2 (Interrupt 3).

To configure ISA adapters, select **Plug and Play** and follow the instructions on the screen. See "Plug and Play" on page 172 and "Plug and Play Technology" on page 214 for additional information.

PCI devices automatically communicate with the server configuration information. This usually results in automatic configuration of a PCI device. If a conflict does occur, see "Resolving Configuration Conflicts" on page 176.

Multiple-function PCI adapters use more than one interrupt. When you install one of these adapters, review the IRQ assignments in the Configuration/Setup Utility programs (see "PCI Routing" on page 163). Verify that the IRQ assignments are correct.

Your Netfinity 5500 uses a rotational interrupt technique to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

Resolving Configuration Conflicts

The resources used by your server consist of IRQs, DMA, I/O ports addresses, and memory. This information is useful when a resource configuration conflict occurs.

Conflicts in the configuration occur if:

- A device is installed that requires the same resource as another device. (For example, a conflict occurs when two adapters try to write to the same address space.)

- A device resource is changed (for example, changing jumper settings).

- A device function is changed (for example, assigning *COM1* to two serial ports).

- A software program is installed that requires the same resource as a hardware device.

The steps required to resolve a configuration error are determined by the number and variety of hardware devices and software programs that you install. If a hardware configuration error is detected, a *configuration error* message appears after the server completes POST and before the operating system is loaded. You can bypass the error by pressing **Esc** while the error message is displayed.

The Configuration/Setup Utility program configures the system hardware and PCI IRQs. The program does not consider the requirements of the operating system or the application programs. See "Resolving Software Configuration Conflicts" on page 177 for additional information.

Resolving Hardware Configuration Conflicts

Use the following information to help resolve hardware
configuration conflicts:

1. Run the Configuration/Setup Utility program to view and
   change resources used by the system board functions and the
   installed options. Record the current settings before making any
   changes. (See "The Configuration/Setup Utility Program" on
   page 160 for instructions.)

2. Determine which adapter or device is causing the conflict. (See
   Chapter 8, "Solving Problems" for instructions.)

3. Change adapter jumpers or switches. Some devices use jumpers
   and switches to define the system resources that the devices
   need. If the settings are incorrect or set to use a resource that
   cannot be shared, a conflict occurs and the device will remain
   deactivated by the configuration program.

4. Change system board jumpers or switches. See "Preparing to
   Install Options" on page 205, for instructions on removing the
   cover. Then, refer to the system-board diagram inside your
   server.

5. Remove the device or adapter. Some configurations are not
   supported. If you must remove an adapter, see "Working with
   Adapters" on page 211.

Resolving Software Configuration Conflicts

The memory-address space and IRQs used by some hardware
options might conflict with addresses defined for use through
application programs or the expanded memory specification (EMS).
(EMS is used only with DOS.)

If a conflict exists, one or more of the following conditions might
exist:

- The system cannot load the operating system.
- The system does not work.
- An application program does not operate, or it returns an error.
- Screen messages indicate a conflict exists.

To resolve conflicts, you can change the software or hardware configuration.

Note: Start the Configuration/Setup Utility program to view the addresses used by your system board functions. (See "The Configuration/Setup Utility Program" on page 160 for instructions.)

The best way to resolve memory-address conflicts is to change the addresses used by the application program or the device driver. You can use the Configuration/Setup Utility program to change addresses.

If a device driver is causing a memory-address conflict, refer to your operating-system documentation or the documentation that comes with the device drivers.

Configuring the Ethernet Controller

Your Netfinity 5500 comes with an Ethernet controller on the system board. The Ethernet controller provides 10BASE-T and 100BASE-TX support through the RJ-45 connector on the back of your server. When you connect your server to the network, the Ethernet controller automatically detects the data-transfer rate (10 Mbps or 100 Mbps) 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). This process is also known as *auto-negotiating*. This auto-negotiation occurs without requiring software intervention. The controller supports half-duplex (HDX) and full-duplex (FDX) modes at both speeds.

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

Fast Ethernet operates at a data rate of 100 Mbps; that is, ten times faster than standard Ethernet. However, except for the different operating speeds, Fast Ethernet and standard Ethernet are structurally identical. Applications and protocols that are currently hosted on a standard Ethernet system can be seamlessly migrated to

a Fast Ethernet system. (In a very small number of cases, minor tuning might be required to adjust the application to the higher performance of a Fast Ethernet system). Because of the equivalence of the two types of Ethernet, mixed Ethernet and Fast Ethernet systems also can be designed and implemented.

The bandwidth required at each workstation connected to a server is generally far less than the bandwidth required at the server. This is because the server might have to handle the bandwidth of multiple workstations at the same time. A cost-effective solution to the bandwidth requirements of this type of system is a mixed Ethernet and Fast Ethernet network. This mixed network consists of standard Ethernet connections at the workstations and Fast Ethernet connections at the servers.

The Ethernet controller is a PCI device, and is therefore, a Plug and Play device. You do not have to set any jumpers or configure the controller for your operating system before you use the Ethernet controller. However, you must install a device driver to enable your operating system to address the Ethernet controller (refer to your ServerGuide documentation or operating-system documentation).

For troubleshooting information, see "Troubleshooting the Ethernet Controller" on page 371.

If you need additional Ethernet connections, you can install an Ethernet adapter, such as the IBM 10/100 PCI Ethernet adapter. Review your network-adapter documentation for any additional configuration requirements and for troubleshooting information.

Failover for Redundant Ethernet

Your Netfinity 5500 has an integrated Ethernet controller. The IBM Netfinity 10/100 Fault Tolerant Adapter is an optional redundant network interface card (NIC adapter) that you can install in your server. If you install this NIC adapter and connect it to the same logical 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. Applications with active sessions do not experience any data loss. When the primary link is restored to an operational state, the Ethernet traffic automatically switches back to the primary Ethernet controller.

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

Special Considerations When Combining Failover and Hot-Plug Functions

If your 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 be automatically switched to the secondary Ethernet controller. This can be very useful when a network problem is caused by faulty adapter hardware or when you want to upgrade the primary adapter hardware.

Configuring for Failover

The failover feature currently is supported by OS/2, Windows NT, and IntraNetware. The setup required for each operating system follows.

OS/2

1. Add the redundant NIC adapter according to the instructions provided with the adapter and in "Working with Adapters" on page 211.

2. Use ServerGuide to install the AMD PCNet Ethernet Family adapter device driver.

3. Using the MPTS utility program, select the driver from the list and select the **Edit** button.

   Note: Only one driver instance needs to be loaded for each redundant pair of Ethernet controllers.

4. Change the PermaNet Server Feature keyword to **True** and specify the Primary and Standby slots that contain the redundant pair. Refer to "System Board Component Locations" on page 418 for the locations and slot numbers of the PCI slots. The integrated controller is located in slot E.

5. To enable the writing of messages to the IBMCOM\LANTRAN.LOG file when a failover occurs:

   a. Copy the file PCNETOS2.EXE from the root directory of the diskette created by ServerGuide to your hard disk drive.

   b. Add the following statement to the CONFIG.SYS file:

      `Run=d:\path\PCNETOS2.EXE`

      where *d* and *path* are the drive and path to which you copied PCNETOS2.EXE.

6. Restart the server.

The failover function is now enabled.

Windows NT

1. Add the redundant NIC adapter according to the instructions provided with the adapter and in "Working with Adapters" on page 211.

2. Use ServerGuide to install the AMD PCNet Ethernet Family adapter device driver.

3. From the NT desktop, select **Control Panel**, then select the **Network** icon, then the **Adapters** tab.

4. Highlight one of the adapters that will be in the redundant pair and then select the **Properties...** button.

5. Check the **Grouping** box. This will show the possible combinations for redundant pairs.

6. Select the adapter pair you want and then select **OK**. Note that the integrated Ethernet controller is located at PCI bus 0, slot 14.

7. 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. If the DMI instrumentation code for the integrated Ethernet controller is active (PCNET.EXE was run), a popup message is generated also.

IntraNetware

1. Add the redundant NIC adapter according to the instructions provided with the adapter and in "Working with Adapters" on page 211.

2. Load the device driver by using the following command:

   ```
   LOAD d:\path\PCNTNW.LAN PRIMARY=x SECONDARY=y
   ```

   where *d* and *path* are the drive and path where the driver is located, and *x* and *y* are the PCI slot numbers where the redundant pair is located.

   The slot number associated with the integrated Ethernet controller can vary depending upon the configuration of the server. To determine the slot number, load the driver with no parameters. The driver will display the available slot numbers. The slot number that is greater that 10000 will be the slot number of integrated Ethernet controller. When the slot number of the integrated Ethernet controller is determined, reload the driver with the appropriate parameters.

3. When the driver is loaded, bind it to a protocol stack.

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

- A message is generated to the operating system console.

- The custom counters for the device driver contains 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.

Failover for Redundant Ethernet

Chapter 5. Netfinity System Management Processor

This chapter contains information about the system management processor that is integrated in your server. It also describes how to access the system management processor without Netfinity Manager.

This chapter contains:

One of the features of your Netfinity 5500 is the integrated system management processor.

Note: To use all of the functions of the system management processor, you must install the Advanced System Management service for Netfinity Manager. You also will need a user-provided modem attached to serial port A to use the remote functions. Refer to "Serial Ports" on page 265 for information about serial port A.

The Advanced System Management service gives you the ability to configure and monitor many features of your server's system management processor. You can connect to, and directly access and control, the system management processor of a remote system. With the Advanced System Management service you can configure Advanced System Management service events (such as, POST, loader, and operating-system timeouts; and critical temperature and voltage failures). If any of these events occur, the Advanced System Management service can be configured to automatically forward a Netfinity alert in one of three ways:

- Alert forwarded to another Netfinity system
- Alert forwarded to a standard numeric pager
- Alert forwarded to an alphanumeric pager

In addition, with the Advanced System Management service you can remotely monitor, record, and replay all textual data generated by a remote system during POST. While monitoring a remote system during POST, you can enter key commands on your keyboard that will then be relayed to the remote system.

The Netfinity Manager software is included in your ServerGuide package. Refer to the documentation that comes with ServerGuide for information on how to install the Netfinity Manager software. Then, refer to the online Netfinity documentation or the online *Advanced System Management Service for Netfinity Manager User's Guide* for information on using the system management processor.

System Requirements for the Advanced System Management Service with Netfinity Manager

The minimum system requirements for using the Advanced System Management service are:

- System management processor (built into the Netfinity 5500)

- Netfinity Manager or Client Services for Netfinity Manager, version 5.10.4 or later

- 2 MB of available hard disk drive space

Accessing the System Management Processor without Netfinity Manager

If for some reason you are unable to use Netfinity Manager to access and manage your system management processor, you can use a terminal program and a modem to connect directly to the system management processor. This modem should be connected to management port C. (Refer to "Management Port C" on page 266 for information on management port C.) When connected, you will be able to access a variety of monitor, configuration, and error log data. You can also power the remote system on or off, shutdown and restart the server, and initiate remote video mode on the system management processor. Remote video mode enables you to remotely monitor all textual output generated during POST. All POST data will be displayed in the terminal program window as the remote system completes POST. While you are monitoring POST on the remote system, all local keystrokes are relayed automatically to the remote system, enabling you to use POST utilities (such as system configuration, RAID mini-configuration program, and diagnostic programs) that can be accessed during POST.

To use a terminal program to establish a connection with the system
management processor:

1. Use a terminal program to establish a connection with the
   system management processor modem. The modem settings
   you should use are:

Baud	57.6 k
Data Bits	8
Parity	None
Stop Bits	1
Flow Control	Hardware

2. Log in to the system management processor.

   When you have established a connection with the system
   management processor, you will be prompted for a username
   and password. You must provide a username and password
   combination that has been previously configured for use with
   the system management processor. You can use one of two
   username and password combinations:

   - The default username (USERID) and password (PASSW0RD)

     Note: The default username and password is case sensitive.
     You must use all caps, and the "0" in PASSW0RD is
     the numeral zero.

   - A username and password that you define using the
     Advanced System Management service and Netfinity
     Manager

   Important

   For security purposes, change the username and password
   using the Netfinity Manager software. For more information
   see the online Netfinity Manager documentation provided in
   ServerGuide.

   If you update the system management processor microcode,
   the default username (USERID) and password (PASSW0RD)
   are reset. If you had previously changed them, you will
   need to change them again.

When you have logged into the system management processor, the following main menu appears:

```
2 Monitors
3 Error Logs
4 Service Processor Configuration
5 System Services
6 System Power
7 Boot
B Remote Terminal Status
Y Disconnect Current Logon
Z Start Remote Video
```

To access a menu item, press the number or letter that corresponds to the information you want to access. After you select a menu item, subsequent menus will offer more specific information that pertains to the selection you made from the main menu.

Note: Selecting **Y Disconnect Current Logon** ends the current session and requires you to enter a new username and password before continuing.

Menu Selection	Data Available for Viewing
Monitors	System board temperature, CPU temperatures, power supply temperatures, voltage readings, voltage regulator module readings, fan status, redundant power supply status
Error Logs	Contents of system error log
Service Processor Configuration	System management processor modem configuration, dial-out entries, dial-out alerts, dial-in logins, system status, thresholds, system statistics, VPD information and system state
System Services	Status of system management processor watchdog timers and event alerts sent to the server
System Power	Current system power status, power-off configuration and power-off delay values.
	Note: You can use selections available from the **System Power** menu to power the system on or off. For more information, see "System Power Menu Selections" on page 190.

Menu Selection	Data Available for Viewing
Boot	You can use selections available from the **Boot** menu to shutdown and restart your system or to restart the system management processor. For more information, see "Boot Menu Selections" on page 192.
Remote Terminal Status	Current remote terminal status
Start Remote Video	Use **Start Remote Video** to enable your terminal program to remotely monitor and manage the server during POST. For more information, see "Using Remote Video Mode to Monitor and Access POST" on page 194.

When you are finished accessing the system management processor using a terminal program, select **Disconnect Current Logon** from the main menu and then use your terminal program to close the connection to the system management processor.

System Power Menu Selections

You can use the selections available from the System Power menu to:

- View data regarding the current server power status
- View data regarding the server power configuration
- Power the server off
- Power the server on

To access these functions:

1. Use a terminal program to establish a connection with the system management processor modem.

2. Log in to the system management processor.

   When you have established a connection with the system management processor, you will be prompted for a username and password. You must provide a username and password combination that has been previously configured for use with the system management processor. You can use one of two username and password combinations:

   - The default username (USERID) and password (PASSW0RD)

> *Note:* The default username and password is case sensitive. You must use all caps, and the "0" in PASSW0RD, is the numeral zero.

- A username and password that you define using the Advanced System Management service and Netfinity Manager

---
Important

For security purposes, change the username and password using the Netfinity Manager software. For more information see the online Netfinity Manager documentation provided in ServerGuide.

If you update the system management processor microcode, the default username (USERID) and password (PASSW0RD) are reset. If you had previously changed them, you will need to change them again.

When you have logged into the system management processor, the following main menu appears:

```
2 Monitors
3 Error Logs
4 Service Processor Configuration
5 System Services
6 System Power
7 Boot
B Remote Terminal Status
Y Disconnect Current Logon
Z Start Remote Video
```

3. Select **6 System Power**.

The following System Power menu appears:

```
1 Current Power Status
2 Power Configuration
3 Power On
4 Power Off
```

4. Select a System Power menu item.

- Select **1 Current power Status** for information about the current server power status.

- Select **2 Power Configuration** for information about the server power configuration.

- Select **3 Power On** to power the server on (if it is currently powered off).

- Select **4 Power Off** to power the server off (if it is currently powered on).

Boot Menu Selections

You can use the selections available from the Boot menu to:

- Shutdown the server operating system and then restart the server

- Restart the server immediately, without first performing an operating system shutdown

- Restart the system management processor

To access these functions:

1. Use a terminal program to establish a connection with the system management processor modem.

2. Log in to the system management processor.

   When you have established a connection with the system management processor, you will be prompted for a username and password. You must provide a username and password combination that has been previously configured for use with the system management processor. You can use one of two username and password combinations:

   - The default username (USERID) and password (PASSW0RD)

     Note: The default username and password is case sensitive. You must use all caps, and the "0" in PASSW0RD, is the numeral zero.

   - A username and password that you define using the Advanced System Management service and Netfinity Manager

> **Important**
>
> For security purposes, change the username and password using the Netfinity Manager software. For more information see the online Netfinity Manager documentation provided in ServerGuide.
>
> If you update the system management processor microcode, the default username (USERID) and password (PASSW0RD) are reset. If you had previously changed them, you will need to change them again.

When you have logged into the system management processor, the following main menu appears:

```
2 Monitors
3 Error Logs
4 Service Processor Configuration
5 System Services
6 System Power
7 Boot
B Remote Terminal Status
Y Disconnect Current Logon
Z Start Remote Video
```

3. Select **7 Boot**.

The following Boot menu appears:

```
1 Reboot w/OS Shutdown
2 Reboot immediately
3 Restart SP
```

4. Select a Boot menu item.

   - Select **1 Reboot w/OS Shutdown** to shutdown the server operating system and then restart the server.
   - Select **2 Reboot immediately** to restart the server immediately, without first shutting down the operating system.
   - Select **3 Restart SP** to restart the system management processor.

Using Remote Video Mode to Monitor and Access POST

You can use a terminal program to remotely monitor all textual output generated during POST. All POST data will be displayed in the terminal program window as the remote system completes POST. While you are monitoring POST on the remote system, all local keystrokes are relayed automatically to the remote system, enabling you to use POST utilities (such as system configuration, RAID mini-configuration program, or diagnostic programs) that can be accessed during POST.

To use Remote Video Mode to monitor and access POST on the server:

1. Use a terminal program to establish a connection with the system management processor modem.

2. Log in to the system management processor.

   When you have established a connection with the system management processor, you will be prompted for a username and password. You must provide a username and password combination that has been previously configured for use with the system management processor. You can use one of two username and password combinations:

   - The default username (USERID) and password (PASSW0RD)

     Note: The default username and password is case sensitive. You must use all caps, and the "0" in PASSW0RD, is the numeral zero.

   - A username and password that you define using the Advanced System Management service and Netfinity Manager

> ┌─ **Important** ─────────────────────────────┐
>
> For security purposes, change the username and password
> using the Netfinity Manager software. For more information
> see the online Netfinity Manager documentation provided in
> ServerGuide.
>
> If you update the system management processor microcode,
> the default username (USERID) and password (PASSW0RD)
> are reset. If you had previously changed them, you will
> need to change them again.
>
> └───┘

When you have logged into the system management processor,
the following main menu appears:

```
2 Monitors
3 Error Logs
4 Service Processor Configuration
5 System Services
6 System Power
7 Boot
B Remote Terminal Status
Y Disconnect Current Logon
Z Start Remote Video
```

3. Start (or restart) the server.

   - If the remote server is currently powered off:

     a. Select **6 System Power** from the main menu.

     b. Select **4 Power On** from the System Power menu.

   - If the server is currently powered on, you must restart the
     server. You can use selections from the System Power menu
     or the Boot menu to restart the server in several ways.

     To restart the server using System Power menu selection:

     a. Select **6 System Power** from the main menu.

     b. Select **3 Power Off** from the System Power menu.

     c. Once the server has powered off, select **4 Power On** to
        restore power to the server.

     To restart the server using Boot menu selections:

a. Select **7 Boot** from the main menu.

b. Select either **1 Reboot w/OS Shutdown** or **2 Reboot Immediately** to restart the server.

Note: For information on the System Power and Boot menus, see "System Power Menu Selections" on page 190 and "Boot Menu Selections" on page 192.

4. After you restart the server, return to the main menu and select **Z Start Remote Video**.

Once you have started Remote Video mode on the system management processor, all textual output generated during POST will be sent to your terminal window. Your terminal will also act as a fully-active remote session, enabling you to enter keyboard commands that will be sent to the remote server. In this way, you can enter key commands and key-combinations that access POST operations and utilities such as system setup or the RAID mini-configuration program.

When you have finished using Remote Video mode, press **Ctrl+R**, then press **Ctrl+E**, and then press **Ctrl+T**. This will end Remote Video mode and return you to the main menu.

This chapter provides instructions to help you add options to your server. Some option-removal instructions are provided, in case you need to remove one option to install another.

Note: Most of the illustrations in this publication show the tower model of the Netfinity 5500 with the IBM Netfinity NetBAY3; the rack model does not come with a NetBAY3.

This chapter contains:

Before You Begin

Notes:

1. You do not need to turn the server off to install or replace hot-swap power supplies, hot-swap drives, hot-swap fans, or hot-plug PCI adapters.

2. The color orange on components or labels in your Netfinity 5500 indicates hot-plug components.

- Become familiar with the safety and handling guidelines specified under "Safety Information" on page ix, "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202. These guidelines will help you work safely while working with your server or options.

- Make sure that you have an adequate number of properly grounded electrical outlets for your server, monitor, and any other options that you intend to install.

- Place your server in a location that is dry. Rain or spilled liquids might damage your server.

- Leave about 50 mm (2 inches) of ventilated space on the right and left sides of the server to allow the server cooling system to work properly. Leave 100 mm (4 inches) of clearance at the rear of the server for cables.

- Have a supply of 1 MB and 2 MB, 3.5-inch diskettes available.

- Back up all important data before you make changes to disk drives.

- Have a small, flat-blade screwdriver available.

- For a list of supported options for the Netfinity 5500, refer to http://www.pc.ibm.com/us/compat on the World Wide Web.

Electrical Safety

For your safety, do the following *before* removing the top cover:

> *Note:* You do *not* need to turn off the server and attached
> devices before you remove the top cover to install or
> remove a hot-plug PCI adapter (see "Installing a
> Hot-Plug PCI Adapter" on page 216), to replace a
> hot-swap fan (see "Replacing a Hot-Swap Fan Assembly"
> on page 255), or to check the diagnostics LED panel.

1. Turn off the server and any attached devices, such as printers,
   monitors, and external drives.

2. If you are in the United Kingdom and have a modem or fax
   machine attached to your server, you must disconnect the
   telephone line from the server *before* unplugging any power
   cords (also known as power cables). When reassembling your
   server, you must reconnect the telephone line *after* you plug in
   the power cords.

3. Unplug all the power cords from electrical outlets.

4. Disconnect all communication cables from external receptacles.

5. Disconnect all cables and power cords from the back of the
   server.

> *Note:* Reconnect the cables or power cords only after you
> reassemble the server and put the covers back on.

9

CAUTION:
Never remove the cover on a power supply or any part (power backplane and AC box) that has the following label attached.

Hazardous voltage, current, and energy levels are present inside the power supplies, power backplane, and AC box. There are no serviceable parts inside the power supplies, power backplane, or AC box. If you suspect a problem with one of these parts, contact an IBM service technician.

Handling Static-Sensitive Devices

Static electricity, though harmless to you, can seriously damage server components or options.

Note: When you are adding an internal option, do not open the static-protective package containing the option until you are instructed to do so.

When you handle options and other server components, take these precautions to avoid damage from static electricity:

- Limit your movement. Movement can cause static electricity to build up around you.

- Always handle components carefully. Handle adapters, the processor board, and memory-module kits by the edges. Never touch any exposed circuitry.

- Prevent others from touching components.

- When you are installing a new option, touch the static-protective package containing the option to a metal expansion-slot screw or other unpainted metal surface on the server for at least two seconds. (This reduces static electricity from the package and from your body.)

- When possible, remove the option and install it directly into the server without setting the option down. When this is not possible, place the static-protective package that the option comes in on a smooth, level surface and place the option on it.

- Do not place the option on the server's covers or any metal surface.

System Reliability Considerations

To help ensure proper cooling and system reliability, 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.

  Note: The front door and side covers (tower model) can be permanently removed without affecting system reliability.

- 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 Power switch on the power supply is off before you remove a functional power supply.

- 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.

- A failed fan is replaced within 48 hours.

Working Inside a Netfinity 5500 with Power On

Your Netfinity 5500 is designed with special features that make it highly available. These features include hot-plug PCI expansion slots and hot-swap fans. You can add or replace PCI adapters (if supported by your operating system) or replace a fan which no longer functions. In the past you would need to power off the server and disconnect power to perform these operations. With the hot-plug features you remove the top cover of your server with the power on — something most people have not done before.

Your Netfinity 5500 is designed to operate safely while powered on with the top cover removed. The server is designed to protect you and the server. Here are some simple guidelines to follow when you work inside a Netfinity 5500 that is powered on:

- Avoid loose-fitting clothing on your forearms. (Button long-sleeved shirts before working inside the server; do not wear cufflinks while you are working inside the server.

- Do not allow your necktie to hang inside the server.

- Remove jewelry, such as bracelets 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.

Preparing to Install Options

Before you begin:

Read "Electrical Safety" on page 200, "Handling Static-Sensitive Devices" on page 202, and "Working Inside a Netfinity 5500 with Power On" on page 204.

Note: You do not need to turn the server off to work with hot-plug or hot-swap devices, such as hot-plug PCI adapters, and hot-swap hard disk drives.

If you are:

- Installing or removing a hot-plug PCI adapter, go to "Working with Adapters" on page 211.

- Installing or replacing a hot-swap hard disk drive, go to "Installing Internal Drives" on page 233.

- Installing or replacing a hot-swap power supply, go to "Installing a Hot-Swap Power Supply" on page 249.

- Removing a hot-swap power supply, go to "Removing a Hot-Swap Power Supply" on page 253.

- Replacing a hot-swap fan, go to "Replacing a Hot-Swap Fan Assembly" on page 255.

- Installing or removing an option not listed in the preceding list, continue with the following steps.

1. Unlock and open the server door.

8

⚠️

CAUTION:
When unlocked, the server door will not support the weight of the server. To avoid personal injury, be sure to remove or lock the server door before moving or lifting the server.

2. Remove all media (diskettes, CDs, optical discs, or tapes) from the drives; then, turn off the server and all attached options.

6

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CAUTION:

The Power Control button on the front of the server does not turn off the electrical current supplied to the server. The server also might have more than one power cord. To remove all electrical current from the server, ensure that all power cords are disconnected from the power source.

3. If you have a modem or fax machine attached to the server, disconnect the telephone line from the electrical outlet.

4. Unplug all power cords (cables) from electrical outlets.

5. Note the location of the remaining cables and cords; then disconnect them from the back of the server.

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

Removing the Top Cover

Before you begin:

Read "Electrical Safety" on page 200 and "Handling
Static-Sensitive Devices" on page 202.
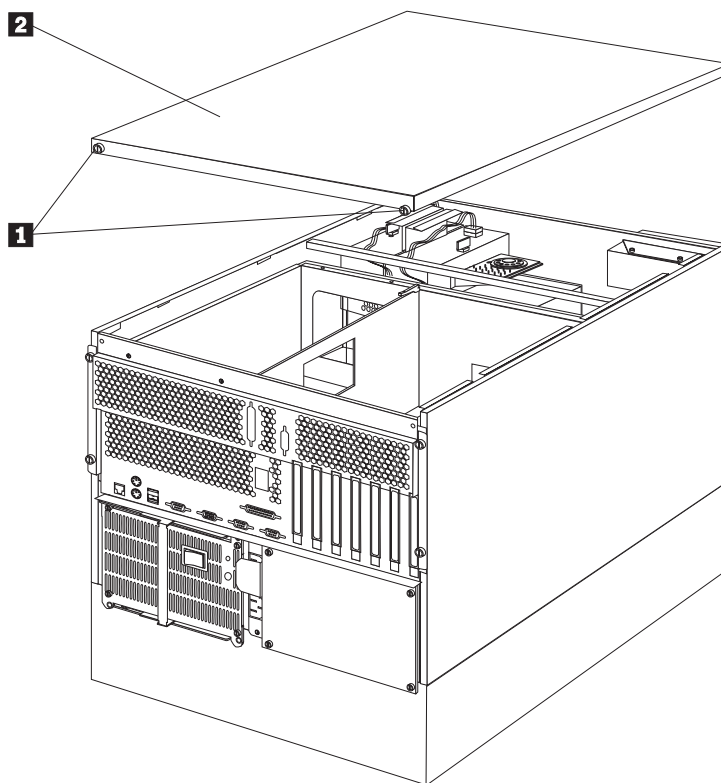
To remove the server top cover:

1. Turn off the server and all attached devices and disconnect all external cables and power cords (see "Preparing to Install Options" on page 205).

2. Loosen the two thumbscrews **1** on the back edge of the top cover.

3. Slide the top cover **2** slightly toward the rear of the server; the cover will stop after about 25 mm (1 inch). 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 Server Door and Trim Bezels

Refer to the following illustration while you perform the steps in
this procedure.
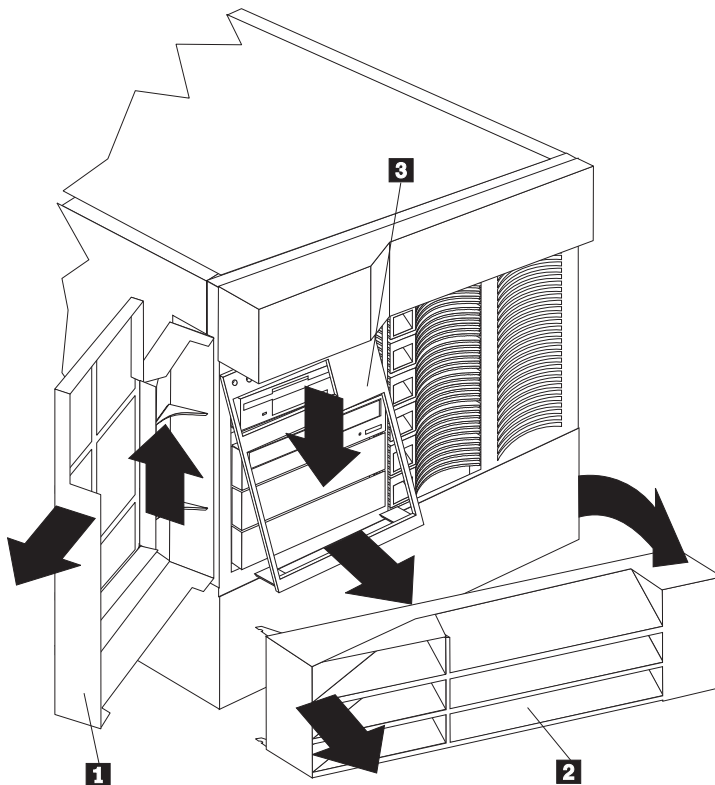
Removing the Server Door and Trim Bezels on the Tower Model

To remove the server door:

1. Unlock and open the server door **1** .

2. Lift the server door up and off its hinges. Store the door in a safe place.

To remove the NetBAY3 bezel (tower model only):

1. Unlock the NetBAY3 bezel **2** .

2. With your fingers on the ribbed area on the right side of the NetBAY3 bezel **2** , grasp the right side of the NetBAY3 bezel and pull it away from the pedestal.

3. Unhook the left side of the bezel from the server. Store the bezel in a safe place.

To remove the media-bay trim bezel:

1. Release the two tabs at the bottom edge of the bezel **3** and pull the bottom of the bezel slightly away from the server.

2. Pull the bezel down to release the two tabs at the top edge of the bezel. Store the bezel in a safe place.

Working with Adapters

You can add adapters to extend the capabilities and power of your server. Many adapters provide bus-master capabilities, which enable the adapters to perform operations without interrupting the server's microprocessor.

You can install up to seven adapters in the expansion connectors, called slots, on the system board of your server. Six of the slots are peripheral component interconnect (PCI) expansion slots and one is an industry standard architecture (ISA) expansion slot.

Four of the PCI slots allow you to install a new PCI adapter or replace an existing PCI adapter with the same type of adapter without turning the server power off and restarting the system, if these features are supported by your operating system. These slots are called *hot-pluggable* PCI slots. They are also referred to as hot-plug PCI slots.

The expansion slots have Plug and Play capabilities. See "Plug and Play Technology" on page 214 for additional information.

Your server comes with a video controller. This video controller is an integrated component on the system board. It is *not* in an expansion slot. The integrated video controller has super video graphics array (SVGA) technology.

The integrated video controller 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. When you install an ISA video adapter, you must move a jumper to disable the integrated video controller. See "System Board Jumpers" on page 420 for more information.

The following illustration shows the location of the PCI and ISA expansion slots on the system board.
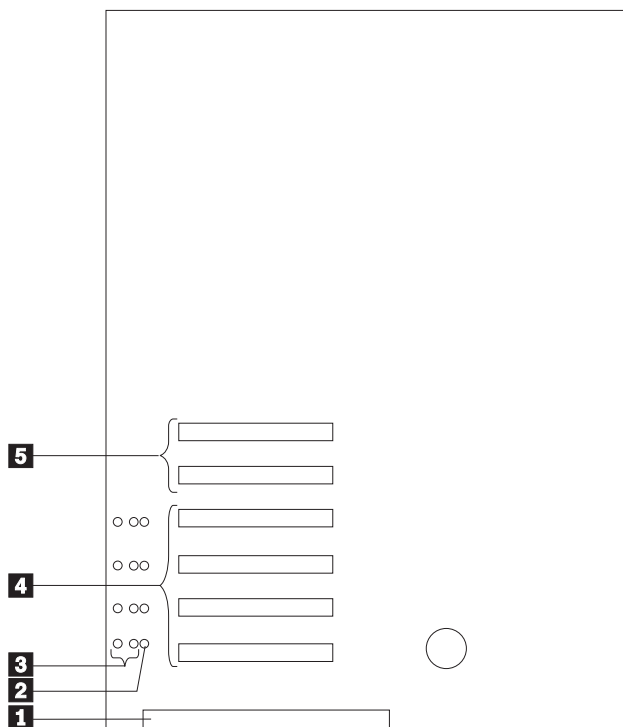
1 16-bit ISA slot
2 Power LEDs for hot-swap slots
3 Attention LEDs for hot-swap slots
4 Hot-plug 32-bit PCI slots 1–4
5 Non-hot-plug 32-bit PCI slots 5 and 6

LEDs for Hot-Plug PCI Slots

Each hot-plug PCI slot has three LEDS associated with it — two Attention LEDS and one Power LED.

- **Power LED:** This LED is on when the hot-plug PCI slot is active and has power. An adapter **must not** be added to or removed from the PCI slot when the Power LED is on. When this LED is off, the PCI slot is inactive and has no power

applied. An adapter can be installed when the Power LED for the PCI slot is off. Refer to your operating system documentation to determine if it supports hot-plug PCI adapters, and, if so, how to disable the hot-plug PCI slot.

- **Attention LEDs:** Each hot-plug PCI slot has an Attention LED that is visible from the rear of the server and one that can be seen from inside the server. (The LEDs have the same meaning; they are duplicated to be visible from outside or inside the server.) An Attention LED flashes approximately once per second when it is on. The meaning of the Attention LEDs is defined by your operating system. Refer to your operating system documentation to determine if it supports hot-plug PCI adapters and, if so, what the Attention LEDs indicate.

The following table describes the LEDs:

Power LED	Attention LED	Description
On	Flashing	The adapter required attention. **Slot still has power applied.** Do not remove or install an adapter in the slot. Refer to your operating system documentation for instructions.
On	Off	Normal operation; no intervention is required.
Off	Flashing	The adapter requires intervention. **Power is removed from the slot.** An adapter can be removed or installed in the slot.
Off	Off	**Power is removed from the slot.** An adapter can be removed or installed in the slot.

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 your adapter, follow the instructions that come with the adapter documentation.

- You can install a full-length ISA adapter in the ISA expansion slot.

- You can install full-length adapters in all PCI expansion slots.

- You can install hot-plug PCI adapters in PCI slots 1–4, if your operating system supports this feature. Non-hot-plug PCI adapters can also be installed in these slots.

- Your server supports 5.0 V and universal PCI adapters; it does not support 3.3 V adapters.

  Note: A universal PCI adapter supports both 3.3 V and 5.0 V operation.

- Your server uses a rotational interrupt technique to configure PCI adapters. This technique enables you to install a variety of PCI adapters that currently do not support sharing of PCI interrupts.

- PCI slots 5 and 6 are on the primary PCI bus and PCI slots 1–4 are on the secondary PCI bus. The performance of the PCI adapters depends on the configuration of adapters in your system.

Plug and Play Technology

Plug and Play is an ISA technology designed to make expanding your server easier. Plug and Play adapter support is built into the system board in your server. If your operating system supports Plug and Play technology, your server will automatically configure itself when you install an ISA Plug and Play device.

Note: PCI adapters are also often referred to as plug and play because they configure automatically.

Plug and Play Adapters

Plug and Play adapters are easier to install and set up because they are auto-configuring. This means that there are no jumpers or switches to set.

A Plug and Play adapter comes with built-in identification and configuration specifications (set in memory on the adapter) that provide installation information to the server during startup. This

information is read by the input/output (I/O) bus and interpreted by the server BIOS. The BIOS routines automatically configure the adapter around the resources already in use by other devices.

Legacy Adapters

If an adapter that you install is not Plug and Play compatible, the Configuration/Setup utility program can help you to manually configure the adapter. Adapters that are not Plug and Play compatible are known as *legacy devices.*

Configuration/Setup Utility Program

Within the Configuration/Setup utility program, the Plug and Play screen displays server resources that are typically required by adapters:

- I/O port address
- Memory address
- IRQ line
- DMA channel

From the Configuration/Setup utility program screens, you can select available resources for the adapter that you are installing. Resources that are not currently being used by adapters that are already installed in your server are listed as [**ISA Legacy**]. The system resources that are in use by other devices are listed as [**Not Applicable**].

Notes:

1. Refer to the documentation that comes with the adapter for information about required system resources. Then, make the appropriate jumper or switch settings on the adapter.

2. If you have a resource conflict, set the resources that are used by the ISA legacy adapter to [**ISA Legacy**]. This will manually configure the ISA legacy adapter to that specific server resource. Once Plug and Play detects that a resource is not available, it will skip that resource, and reconfigure to other available system resources. (See "Plug and Play" on page 172.)

Installing a Hot-Plug PCI Adapter

This section gives the procedure for installing a hot-plug PCI adapter. If you want to remove a hot-plug adapter, reverse the steps. If your operating system supports hot-replace PCI adapters, you can replace a failing hot-plug PCI adapter with a new adapter of the same type without turning off power to the server. If your operating system and adapter also support the hot-add feature, you can install a new adapter without turning off the power to the server.

Note: You do not need to turn the server off to install or remove a hot-plug PCI adapter.

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your adapter for any special requirements or restrictions.

- Read the documentation that comes with your operating system.

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 your system to lock up. Refer to your operating system documentation.

Refer to the following illustrations while you perform the steps in this procedure.
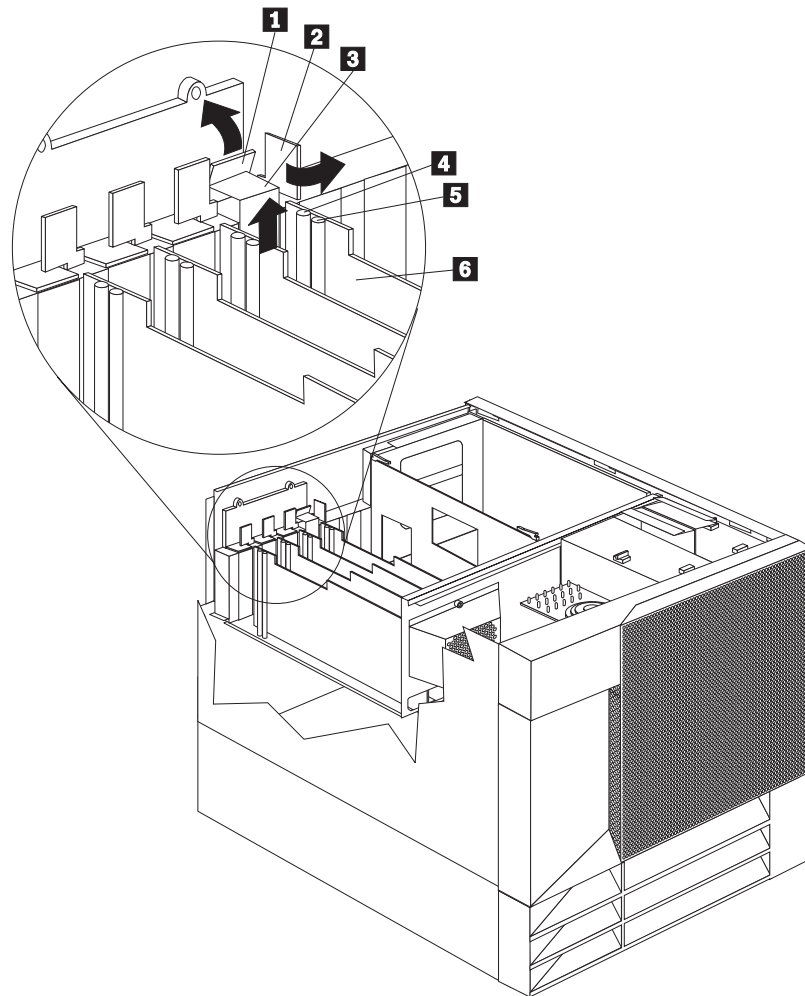
1 Tab
2 Adapter retention latch
3 Expansion-slot cover
4 Attention light
5 Power light
6 Plastic divider

Working with Adapters
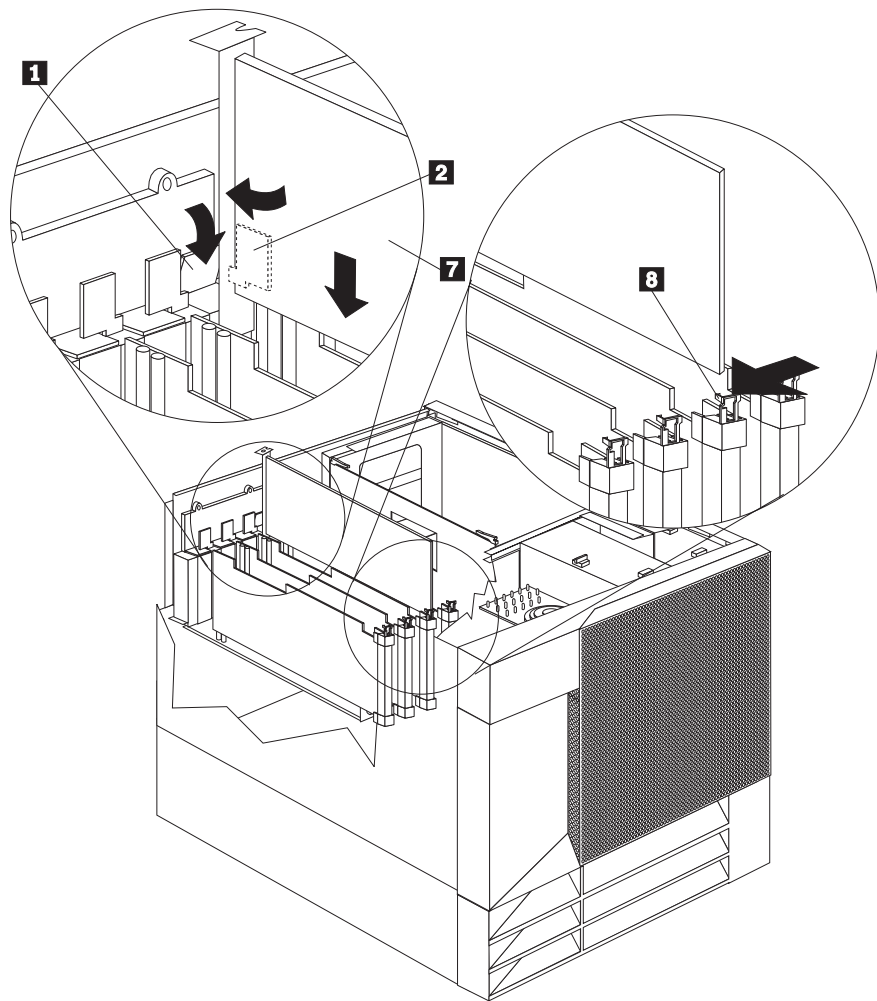
1	Tab
2	Adapter retention latch
7	Adapter
8	Adapter retention latch

To install a hot-plug PCI adapter:

1. Remove the top cover (see "Removing the Top Cover" on page 207).

2. Determine which expansion slot you will use for the adapter.

   Note: Only PCI slots 1–4 can be used for hot-plug PCI adapters.

3. Disable the selected PCI slot from your operating system. (Refer to the documentation that comes with your 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 **5** for the hot-plug PCI slot is off before you continue to the next step.

4. Remove the expansion-slot cover **3** :

   a. Rotate the adapter retention latch **2** counterclockwise.

   b. Lift the tab **1** covering the top of the expansion-slot cover **3** and remove expansion-slot cover from the server. Store it in a safe place for future use.

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

5. Refer to the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.

6. Remove the adapter from the static-protective package.

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

7. Place the adapter, component-side up, on a flat, static-protective surface.

8. Install the adapter **7** :

    a. Carefully grasp the adapter **7** by its top edge or upper corners, and align it with the expansion slot on the system 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 system-board connector. Incomplete insertion might cause damage to the system board or the adapter.

    c. Lower the tab **1** over the tab on the top corner of adapter. Rotate the adapter retention latch **2** clockwise until it snaps into place.

        Note: The expansion slot also has an adapter retention latch **8** at the end of the slot toward the middle of the server. To remove the adapter, you need to push this adapter retention latch **8** away from the adapter until the top edge of the adapter is past the latch.

9. Connect any needed cables to the adapter.

10. Enable the PCI slot from your operating system. (Refer to the documentation that comes with your operating system for information about enabling a hot-plug PCI slot.) Make sure that the Power light **5** 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 258.

Installing a Non-Hot-Plug Adapter

This section gives the procedure for installing a non-hot-plug adapter. If you want to remove a non-hot-plug adapter, reverse the steps.

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your option.

Working with Adapters

Refer to the following illustration while you perform the steps in this procedure.
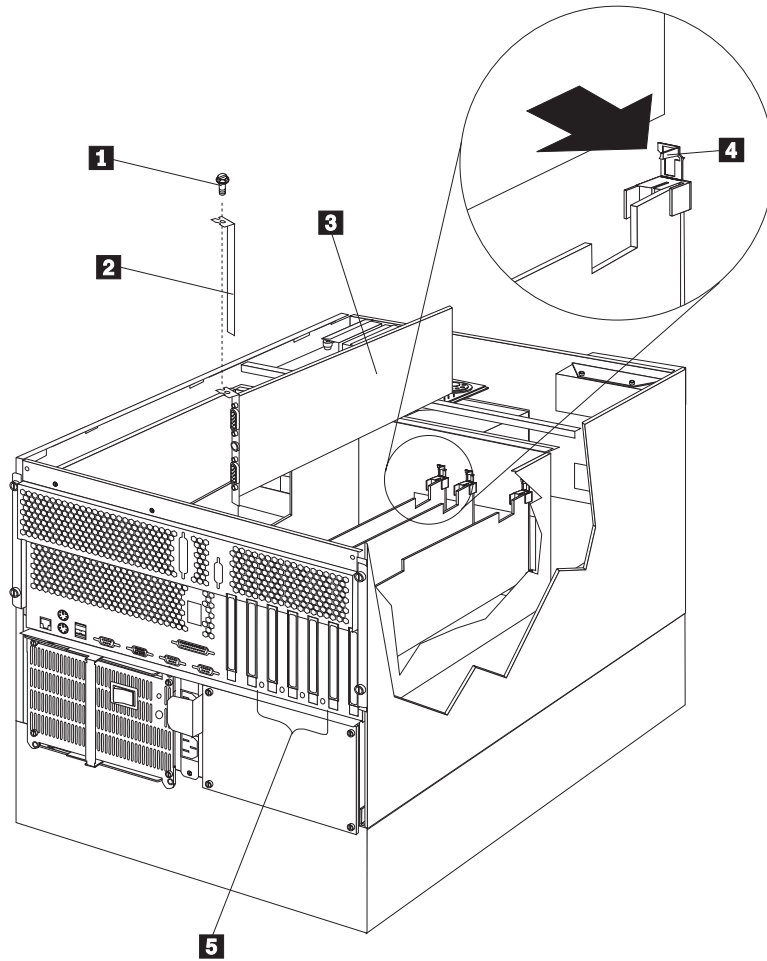
1 Expansion-slot cover screw
2 Expansion-slot cover
3 Adapter
4 Adapter retention latch

To install a non-hot-plug adapter:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords (see "Preparing to Install Options" on page 205); then remove the top cover (see "Removing the Top Cover" on page 207).

2. Determine which expansion slot you will use for the adapter.

   Note: Check the instructions that come with the adapter for any requirements or restrictions.

3. Remove the expansion-slot cover **2** :

   • If you are installing an adapter in PCI slot 1, 2, 3, or 4:

      a. See the illustration in "Installing a Hot-Plug PCI Adapter" on page 216 for operation of the adapter retention latch on the end of the slot near the rear of the server.

      b. Rotate the adapter retention latch counterclockwise.

      c. Lift the tab covering the top of the expansion-slot cover and remove expansion-slot cover from the server. Store it in a safe place for future use.

   • If you are installing an adapter in PCI slot 5 or 6 or in the ISA slot:

      a. Remove the screw **1** on the top of the expansion-slot cover **2** .

      b. Slide the expansion-slot cover out of the server.

      c. Store these items in a safe place for future use.

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

4. Refer to the documentation that comes with your adapter for any cabling instructions. It might be easier for you to route any cables before you install the adapter.

5. Remove the adapter from the static-protective package.

> *Note:* Avoid touching the components and gold-edge
> connectors on the adapter.

6. Place the adapter, component-side up, on a flat, static-protective
   surface.

7. Set any jumpers or switches as described by the adapter
   manufacturer.

8. Install the adapter:

   a. Carefully grasp the adapter **3** by its top edge or upper
      corners, and align it with the expansion slot on the system
      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 system-board
      connector before you apply power. Incomplete insertion
      might cause damage to the system board or the adapter.

9. If you are installing an adapter in PCI slots 1, 2, 3, or 4:

   a. Refer to the illustration in "Installing a Hot-Plug PCI
      Adapter" on page 216 for operation of the adapter
      retention latch on the end of the slot near the rear of the
      server.

   b. Lower the tab on the adapter guide over the tab on the top
      corner of the adapter. Rotate the adapter retention latch
      clockwise until it snaps into place.

   If you are installing an adapter in PCI slots 5 or 6 or in the ISA
   slot:

   a. Align the rounded notch in the retaining bracket with the
      threaded hole in the expansion-slot frame. The retaining
      bracket on the adapter fits into the space that was occupied
      by the expansion-slot cover.

   b. Insert the expansion-slot screw **3** that you removed earlier
      into the threaded hole, and push the rounded notch up
      against the screw.

   c. Tighten the expansion-slot screw firmly.

> *Note:* The expansion slot also has an adapter retention latch
> **4** at the end of the slot toward the middle of the
> server. To remove the adapter, you need to push this
> adapter retention latch **4** away from the adapter
> until the top edge of the adapter is past the latch.

10. Connect any needed cables to the adapter.

11. If you have other options to install or remove, do so now;
    otherwise, go to "Completing the Installation" on page 258.

Verifying Compatibility between Network Adapters and Device Drivers

Your server supports several types of network adapters. If you are
having trouble with the installation or operation of a network
adapter or network operating system, ensure that the
network-adapter device driver supports dual processors. Refer to
your network-adapter documentation for additional information
about adapter compatibility requirements.

Installing a Microprocessor Kit

Your server comes with one microprocessor installed on the processor board. When you install an additional microprocessor kit, your server can operate as a symmetric multiprocessing (SMP) server. With SMP, certain operating systems and application programs can distribute the processing load between the microprocessors. This enhances performance for database and point-of-sale applications, integrated manufacturing solutions, and other applications.

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- 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). The latest level of BIOS for your server is available through the World Wide Web and the IBM Bulletin Board System (BBS). See Chapter 9, "Getting Help, Service, and Information" for the appropriate World Wide Web addresses and bulletin-board telephone numbers.

- Obtain an SMP-capable operating system (optional). For a list of supported operating systems, see http://www.pc.ibm.com/us/compat/ on the World Wide Web.

Notes:

1. The illustrations in this section might differ slightly from your hardware.

2. To order additional microprocessor options, contact your IBM reseller or IBM marketing representative.

3. To avoid damage and ensure proper server operation when you install a new or additional microprocessor, use the same speed and voltage as those of the currently installed microprocessor. Microprocessor internal and external clock frequencies must be identical.

4. The microprocessor that is installed in the primary microprocessor connector is CPU or processor 1. If a microprocessor is installed in the secondary microprocessor connector, it is CPU or processor 2. If the server has only one microprocessor installed, that microprocessor is installed in the primary microprocessor connector and is the boot processor. If the server has two microprocessors installed, the microprocessor in the secondary microprocessor connector is the boot processor and the microprocessor in the primary microprocessor connector is the application processor.

Installing a Microprocessor Kit

Refer to the following illustration while you perform the steps in
this section.

Note: The illustration shows only the processor board for simplicity;
you do not need to remove the processor board to install a
microprocessor kit.
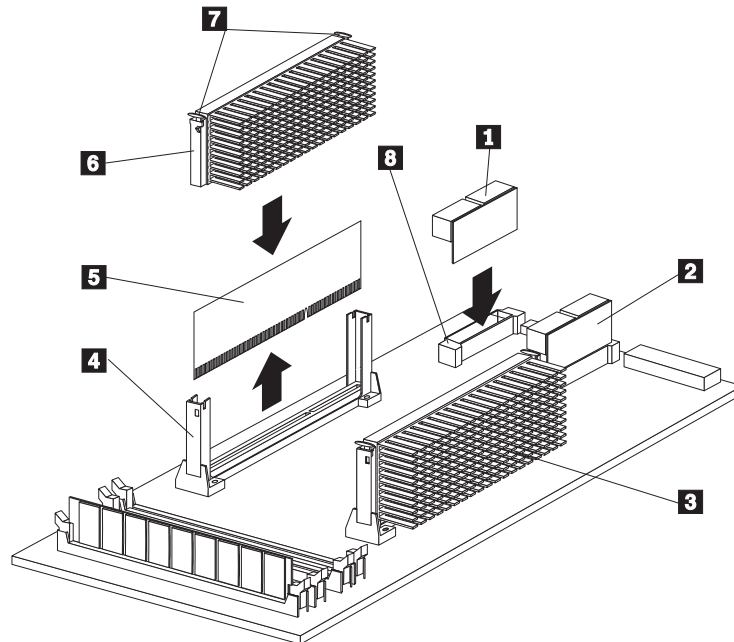
1 Voltage regulator module (VRM) for secondary
microprocessor
2 VRM for primary microprocessor
3 Primary microprocessor (CPU or processor 1)
4 Secondary microprocessor connector
5 Terminator card
6 Secondary microprocessor (CPU or processor 2)
7 Latches
8 Connector for VRM for secondary microprocessor

To install an additional microprocessor kit:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords (see "Preparing to Install Options" on page 205); then remove the top cover (see "Removing the Top Cover" on page 207).

2. Remove the terminator card **5** from the secondary microprocessor connector **4**. You do not need the terminator card when you have a second microprocessor installed. You can store it in a safe place in the static-protective package that your new microprocessor is shipped in.

3. 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. Center the microprocessor **6** over the secondary connector **4**.

      Attention:
      Make sure the microprocessor is oriented and aligned correctly before you try to press it into the connector.

   c. Press in on the latches **7** and carefully insert the microprocessor into the connector.

   d. Press outward on the latches **7** to lock the microprocessor in place.

      Note: To remove the microprocessor, press in on the latches **7** and lift the microprocessor out of the connector.

4. Install the voltage regulator module (VRM) **1** included in the microprocessor kit in the secondary VRM connector **8**.

   Note: If you remove the secondary microprocessor at some time in the future, remember to install the terminator card in the secondary microprocessor connector and to remove the VRM for the secondary microprocessor.

5. If you have other options to install or remove, do so now; otherwise, go to "Completing the Installation" on page 258.

Installing Memory-Module Kits

Adding memory to your server is an easy way to make programs run faster. You can increase the amount of memory in your server by installing options called *memory-module kits*. Each kit contains one industry-standard, dual-inline memory module (DIMM). Your server uses a noninterleaved memory configuration.

Your server comes with a memory-module installed in connector J1, the connector nearest the rear of the server. Install additional memory modules in connectors J2, J3, and J4, in that order. If you mix DIMM sizes, install the largest sized DIMM in connector J1, the next largest sized DIMM in connector J2, and so forth.

Notes:

1. The memory-module kit sizes available for your server are 64 MB, 128 MB, and 256 MB. Your server supports a minimum of 128 MB and a maximum of 1 GB of system memory.

2. Install only 3.3 V, 168-pin, 8-byte DIMMs. Only 100 MHz, 72-bit, unbuffered, synchronous, error correcting code (ECC), x8 configuration DIMM memory is supported for the 64 MB and 128 MB DIMMs. Only 100 MHz, 72-bit, registered, synchronous, ECC, x4 configuration DIMM memory is supported for the 256 MB DIMMs.

3. Mixing of DIMM types (registered and unbuffered) is not supported. You can install 64 MB unbuffered and 128 MB unbuffered DIMMs in the same system, but neither 64 MB unbuffered nor 128 MB unbuffered DIMMs can be installed in a system with 256 MB registered DIMMs.

4. Installing or removing memory modules changes the configuration information in the server. Therefore, after installing or removing a DIMM, save the new configuration information in the Configuration/Setup program. When you restart the server, the system displays a message indicating that the memory configuration has changed. Start the Configuration/Setup program and select **Save Settings.** See "Using the Configuration/Setup Utility Main Menu" on page 161 for more information.

Refer to this illustration while you perform the steps in this procedure.

Note: The illustration shows only the processor board for simplicity; you do not need to remove the processor board to install a memory module.
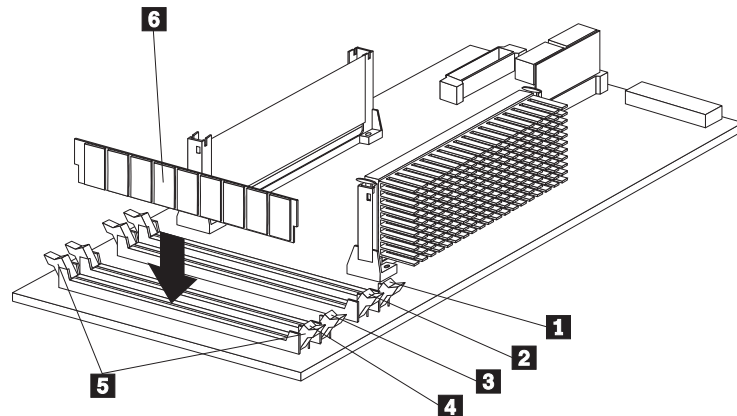
1 Memory socket 1 (J4)
2 Memory socket 2 (J3)
3 Memory socket 3 (J2)
4 Memory socket 4 (J1)
5 Retaining clips
6 DIMM

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your option.

To install a memory module:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords (see "Preparing to Install Options" on page 205); then remove the top cover (see "Removing the Top Cover" on page 207).

2. Locate the memory-module connectors on the memory board.

3. Touch the static-protective package containing the memory-module kit to any unpainted metal surface on the server. Then, remove the memory module from the package.

4. Install the memory module:

   Note: To avoid breaking the retaining clips or damaging the memory-module connectors, handle the clips gently.

   a. Locate the lowest-numbered, empty memory-module connector on the processor board.

   b. Turn the memory module (DIMM) **6** so that the pins align correctly with the connector **4** .

   c. Insert the DIMM into the connector by pressing on one edge of the DIMM and then on the other edge of the DIMM. Be sure to press straight into the connector.

   d. Repeat the preceding step to make sure the DIMM is seated correctly.

   e. Make sure the retaining clips **5** are in the closed position.

   f. If a gap exists between the DIMM and the retaining clips, the DIMM has not been properly installed. In this case, open the retaining clips and remove the DIMM; then, reinsert the DIMM.

   g. Repeat these steps for each memory module that you install.

5. If you have other options to install or remove, do so now; otherwise, go to "Completing the Installation" on page 258.

Installing Internal Drives

Different types of drives allow your system to read multiple types of media and store more data. Several types of drives are available, such as:

- Diskette
- Hard disk
- CD-ROM
- Tape

Internal Drive Bays

Internal drives are installed in *bays*. Your server comes with one 3.5-inch, 1.44 MB diskette drive and one CD-ROM drive.
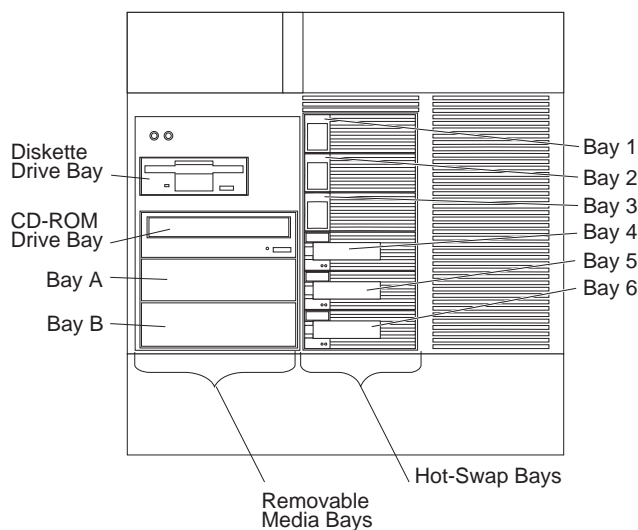
Your server contains hardware that lets you replace a failed hard disk drive without turning off the server. Therefore, you have the advantage of continuing to operate your system while a hard disk drive is removed or installed. These drives are known as *hot-swappable* drives. They are also referred to as hot-swap drives.

Each hot-swap drive bay has two indicator lights on the front of the server (see "Information LED Panel" on page 12). 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 have a hot-swap-drive tray attached. The drive must have a single connector attachment (SCA) connector. Hot-swap-drive trays come with the hot-swap drives.

- Your server comes with a preinstalled 3.5-inch, 1.44 MB diskette drive and a preinstalled IDE CD-ROM drive.

- Bays A and B come without a device installed. These bays are for 5.25-inch, half-high, removable-media drives, such as tape backup drives. Bays A and B can be combined into a single full-high bay.

- The Netfinity 5500 supports only one diskette drive.

- Your server does not support hard disk drives in bays A and B because of cooling considerations.

  Note: The server's EMI integrity and cooling are both protected by having the left front bays (removable-media 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.

- If you are installing a device with a 50-pin connector in one of the removable-media bays (bays A–B), you need a 68-pin to 50-pin converter. To order the converter, contact your IBM reseller or IBM marketing representative.

- Your server supports six slim (1-inch) or three half-high (1.6-inch), 3.5-inch hot-swap hard disk drives in the hot-swap bays.

- The hot-swap bays connect to a SCSI *backplane*. This backplane is the printed circuit board behind the bay. The backplane supports up to six hard disk drives.

- The diskette drive uses 1 MB and 2 MB diskettes. For optimum use, format 1 MB diskettes to 720 KB and format 2 MB diskettes to 1.44 MB.

SCSI Drives

Some drives have a special design called *small computer system interface*, or SCSI. This design allows you to attach multiple drives to a single SCSI channel.

Notes:

1. Any information about SCSI drives also applies to other SCSI devices, such as tape drives.

2. If you plan to install both internal and external SCSI devices, you must follow the instructions in "Connecting External Options" on page 263, in addition to the instructions in this section.

A 16-bit (wide) SCSI cable connects the hot-swap backplane to one channel of the integrated RAID SCSI controller on the system board. An additional 16-bit SCSI cable with connectors for optional devices in bays A and B connects to the second channel of the RAID controller. This cable has a terminator at the other end and is folded and restrained with a cable clamp to the bottom of your server between the open bays and the power supply area.

SCSI IDs

Each SCSI device that is connected to an individual channel of the RAID controller needs a unique identification (ID) so that the controller can identify the devices and ensure that different devices do not attempt to transfer data at the same time. (The two channels of the integrated RAID controller operate independently.) If you need to set IDs for SCSI devices, refer to the instructions that come with those devices.

Your server automatically sets SCSI IDs for hot-swap hard disk drives, according to the jumper settings on the SCSI backplanes. The server uses the hard disk drive SCSI IDs to send status information to the indicator lights above each hot-swap bay.

The SCSI backplane in the server supports up to six hot-swap bays. Table 2 on page 236 shows the default SCSI IDs that the backplane assigns for hot-swap hard disk drives.

Table 2. Automatically Assigned SCSI IDs						
Bay	1	2	3	4	5	6
ID	0	1	2	3	4	5
Note: The default SCSI ID for the SCSI backplane is 15. The default SCSI ID for each channel of the RAID controller is 7.						

You can change the default ID addresses of the drives by changing the jumper settings on the SCSI backplane. See "SCSI Backplane Option Jumpers" on page 427. A simplified layout of the SCSI backplane is shown in "SCSI Backplane Component Locations" on page 426.

The processing sequence for SCSI devices is set through the ServeRAID Configuration Utility program. The sequence proceeds from the lowest SCSI ID to the highest (0 to 6, then 8 to 15).

Termination (Internal SCSI Devices)
SCSI buses must be terminated at each end. The ends of the SCSI buses in your server are already terminated.

All the hot-swap drives in your server have automatic termination and the RAID controller provides termination at the other end of the SCSI bus.

If you install SCSI devices in the removable-media bays (bays A and B), you must disable the termination on the devices; the RAID controller is already terminated and the SCSI cable for devices in the removable-media drive bays has a terminator at the other end. For example, when you install a SCSI device in a removable-media drive bay (bay A or B), set its termination to Disable, because the SCSI cable is already terminated at the end.

Refer to the information that come with the SCSI device for instructions about setting device jumpers or switches that control termination.

Preinstallation Steps (All Bays)

Before you install drives in your server, verify that you have all the cables and any other equipment specified in the documentation that comes with the internal drive. You might also need to perform certain preinstallation activities. Some of the steps are required only during the initial installation of an option.

┌─── **Before you begin:** ─────────────────────────────────┐

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.
- Read the documentation that comes with the internal drive.

└──┘

1. Choose the bay in which you want to install the drive.

2. Check the instructions that come with the drive to see if you need to set any switches or jumpers on the drive.

3. To install the drive, go to "Installing a 5.25-inch Removable-Media Drive" or "Installing a Drive in a Hot-Swap Bay" on page 241.

Installing a 5.25-inch Removable-Media Drive

┌─── **Before you begin:** ─────────────────────────────────┐

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your drive.

- Prepare the drive for installation (see "Preinstallation Steps (All Bays)").

└──┘

Note: The server's 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.

Installing Internal Drives

Refer to the following illustrations while you perform the steps in this procedure.
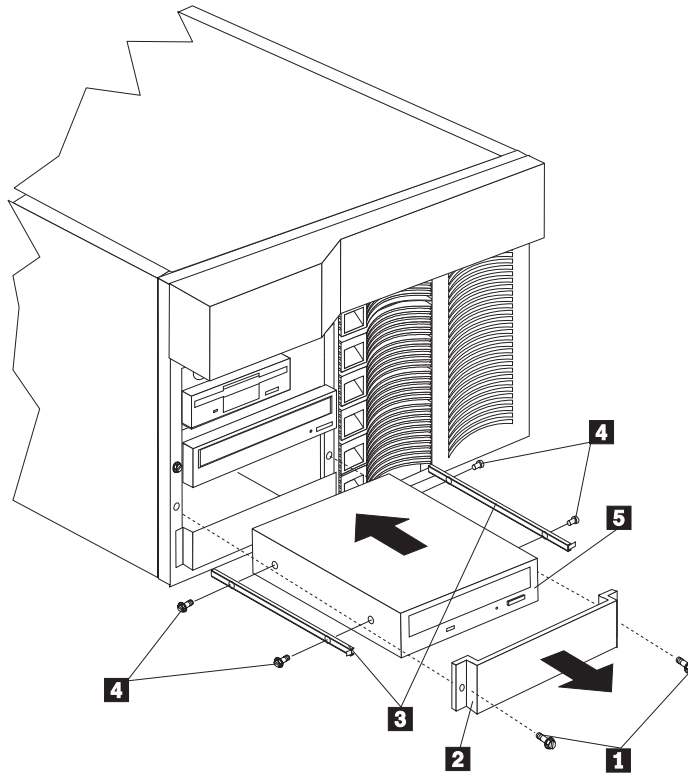
1 Screws for filler panel
2 Filler panel with EMI shield
3 Slide rails
4 Screws for slide rails
5 Drive
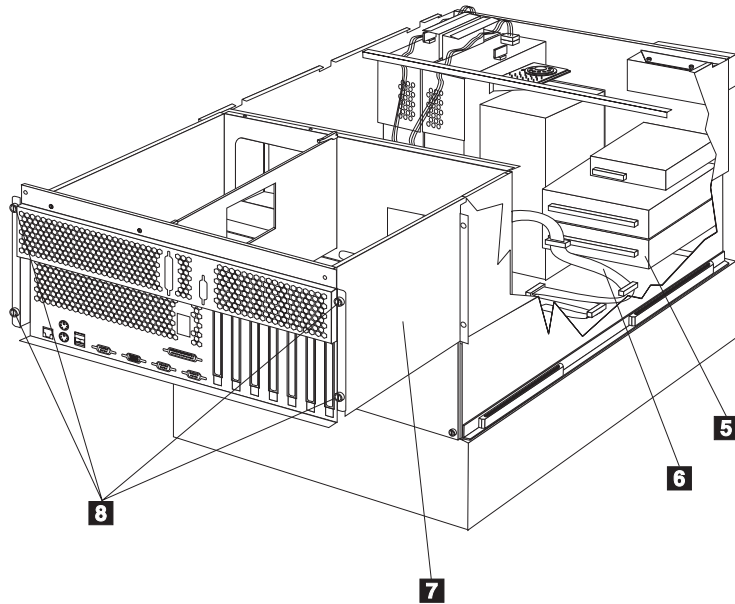
5 Drive
6 SCSI cable for the removable-media drive bays
7 Shuttle
8 Thumbscrews

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

1. Turn off the server and peripheral devices (see "Preparing to Install Options" on page 205) and remove the top cover (see "Removing the Top Cover" on page 207).

2. Remove the NetBAY3 bezel and the media-bay trim bezel. (See "Removing the Server Door and Trim Bezels" on page 209.)

3. Remove the screws **1** and filler panel **2** from the bay opening. Save screws for later use in this procedure. You do not need the filler panel when you have a drive installed in the bay.

4. 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.

5. Set any jumpers or switches on the drive according to the documentation that comes with the drive.

6. Use screws **4** of the appropriate size and length to attach a slide rail **3** to each side of the drive **5**.

   Note: The slide rails and screws are included in the drive accessory kit that comes with your server.

7. Place the drive so that the slide rails engage in the bay guide rails. Push the drive into the bay and attach it with the two screws **1** from the filler panel.

8. Loosen the four thumbscrews **8** on the shuttle at the back of the server.

9. Pull the shuttle **7** toward the back of the server.

10. Connect one of the connectors on the SCSI cable for the removable-media drive bays **6** to the back of the drive **5**.

11. Connect a power cable to the back of the drive. Power cables for removable-media drives come installed in your server. The connectors are keyed and can be inserted only one way.

12. If you are installing another 5.25-inch drive, do so at this time. Otherwise, continue with the next step.

13. Push the shuttle **7** toward the front of the server and tighten the four thumbscrews **8** at the back of the shuttle.

14. Install the media-bay trim bezel and the NetBAY3 bezel that you removed earlier. (See "Installing the Trim Bezels and Server Door" on page 260)

15. If you have other options to install or remove, do so now; otherwise, go to "Completing the Installation" on page 258.

Installing a Drive in a Hot-Swap Bay

The bays on the right front of the server support hot-swap drives only.

Note: You do not have to turn off the server to install hot-swap drives in these bays. However, you must turn off the server when performing any steps that involve installing or removing cables.

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your drive.

- Reviewed Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33 for information about the RAID controller and disk-array configuration.

- Prepare the drive for installation (see "Preinstallation Steps (All Bays)" on page 237).

Installing Internal Drives

Refer to the following illustration while you perform the steps in this procedure.
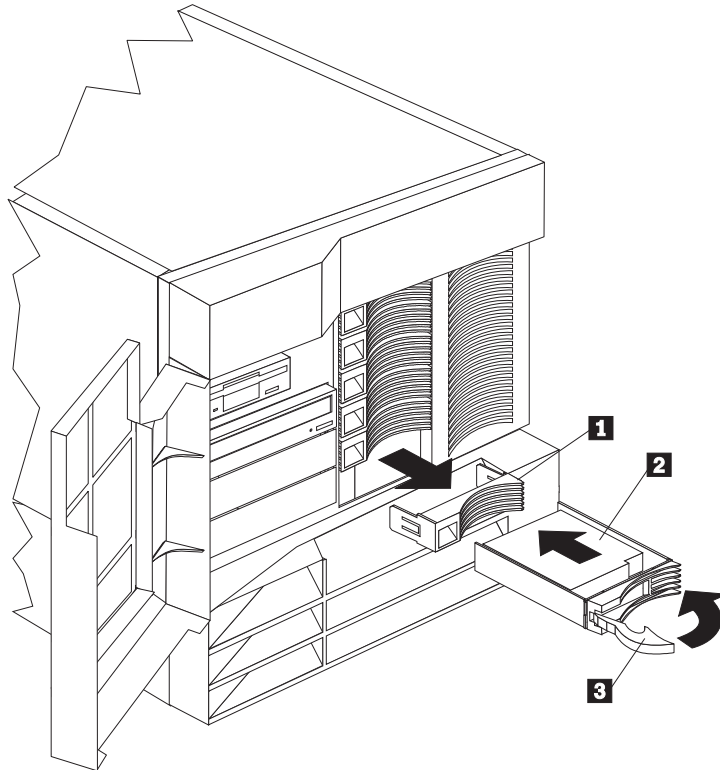
1 Filler panel
2 Hot-swap hard disk drive
3 Drive tray handle (open position)

To install a drive in a hot-swap bay:

1. Unlock and open the server door (see "Preparing to Install Options" on page 205).

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

2. Remove the filler panel **1** 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.

3. Install the hard disk drive **2** in the hot-swap bay:

   a. Ensure the tray handle **3** is open (that is, perpendicular to the drive).

   b. Align the drive/tray assembly so that it engages the guide rails in the bay.

   c. Gently push the drive assembly into the bay until the drive connects to the backplane.

   d. Push the tray handle to the right until it locks.

4. Check the hard disk drive status indicators to verify that the hard disk drives are operating properly. See "Identifying Problems Using Status LEDs" on page 377 for details.

5. Close and lock the server door.

   Note: Because your server has a RAID controller, you must reconfigure your disk arrays after installing hard disk drives. Record the configuration information in the appropriate tables in "Installed Device Records" on page 403.

Replacing a Drive in a Hot-Swap Bay

Note: You do not have to turn off the server to remove a drive
from the hot-swap bays.

Attention:

Before you remove from a hot-swap bay a hard disk drive that is
not defective, back up all important data.

Before you attempt to remove a defective drive, thoroughly review
the information that appears on your server screen to determine the
location of the failed drive. "ServeRAID Menus, Screens, and Drive
States" on page 40 explains the status codes that your server uses to
indicate a defective drive. Also, if the amber Hard Disk Status light
for a drive is lit continuously, that individual drive is faulty and
needs to be replaced. If you remove a hard disk drive that is not
defective from an array that already has a defective hard disk drive,
all data in the array will be lost. This situation is especially relevant
if you assigned RAID level 1 or 5 to the logical drives in your disk
array. However, the RAID controller can rebuild the data that you
need, provided that certain conditions are met. See "Replacing a
Faulty Drive" on page 86 for further details.

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling
  Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your drive.

- Reviewed Chapter 3, "Configuring and Monitoring Your
  Disk Arrays" on page 33 for information about the
  ServeRAID controller and disk-array configuration.

- Prepare the drive for installation (see "Preinstallation Steps
  (All Bays)" on page 237).

Refer to the following illustrations while you perform the steps in
this procedure.
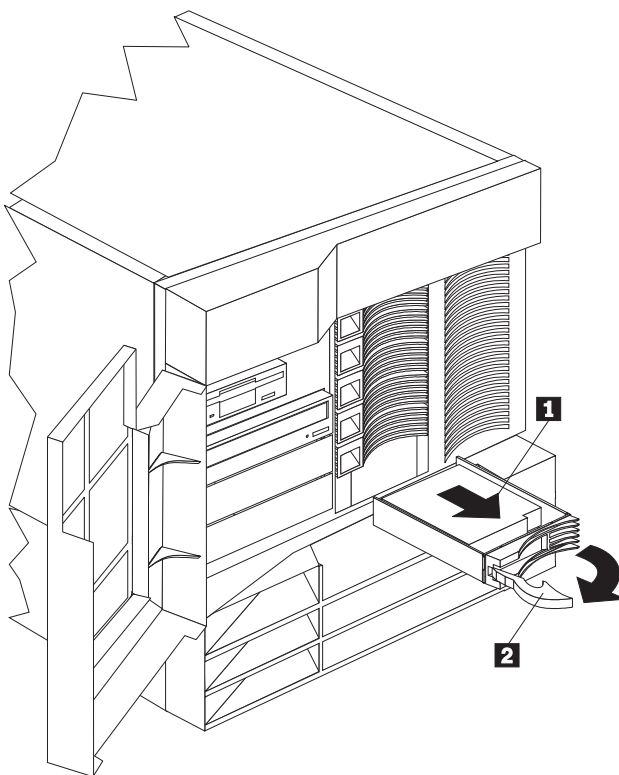
■1 Hard disk drive
■2 Drive tray handle (open position)

Installing Internal Drives
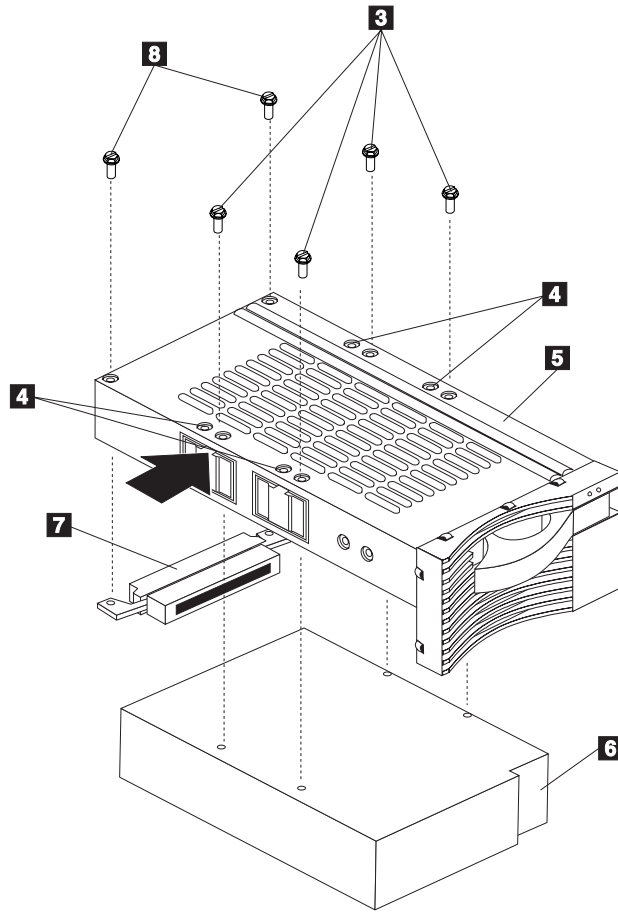
3 Screws for half-high drive
4 Screw holes for slim-high drive
5 Drive tray
6 Drive
7 Connector for half-high drive
8 Screws for half-high drive connector

To replace a drive in a hot-swap bay:

1. Unlock and open the server door (see "Preparing to Install Options" on page 205).

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

2. Remove the defective hard disk drive **1** by placing the handle **2** on the drive to the open position (perpendicular to the drive) and pulling the hot-swap tray from the bay.

3. Remove the hard disk drive from the tray:

   a. If the drive is a half-high drive, remove the two screws **8** that hold the connector **7** to the hot-swap tray **5** ; then, remove the connector from the back of the drive.

   b. Remove the four screws **3** (for a half-high drive) or **4** (for a slim-high drive) that attach the drive **6** to the hot-swap tray, and remove the drive from the tray.

4. Place the new hard disk drive on the hot-swap tray and attach the drive to the tray using four screws, as follows:

   a. If the drive is a half-high drive, use screws **3** to attach the drive to the tray. If the drive is a slim-high drive, use screws in holes **4** to attach the drive to the tray.

   b. As you tighten each screw, press on the metal spring nearest the screw at the point indicated by the arrow on the illustration.

   c. If the drive is a half-high drive, plug the connector **7** to the back of the drive and secure the connector to the drive with screws **8** . (Slim-high drives do not need the connector.)

5. Install the hard disk drive in the hot-swap bay:

   a. Ensure the tray handle is open (that is, perpendicular to the drive).

   b. Align the drive/tray assembly so that it engages the guide rails in the bay.

    c. Push the drive assembly into the bay until the drive connects to the backplane.

    d. Push the tray handle to the right until it locks.

6. Check the hard disk drive status indicators to verify that the hard disk drive is installed properly. See "Identifying Problems Using Status LEDs" on page 377 for details.

7. Close and lock the server door.

Installing a Hot-Swap Power Supply

Your server comes with one power supply. You can add a second power supply to provide redundant power. After you install a power supply, check the power-supply status indicators to verify that the power supply is operating properly. See "Power Supplies" on page 17 for details.

9

⚠️

CAUTION:
Never remove the cover on a power supply or any part (power backplane and AC box) that has the following label attached.

⊗ ⚡

Hazardous voltage, current, and energy levels are present inside the power supplies, power backplane, and AC box. There are no serviceable parts inside the power supplies, power backplane, or AC box. If you suspect a problem with one of these parts, contact an IBM service technician.

Installing a Hot-Swap Power Supply

Refer to the following illustration while performing the steps in this procedure.

Note: You do not need to turn off the power to the server to install hot-swap power supplies.
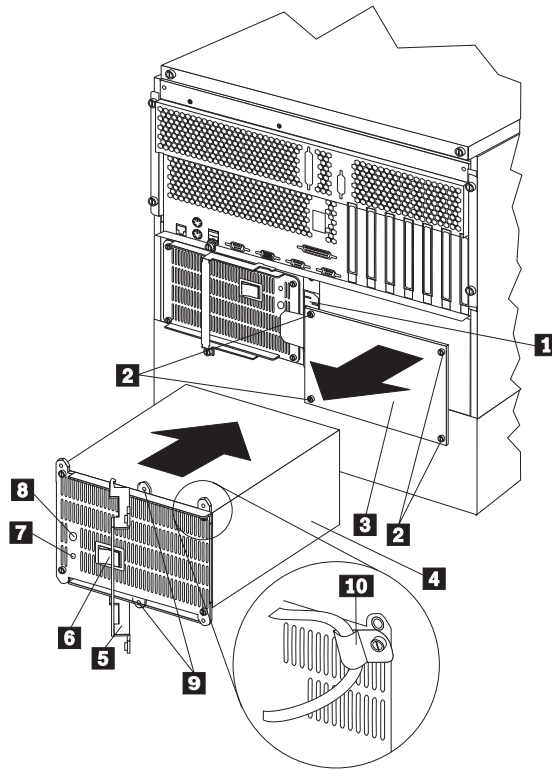
1 Power cord connector for power supply 2
2 Screws
3 Filler panel
4 Power supply
5 Handle
6 Power switch on power supply
7 AC Power light
8 DC Power light
9 Holes for shipping screws
10 Power-cord strain-relief bracket

To add a power supply:

9

CAUTION:
Never remove the cover on a power supply or any part
(power backplane and AC box) that has the following label
attached.

Hazardous voltage, current, and energy levels are present
inside the power supplies, power backplane, and AC box.
There are no serviceable parts inside the power supplies,
power backplane, or AC box. If you suspect a problem
with one of these parts, contact an IBM service technician.

Note: It is not necessary to turn the Power switch on the power
supply off when you are installing a power supply.

1. Remove the filler panel **3** :

   a. Remove the four screws **2** from the filler panel.

   b. Remove the filler panel **3** from the power-supply bay and
   save it and the four screws you removed for future use.

      Note: During normal operation, each power-supply bay
      should have either a power supply or filler panel
      installed for proper cooling.

2. Place the handle **5** on the power supply in the open position,
   and slide the power supply into the chassis.

3. Gently close the handle **5** on the power supply to seat the
   power supply in the bay.

4. Plug the power cord for the added power supply into power
   cord connector **1** .

7

⚠

CAUTION:
When the power-cord strain-relief bracket option is installed on the power cord, the server must be plugged to a power source that is easily accessible.

5. Install a power-cord strain-relief bracket **10** , if desired.

6. Plug the power cord into a properly grounded electrical outlet.

7. Make sure the Power switch **6** on the power supply is in the On position.

8. Verify that the DC Power light **8** and AC Power light **7** on the power supply are lit, indicating that the power supply is operating correctly.

Removing a Hot-Swap Power Supply

Your server comes with one power supply. You can add a second power supply to provide redundant power. Each power supply has two status indicators; see "Power Supplies" on page 17 for information about the status indicators.

Attention:
You cannot hot swap a power supply if your server has only one power supply installed.

Refer to the illustration in "Installing a Hot-Swap Power Supply" on page 249 while you perform the steps in this procedure.

To remove a hot-swap power supply:

9

⚠️

CAUTION:
Never remove the cover on a power supply or any part (power backplane and AC box) that has the following label attached.

Hazardous voltage, current, and energy levels are present inside the power supplies, power backplane, and AC box. There are no serviceable parts inside the power supplies, power backplane, or AC box. If you suspect a problem with one of these parts, contact an IBM service technician.

1. If your server has only one power supply installed, turn off the server and peripheral devices (see "Preparing to Install Options" on page 205); otherwise, go to the next step.

   Attention:
   Before removing a functional power supply, set the Power switch on the power supply to the Off position.

Removing a Hot-Swap Power Supply

2. Set the Power switch on the power supply that you are removing to the Off position.

3. Remove the power supply **4** :

   a. Remove the shipping screws **9** from the power supply, if they have not already been removed.

      Note: You do not need to replace the shipping screws.

   b. Remove the power-cord strain-relief bracket **10** , if one is installed.

   c. Grasp the handle **5** on the power supply and pull the handle toward the center of the server; then, slide the power supply out of the chassis.

      Note: During normal operation, each power-supply bay should have either a power supply or filler panel installed for proper cooling.

4. If you are not installing a replacement power supply:

   a. Disconnect the power cord for the power supply that you replaced.

   b. Install a power-supply filler panel; then go to step 5 on page 255.

   If you are replacing the power supply:

   a. Place the handle **5** on the power supply in the open position, and slide the power supply into the chassis.

   b. Gently close the handle **5** on the power supply to seat the power supply in the bay.

   c. Make sure the Power switch **6** on the power supply is in the On position.

   d. Verify that the AC Power light **7** and DC Power light **8** are lit, indicating that the power supply is operating correctly.

7

⚠

CAUTION:
When the power-cord strain-relief bracket option is installed on the power cord, the server must be plugged to a power source that is easily accessible.

e. Install a power-cord strain-relief bracket **10** , if desired.

5. If you have other options to install or remove, do so now; otherwise, go to "Completing the Installation" on page 258.

Replacing a Hot-Swap Fan Assembly

Your server comes with three hot-swap fan assemblies.

Attention:
Replace a fan that has failed within 48 hours to help ensure proper cooling.

Note: You do not need to turn off the power to the server to replace a hot-swap fan assembly.

Replacing a Hot-Swap Fan Assembly

The following illustration shows the replacement of a hot-swap fan assembly. Refer to this illustration while performing the steps in this procedure.
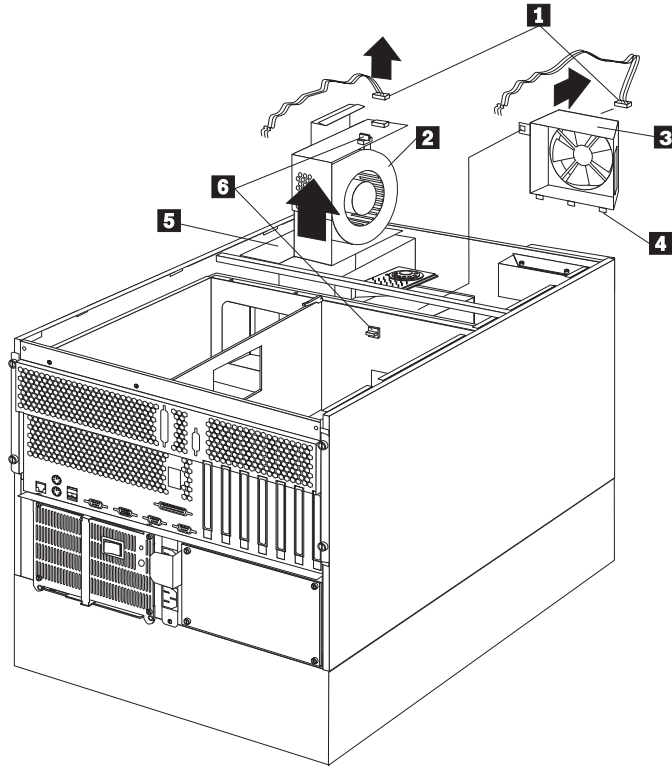
1 Fan power cables
2 Hot-swap fan assembly 2
3 Hot-swap fan assembly 1
4 Tabs
5 Hot-swap fan assembly 3
6 Quarter-turn fasteners

To replace a hot-swap fan assembly:

11

⚠

CAUTION:
The power cable to the fan should be disconnected
whenever the fan assembly is not installed in the server;
otherwise, the fan might start turning while you are holding
it and the fan blades could injure your fingers.

1. Remove the top cover (see "Removing the Top Cover" on page 207).

   Attention:
   To ensure proper system cooling, the top cover should be removed for no more than 30 minutes during this procedure.

2. Determine which fan assembly **2** , **3** , or **5** needs to be replaced by checking the fan LEDs on the diagnostic panel (see "Diagnostics Panel LEDs" on page 379).

3. Disconnect the fan power cable **1** from the fan assembly that you are replacing.

4. Turn the quarter-turn fastener **6** for the fan assembly one quarter turn and remove the fan assembly from the server.

5. Slide the replacement fan assembly into the server. (If you are replacing fan assembly 1 **3** , make sure the tabs **4** fit into the slots at the bottom of the fan opening in the server.)

6. When you have the fan assembly correctly seated, turn the quarter-turn fastener **6** one quarter turn to secure the fan in the server.

7. Connect the fan power cable **1** to the power connector.

8. Replace the top cover (see "Installing the Top Cover" on page 259).

Completing the Installation

To complete your installation, you must reinstall the side and top covers, reconnect all the cables that you disconnected in "Preparing to Install Options" on page 205, and, for certain options, run the Configuration utility program. Follow the instructions in this section.

Attention:
For correct 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 Top Cover
To install the server top cover:

1. Before installing a 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 **2** 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.
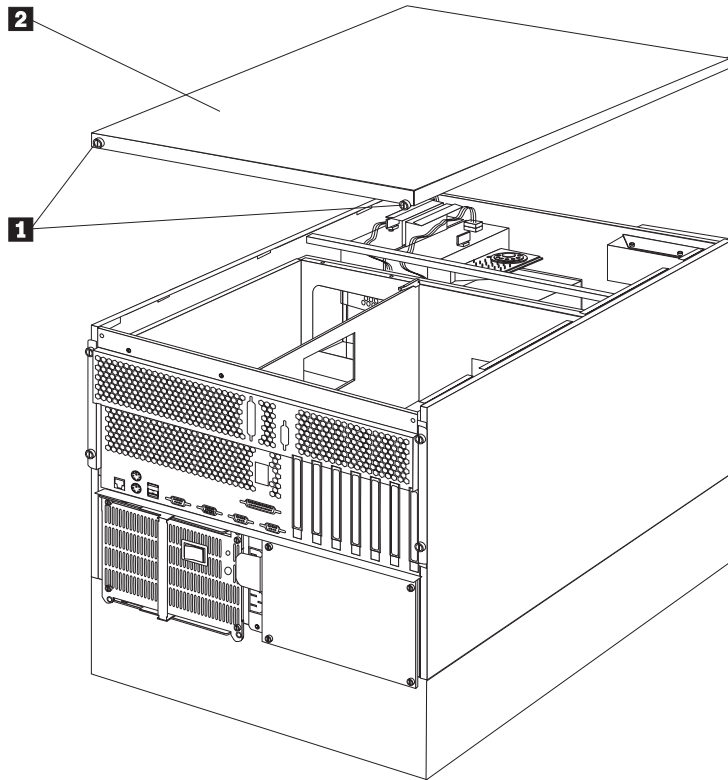
4. Tighten the two thumbscrews **1** on the back edge of the cover.

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.

Notes:

a. If you are in the United Kingdom and have a modem or fax machine attached to your server, reconnect the telephone line *after* you plug in the power cords.

b. If necessary, see "Input/Output Connectors and Expansion Slots" on page 14 for connector locations.

Installing the Trim Bezels and Server Door

Refer to the following illustration while you perform the steps in this procedure.
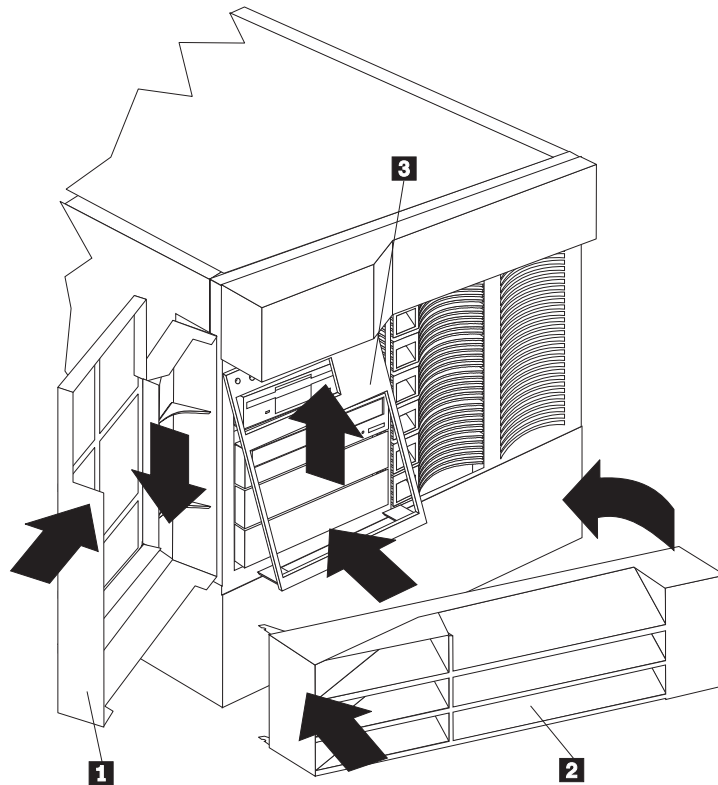
To install the media-bay trim bezel:

1. Insert the two tabs on the top of the media-bay trim bezel **3** in the matching holes on the server chassis.

2. Push the bottom of the bezel toward the server until the two tabs at the bottom of the bezel snap into place.

To install the NetBAY3 bezel:

1. Hook the tabs on the left side of the NetBAY3 bezel **2** around the posts on the NetBAY3.

2. Gently push the right side of the bezel toward the server until the bezel snaps into place.

3. Lock the NetBAY3 bezel.

To install the server front door:

1. Align the pins on the server door **1** with the hinges on the server and slide the door down.

2. Close and lock the door.

Updating Device Records and Reconfiguring the Server

When you start your 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.

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

If you have installed a new microprocessor, you might want to upgrade your operating system. Refer to your ServerGuide package. If you have installed or removed hard disk drives, see Chapter 3, "Configuring and Monitoring Your Disk Arrays" for information about reconfiguring your disk arrays.

Run the Configuration/Setup utility program to save the new configuration information. See Chapter 4, "Configuring Your Server."

Record your updated device and configuration information in the appropriate tables in "Installed Device Records" on page 403.

Connecting External Options

Before you begin:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Read the documentation that comes with your options.

Connecting External SCSI Devices

You can attach a SCSI storage expansion enclosure to your server.

Cabling Requirements

The ServeRAID II controller in your server has one channel that can be used to attach external devices.

If you plan to install external SCSI devices, you must order additional SCSI cables. The cables must have the proper connectors for the ServeRAID II controller and the external devices. To select and order the correct cables for use with external devices, contact your IBM reseller or IBM marketing representative.

Refer to the information provided with your adapter to determine the number of internal and external connectors, channels, and SCSI devices that the adapter supports.

For information about the maximum length of SCSI cable between the terminated ends of the cable, see ANSI SCSI Standards:

- X3.131-1986 (SCSI)
- X3.131-1994 (SCSI-2)
- X3T10/1071D

Adhering to these standards ensures that your server operates properly.

Setting SCSI IDs for External Devices

Each SCSI device that is connected to a SCSI controller must have a unique SCSI ID, so that the SCSI controller can identify the devices and ensure that different devices do not attempt to transfer data at the same time. SCSI devices that are connected to different SCSI

controllers can have duplicate SCSI IDs. See "SCSI IDs" on page 235 and to the instructions that come with the SCSI devices for more information about setting a SCSI ID.

Installation Procedure
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 and Connectors

The input/output (I/O) connectors are for attaching external devices, such as printers, keyboards, and displays, to your server. The I/O connectors on your server include:

- Two serial-port connectors
- One systems management connector
- One parallel-port connector
- One video-port connector
- One keyboard-port connector
- One auxiliary-device-port connector
- One Ethernet-port connector
- Two USB-port connectors

See the illustration in "Input/Output Connectors and Expansion Slots" on page 14 for the locations of the connectors.

Serial Ports

Your server comes with two serial ports. (See "Input/Output Connectors and Expansion Slots" on page 14 for the locations of the connectors.) These ports are used to communicate with printers, plotters, external modems, scanners, and auxiliary terminals. These ports also enable you to transfer data between computers.

Serial ports can transfer data *asynchronously*, which means that they can transmit any number of characters at any time, with no restriction on the duration of the pauses between characters.

The serial ports can transmit and receive data and commands at rates of from 300 bits per second up to 115 000 bits per second.

Serial port A is shared by the operating system and the integrated system management processor. Serial port B can be used by only by the operating system.

Each serial port has a 9-pin, male D-shell connector on the back of the server. The pin-number assignments of this connector conform to the industry standard.

```
1          5
( O O O O O )
  O O O O
6          9
```
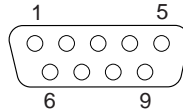
The following table shows the pin-number assignments for the serial-port connectors.

Table 3. Serial Port 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		

When you turn on your server, the POST routine assigns the serial ports to specific communication port addresses.

Some application programs use only certain ports, and some modems are designed for use only at certain communication port addresses. You might need to use the Configuration/Setup Utility program to change communication port address assignments to resolve conflicts.

Management Port C
Your server has a dedicated systems management I/O port. This port can be used to attach a modem that is dedicated to communication with the system management processor.

The connector on the back of the server and the pin-number assignments are the same as for the serial ports.

Parallel Port

The parallel port usually is used to communicate with printers, and transfers data one byte at a time. The parallel port has a 25-pin, female D-shell connector on the back of your server. It support three standard IEEE 1284 modes of operation: Standard Parallel Port (SPP), Enhanced Parallel Port (EPP), and Extended Capacity Port (ECP). (See "Input/Output Connectors and Expansion Slots" on page 14 for the location of the connector.)
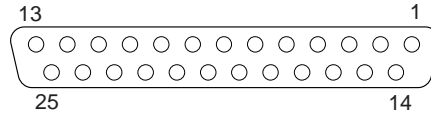
The following table shows the pin-number assignments for the parallel-port connector.

Table 4. Parallel Port 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)	–DSTRB
15	I	–ERROR	–ERROR
16	O	–INIT	–INIT
17	O	–SLCT IN	–ASTRB
18	-	Ground	Ground
19	-	Ground	Ground
20	-	Ground	Ground
21	-	Ground	Ground
22	-	Ground	Ground
23	-	Ground	Ground
24	-	Ground	Ground
25	-	Ground	Ground

When you turn on your server, the POST routine assigns the parallel port a specific port address. You can change the parallel-port assignment by using the Configuration/Setup Utility program.

Video Port

The system board in your server has one SVGA video port. This port is used to attach a video monitor. The video port has a 15-pin analog connector on the back of the server. (See "Input/Output Connectors and Expansion Slots" on page 14 for the location of the connector.)

```
  5         1
 ┌─────────────┐
 │ ○ ○ ○ ○ ○ │
 │  ○ ○ ○ ○ ○  │
 │ ○ ○ ○ ○ ○ │
 └─────────────┘
  15        11
```
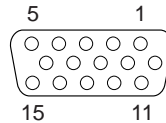
The following table shows the pin-number assignments for the video connector.

Table 5. Video Port 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
10	Ground
11	Monitor ID bit 0
12	DDC SDA
13	Horizontal synchronization (Hsync)
14	Vertical synchronization (Vsync)
15	DDC SDL

Keyboard and Auxiliary-Device Ports

The system board has one keyboard port and one auxiliary-device port that supports a mouse or other pointing device. (See "Input/Output Connectors and Expansion Slots" on page 14 for the locations of the connectors.)
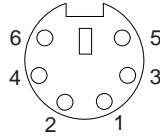
The following table shows the pin-number assignments for the connectors used by the keyboard and auxiliary-device ports.

Table 6. Keyboard and Auxiliary-Device Port Pin-Number Assignments	
Pin	**Signal**
1	Data
2	Not connected
3	Ground
4	+5 V dc
5	Clock
6	Not connected

Ethernet Port

The system board in your Netfinity 5500 contains an Ethernet
controller. The controller has an external RJ-45 connector on the rear
of the server that is used with a category 3, 4, or 5 unshielded
twisted-pair (UTP) cable. The connector enables an Ethernet
network to attach to the internal transceiver in your server.

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

See "Configuring the Ethernet Controller" on page 178 for
additional information about the Ethernet controller.

Table 7 shows the pin-number assignments for the RJ-45 connector.
These assignments apply to both 10BASE-T and 100BASE-TX
devices.
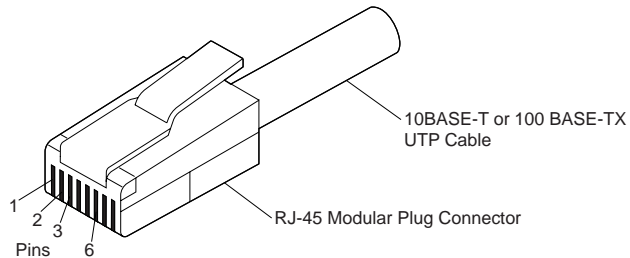
Table 7. Ethernet Connector Pin-Number Assignments			
Pin	**Signal**	**Pin**	**Signal**
1	Transmit data+	5	Reserved
2	Transmit data–	6	Receive data–
3	Receive data+	7	Reserved
4	Reserved	8	Reserved

Universal Serial Bus Ports

The system board in your Netfinity 5500 contains two universal serial bus (USB) ports. Each USB port has an external connector on the rear on the server for attaching devices that previously used serial, parallel, keyboard, mouse, and game ports.

USB is an emerging serial interface standard for telephony and multimedia devices. USB technology uses Plug and Play to determine what device is attached to the connector. Each USB device is accessed by a unique *USB address*. A device called a hub is used to convert the USB port into multiple attachment points. A hub has multiple ports where peripherals can be attached. USB provides 12 megabits-per-second (Mbps) bandwidth with a maximum of 63 peripherals and a maximum signal distance of five meters (16 ft.) per segment.

Note: If more than one USB device is to be attached, then the device must be connected to a hub.

Table 8 shows the pin-number assignments for the USB connectors.

Table 8. USB Connector Pin-Number Assignments	
Pin	**Signal**
1	VCC
2	–Data
3	+Data
4	Ground

Connecting External Options

This chapter provides instructions for installing a server in a rack and for removing a server from a rack.

This chapter contains:

Your server comes with all the rack installation hardware (rack model only). Review the preinstallation information in "Before You Begin"; then, continue with "Installing and Removing the Server" on page 275.

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>50 kg (110 lbs)

CAUTION:
Do not place any object weighing more than 50 kg (110 lbs) on top of the rack model of the server.

Before You Begin

- You will need the following items:

  - An assortment of small screwdrivers
  - 8-inch adjustable wrench or pliers

  Some of the installation procedures require three people.

- Before you begin to install your server in the rack, review the safety and handling guidelines specified under "Safety Information" on page ix, and "Electrical Safety" on page 200.

These guidelines will help you work safely while working with your server and options.

- To ensure rack stability, plan the installation of servers in the rack starting from the bottom. For more information, refer to the IBM Netfinity Rack Configurator program provided with ServerGuide.

- Review the documentation that comes with your rack enclosure for safety or cabling considerations. Ensure that your planned installation is within the rack's guidelines for heat generation, electrical requirements, air flow, and mechanical loading.

- Verify that the rack can meet the operating parameters, as detailed in "Specifications" on page 412.

Installing and Removing the Server

During the installation procedure, you must install parts on the rack and the server. This process can be divided into two parts:

- Preparing the rack
- Installing the server in the rack

Preparing the Rack

5

≥32 kg (70.5 lbs)   **≥55 kg (121.2 lbs)**

CAUTION:
Use safe lifting practices when lifting your machine.

In this section, you will use the following parts:

- IBM Installation Template
- Two slide-bracket assemblies
- One cable-management arm
- Two bezel brackets
- Six screws (for attaching the bezel brackets)
- Sixteen long screws (M6 by 16 mm)
- Eight short screws (M4 by 8 mm)
- Six cage nuts
- Two hex nuts (M6)
- Four lift handles (shipped with some servers)
- Cable ties
- One server bracket (for attaching the cable management arm to the server)

Attention:
To ensure rack stability, plan the installation of servers in the rack starting from the bottom.

To attach the mounting hardware to the rack:

1. Remove the rack front door. Refer to the rack documentation for instructions.

2. Mark the positions of the slide-bracket assemblies, bezel brackets, and the cable-management arm on the rack:

   a. Position the installation template on the front mounting rails on the rack, aligning the holes.

   b. Mark the holes for the slide-bracket assemblies and bezel brackets.

   c. Move the template to the same U level at the rear of the server and mark the locations for the slide-bracket assemblies and cable-management arm.

   d. Install the six cage nuts at the locations marked on the mounting rails.
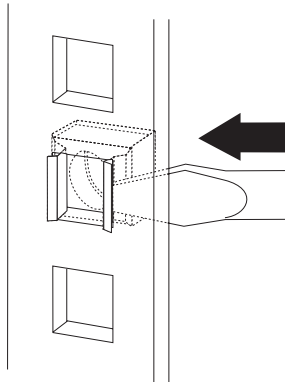
3. Attach a slide-bracket assembly to the front of the rack:

   Notes:

   - Get another person to help you attach the slide-bracket assemblies to the rack.

   - The slide-bracket assemblies can be installed on either the left or right side of the rack.

   - Refer to the illustrations for examples of the proper alignment of the slide-bracket assemblies.

   a. Position the slide-bracket assembly behind the mounting rail so that the slides will extend out from the front of the rack.

   b. If necessary, loosen the screws at the rear of the slide bracket assembly and adjust the length of the slide-bracket to fit the mounting rail. Tighten the screws.
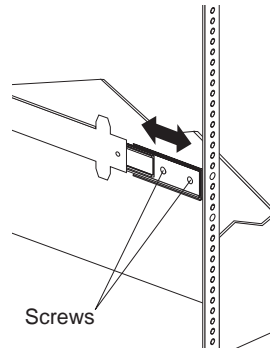
Screws

    c. Insert screws (6M by 16 mm) through the mounting rail to the slide-bracket assembly. Do not tighten the screws.
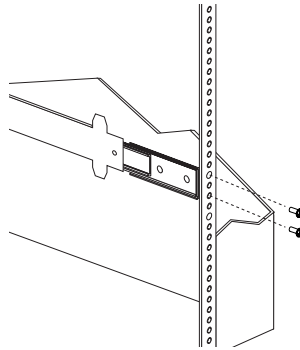
4. Attach the slide bracket assembly to the rear of the rack:

    a. Position the slide-bracket assembly inside the mounting rail.

    b. Insert screws (6M by 16 mm) through the mounting rail to the slide-bracket assembly. Do not tighten the screws.
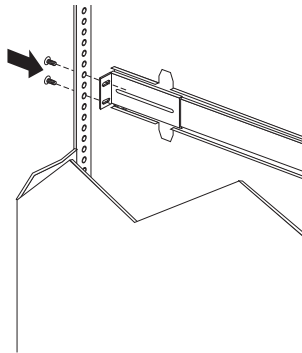
5. Attach the other slide-bracket assembly to the front and rear of the rack.

6. Push the slide-bracket assemblies to the outermost positions on the rack.
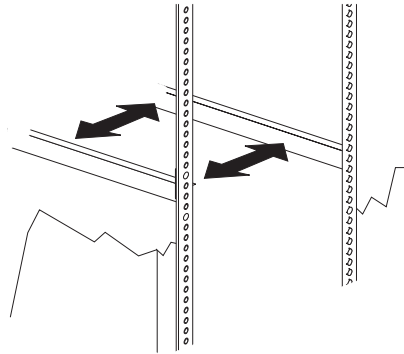
7. Tighten all screws to secure both slide-bracket assemblies. If you are using a torque screwdriver, use the following torque setting: 8–11 Nm (70.8–97.0 in/lbs).

8. Attach the cable-management arm to the rear of the rack:

   a. Position the cable-management arm bracket on the outside of the mounting rail.

   b. Insert screws (M6 by 16 mm) through the cable-management arm bracket, mounting rail, and cage nuts. Tighten the screws.
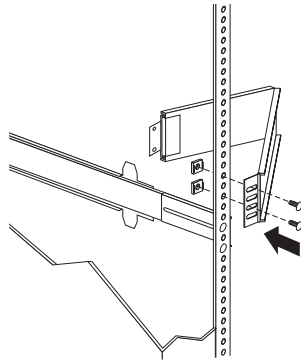
   c. Position the server bracket on the cable-management arm.

   d. Insert screws through the cable-management arm and the server bracket. Attach M6 hex nuts to the screws and tighten the hex nuts.
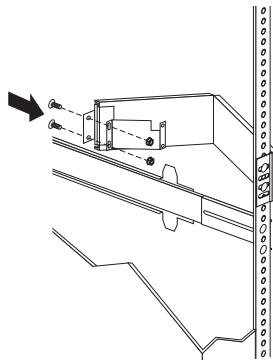
Installing the Server in the Rack
In this section, you will use eight screws (M4 by 8).

To install the server in the rack:

1. Fully extend the slide-bracket assemblies until they lock.

2. Install the four lift handles on the sides of the server:

   a. Press in on the sides of the lift handle near the tabs and insert the handle tabs into the slots on the side of the server.

   b. Move the handle up in the slots so that the hooked part of each tab is inside the server. Release the pressure on the sides of the handle.

   c. Install the remaining three lift handles.

5
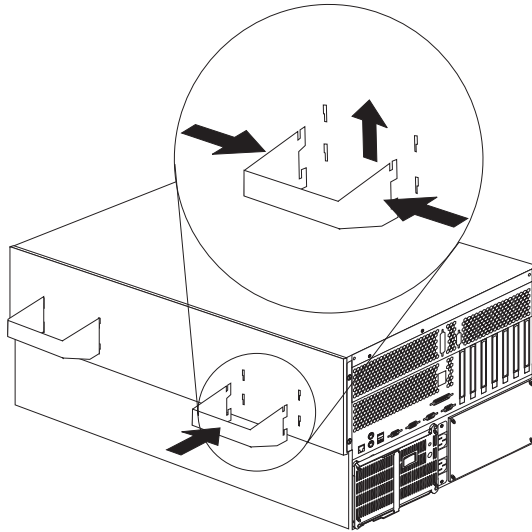
≥32 kg (70.5 lbs)   ≥55 kg (121.2 lbs)
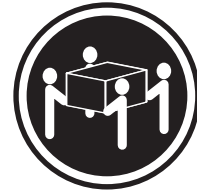
CAUTION:
Use safe lifting practices when lifting your machine.

3. Lift and position the server so that the bayonet slots on the
   server are above the bayonets on the slide-bracket assemblies.

4. Lower the server and slip the bayonets into the bayonet slots.

5. Insert screws through one slide-bracket assembly and server
   side. Tighten the screws. Repeat this step for the other
   slide-bracket assembly on the opposite side of the server. This
   secures the server.
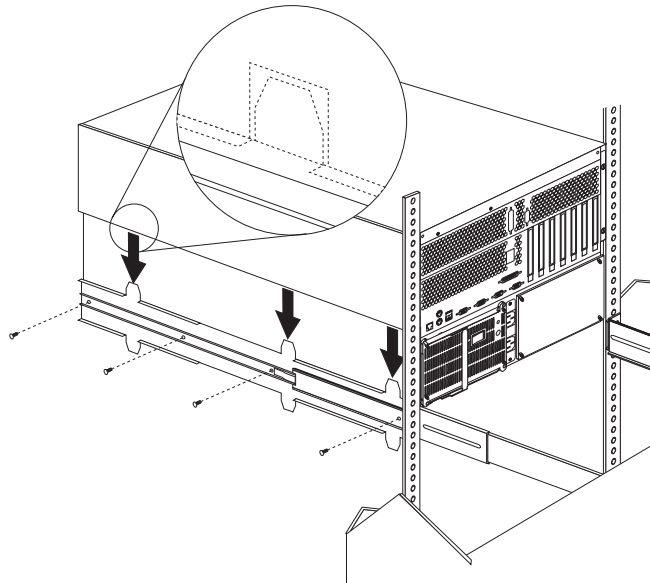
6. Remove the four lift handles from the sides of the server:

   a. Grasp the lift handle and press in on the sides of the lift handle near the tabs until the tabs touch the inside edges of the slots.

   b. Move the handle down in the slots so that the hooked parts of the tabs clear the top edges of the slots; then, pull the handle away from the server.

   c. Remove the remaining three handles. Store the handles in a safe place.

   Note: When the drawer is fully extended, safety latches on the slide-brackets lock into place. To release the safety latch, press the latch on each side of the rack.

7. Press the safety latches and slide the drawer about halfway into the rack.
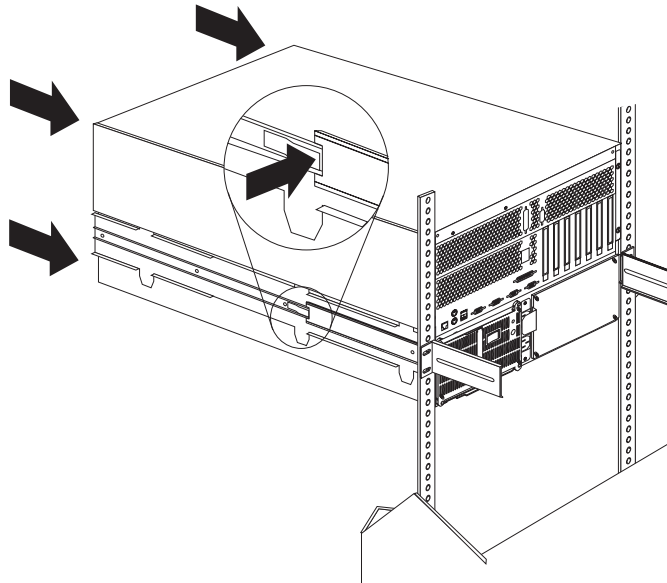
8. Attach the cable-management arm to the server using the captive screws.
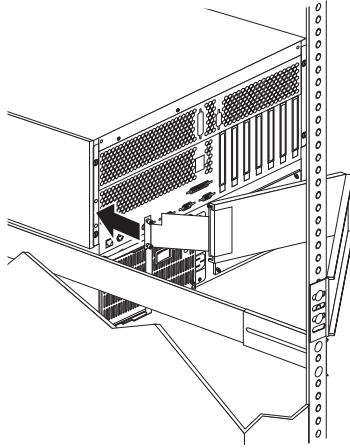
9. Attach the monitor, keyboard, and power cables to the corresponding connectors on the server. Refer to the rack documentation for instructions.

10. Attach the cables to the cable-management arm using cable ties.

11. Attach the two bezel brackets (one for each side) to the front
    sides of the server with the six screws provided.
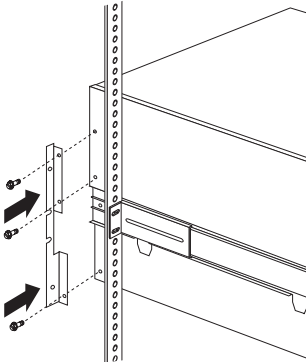
12. Secure the server in the rack:

    a. Slide the server into the rack.

    b. Secure the server to both sides of the rack by inserting screws (M6 by 16 mm) through the bezel brackets, mounting rails, and cage nuts.
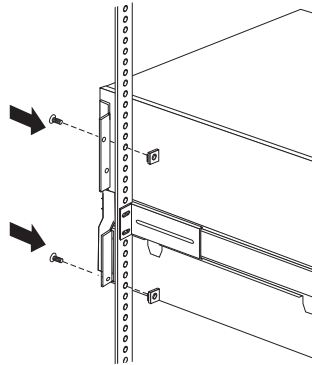
13. Install the rack front door.
14. To complete the installation, refer to the documentation that came with the rack.

Removing the Server from a Rack

Before you begin

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.
- Turn off the server.
- Follow any additional installation and safety instructions that come with the rack.

To remove the server from a rack:

1. If you have a modem or fax machine attached to the server, disconnect the telephone line from the electrical outlet and the server.

   Note: If you are in the United Kingdom, you must perform this step before disconnecting the power cords.

2. Disconnect all cables and power cords from the rear of the server.

3. Disconnect all power cords from the rack.

4. Remove the screws from the bezel brackets on each side of the front bezel. Set them aside for later use.

5. Slide the server about halfway out of the rack.

6. Loosen the captive screws that secure the cable-management arm.

7. Fully extend the slide-bracket assemblies until they lock.

8. Remove the screws that attach the server to each slide-bracket assembly.

5

≥32 kg (70.5 lbs)   ≥55 kg (121.2 lbs)

CAUTION:
Use safe lifting practices when lifting your machine.

9. Install the four lift handles on the sides of the server:

   a. Press in on the sides of the lift handle near the tabs and insert the handle tabs into the slots on the side of the server.

   b. Move the handle up in the slots so that the hooked part of each tab is inside the server. Release the pressure on the sides of the handle.

   c. Install the remaining three lift handles.
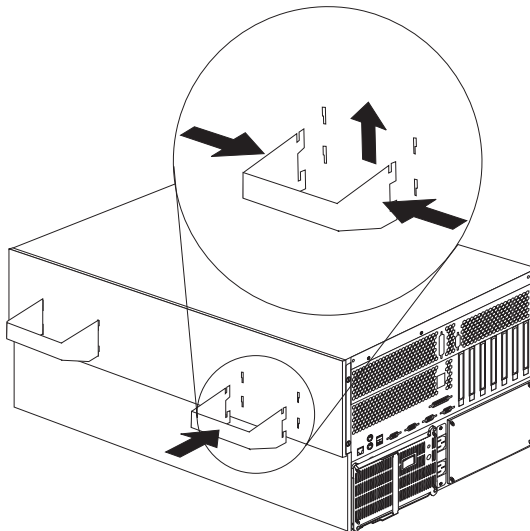
10. Lift the server from the slide bracket assemblies and place the
    server on a flat, nonconductive surface.

Removing the Server from a Rack

Server problems can be caused by hardware, software, or a user error. An example of a user error is pressing the wrong key on the keyboard. You can check server hardware by using the diagnostic programs and other information in this chapter.

This chapter contains:

Diagnostic Tools Overview

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

- Diagnostic programs
- Power-on self-test (POST)
- POST beep codes
- Error messages
- Troubleshooting charts
- Option diskettes

Diagnostic Programs

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 your server:
the system board, Ethernet controller, video controller, RAM,
keyboard, mouse (pointing device), diskette drive, serial port, and
parallel port. You can also use them to test some external devices.

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.

Note: 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.

Power-on Self Test (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.

POST does the following:

- Checks the operation of some basic system-board operations
- Checks the memory

- Compares the current server configuration with the stored server configuration information
- Configures PCI adapters
- Starts the video operation
- Verifies that drives (such as the diskette, CD-ROM, and hard disk drives) are connected properly

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.

While the memory is being tested, the amount of available memory appears on the screen. These numbers advance as the server progresses through POST and the final number that appears on the screen represents the total amount of memory available. If POST finishes without detecting any problems, a single beep sounds, the first screen of your operating system or application program appears, and the System POST Complete (OK) light is illuminated on the information LED panel.

If POST detects a problem, more than one beep sounds and an error message appears on your screen.

Note: 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 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 "Power-on Self Test (POST) Beep Codes" on page 315.

Error Messages

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 indicated by error messages should be performed by trained service personnel.

Hardware error messages that occur can be text, numeric, or both. Messages generated by your software generally are text messages, but they also can be numeric.

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 more information, see "Power-on Self Test (POST) Messages" on page 299.

Diagnostic Error Messages

Diagnostic error messages occur when a test finds a problem with the server hardware. These error messages are alphanumeric and they are saved in the Test Log. For more information, see "Diagnostic Error Message Tables" on page 319.

Software-Generated Error Messages

These messages occur if a problem or conflict is found by an application program, the operating system, or both. Messages are generally text messages, but they also can be numeric. For information about these error messages, refer to the documentation that comes with your software.

Troubleshooting Charts

The charts under "Troubleshooting Charts" on page 360 list symptoms of problems (for example, a symptom might be "The mouse or pointing device does not work."), along with steps to correct the problems.

System Error Log

The system error log contains all error and warning messages issued during POST and all system status messages from the the system management processor. See "System Error Log" on page 173 for information about how to view the system error log.

Option Diskettes

An optional device or adapter can come with an Option Diskette. Option Diskettes usually contain option-specific diagnostic test programs or configuration files.

If your optional device or adapter comes with an Option Diskette, follow the instructions that come with the option. Different instructions apply depending on whether the Option Diskette is startable or not.

Diagnostic Programs

This section includes useful information about running the diagnostic programs. These programs are designed to test the IBM Netfinity 5500. If you want to test a non-IBM product, refer to the information that comes with that product.

Note: 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 usually will not occur the next time you run the test.

Running Diagnostic Programs

While you are running the diagnostic programs, **F1** displays `Help` information. Pressing **F1** from within a help screen provides a help index from which you can select different categories. Pressing **Esc** exits `Help` and returns to where you left off.

Notes:

1. To run the diagnostic programs, you must start the server with the highest level password.

   That is, if you enter the power-on password and an administrator password is set, you cannot run the programs. You can only view the error messages in the Test Log.

   You must enter the administrator password to run the diagnostic programs.

2. If the server stops during testing and you cannot continue, restart the server and try running the diagnostic programs again. If the problem persists, have the system serviced.

3. If the diagnostic tests do not find a problem but the problem persists during normal operations, see "Troubleshooting" on page 360 and look for the problem symptom.

4. You might have to install a wrap connector on your active parallel or serial port to obtain accurate test results for these ports. If you do not have a wrap connector, contact your IBM reseller or IBM marketing representative.

5. You might need a scratch diskette to obtain accurate test results when testing the diskette drive.

6. The keyboard and mouse (pointing device) tests assume that a keyboard and mouse are attached to the server.

To start the diagnostic programs:

1. Turn on the server and watch the screen.

   If the server is turned on already, shut down your 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. The Diagnostic Programs screen appears.

4. Select either **Extended** or **Basic** from the top of the screen.

5. Select the test you want to run from the list that appears; then, follow the instructions on the screen.

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

   Also, 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.

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

If you are already running the diagnostic programs, continue with step 4 in this procedure.

To view the Test Log:

1. Turn on the server and watch the screen.

   If the server is turned on already, shut down your 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. The Diagnostic Programs screen appears.

4. Select **Utility** from the top of the screen.

5. Select **View Test Log** from the list that appears; then, follow instructions on the screen.

Power-on Self Test (POST) Messages

The following table shows error messages that can appear on the screen during the power-on self-test (POST).

Notes:

1. The actions for some of the messages require you to run the Configuration/Setup Utility. For information about using these programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.

2. If a password prompt appears with a POST message, type the administrator or power-on password; then, press **Enter.**

POST Message Table

POST Message	Description
062	The server failed to boot on three consecutive attempts.
	All caches are disabled. This can be caused by repeatedly turning the server on and then off or resetting the server.
	Action: Start the Configuration/Setup Utility and verify that all settings are correct. (See Chapter 4, "Configuring Your Server.") Use the **Cache Control** selection in the Advanced Setup menu of the Configuration/Setup Utility to enable the caches. (See "Advanced Setup" on page 171.)
	If the problem persists, have the system serviced. When the problem is corrected, make sure to enable the caches.
101 102	An error occurred during the system board and microprocessor test.
	Action: Have the system serviced.
106	An error occurred during the system board and microprocessor test.
	Action: Have the system serviced.
114	An adapter read-only memory (ROM) error occurred.
	Action: Remove the options. If you can start the server without the options installed, reinstall each option one at a time and retest after each is reinstalled. When an option fails, replace it.
	If you cannot isolate and correct the problem, have the system serviced.

POST Message	Description
129	An error was detected in the L1 cache of one of the microprocessors.
	Action:
	1. If you just installed a microprocessor, verify that the microprocessor is installed and seated correctly.
	2. If the problem persists, check to see if the system has isolated the problem to a microprocessor:
	• If the System Error LED on the information LED panel is on, check to see if the CPU LED on the diagnostics panel is on. If it is on, check the Microprocessor Error LEDs next to the microprocessor sockets on the processor board (see "Processor Board Component Locations" on page 422).
	– If a Microprocessor LED is on, run the diagnostic program for the microprocessor indicated by the LED. If the tests fail, replace the microprocessor.
	– If the microprocessor tests do not fail, have the system serviced.
	• If no error LED is on, the error logs in the Configuration/Setup Utility might provide additional information on the microprocessor error.
	If the problem persists, have the system serviced.
151	A real-time clock (RTC) error occurred.
	Action: Have the system serviced.
161	The real-time clock battery has failed.
	Action: Have the system serviced or replace the battery yourself. For additional information, see "Replacing the Battery" on page 387 and "Lithium Battery Notice" on page xi **before** you attempt to change the battery.
	You can use the server until you replace the battery. However, you must run the configuration programs and set the time and date and other custom settings each time you turn on the server.

POST Messages

POST Message	Description
162	A change in device configuration occurred. This error occurs under one or more of the following conditions: • A new device has been installed. • A device has been moved to a different location or cable connection. • A device has been removed or disconnected from a cable. • A device is failing and is no longer recognized by the server as being installed. • An external device is not turned on. • An invalid checksum is detected in the battery-backed memory. *Action:* Verify that all external devices are turned on. You must turn on external devices before turning on the server. If you did not add, remove, or change the location of a device, a device is probably failing. Running the diagnostic test programs might isolate the failing device, but you must have the system serviced.
163	The time of day has not been set. *Action:* Set the correct date and time. If the date and time are set correctly and saved, but the 163 error message reappears, have the system serviced. The server can be used until the system is serviced, but any application programs that use the date and time will be affected.

POST Message	Description
164	A change in the memory configuration occurred. This message might appear after you add or remove memory.
	Note: The server can be used with decreased memory capacity.
	Action:
	1. If POST error message 289 also occurred, follow the instructions for that error message first.
	2. If you have installed or removed memory, run the Configuration/Setup Utility; then, exit, saving the new configuration settings. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.
	If the message appears again, shutdown the server, reseat the memory modules, and restart the server.
	3. If the problem persists, check to see if the system has isolated the problem to a memory module:
	• If the System Error LED on the information LED panel is on, check to see if the MEM LED on the diagnostics panel is on. If it is on, check the DIMM Error LEDS next to the memory sockets on the processor board (see "Processor Board Component Locations" on page 422). If a DIMM Error LED is on, run the diagnostic program for the memory.
	– If the tests fail, replace the DIMM. If the problem persists after you replace the DIMM, have the system serviced.
	– If the memory tests do not fail, have the system serviced.
	• If no error LED is on, the error logs in the Configuration/Setup Utility might provide additional information on the memory error.
	If the problem persists, have the system serviced.
175	A vital product data (VPD) error occurred.
	Action: Have the system serviced.
176 177 178	A security hardware error occurred. *Action:* Check for indications that someone has tampered with the server. If no one has tampered with the server, have the system serviced.

POST Messages

POST Message	Description
184	The power-on password information stored in your server has been removed. *Action:* From the Configuration/Setup Utility main menu, select **System Security.** Then, follow the instructions on the screen. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. If this information cannot be restored, have the system serviced.
185	A power failure damaged the stored information about the drive-startup sequence. *Action:* From the Configuration/Setup Utility main menu, select **Start Options**; then, follow the instructions on the screen. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. If this information cannot be restored, have the system serviced.
186	A system board or hardware error occurred. *Action:* Have the system serviced.
187	The VPD serial number is not set. *Action:* The system serial number is set in the VPD EEPROM at the time of manufacturing. If the system board has been replaced, the system serial number will be invalid and should be set. From the main menu of the Configuration/Setup Utility, select **System Information**, then select **Product Data**. If the problem persists, have the system serviced.
188	A vital product data (VPD) error occurred. *Action:* Have the system serviced.
189	An attempt has been made to access the server with invalid passwords. After three incorrect attempts, the server locks up; that is, the logon data fields are no longer available to the user.

POST Message	Description

201	An error occurred during the memory controller test. This error can be caused by:
	
	• Incorrectly installed memory
	• A failing memory module
	• A processor-board problem
	• A system board problem
	
	Action:
	
	1. If you just installed memory, see "Installing Memory-Module Kits" on page 230 to verify that the new memory is correct for your server. Verify that the memory modules are installed and seated correctly.
	
	2. If the problem persists, check to see if the system has isolated the problem to a memory module:
	
	  • If the System Error LED on the information LED panel is on, check to see if the MEM LED on the diagnostics panel is on. If it is on, check the DIMM Error LEDS next to the memory sockets on the processor board (see "Processor Board Component Locations" on page 422). If a DIMM Error LED is on, run the diagnostic program for the memory.
	
	  • If the tests fail, replace the DIMM. If the problem persists after you replace the DIMM, have the system serviced.
	
	  • If the memory tests do not fail, have the system serviced.
	
	3. If no error LED is on, the error logs in the Configuration/Setup Utility might provide additional information on the memory error.
	
	If the problem persists, have the system serviced.

POST Message	Description

229	An error was detected in the L2 cache of one of the microprocessors.
	
	Action:
	
	1. If you just installed a microprocessor, verify that the microprocessor is installed and seated correctly.
	
	2. If the problem persists, check to see if the system has isolated the problem to a microprocessor:
	
	   • If the System Error LED on the information LED panel is on, check to see if the CPU LED on the diagnostics panel is on. If it is on, check the Microprocessor Error LEDs next to the microprocessor sockets on the processor board (see "Processor Board Component Locations" on page 422).
	
	     – If a Microprocessor LED is on, run the diagnostic program for the microprocessor indicated by the LED. If the tests fail, replace the microprocessor.
	
	     – If the microprocessor tests do not fail, have the system serviced.
	
	   • If no error LED is on, the error logs in the Configuration/Setup Utility might provide additional information on the microprocessor error.
	
	If the problem persists, have the system serviced.

289	An error occurred during POST memory tests and a failing DIMM was disabled. *Note:* The server can be used with decreased memory. *Action:* 1. If you just installed memory, see "Installing Memory-Module Kits" on page 230 to verify that the new memory is correct for your server. Verify that the memory modules are installed and seated correctly. Start the Configuration/Setup Utility (see Chapter 4, "Configuring Your Server"). In the Advanced Setup menu, select **Memory Settings** and enable the DIMM. (See "Advanced Setup" on page 171.) 2. If the problem persists, replace the failing DIMM. If the problem persists, have the system serviced.

POST Message	Description
301 303	An error occurred during the keyboard and keyboard controller test. These error messages also might be accompanied by continuous beeping. *Action:* Ensure that: 1. Nothing is resting on the keyboard and pressing a key. 2. No key is stuck. 3. The keyboard cable is connected correctly to the keyboard and to the correct connector on the server. Running the diagnostic tests can isolate the server component that failed, but you must have your system serviced. If the error message remains, have the keyboard, cable, and system serviced. *Note:* If you have just connected a new mouse or other pointing device, turn off the server and disconnect that device. Wait at least 5 seconds, and then, turn on the server. If the error message goes away, replace the device.
604	An error occurred during a diskette drive test. *Action:* 1. Verify that the configuration programs correctly reflect the type of diskette drive that you have installed. 2. Run the diagnostic tests. If the diagnostic tests fail, have the system serviced.
662	A diskette drive configuration error occurred. *Action:* If you removed a diskette drive, make sure that the diskette drive setting is correct in the configuration programs. If the setting is not correct, change it. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. If the problem persists, have the system serviced.
962	A parallel port configuration error occurred. *Action:* If you changed a hardware option, make sure that the parallel port setting is correct in the configuration programs. If the setting is not correct, change it. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. If the problem persists, have the system serviced.

POST Messages

POST Message	Description
11*xx*	An error occurred during the system-board serial port test.
	Action: If you have a modem, serial printer, or other serial device attached to your server, verify that the serial cable is connected correctly. If it is, use the following procedure:
	1. Turn off the server. 2. Disconnect the serial cable from the serial port. 3. Wait five seconds; then, turn on the server.
	If the POST error message does not reappear, either the serial cable or the device is probably failing. See the documentation that comes with the serial device for additional testing information.
	If the POST error message reappears, have the system serviced.
1162	The serial port configuration conflicts with another device in the system.
	Action:
	1. Make sure the IRQ and I/O port assignments needed by the serial port are available. (See Chapter 4, "Configuring Your Server.")
	2. If all interrupts are being used by adapters, you might need to remove an adapter to make an interrupt available to the PCI adapter, or force other adapters to share an interrupt. For information about removing adapters, see "Working with Adapters" on page 211. For information about setting interrupts, see Chapter 4, "Configuring Your Server."
1600	POST is unable to communicate with the system management processor.
	Action:
	1. If the RAID System Error LED (CR30) on the system board is on, have your system serviced. (See "System Board Component Locations" on page 418 for the location of the LED.)
	2. If the RAID System Error LED is not on, disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server.
	If the problem persists, have the system serviced.

POST Message	Description
1800	A PCI adapter has requested a hardware interrupt that is not available.
	Action:
	1. Make sure that the PCI adapter and all other adapters are set correctly in the configuration programs. If the interrupt resource settings are not correct, change the settings. For information about using the configuration programs, see "PCI Bus Control" on page 171.
	2. If all interrupts are being used by other adapters, you might need to remove an adapter to make an interrupt available to the PCI adapter, or force other adapters to share an interrupt. For information about removing adapters, see "Working with Adapters" on page 211. For information about setting interrupts, see "PCI Bus Control" on page 171.
1801	A PCI adapter has requested memory resources that are not available.
	Action:
	1. Make sure that the PCI adapter and all other adapters are set correctly in the configuration programs. If the memory resource settings are not correct, change the settings. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.
	2. If all memory resources are being used, you might need to remove an adapter to make memory available to the PCI adapter. For information about removing adapters, see "Working with Adapters" on page 211. Disabling the adapter BIOS on the adapter might correct the error. Refer to the documentation provided with the adapter.
1802	A PCI adapter has requested an I/O address that is not available, or the PCI adapter might be defective.
	Action:
	1. Make sure that the I/O address for the PCI adapter and all other adapters are set correctly in the configuration programs. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.
	2. If the I/O port resource settings are correct, the PCI adapter might be defective. Have the system serviced.

POST Messages

POST Message	Description
1803	A PCI adapter has requested a memory address that is not available, or the PCI adapter might be defective.
	Action:
	1. Make sure that the memory address for all other adapters are set correctly in the configuration programs. If the memory resource settings are not correct, change the settings. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.
	2. If the memory resource settings are correct, the PCI adapter might be defective. Have the system serviced.
1804	A PCI adapter has requested a memory address that is not available.
	Action: If all memory addresses are being used, you might need to remove an adapter to make memory address space available to the PCI adapter. For information about removing adapters, see "Working with Adapters" on page 211. Disabling the adapter BIOS on the adapter might correct the error. Refer to the documentation provided with the adapter.
1805	A PCI adapter ROM error occurred.
	Action: Remove the PCI adapters. If you can start the server without the adapters, reinstall each adapter one at a time and retest after each is reinstalled. When an adapter fails, replace it.
	If you cannot isolate and correct the problem, have the system serviced.
1806	A PCI-to-PCI bridge error occurred. More than one PCI bus tried to access memory below 1 MB.
	Action: Remove the PCI adapter that has the PCI bridge. If you can start the server without the adapter, reinstall and retest the adapter. If the adapter fails, replace it.
	If you cannot isolate and correct the problem, have the system serviced.
1808	Unsupported PCI device is installed.
	The latch on a hot-plug PCI slot might have been opened while the slot was active or the optical switch for the slot might be defective.
	Action: Shut down the server, ensure the latches on the hot-plug PCI slots are closed and locked; then, restart the server.
	If the problem persists, have the system serviced.

POST Message	Description
1962	No valid startup devices were found. The system cannot find the startup drive or operating system.
	Action: Be sure that the drive you want to start from is in the startup sequence.
	1. Select **Start Options** from the Configuration/Setup utility program main menu. If you are unable to set the startup sequence, have the system serviced.
	2. Check the list of startup devices in the **Startup device** data fields. Is the drive you want to start from in the startup sequence?
	Yes Exit from this screen; then select **Exit Setup** to exit the Configuration/Setup menu. Go to step 3.
	No Follow the instructions on the screen to add the drive; then save the changes and exit the Configuration/Setup menu. Restart the server.
	3. Is an operating system installed?
	Yes Turn off the server. Go to step 4.
	No Install the operating system in your server; follow your operating system instructions to shut down and restart the server.
	4. During server startup, watch for messages indicating a hardware problem.
	If the same error message appears, have the system serviced.
2400	An error occurred during the video controller (on the system board) test. This error can be caused by a failing monitor, a failing system board, or, if a video adapter is installed, a failing video adapter.
	Action: Verify that the monitor is connected correctly to the video connector. If the monitor is connected correctly, have the system serviced.
2462	A video memory configuration error occurred.
	Action:
	1. Make sure that the monitor cables are correctly and securely connected to the server.
	2. If the problem persists, have the system serviced.

POST Message	Description
5962	An IDE CD-ROM configuration error occurred.
	Action: Check the signal and power cable connections to the CD-ROM drive. See "System Board Component Locations" on page 418 for the locations of the cable connectors on the system board.
	If the problem persists, have the system serviced.
8603	An error occurred during the mouse (pointing device) and mouse (pointing device) controller test. This error can be caused by the addition or removal of a mouse, or by a failing system board.
	Note: This error also can occur if electrical power was lost for a very brief period and then restored. In this case, turn off the server for at least 5 seconds, and then, turn it back on.
	Action: Ensure that the keyboard and mouse (pointing device) are attached to the correct connectors. If they are connected correctly, use the following procedure:
	1. Turn off the server. 2. Disconnect the mouse from the server. 3. Turn on the server.
	If the POST error message does not reappear, the mouse is probably failing. See the documentation that comes with the mouse for additional testing information. If the problem remains, have the mouse (pointing device) serviced.
	If the POST error message reappears, run the diagnostic tests to isolate the problem. If the diagnostic tests do not find a problem and the POST error message remains, have the system serviced.
00019501	Processor 1 is not functioning.
	Action: Replace the primary microprocessor. (The Primary Microprocessor Error LED on the system board will be on. See "System Board Component Locations" on page 418 for the location of the LED.)
	If the problem persists, have the system serviced.
00019502	Processor 2 is not functioning.
	Action: Replace the secondary microprocessor. (The Secondary Microprocessor Error LED on the system board will be on. See "System Board Component Locations" on page 418 for the location of the LED.)
	If the problem persists, have the system serviced.

POST Message	Description
00019701	Processor 1 failed the built-in self test.
	Action: Replace the primary microprocessor. (The Primary Microprocessor Error LED on the system board will be on. See "System Board Component Locations" on page 418 for the location of the LED.)
	If the problem persists, have the system serviced.
00019702	Processor 2 failed the built-in self-test.
	Action: Replace the secondary microprocessor. (The Secondary Microprocessor Error LED on the system board will be on. See "System Board Component Locations" on page 418 for the location of the LED.)
	If the problem persists, have the system serviced.
01298001	No update data for the processor 1 (the primary microprocessor).
	Action: Update the system BIOS to a level that supports the microprocessors installed in the server. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates from the World Wide Web.
01298002	No update data for processor 2 (the secondary microprocessor).
	Action: Update the system BIOS to a level that supports the microprocessors installed in the server. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates from the World Wide Web.
01298101	Bad update data for processor 1 (the primary microprocessor).
	Action: Update the system BIOS to a level that supports the microprocessors installed in the server. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates from the World Wide Web.
01298102	Bad update data for processor 2 (the secondary microprocessor).
	Action: Update the system BIOS to a level that supports the microprocessors installed in the server. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates from the World Wide Web.
I9990301	A hard disk drive error occurred.
	Action: Have the system serviced.

POST Messages

POST Message	Description
I9990305	POST could not find an operating system.
	Action: Install an operating system. If you have already installed the operating system, check the drive startup sequence (see "Start Options" on page 170). If the drive sequence is correct, run the diagnostic tests to verify that the hard disk drive is functioning correctly. If there is a problem with the hard disk drive (such as a bad sector), you might have to reinstall the operating system.
	If you cannot reinstall the operating system, have the system serviced.
Other Numbers	POST found an error.
	Action: Follow the instructions on the screen.

Power-on Self Test (POST) Beep Codes

The successful completion of POST is indicated by one beep and the appearance of the first screen of your operating system or application program. More than one beep indicates that POST detected an error.

Beep codes are sounded in a series of beeps. For example, a 1–2–4 beep code sounds like one beep, a pause, two consecutive beeps, another pause, and four more consecutive beeps.

POST Beep Code Descriptions

The following list contains more detailed descriptions of the possible types of beeps that your server might emit.

No beeps
> If no beep occurs after your server successfully completes POST (that is, after the System POST Complete (OK) light on the information LED panel is illuminated), have the system serviced.

Continuous beep
> This indicates that your boot microprocessor has failed, or your system board or speaker subsystem might contain a failing component. If the system continues through POST with no errors, have the system serviced. If no video appears, the boot processor has failed; replace the boot processor.
>
> *Note:* If the server has only one microprocessor installed, that microprocessor is the boot processor. If the server has two microprocessors installed, the microprocessor in the secondary microprocessor connector is the boot processor and the microprocessor in the primary microprocessor connector is the application processor.

One short beep
> If one beep occurs after your server successfully completes POST (that is, after the System POST Complete (OK) light on the information LED panel is illuminated), then POST has no configuration or functional errors to report. One beep also

occurs after your server completes POST if you enter an incorrect power-on password.

Two short beeps

This beep combination indicates that POST encountered an error. The Configuration/Setup Utility program will display additional information; follow the instructions displayed. See "Power-on Self Test (POST) Messages" on page 299 for explanations of any POST error messages.

Three short beeps

This beep combination indicates a system memory error. This combination occurs only if the video BIOS cannot display the error message. Replace the failing memory module.

Repeating short beeps

This beep combination indicates that your server system board might contain a failing component, your keyboard might be defective, or a key on the keyboard might be stuck. Ensure that:

1. Nothing is resting on the keyboard and pressing a key.
2. No key is stuck.
3. The keyboard cable is connected correctly to the keyboard and to the correct connector on the server.

Running the diagnostic tests can isolate the server component that failed, but you must have your system serviced. If the error message remains, have the keyboard, cable, and system serviced.

Note: If you have just connected a new mouse or other pointing device, turn off the server and disconnect that device. Wait at least 5 seconds, and then, turn on the server. If the error message goes away, replace the device.

One long and one short beep

This beep combination indicates that POST encountered an error on a video adapter. Have the system serviced if the integrated video adapter on the system board is being used. If an optional video adapter is being used, replace the failing video adapter.

One long and two short beeps

> This beep combination indicates that a video I/O adapter ROM is not readable, or the video subsystem is defective. If you hear this beep combination twice, both the server system board and an optional video adapter have failed the test. This beep combination might also indicate that your server system board contains a failing component.

One long and three short beeps

> This beep combination indicates that the system-board video subsystem has not detected a monitor connection to the server. Ensure that the monitor is connected to the server. If the problem persists, replace the monitor.

Two long and two short beeps

> This beep combination indicates that POST does not support the optional video adapter. This beep combination occurs when a video adapter is installed that is incompatible with your server. Replace the optional video adapter with one that is supported by the server or use the integrated video controller on the system board.

POST Beep Code Table

Beep Code	Description
1-1-2	Microprocessor register test has failed.
1-1-3	CMOS write/read test has failed.
1-1-4	BIOS ROM checksum has failed.
1-2-1	Programmable Interval Timer test has failed.
1-2-2	DMA initialization has failed.
1-2-3	DMA page register write/read test has failed.
1-4-3	Interrupt vector loading test has failed.
2-1-1	Secondary DMA register test has failed.
2-1-2	Primary DMA register test has failed.
2-1-3	Primary interrupt mask register test has failed.
2-1-4	Secondary interrupt mask register test has failed.
2-2-1	Interrupt vector loading has failed.
2-2-2	Keyboard controller test has failed.
2-2-3	CMOS power failure and checksum checks have failed.
2-2-4	CMOS configuration information validation has failed.
2-3-2	Screen memory test has failed.
2-3-3	Screen retrace tests have failed.
2-3-4	Search for video ROM has failed.
2-4-1	Screen test indicates the screen is operable.
3-1-1	Timer tick interrupt test has failed.
3-1-2	Interval timer channel 2 test has failed.
3-1-3	RAM test has failed above address hex 0FFFF.
3-1-4	Time-of-Day clock test has failed.
3-2-1	Serial port test has failed.
3-2-2	Parallel port test has failed.
3-2-3	Math Coprocessor test has failed.
3-2-4	Comparison of CMOS memory size against actual has failed.
	Action: Have the system serviced.
1-2-4	RAM refresh verification has failed.
1-3-1	First 64 Kb RAM test has failed.
1-3-2	First 64 Kb RAM parity test has failed.
3-3-1	A memory size mismatch has occurred.
	Action: Reseat the memory modules. If the problem persists, have the system serviced.
2-3-1	Screen initialization has failed.
	Action: Make sure that a jumper is installed on pins 1 and 2 of the Reset Video Controller jumper (J14) on the system board. (This is the default position, which enables the video controller on the system board.) If the problem persists, have the system serviced.

Diagnostic Error Message Tables

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 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 pages contain the error codes that you might receive in the diagnostic program detailed test log and summary log when running the diagnostic programs for your Netfinity 5500.

The format for the codes is:

`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. (These codes are for trained service personnel and are not listed.)

iii　　　　is the three-digit device ID. (These codes are for trained service personnel and are not listed.)

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 a message that the diagnostic program generates that indicates the reason for the problem. More information about the text message follows.

Text Messages

The text message format is:

```
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.

Aborted This result occurs when the user ends the diagnostic test before it is complete.

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 the user can use to analyze the diagnostic problem.

Failed Diagnostic Messages

The following tables display the primary hardware failure messages that the diagnostics might display.

Function: Core System Messages (001)

Result	Test Specific String
Failed	System board.
	Action: Have the system serviced.

Function: Video System Messages (005)

Result	Test Specific String
Failed	Processor and system boards.
	Action: Have the system serviced.

Function: Serial Port Messages (011)

Result	Test Specific String
Failed	Built-in serial port on system board.
	Action: Have the system serviced.

Function: Parallel Port Messages (014)

Result	Test Specific String
Failed	Built-in parallel port on system board.
	Action: Have the system serviced.

Function: USB Port Interface Messages (015)

Result	Test Specific String
Failed	System board.
	Action: Have the system serviced.

Function: PCI Interface Messages (020)

Result	Test Specific String
Failed	Tab on PCI Hot Swap slot #1 is bad.
	Action: Make sure the tab and latch on hot-plug PCI slot 1 are closed correctly.
	Note: For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention LEDs will be off.
	If the problem persists, have the system serviced.
Failed	Tab on PCI Hot Swap slot #2 is bad.
	Action: Make sure the tab and latch on hot-plug PCI slot 2 are closed correctly.
	Note: For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention LEDs will be off.
	If the problem persists, have the system serviced.
Failed	Tab on PCI Hot Swap slot #3 is bad.
	Action: Make sure the tab and latch on hot-plug PCI slot 3 are closed correctly.
	Note: For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention LEDs will be off.
	If the problem persists, have the system serviced.
Failed	Tab on PCI Hot Swap slot #4 is bad.
	Action: Make sure the tab and latch on hot-plug PCI slot 4 are closed correctly.
	Note: For normal operation, the Power LED for the hot-plug PCI slot will be on and the Attention LEDs will be off.
	If the problem persists, have the system serviced.
Failed	System board.
	Action: Have the system serviced.

Function: SCSI Interface Messages (030)

Result	Test Specific String
Failed	Internal SCSI interface.
	Action: Have the system serviced.

Function: RAID Messages (035)

Result	Test Specific String
Failed	On system board.
	Action: Have the system serviced.
Failed	On system board adapter; indicates POST error
	Action: Have the system serviced.
Failed	On system board testing drive in bay #1, SCSI ID 0
	Action: Have the system serviced.
Failed	On system board testing drive in bay #2, SCSI ID 1
	Action: Have the system serviced.
Failed	On system board testing drive in bay #3, SCSI ID 2
	Action: Have the system serviced.
Failed	On system board testing drive in bay #4, SCSI ID 3
	Action: Have the system serviced.
Failed	On system board testing drive in bay #5, SCSI ID 4
	Action: Have the system serviced.
Failed	On system board testing drive in bay #6, SCSI ID 5
	Action: Have the system serviced.

Function: Power Supply Messages (075)

Result	Test Specific String
Failed	Voltage sensed by the system is out of range.
	Action: Have the system serviced.

Function: Microprocessor Error Messages (089)

Result	Test Specific String
Failed	Secondary microprocessor in socket number U6.
	Note: The Secondary Microprocessor Error LED will be on. See "Processor Board Component Locations" on page 422 for the location of the LED.
	Action:
	1. Reseat the secondary microprocessor (in connector U6).
	2. If the problem persists, replace the secondary microprocessor.
	If the problem persists, have the system serviced.
Failed	Microprocessor in socket number U5.
	Note: The Primary Microprocessor Error LED will be on. See "Processor Board Component Locations" on page 422 for the location of the LED.
	Action:
	1. Reseat the primary microprocessor (in connector U5).
	2. If the problem persists, replace the primary microprocessor.
	If the problem persists, have the system serviced.

Function: System Management Processor Messages (165)

Result	Test Specific String
Failed	System management processor on system board.
	Action: Have the system serviced.

Function: Thermal System Messages (175)

Function	Test Specific String
Failed	Fan #1
	Note: The FAN1 LED on the diagnostics panel will also be on.
	Action: Replace fan 1.
	If the problem persists, have the system serviced.
Failed	Fan #2
	Note: The FAN2 LED on the diagnostics panel will also be on.
	Action: Replace fan 2.
	If the problem persists, have the system serviced.
Failed	Fan #3
	Note: The FAN3 LED on the diagnostics panel will also be on.
	Action: Replace fan 3.
	If the problem persists, have the system serviced.
Failed	Temperature sensed on processor board is out of range.
	Action: If one of the FAN LEDs on the diagnostics panel is on, replace the indicated fan.
	If the problem persists, have the system serviced.

Function: Status Display Messages (180)

Result	Test Specific String
Failed	Information LED panel.
	Action: Have the system serviced.
Failed	Diagnostics LED panel.
	Action: Have the system serviced.
Failed	LED on system board.
	Action: Have the system serviced.
Failed	LED on processor board.
	Action: Have the system serviced.
Failed	LED on hot-swap SCSI backplane.
	Action: Have the system serviced.

Function: System Memory Messages (201)

Result	Test Specific String
Failed	DIMM location J1
	Note: The DIMM 4 Error LED will be on. See "Processor Board Component Locations" on page 422 for the locations of the LED and the DIMMs.
	Action:
	1. Reseat the DIMM in DIMM socket J1. 2. If the problem persists, replace the DIMM.
	If the problem persists, have the system serviced.
Failed	DIMM location J2
	Note: The DIMM 3 Error LED will be on. See "Processor Board Component Locations" on page 422 for the locations of the LED and the DIMMs.
	Action:
	1. Reseat the DIMM in DIMM socket J2. 2. If the problem persists, replace the DIMM.
	If the problem persists, have the system serviced.
Failed	DIMM location J3
	Note: The DIMM 2 Error LED will be on. See "Processor Board Component Locations" on page 422 for the locations of the LED and the DIMMs.
	Action:
	1. Reseat the DIMM in DIMM socket J3. 2. If the problem persists, replace the DIMM.
	If the problem persists, have the system serviced.
Failed	DIMM location J4
	Note: The DIMM 1 Error LED will be on. See "Processor Board Component Locations" on page 422 for the locations of the LED and the DIMMs.
	Action:
	1. Reseat the DIMM in DIMM socket J4. 2. If the problem persists, replace the DIMM.
	If the problem persists, have the system serviced.

Function: System Cache Messages (202)

Result	Test Specific String
Failed	Microprocessor in socket number U5.
	Note: The Primary Microprocessor Error LED will be on. See "Processor Board Component Locations" on page 422 for the location of the LED.
	Action:
	1. Reseat the primary microprocessor (in connector U5).
	2. If the problem persists, replace the primary microprocessor.
	If the problem persists, have the system serviced.
Failed	Microprocessor in socket number U6.
	Note: The Secondary Microprocessor Error LED will be on. See "Processor Board Component Locations" on page 422 for the location of the LED.
	Action:
	1. Reseat the secondary microprocessor (in connector U5).
	2. If the problem persists, replace the secondary microprocessor.
	If the problem persists, have the system serviced.

Function: Diskette Drive Messages (206)

Result	Test Specific String
Failed	Internal diskette drive bay.
	Action: Have the system serviced.

Function: CD-ROM Messages (215)

Result	Test Specific String
Failed	On system board.
	Action: Have the system serviced.

Function: Hard Disk Drive Messages (217)

Result	Test Specific String
Failed	BIOS drive #1.
	Action: Have the system serviced.
Failed	BIOS drive #2.
	Action: Have the system serviced.
Failed	BIOS drive #3.
	Action: Have the system serviced.
Failed	BIOS drive #4.
	Action: Have the system serviced.
Failed	BIOS drive #5.
	Action: Have the system serviced.
Failed	BIOS drive #6.
	Action: Have the system serviced.

Function: Keyboard Messages (301)

Result	Test Specific String
Failed	On system board keyboard test failed.
	Action:
	1. Replace the keyboard. 2. If the problem persists, replace the keyboard cable.
	If the problem persists, have the system serviced.

Function: Pointing Device (Mouse) Messages (302)

Result	Test Specific String
Failed	On system board pointing device test failed.
	Action: Replace the pointing device (mouse).
	If the problem persists, have the system serviced.

Function: Ethernet Messages (405)

Result	Test Specific String
Failed	On system board.
	Action: Have the system serviced.

Failed Diagnostic Messages That Prevent Proper Testing

The following tables display failures that occur during diagnostics that prevent proper testing of the hardware.

Function: RAID Messages (035)

Result	Test Specific String
Failed	Test setup error: On system board. Cannot find RAID adapter on PCI bus or BIOS setup problem.
	Action: Have the system serviced.
Failed	Test setup error: On system board. PCI configuration of RAID adapter cannot be determined or BIOS setup problem.
	Action: Have the system serviced.

Function: Microprocessor Messages (089)

Result	Test Specific String
Failed	Test setup error: Primary microprocessor in socket number U5 is installed but not functioning; check system error log.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the primary microprocessor and run the microprocessor diagnostic program again.
	If the problem persists, have the system serviced.
Failed	Test setup error: Secondary microprocessor in socket number U6 is installed but not functioning; check system error log.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the secondary microprocessor and run the microprocessor diagnostic program again.
	If the problem persists, have the system serviced.

Result	Test Specific String
Failed	Test setup error: Invalid microprocessor in socket number U5 or BIOS setup problem.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the primary microprocessor and run the microprocessor diagnostic program again.
	If the problem persists, have the system serviced.
Failed	Test setup error: Invalid microprocessor in socket number U6 or BIOS setup problem.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the secondary microprocessor and run the microprocessor diagnostic program again.
	If the problem persists, have the system serviced.
Warning	Test setup error: Secondary microprocessor not installed or BIOS setup problem.
	Action:
	1. Verify that the secondary microprocessor is installed and seated correctly.
	2. If the problem persists, update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	3. If the problem persists, replace the secondary microprocessor and run the microprocessor diagnostic program again.
	If the problem persists, have the system serviced.

Function: System Memory Messages (201)

Result	Test Specific String
Failed	Test setup error: Corrupt DMI BIOS, information in BIOS is not as expected.
	Action: Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	If the problem persists, have the system serviced.
Failed	Test setup error: Unknown hardware problem associated with microprocessor in socket number U5.
	Action:
	1. Update the BIOS and run the diagnostic program again. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the primary microprocessor.
	If the problem persists, have the system serviced.
Failed	Test setup error: Unknown hardware problem associated with microprocessor in socket number U6.
	Action:
	1. Update the BIOS and run the diagnostic program again. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the secondary microprocessor.
	If the problem persists, have the system serviced.
Failed	Test setup error: Corrupt BIOS in ROM.
	Action: Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	If the problem persists, have the system serviced.

Function: System Cache Messages (202)

Result	Test Specific String
Failed	Test setup error: No L2 cache detected on microprocessor socket U5 or BIOS setup problem. *Action:* 1. Update the BIOS and run the diagnostic program again. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates. 2. If the problem persists, replace the primary microprocessor. If the problem persists, have the system serviced.
Failed	Test setup error: No L2 cache detected on microprocessor socket U6 or BIOS setup problem. *Action:* 1. Update the BIOS and run the diagnostic program again. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates. 2. If the problem persists, replace the secondary microprocessor. If the problem persists, have the system serviced.
Warning	Test setup error: Cache is disabled. Use system setup to enable before retrying the test. *Action:* Use the **Cache Control** selection in the Advanced Setup menu of the Configuration/Setup Utility to enable the cache. (See "Advanced Setup" on page 171.) If the problem persists, have the system serviced.
Failed	Test setup error: Corrupt DMI BIOS. Information in BIOS is not as expected. *Action:* Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates. If the problem persists, have the system serviced.
Failed	Test setup error: BIOS cannot access VPD information. *Action:* Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates. If the problem persists, have the system serviced.

Result	Test Specific String
Failed	Test setup error: Unknown hardware problem associated with microprocessor in socket number U5.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the primary microprocessor and run the diagnostic program again.
	If the problem persists, have the system serviced.
Failed	Test setup error: Unknown hardware problem associated with microprocessor in socket number U6.
	Action:
	1. Update the BIOS. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates.
	2. If the problem persists, replace the secondary microprocessor and run the diagnostic program again.
	If the problem persists, have the system serviced.
Failed	Test setup error: Cannot allocate memory due to unknown memory problem.
	Action: Have the system serviced.

Ethernet Controller Messages

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

- Novell NetWare or IntraNetware Server ODI
- Novell NetWare or IntraNetware Server LAN
- NDIS Adapter for level 2.01 (OS/2)
- NDIS Adapter for level 4.0 (Windows NT)
- SCO UNIX LLI

Novell NetWare or IntraNetware Server ODI Driver Messages

This section contains the error messages for the Novell NetWare or IntraNetware server ODI driver. The explanation and recommended action are included with each message.

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 jumper on the system board is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

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 programs. See "PCI Bus Control" on page 171 for information on setting the interrupt requests. If the IRQ settings are correct, have the system serviced.

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: If you installed an IBM Ethernet adapter, make sure that the adapter is seated correctly. If the adapter is seated correctly, have the system serviced.

PCNTNW-NW-072 A resource tag is unavailable.

Explanation: The driver tried to allocate some resources that were not available.

Action: Add or free some memory 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.

PCNTNW-NW-074 The hardware interrupt cannot be set.

Explanation: An attempt was made to initialize a given hardware interrupt. The attempt was not successful.

Action: Verify that the Ethernet jumper on the system board is set to the default (enabled) position (see "System Board Jumpers" on page 420).

Make sure that the interrupt request numbers are set correctly. If you are using an ISA adapter, make sure resources are reserved as ISA Legacy in the configuration programs (see "Plug and Play" on page 172.)

PCNTNW-NW-075 The Multiple Link Interface Driver (MLID) cannot be registered with the Link Support Layer (LSL).

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.

PCNTNW-NW-076 The polling procedure cannot be added.

Explanation: An error occurred while the driver was adding a polling procedure to the NetWare or IntraNetware Operating System polling routines.

Action: Check the version of 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.

PCNTNW-NW-077 The event notification cannot be registered.

Explanation: The driver failed to register its event notification routines with the NetWare or IntraNetware Operating System.

Action: Check the version of 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.

PCNTNW-NW-078 The microcode file cannot be read.

Explanation: The driver attempted to read a microcode file. The read process failed.

Action: Make sure that the support files that accompany the driver are present. Restart the server.

PCNTNW-NW-079 The Multiple Link Interface Driver (MLID) did not initialize MSMTx Free Count.

Explanation: The MSMTx Free Count is not initialized correctly.

Action: Restart the server. If the problem persists, have the system serviced.

PCNTNW-NW-084 Unable to allocate memory below the 16 Mb boundary.

Explanation: A request was made to allocate memory below 16 Mb. The request did not complete successfully.

Action: Free some memory below 16 Mb by unloading some NLMs (NetWare loadable modules). If the problem persists, have the system serviced.

PCNTNW-NW-086 The driver parameter block is too small.

Explanation: The driver parameter block is too small.

Action: Restart the server. If the problem persists, have the system serviced.

PCNTNW-NW-087 The media parameter block is too small.

Explanation: The driver media parameter block is too small.

Action: Restart the server. If the problem persists, have the system serviced.

PCNTNW-NW-091 The hardware configuration conflicts.

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. See "PCI Bus Control" on page 171 for information on viewing and changing interrupt requests.

PCNTNW-NW-126 The group bit in the node address override was cleared.

Explanation: The IEEE address has a group bit indicating 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.

PCNTNW-NW-127 The local bit in the node address override was set.

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.

PCNTNW-NW-164 The device was not found.

Explanation: The driver cannot find an Ethernet controller in the server.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

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 jumper on the system board is set to the default (enabled) position (see "System Board Jumpers" on page 420).

If the problem persists, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

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 2.01 (OS/2) Driver Messages

This section contains the error messages for the NDIS 2.01 (OS/2) drivers. The explanation and recommended action are included with each message.

PCNTND-1 Unable to open the Protocol Manager.

Explanation: The NDIS stack is not configured correctly.

Action: Check and correct your configuration.

PCNTND-6 Out of memory while allocating buffers.

Explanation: The driver could not allocate the requested buffers.

Action: Check your system configuration. Edit the PROTOCOL.INI file to reduce the number of Txbuffers and Rxbuffers specified for the driver.

PCNTND-7 A Protocol Manager device error occurred.

Explanation: The NDIS stack is not configured correctly.

Action: Check and correct your configuration.

PCNTND-8 Bad status for the Protocol Manager.

Explanation: The NDIS stack is not configured correctly in the PROTOCOL.INI file.

Action: Check and correct your configuration.

PCNTND-9 Cannot find the PROTOCOL.INI entry.

Explanation: The NDIS stack is not configured correctly in the PROTOCOL.INI file.

Action: Check and correct your configuration.

PCNTND-10 The Protocol Manager Input Output Control (IOCTL) failed.

Explanation: The NDIS stack is not configured correctly in the PROTOCOL.INI file.

Action: Check and correct your configuration.

PCNTND-11 Protocol Manager registration failed.

Explanation: The NDIS stack is not configured correctly.

Action: Check and correct your configuration.

PCNTND-15 Device not found.

Explanation: The driver cannot find an Ethernet controller in the server.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

PCNTND-16 PCI scan specified, device not found.

Explanation: The driver cannot locate the Ethernet controller on the PCI bus.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

PCNTND-21 The adapter failed the checksum test.

Explanation: The driver cannot find an Ethernet controller.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

PCNTND-23 WARNING: PCNET IRQ found = *xx*

Explanation: The interrupt request (IRQ) setting (*xx*) in the PROTOCOL.INI file does not match the hardware IRQ setting.

Action: Remove the IRQ setting from the PROTOCOL.INI file or change the IRQ setting in the PROTOCOL.INI file to match the IRQ setting shown in the **PCI Routing** selection of the System Information menu in the Configuration/Setup Utility. (See "PCI Routing" on page 163.)

PCNTNW-24 WARNING: PCNET IRQ does not match PROTOCOL.INI.

Explanation: The interrupt request (IRQ) setting in the PROTOCOL.INI file does not match the hardware IRQ setting.

Action: Remove the IRQ setting from the PROTOCOL.INI file or change the IRQ setting in the PROTOCOL.INI file to match the IRQ setting shown in the **PCI Routing** selection of the System Information menu in the Configuration/Setup Utility. (See "PCI Routing" on page 163.)

PCNTNW-25 PCI scan specified, PCI bus not found!

Explanation: The driver cannot locate the Ethernet controller on the PCI bus.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

PCNTNW-29 WARNING: DMA number is not necessary for PCI device.

Explanation: The Ethernet controller does not require a DMA setting.

Action: Remove the DMA setting in the PROTOCOL.INI file.

PCNTNW-32 IRQ number is already in use by another PCNET device.

Explanation: The specified interrupt request (IRQ) number is already in use by another Ethernet controller or device.

Action: Modify the IRQ setting in the PROTOCOL.INI file, or modify the IRQ settings in the configuration programs. See "PCI Bus Control" on page 171 for information about setting the interrupt requests in the configuration programs.

PCNTNW-33 PCNET device with specified IOBASE is already in use.

Explanation: The specified I/O address number is already in use by another Ethernet controller or device.

Action: Remove the I/O address setting in the PROTOCOL.INI file.

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.

PermaNet(tm) 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(tm) 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(tm) 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 contains the error messages for the SCO UNIX LLI driver.

pnt0-2   PCI search specified, PCI device not found!

Explanation: The driver cannot locate the Ethernet controller on the PCI bus.

Action: Run the NETCONFIG program to search for another Ethernet controller.

Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420).

If the problem persists, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

pnt0-6   Cannot allocate memory for the adapter during an interrupt. Please check your Streams parameters.

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 programs, or run the NETCONFIG program to match the hardware settings.

pnt0-7   Cannot allocate memory for the adapter during reset. Please check your Streams parameters.

Explanation: The system is out of Streams memory blocks.

Action: Use the CRASH utility to increase the number of Streams memory blocks.

Ethernet Controller Messages

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pnt0-11   **Device not found!**

Explanation: The driver cannot find an Ethernet controller.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

---

pnt0-12   **Device failed checksum test!**

Explanation: The driver cannot find an Ethernet controller.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

---

pnt0-13   **add_intr_handler failed! Interrupts already enabled.**

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to match the hardware settings.

---

pnt0-14   **Cannot locate hardware.**

Explanation: The SunSoft Solaris driver cannot find any Ethernet controller.

Action: Verify that the Ethernet enable jumper is set to the default (enabled) position (see "System Board Jumpers" on page 420). If the jumper is set to the default (enabled) position, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

---

pnt0-15   **No more devices to open.**

Explanation: The SunSoft Solaris driver cannot find any more Ethernet controllers.

Action: Verify that additional IBM PCI Ethernet adapters are present or replace the Ethernet adapter that fails to respond. If the problem persists, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

---

pnt0-17   **Device fault...Reset initiated!**

Explanation: The SunSoft Solaris driver has been reset due to a device fault.

Action: Verify that additional IBM PCI Ethernet adapters are present or replace the PCnet card that fails to respond. If the problem persists, go to "Diagnostic Programs" on page 296 to run the diagnostic utility.

---

pnt0-19   IRQ found for PCnet hardware does not match space.c (or pnt.conf)!

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.

---

pnt0-20   add_intr_handler failed! Unknown interrupt type.

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to search for another Ethernet controller.

---

pnt0-21   add_intr_handler failed! Out of range interrupt number.

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to search for another Ethernet controller.

---

pnt0-22   add_intr_handler failed! Out of range IPL.

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to search for another Ethernet controller.

---

pnt0-23   add_intr_handler failed! Vector already occupied.

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to search for another Ethernet controller.

---

pnt0-24   add_intr_handler failed! Vector already shared at different IPL.

Explanation: The interrupt request (IRQ) that was specified, or the IRQ that was found, conflicts with other devices in the server.

Action: Modify your hardware settings.

Run the NETCONFIG program to search for another Ethernet controller.

pnt0-26   **The DMA number is not necessary for PCI device.**

Explanation: The IBM PCI Ethernet adapter does not require a DMA setting.

Action: Edit the SPACE.C file to delete the DMA parameter.

---

pnt0-29   **The IRQ number is already in use.**

Explanation: The specified I/O address is already in use.

Action: Run the NETCONFIG program to modify your hardware settings.

---

pnt0-31   **I/O address is not necessary for the PCI device.**

Explanation: The I/O address specified is not required.

Action: Remove the assigned I/O address specified for the Ethernet controller.

ServeRAID II Controller Messages

This section lists the ServeRAID II diagnostic and run-time error messages that might appear during system startup.

The ServeRAID II controller contains a Device Event Log that collects statistics on the number and types of events that occur on a selected hard disk drive. After correcting a problem with the disk array, clear the table so that you can identify any subsequent errors quickly. For more information, see "Viewing the Drive Information" on page 66.

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

The ServeRAID II controller also adds an additional unique identifier, called the host ID, to each hard disk drive that is part of a logical drive. The host ID is a user-defined 12-character string. See "Viewing or Changing the ServeRAID Controller Parameters" on page 68 for information on assigning a host ID.

ServeRAID II POST and Setup Messages

During power-on self-test (POST), the ServeRAID II 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. When the ServeRAID II controller requires your input, a list of function keys will appear below the message.

A new drive was installed.

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

Following new drives found (`old state:` `new state:` `ch:` `bay`)

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

Configured drives are missing.

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

Following drives not responding (`old state:` `new state:` `ch:` `bay`)

Where: **old state** is the configured state of the drive.

new state is the state that the ServeRAID II controller will assign to the drive.

ch is the channel where the drive was located previously.

bay is bay where the drive was located previously.

Examples of the possible state changes include:

```
(ONL: DDD x:  y)
(RDY: EMP x:  y)
(SBY: EMP x:  y)
(RBL: DDD x:  y)
(HSP: DHS x:  y)
(SHS: DHS x:  y)
```

Action: Press one of the following keys:

F4   Retry. Press this key after correcting a problem. For example, press retry after you turn on the external storage enclosure that contains the hard disk drive.

F5   Accept. Press this key to accept the new state that the ServeRAID II controller will assign to the drive. For example, the controller will assign the drive a state of defunct (DDD) or empty (EMP).

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 II controller will assign the drive a state of defunct (DDD), 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 hard disk drive in the DDD 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 hard disk 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 "Understanding the Drive Rebuild Process" on page 88 for more information.

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

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

Configured drives are not in the configured location.

Explanation: This message will be preceded by the previous messages and the **F5** key choice because configured drives were not found in the configured location. When the ServeRAID II controller detects that a previously configured drive is present, but the drive is in a new location, the following message appears:

Following drives found in new location (old ch: old bay: > new ch: new bay)

Where: **old ch** is the channel that matches the existing drive configuration information.

old bay is the bay that matches the existing drive configuration information.

new ch is the channel where the drive is now located.

new bay is the bay where the drive is now located.

For example:

(1 :5 > 1: 14)

In this example, the message indicates that the drive from Channel 1, Bay 5 is now located at Channel 1, Bay 14. The drive might have been physically moved to the new bay.

Action: Press one of the following keys:

F4   Retry. Press this key after correcting a problem. For example, press retry after you move the hard disk drive to its previously assigned location.

F5   Accept. Press this key to accept the new state that the ServeRAID II controller will assign to the drive. For example, the controller will assign the drive a state of defunct (DDD) or empty.

Note: A hard disk drive in the DDD 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 hard disk 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 "Understanding the Drive Rebuild Process" on page **88** for more information.

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

F6   Modify. 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 bays, you can press **F6** to accept the new locations, and the ServeRAID II controller will update the configuration.

New adapter installed in a configured server or drives are imported from a different server.

Explanation: This message might be preceded by the previous two messages and the **F5** and **F6** key choices because the drives were not found in the configured location. When the ServeRAID II controller detects that the identifiers of the drives do not match the adapter configuration information, the following message appears:

Following new drive found: (host id: old ch: old bay: new ch: new bay)

Where: **host id** is the adapter identification.

          old ch is the channel that matches the drive configuration information.

          old bay is the bay that matches the drive configuration information.

          New ch is the channel where the drive is now located.

          new bay is the bay where the drive is now located.

This message might be preceded by the two previously described messages and the **F5** and **F6** function key choices, because the drives are not found in the configured location.

For example, when drivers are imported from a server with the host ID of *My Machine*: (My Machine: 1:6 > 1:10)

In this example, the message indicates that the drive from Channel 1, Bay 6 is now located at Channel 1, Bay 10. The drive might have been physically moved to the new bay.

Action: Press one of the following keys:

F4   Retry. Press this key after correcting the problem. For example, press retry after you move the hard disk drive to its previously assigned location, or after you install the original hard disk drives back in the server.

F5   Accept. Press this key to accept the new state that the ServeRAID II controller will assign to the drive. For example, the controller will assign the drive a state of defunct (DDD) or empty.

Note: A hard disk drive in the DDD 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 hard disk 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 "Understanding the Drive Rebuild Process" on page 88 for more information.

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

F6   Modify. This choice is not always active. 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 bays, you can press **F6** to accept the new locations, and the ServeRAID II controller will update the configuration.

F7   Import. Press this key to import the configuration information from the drive and to update the configuration information on the ServeRAID II controller. This choice is useful when you replace the ServeRAID II controller in an existing disk-array model.

You also might press F7 if you replace a whole set of drives with drives that were configured in another server with a ServeRAID II controller.

Note: When you install drives in a server that has no logical drives defined, the F7 choice will not appear. The 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 96).

2. Select **Advanced Functions**.

3. Select **Import Configuration from Drives to Adapter** and follow the instructions on the screen.

ServeRAID II Status and Messages

This table lists, in alphabetical order, messages associated with the IBM ServeRAID II Controller.

Where the "Action" information tells you to start the IBM ServeRAID Configuration program, insert the ServeRAID Configuration Diskette in the primary diskette drive (usually drive A); then, press **Ctrl**+**Alt**+**Del**. The action column also provides general information about the message.

Where *m* or *n* appears in these messages, a number will appear in the actual message.

---

n logical drives are installed.

Explanation: *n* represents the number of defined logical drives.

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

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

Explanation: The ServeRAID II controller is not operational.

Action: Have the system serviced.

Error: Cannot disable this adapter BIOS.

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

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

Following drives not responding (old state: new state ch: bay)

Explanation: One or more drives did not respond to the controller. For example, the controller detected a new drive in an unconfigured bay, and the drive is not part of the current configuration. This might also occur if the controller detected that a configured drive is missing.

Action: Select **F5** to accept the new state that the ServeRAID II controller will assign to the drive. For example, the controller will assign the drive a state of defunct (DDD) or empty (EMP).

A hard disk drive in the DDD 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 hard disk drive. Also, ensure that all cables inside the server are connected properly.

ServeRAID II Controller Messages

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 "Understanding the Drive Rebuild Process" on page 88 for more information.

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

For more information, see "Configured drives are missing." on page 345.

Following new drives found (old state: new state ch: bay)

Explanation: One or more drives were found in an unconfigured bay. For each drive listed, a new state of Ready (RDY) appears.

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

Following drives found in new location (old ch: old bay > new ch: new bay)

Explanation: POST found that the location of one or more drives does not match the stored configuration information.

Action: For more information, see "Configured drives are not in the configured location." on page 346.

Installation stopped.

Explanation: The server cannot access the ServeRAID II controller.

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

Recoverable configuration error; run Configuration program.

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

Action:

1. Insert the ServeRAID II Configuration CD.
2. Press **Ctrl**+**Alt**+**Del** to restart the system.
3. Select **Advanced Functions** and synchronize the configuration.
4. See "Synchronizing Logical Drives" on page 60 for more information.

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

Explanation: One or more hard disk 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 in a blocked state. A blocked logical drive cannot be accessed. See "Rebuilding Drives" on page 140 for additional information.

Action: Press **F4** to unblock the logical drive.

Press **F5** to continue without unblocking.

ServeRAID II Configuration Conflict Messages
This table lists messages associated with ServeRAID II controller configuration conflicts.

Auto rearrange message M0

Explanation: Auto rearrange is enabled/disabled.

Action: None

Standard BIOS error message M1

Explanation: Your system has a configuration error due to the conditions in the message.

Action: Press the following keys:

    F1 Retry

    F2 Accept the changes in configuration.

    F3 Rearrange with the drive configuration.

    F4 Synchronize with the drive configuration.

    F10 Exit without any change in configuration.

Recoverable configuration error M2

Explanation: A recoverable configuration error occurred.

Action: Run ServeRAID II configuration. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.

Unrecoverable configuration error M3

Explanation: An unrecoverable configuration error occurred.

Action: Run ServeRAID II configuration. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.

Adapter not responding properly M4

Explanation: The ServeRAID II adapter is not responding correctly.

Action: Run ServeRAID II diagnostics, get the adapter status, and display message M0.

- If no errors are detected:

  > BCS = X'0F' or X'09'
  > ECS = X'00'

- If the BCS is NOT X'0F' or X'09', and ECS is NOT X'00', then:

  - Get and display the Power-on Change list if present.

  - Get and display the Wrong SCSI ID list if present.

  - Get and display the Undefined Device list if present.

  - Display message M1.

    Press the corresponding F*x* keys and use the table under "BCS/ECS Configuration Registers Codes" on page 355.

ServeRAID II Diagnostic Messages

Diagnostic Message	Description
2601h	A ServeRAID error occurred.
2602h	*Action:* Have the system serviced.
2603h	
2603h	
2604h	
2605h	
2606h	
2607h	
2608h	
2609h	
260Ah	
260Bh	
2610h	A ServeRAID controller hardware error occurred.
	Action: Have the system serviced.
2620h	A ServeRAID disk configuration or hard disk error occurred.
	Action: Run ServeRAID II configuration. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.
	If the problem persists, have the system serviced.

ServeRAID II ISPR, BCS, and ECS Codes

Once the RAID test has completed the following register information is displayed on the screen before returning to the Diagnostic (test selection) menu.

```
Hardware:  ISPR=aaaa  BCS=bb  ECS=cc
```

ISPR is the Interrupt Status Port Register; BCS and ECS are Configuration Registers.

If NO errors occur:

ISPR (*aaaa***)** = X'EF10'
BCS (*bb***)** = X'0F' or X'09'
ECS (*cc***)** = X'00'

If an error occurs:

- ISPR is translated into the error codes under "ISPR (Interrupt Status Port Register) Codes."

- BCS and ECS are translated into the codes under "BCS/ECS Configuration Registers Codes" on page 355.

ISPR (Interrupt Status Port Register) Codes

EF10

Explanation: No Error

Action: None

1xxx

Explanation: A flash checksum error occurred.

Action: Have the system serviced.

2xxx

Explanation: A code DRAM error occurred.

Action: Have the system serviced.

3xxx

Explanation: A NVRAM error occurred.

Action: Have the system serviced.

ServeRAID II Controller Messages

4xxx

Explanation: A timer/cache memory controller error occurred.

Action: Have the system serviced.

5xxx

Explanation: A cache memory controller error occurred.

Action: Have the system serviced.

6xxx

Explanation: A cache DRAM error occurred.

Action: Have the system serviced.

7xxx

Explanation: A host/local PCI bus interface error occurred.

Action: Have the system serviced.

8xxx

Explanation: A SCSI I/O port error occurred.

Action: Have the system serviced.

9xxx

Explanation: A SCSI termination error occurred.

Action: Check cable connections and device termination. See "Termination (Internal SCSI Devices)" on page 236 for more information.

If the problem persists, have the system serviced.

Axxx

Explanation: A SCSI I/O port error occurred.

Action: Have the system serviced.

Bxxx

Explanation: A SCSI bus interface error occurred.

Action: Have the system serviced.

BCS/ECS Configuration Registers Codes

BCS	ECS	Explanation and Possible Recovery Action
BCS not in table	ECS not in table	**Explanation:** The adapter is not functioning properly.
		Action: Run ServeRAID II diagnostics and display message M4.
0000 0000 (X'00')	0000 0001 (X'01')	**Explanation:** Invalid Flash configuration.
		Action: Run ServeRAID II configuration and display message M2. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.
0000 0000 (X'00')	0000 0010 (X'02')	**Explanation:** Invalid NVRAM configuration.
		Action: Run ServeRAID II configuration and display message M2. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.
0000 0000 (X'00')	0000 0011 (X'03')	**Explanation:** Invalid Flash and NVRAM configuration.
		Action: Run ServeRAID II configuration and display message M3. See Chapter 3, "Configuring and Monitoring Your Disk Arrays" on page 33.
0000 0001 (X'01')	0000 1000 (X'08')	**Explanation:** No configuration was found in drive(s) and ONL/RBL drive(s) are not responding.
		Action: Press F1, F2, F4, F10
0000 0001 (X'01')	0001 1000 (X'18')	**Explanation:** No configuration was found in drive(s) and ONL/RBL and HSP/SHS drive(s) are not responding.
		Action: Press F1, F2, F4, F10
0000 0001 (X'01')	0010 1000 (X'28')	**Explanation:** No configuration was found in drive(s) and ONL/RBL and RDY/SBY drive(s) are not responding.
		Action: Press F1, F2, F4, F10
0000 0001 (X'01')	0011 1000 (X'38')	**Explanation:** No configuration was found in drive(s) and ONL/RBL, HSP/SHS, and RDY/SBY drive(s) are not responding.
		Action: Press F1, F2, F4, F10
0000 0001 (X'01')	0100 1000 (X'48')	**Explanation:** No configuration was found in drive(s) and ONL/RBL drive(s) are not responding and unidentified drive(s) were found.
		Action: Press F1, F2, F4, F10

ServeRAID II Controller Messages

BCS	ECS	Explanation and Possible Recovery Action
0000 0001 (X'01')	0101 1000 (X'58')	**Explanation:** No configuration was found in drive(s) and ONL/RBL and HSP/SHS drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F4, F10
0000 0001 (X'01')	0110 1000 (X'68')	**Explanation:** No configuration was found in drive(s) and ONL/RBL and RDY/SBY drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F4, F10
0000 0001 (X'01')	0111 1000 (X'78')	**Explanation:** No configuration was found in drive(s) and ONL/RBL, HSP/SHS, and RDY/SBY drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1000 1000 (X'88')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL drive(s) are not responding. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1001 1000 (X'98')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL and HSP/SHS drive(s) are not responding. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1010 1000 (X'A8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL and RDY/SBY drive(s) are not responding. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1011 1000 (X'B8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL, HSP/SHS, and RDY/SBY drive(s) are not responding. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1100 1000 (X'C8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F4, F10
0000 0011 (X'03')	1101 1000 (X'D8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL and HSP/SHS drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F4, F10

BCS	ECS	Explanation and Possible Recovery Action
0000 0011 (X'03')	1110 1000 (X'E8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL and RDY/SBY drive(s) are not responding and unidentified drive(s) were found.
		Action: Press F1, F2, F4, F10
0000 0011 (X'03')	1111 1000 (X'F8')	**Explanation:** A drive was imported from another system and it has valid configuration and ONL/RBL, HSP/SHS, and RDY/SBY drive(s) are not responding and unidentified drive(s) were found.
		Action: Press F1, F2, F4, F10
0000 0111 (X'07')	0000 1000 (X'08')	**Explanation:** ONL/RBL drive(s) are not responding.
		Action: Press F1, F2, F10
0000 0111 (X'07')	0000 1100 (X'0C')	**Explanation:** ONL/RBL drive(s) are not responding and drive in wrong ID.
		Action: Press F1, F2, F3, F10
0000 0111 (X'07')	0001 1000 (X'18')	**Explanation:** ONL/RBL and HSP/SHS drive(s) are not responding.
		Action: Press F1, F2, F10
0000 0111 (X'07')	0001 1100 (X'1C')	**Explanation:** ONL/RBL and HSP/SHS drive(s) are not responding and drive in wrong ID.
		Action: Press F1, F2, F3, F10
0000 0111 (X'07')	0010 1000 (X'28')	**Explanation:** ONL/RBL and RDY/SBY drive(s) are not responding.
		Action: Press F1, F2, F10
0000 0111 (X'07')	0010 1100 (X'2C')	**Explanation:** ONL/RBL and RDY/SBY drive(s) are not responding and drive in wrong ID.
		Action: Press F1, F2, F3, F10
0000 0111 (X'07')	0011 1000 (X'38')	**Explanation:** ONL/RBL, RDY/SBY, and HSP/SHS drive(s) are not responding.
		Action: Press F1, F2, F10
0000 0111 (X'07')	0011 1100 (X'3C')	**Explanation:** ONL/RBL, RDY/SBY, and HSP/SHS drive(s) are not responding and drive in wrong ID.
		Action: Press F1, F2, F3, F10
0000 0111 (X'07')	0100 1000 (X'48')	**Explanation:** ONL/RBL drive(s) are not responding and unidentified drive(s) were found.
		Action: Press F1, F2, F10

ServeRAID II Controller Messages

BCS	ECS	Explanation and Possible Recovery Action
0000 0111 (X'07')	0100 1100 (X'4C')	**Explanation:** ONL/RBL drive(s) are not responding, drive in wrong ID, and unidentified drive(s) were found. **Action:** Press F1, F2, F3, F10
0000 0111 (X'07')	0101 1000 (X'58')	**Explanation:** ONL/RBL and HSP/SHS drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F10
0000 0111 (X'07')	0101 1100 (X'5C')	**Explanation:** ONL/RBL and HSP/SHS drive(s) are not responding, drive in wrong ID, and unidentified drive(s) were found. **Action:** Press F1, F2, F3, F10
0000 0111 (X'07')	0110 1000 (X'68')	**Explanation:** ONL/RBL and RDY/SBY drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F10
0000 0111 (X'07')	0110 1100 (X'6C')	**Explanation:** ONL/RBL and RDY/SBY drive(s) are not responding, drive in wrong ID, and unidentified drive(s) were found. **Action:** Press F1, F2, F3, F10
0000 0111 (X'07')	0111 1000 (X'78')	**Explanation:** ONL/RBL, RDY/SBY, and HSP/SHS drive(s) are not responding and unidentified drive(s) were found. **Action:** Press F1, F2, F10
0000 0111 (X'07')	0111 1100 (X'7C')	**Explanation:** ONL/RBL, RDY/SBY, and HSP/SHS drive(s) are not responding, drive in wrong ID, and unidentified drive(s) were found. **Action:** Press F1, F2, F3, F10
0000 1001 (X'09')	0000 0000 (X'00')	**Explanation:** No error occurred. **Action:** None
0000 1001 (X'09')	0001 0000 (X'10')	**Explanation:** HSP/SHS drive(s) are not responding. **Action:** Press F1, F2, F10
0000 1001 (X'09')	0010 0000 (X'20')	**Explanation:** RDY/SBY drive(s) are not responding. **Action:** Press F1, F2, F10
0000 1001 (X'09')	0011 0000 (X'30')	**Explanation:** HSP/SHS and RDY/SBY drive(s) are not responding. **Action:** Press F1, F2, F10

BCS	ECS	Explanation and Possible Recovery Action
0000 1111 (X'0F')	0000 0000 (X'00')	**Explanation:** No error occurred. **Action:** None
0000 1111 (X'0F')	0001 0000 (X'10')	**Explanation:** HSP/SHS drives are not responding. **Action:** Press F1, F2, F10
0000 1111 (X'0F')	0010 0000 (X'20')	**Explanation:** RDY/SBY drives are not responding. **Action:** Press F1, F2, F10
0000 1111 (X'0F')	0011 0000 (X'30')	**Explanation:** HSP/SHS and RDY/SBY drive(s) are not responding. **Action:** Press F1, F2, F10

Troubleshooting

You can use the troubleshooting charts in this section to find solutions to problems that have definite symptoms.

Troubleshooting Charts

Look for the symptom in the left column of the chart. Instructions and probable solutions to the problem are in the right column. If you have just added new software or a new option and your server is not working, do the following before using the troubleshooting charts:

- Remove the software or device that you just added.

- Run the diagnostic tests to determine if your server is running correctly.

- Reinstall the new software or new device.

Integrated ServeRAID II Controller Problems	Action
Drives are not responding or errors are reported when ServeRAID II BIOS is loaded during POST.	If the Systems Management Processor Error LED (CR24) on the system board is on, have your system serviced.
	If the Systems Management Processor Error LED (CR24) is not on, check the RAID Channel 1 Error LED (CR30) and the RAID Channel 2 Error LED (CR31) on the system board.
	1. If either CR30 or CR31 is on and not flashing, have your system serviced.
	2. If either CR30 or CR31 are flashing in a pattern of 3 or 6 flashes followed by a pause, update the ServeRAID II controller firmware. See Chapter 9, "Getting Help, Service, and Information" for information on obtaining updates.
	If a problem still exists, have the system serviced.
	Note: See "System Board Component Locations" on page 418 for the locations of the LEDS on the system board.

CD-ROM Drive Problems	Action
The CD is not working properly.	Clean the CD by wiping it with a soft, lint-free cloth, from the center of the CD to the outer edge. Do not clean in a circular pattern. This can cause loss of data.
	If this does not correct the problem, clean the optical-head lens. Discs for cleaning the lens are available from your place of purchase.
	If a problem still exists, have the system serviced.
The CD-ROM drive tray is not working.	The server must be turned on. If the server is on and the tray does not eject, insert the end of a paper clip into the manual tray-release opening. If the drive still does not work correctly, have the system serviced.
The CD-ROM drive is not recognized.	Verify that: 1. The primary IDE channel is enabled in the Configuration/Setup utility program. 2. All cables and jumpers are installed correctly. 3. The correct device driver is installed for the CD-ROM drive.

Diskette Drive Problems	Action
The diskette drive in-use light stays on, or the system bypasses the diskette drive.	If there is a diskette in the drive, verify that: 1. The diskette drive is enabled in the configuration programs. 2. The diskette is good and not damaged. (Try another diskette if you have one.) 3. The diskette is inserted correctly in the drive. 4. The diskette contains the necessary files to start the server. 5. Your software program is OK. See "Software Problem" on page 370. If the diskette drive in-use light stays on, or the system continues to bypass the diskette drive, have the system serviced.

Troubleshooting

Monitor Self-Tests	Action
	Some IBM monitors have their own self-tests. If you suspect a problem with your monitor, refer to the information that comes with the monitor for adjusting and testing instructions.
	If you still cannot find the problem, have the monitor and system serviced.

Monitor Problems	Action
The screen is blank.	Verify that: 1. The server power cord is plugged into the server and a working electrical outlet. 2. The monitor is turned on and the Brightness and Contrast controls are adjusted correctly. 3. The monitor signal cable is connected to the correct connector on the server. If the items above are correct and the screen remains blank, have the system serviced.
Only the cursor appears.	Have the system serviced.
The monitor works when you turn on the server, but goes blank when you start some application programs.	Verify that the primary monitor cable is connected to the video port. To find the video port, see "Input/Output Connectors and Expansion Slots" on page 14. Be sure that you installed the necessary device drivers for the applications.
The screen flickers.	Set the monitor for the highest, noninterlaced refresh rate available. To reset the refresh rate, use a utility program, such as AnyView Professional or WinMode.

Monitor Problems	Action
Wavy, unreadable, rolling, distorted screen, or screen jitter.	If the monitor self-tests show the monitor is OK, consider the location of the monitor. Magnetic fields around other devices (such as transformers, appliances, fluorescent lights, and other monitors) can cause screen jitter or wavy, unreadable, rolling, or distorted screen images. If this happens, turn off the monitor. (Moving a color monitor while it is turned on might cause screen discoloration.) Then move the device and the monitor at least 305 mm (12 in.) apart. Turn on the monitor.
	Note:
	1. To prevent diskette drive read/write errors. be sure the distance between monitors and diskette drives is at least 76 mm (3 in.).
	2. Non-IBM monitor cables might cause unpredictable problems.
	3. An enhanced monitor cable with additional shielding is available for the 9521 and 9527 monitors. For information about the enhanced monitor cable, see your IBM reseller or IBM marketing representative.
	If the problem still exists, have the monitor and system serviced.
Wrong characters appear on the screen.	If the wrong language is displayed, update the BIOS with the correct language. See Chapter 9, "Getting Help, Service, and Information" for information about obtaining updates for the BIOS.
	If the problem still exists, have the system serviced.

General Problems	Action
Problems such as broken cover locks or indicator lights not working.	Have the system serviced.

Troubleshooting

Power Problems	Action
The server does not power on.	Verify that: 1. The power cables are properly connected to the server. 2. The power outlet functions properly. 3. The type of memory installed is correct. 4. If you just installed an option, remove it, and restart the server. If the server now powers on, you might have installed more options than the power supply supports. 5. The LEDs on the power supply are on. See "Power Supply LEDs" on page 377 for more information about the power supply LEDs. If the problem still exists, have the system serviced.

Intermittent Problems	Action
A problem occurs only occasionally and is difficult to detect.	Verify that: 1. All cables and cords are connected securely to the rear of the server and attached options. 2. When the server is turned on, air is flowing from the rear of the server at the fan grill. If there is no air flow, the fan is not working. This causes the server to overheat and shut down. 3. Ensure that the SCSI bus and devices are configured correctly and that the last external device in each SCSI chain is terminated correctly. See "SCSI Drives" on page 235. If the items above are correct, have the system serviced.

Microprocessor Problems	Action
The server emits a continuous tone during POST.	The startup (boot) microprocessor is not working properly. If your server contains two microprocessors the microprocessor in the secondary microprocessor socket is the startup microprocessor. 1. Verify that the startup microprocessor is seated properly. 2. If your server contains two microprocessors, remove the startup microprocessor and restart the server. If the server starts properly, replace the old startup microprocessor. 3. Replace the startup microprocessor. Restart the server. If the problem still exists, have the system serviced.

Keyboard, Mouse, or Pointing-Device Problems	Action
All or some keys on the keyboard do not work.	1. Make sure that the keyboard cable is properly connected to the server. 2. Make sure that the server and the monitor are turned on. 3. Try using another keyboard. If the items above are correct, have the system serviced.
The mouse or pointing device does not work.	1. Verify that the mouse or pointing-device cable is securely connected and the device drivers are installed correctly. 2. Try using another mouse or pointing device. If the problem still exists, have the server and the device serviced.

Memory Problems	Action
The amount of memory displayed is less than the amount of memory installed.	Verify that: 1. The memory modules are seated properly. 2. You have installed the correct type of memory (see "Installing Memory-Module Kits" on page 230). 3. If you changed the memory, you updated the memory configuration with the Configuration/Setup utility. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. 4. All banks of memory on the DIMMs are enabled (see "Memory Settings" on page 172). The server might have automatically disabled a DIMM bank when it detected a problem or a DIMM bank could have been manually disabled. If the above items are correct, run the memory diagnostic program. The system might have detected a bad memory module and automatically reallocated memory to enable you to continue to operate. If the memory tests fail, have the system serviced or replace the failing DIMM.

Option Problems	Action
An IBM option that used to work does not work now.	Verify that all of the option hardware and cable connections are secure. If the option comes with its own test instructions, use those instructions to test the option. If the failing option is a SCSI option, verify that: 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. If the problem still exists, have the system serviced.

Option Problems	Action
An IBM option that was just installed does not work.	Verify that: 1. The option is designed for the server. 2. You followed the installation instructions that come with the option. 3. The option is installed correctly. 4. You have not loosened any other installed options or cables. 5. You updated the configuration information in the Configuration/Setup utility. Whenever memory or an option is changed, you must update the configuration. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161. If the problem still exists, have the system serviced.

Parallel Port Problems	Action
The number of parallel ports displayed is less than the number of parallel ports installed.	Verify that: 1. Each port is assigned a unique address. 2. The parallel-port adapter, if you installed one, is seated properly. If the problem still exists, have the system serviced.

Serial Port Problems	Action
The number of serial ports identified by the operating system is less than the number of serial ports installed.	Verify that: 1. Each port is assigned a unique address by the Configuration/Setup utility program and none of the serial ports are disabled. *Note:* The management C connector is the same as a serial port connector, but it is used only by the integrated system management processor and is not available for use by the operating system. This port does not appear in the Configuration/Setup utility program menus; it can be configured using Netfinity Manager. 2. The serial-port adapter, if you installed one, is seated properly. If the problem still exists, have the system serviced.

Serial Port Problems	Action
A serial device does not work.	Verify that: 1. The serial port is enabled and is assigned a unique address. 2. Make sure that the device is not connected to the management port C. *Note:* The management C connector is the same as a serial port connector, but it is used only by the integrated system management processor and is not available for use by the operating system. This port does not appear in the Configuration/Setup utility program menus; it can be configured using Netfinity Manager. If the problem still exists, have the system serviced.

Universal Serial Bus (USB) Port Problems	Action
A USB device does not work.	Verify that: 1. You are not trying to use a USB device during POST if you have a standard (non-USB) keyboard attached to the keyboard port. *Note:* If a standard (non-USB) keyboard is attached to the keyboard port, then the USB is disabled and no USB device will work during POST. 2. The correct USB device driver is installed. 3. Your operating system supports USB devices. If the problem still exists, have the system serviced.

Printer Problems	Action
The printer does not work.	Verify that: 1. The printer is turned on and is online. 2. The printer signal cable is connected to the correct serial or parallel port on the server. For the location of the serial or parallel port, see "Input/Output Connectors and Expansion Slots" on page 14. *Note:* Non-IBM printer cables might cause unpredictable problems. 3. You have assigned the printer port correctly in your operating system or application program. 4. You have assigned the printer port correctly using the configuration programs. If the items above are correct and the printer still does not work, run the tests described in the documentation that comes with your printer. If the tests show that the printer is OK, have the system serviced.

Expansion Enclosure Problems	Action
The SCSI expansion enclosure used to work, but does not work now.	Verify that all of the SCSI expansion enclosure hardware and cable connections are secure. Verify that: 1. The cables for all external SCSI options are connected correctly. 2. The last option in each SCSI chain, or the end of the SCSI cable, is terminated correctly. 3. Any external SCSI option is turned on. You must turn on an external SCSI option before turning on the server. For more information, see your SCSI and expansion enclosure documentation. If the SCSI expansion enclosure comes with its own test instructions, use those instructions to test it. In addition, test the power supply. If the items above are correct and the test programs found no problem, have the server and SCSI expansion enclosure serviced.

Software Problem	Action
Suspected software problem.	To determine if problems are caused by the software, verify that:

1. Your server has the minimum memory requirements needed to use the software. For memory requirements, refer to the information that comes with the software.

   Note: If you have just installed an adapter or memory, you might have a memory address conflict.
2. The software is designed to operate on your server.
3. Other software works on your server.
4. The software that you are using works on another system.

If you received any error messages when using the software program, refer to the information that comes with the software for a description of the messages and solutions to the problem.

If the items above are correct and the problem remains, contact your place of purchase.

Netfinity Service Processor Manager Problems	Action
Netfinity Service Processor Manager reports a general monitor failure	If the Systems Management Processor Error LED (CR24) on the system board is on, have your system serviced. See "System Board Component Locations" on page 418 for the location of the LED.
	If the Systems Management Processor Error LED (CR24) is not on, disconnect the server from all electrical sources, wait for 30 seconds, reconnect the server to the electrical sources, and restart the server.
	If a problem still exists, have the system serviced.

Note: If you cannot find the problem in the troubleshooting charts, go to "Running Diagnostic Programs" on page 297 to test the server. If you have run the diagnostic test programs or if running the tests does not reveal the problem, have the system serviced.

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 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 bad 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 your 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 "Configuring the Ethernet Controller" on page 178).

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.

Controller Problem	Action
The server stops running when loading device drivers.	The PCI BIOS interrupt settings are incorrect.
	Check the following:
	• Determine if the interrupt (IRQ) setting assigned to the Ethernet controller is also assigned to another device in the Configuration/Setup utility program.
	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. (See "Resolving Configuration Conflicts" on page 376.)
	• For NetWare and IntraNetware, do not use IRQ 14 or 15 for PCI devices. IRQ 14 is used for IDE devices (CD-ROM drive). If the IDE CD-ROM in your system is disabled, reserve IRQ 14 as ISA Legacy in the **Plug and Play** menu of the Configuration/Setup Utility. (See "Plug and Play" on page 172.) IRQ 15 should be reserved for ISA legacy devices.
	• Make sure that you are using the most recent device driver available from the World Wide Web. (See Chapter 9, "Getting Help, Service, and Information" World Wide Web addresses.)
	• Run the network diagnostic program.
	If the problem still exists, have the system serviced.
Ethernet Link Status light does not light.	Check the following:
	• 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 for the LEDs.
	If the problem still exists, have the system serviced.

Troubleshooting

Controller Problem	Action
The Ethernet Transmit/Receive Activity light does not light.	Check the following:
	Note: The Ethernet Transmit/Receive Activity LED illuminates only when data is sent to or by this Ethernet controller.
	• 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 device driver load parameters. If necessary, remove any LED parameter settings when you load the device drivers.
Data is incorrect or sporadic.	Check the following:
	• 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.	Check the following:
	• Make sure that the cable is connected to the Ethernet controller. • Make sure that your PCI system BIOS is current. • Reseat the adapter (see "Working with Adapters" on page 211). • Determine if the interrupt (IRQ) setting assigned to the Ethernet adapter is also assigned to another device in the Configuration/Setup utility program.
	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. (See "Resolving Configuration Conflicts" on page 376.)
	If the problem still exists, have the system serviced.

Controller Problem	Action
The Ethernet controller stopped working without apparent cause.	Check the following: • Run diagnostics for the Ethernet controller. • Try a different connector on the hub. • Reinstall the device drivers (see your operating-system documentation and your ServerGuide instructions, if you used ServerGuide to install your operating system). If the problem still exists, have the system serviced.

Resolving Configuration Conflicts

The Configuration/Setup utility program configures only the server hardware. It does not consider the requirements of the operating system or the application programs. For these reasons, memory-address configuration conflicts might occur.

Changing the Software Configuration Setup

The best way to resolve memory-address conflicts is to change the software configuration by changing the addresses that the EMS device driver defined. The SVGA video memory occupies 32 Kb (1 Kb = approximately 1000 bits) of space in the hex C0000 to C7FFF EMS memory area. EMS device drivers must use addresses different from those assigned to video read-only memory (ROM). You can use the Configuration/Setup utility program to view or change the current setting for video ROM. For information about using the configuration programs, see "Using the Configuration/Setup Utility Main Menu" on page 161.

Changing the Hardware Configuration Setup

An alternative way to resolve memory-address conflicts is to change the address of the conflicting hardware option. See "Plug and Play" on page 172 for information about reserving resources for ISA legacy adapters.

Identifying Problems Using Status LEDs

Your 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. See
"Light Path Diagnostics" on page 380 for more information.

Status LEDs are located on the following components:

- Information panel

  For more information, see "Information LED Panel" on page 12.

- Hard disk drive trays

  For more information, see "Controls and Indicators" on page 9.

- Power supply

  For more information, see "Power Supply LEDs."

- Diagnostic panel

  For more information, see "Diagnostics Panel LEDs" on
  page 379.

- Processor board

  See "Processor Board Component Locations" on page 422 for
  locations of the LEDs on the processor board.

- System board

  See "System Board Component Locations" on page 418 for
  locations of the LEDs on the system board.

Power Supply LEDs

The AC and DC Power LEDs on the power supply provide status
information about the power supply. See "Power Supplies" on
page 17 for the location of these LEDs.

The following table describes the AC and DC Power LEDs.

Identifying Problems Using Status LEDs

AC Power LED	DC Power LED	Description and Action
On	On	The power supply is on and operating correctly.
On	Off	There is a DC power problem. Possible causes: 1. The Power Control button on the front of the server is in the Off position. *Action:* Press the Power Control button to start the server. 2. The Power switch on the power supply is in the Off position. *Action:* Turn the Power switch to the On position. 3. The power supply has failed. *Action:* Replace the power supply. If the problem persists, have the system serviced.
Off	Off	There is an AC power problem. Possible causes: 1. There is no AC power to the power supply. *Actions:* Verify that: • The power cord is properly connected to the server. • The power outlet functions properly. 2. The power supply has failed. *Action:* Replace the power supply. If the problem persists, have the system serviced.

Diagnostics Panel LEDs

The following illustration shows the LEDs on the diagnostics panel inside the server. See "Light Path Diagnostics" on page 380 for information on identifying problems using these LEDs.
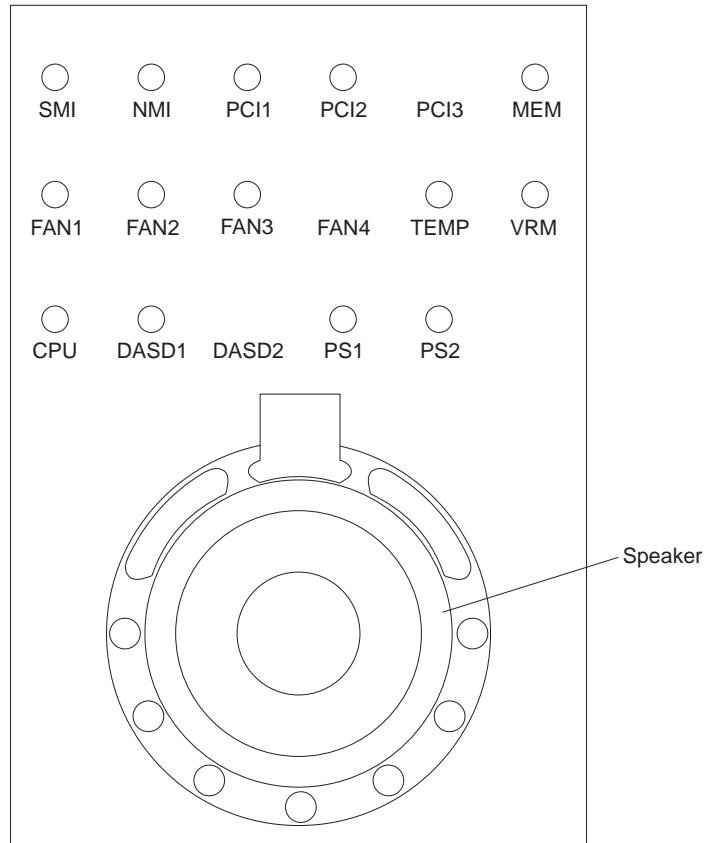
Light Path Diagnostics

The light path diagnostics built into your server allow you to quickly identify the type of system error that occurred. The light path diagnostics begins with the System Error LED on the information LED panel. When this light is illuminated, use the following information to isolate the problem.

- If the System Error LED on the information LED panel on the front of the server is on, a system error was detected. Check to see which of the LEDs on the diagnostics panel inside the server are on.

  - SMI LED on

    A systems management event occurred.

    Action: Restart the server. If the problem persists, have the system serviced.

  - NMI LED on

    A non-maskable interrupt occurred. The PCI 1 or PCI 2 LED will probably also be on.

    Actions:

      1. If the PCI 1 or PCI 2 LED is on, follow the instructions for those LEDs.

      2. If the PCI 1 or PCI 2 LED is not on, restart the server. If the problem persists, have the system serviced.

  - PCI 1 LED on

    An error occurred on the primary PCI channel. An adapter in PCI slot 5 or 6 or the system board caused the error.

    Actions:

      1. Check the error log for additional information. If the error log indicates a problem with the integrated ServeRAID II controller or the Ethernet controller, have your system serviced.

      2. If you cannot isolate the failing adapter from the information in the error log, try to determine the

failing adapter by removing one adapter at a time from the primary PCI bus (PCI slots 5 and 6) and restarting the server after each adapter is removed.

If the problem persists, have the system serviced.

– PCI 2 LED on

An error occurred on the secondary PCI channel. An adapter in PCI slot 1, 2, 3, or 4 or the system board caused the error.

Actions:

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 the secondary PCI bus (PCI slots 1–4) and restarting the server after each adapter is removed.

If the problem persists, have the system serviced.

– MEM LED on

A memory error occurred. Check the DIMM Error LEDs on the processor board.

- DIMM 1 Error LED on

The DIMM in DIMM slot 1 has failed.

Action: Replace the DIMM in DIMM slot 1.

- DIMM 2 Error LED on

The DIMM in DIMM slot 2 has failed.

Action: Replace the DIMM in DIMM slot 2.

- DIMM 3 Error LED on

The DIMM in DIMM slot 3 has failed.

Action: Replace the DIMM in DIMM slot 3.

- DIMM 4 Error LED on

The DIMM in DIMM slot 4 has failed.

Action: Replace the DIMM in DIMM slot 4.

– FAN 1 LED on

Fan 1 has failed or is operating too slowly.

Note: A failing fan can also cause the TEMP and DASD1 LEDs to be on.

Action: Replace fan 1.

– FAN 2 LED on

Fan 2 has failed or is operating too slowly.

Note: A failing fan can also cause the TEMP and DASD1 LEDs to be on.

Action: Replace fan 2.

– FAN 3 LED on

Fan 3 has failed or is operating too slowly.

Note: A failing fan can also cause the TEMP and DASD1 LEDs to be on.

Action: Replace fan 3.

– TEMP LED on

The system temperature has exceeded the maximum rating.

Actions:

1. Check to see if a fan has failed. If it has, replace the fan.

2. Make sure the room temperature is not too hot. (See "Specifications" on page 412)

If the problem persists, have the system serviced.

– VRM LED on

One of the voltage regulator modules on the processor board has failed. Check the VRM Error LEDs on the processor board.

- Primary Processor VRM Error LED on

The VRM for the primary microprocessor slot has failed.

Actions:

1. Turn the server off, reseat the VRM, and restart the server.

2. If the problem persists, replace the VRM.

If the problem persists, have the system serviced.

- Secondary Processor VRM Error LED on

The VRM for the secondary microprocessor slot has failed.

Actions:

1. Turn the server off, reseat the VRM, and restart the server.

2. If the problem persists, replace the VRM.

If the problem persists, have the system serviced.

– CPU LED on

One of the microprocessors has failed. Check the Microprocessor Error LEDs on the processor board.

- Primary Microprocessor Error LED on

The microprocessor in the primary microprocessor slot has failed.

Actions:

1. Turn the server off, reseat the microprocessor, and restart the server.

2. If the problem persists, replace the microprocessor.

If the problem persists, have the system serviced.

- Secondary Microprocessor Error LED on

The microprocessor in the secondary microprocessor slot has failed.

Actions:

1. Turn the server off, reseat the microprocessor, and restart the server.

2. If the problem persists, replace the microprocessor.

If the problem persists, have the system serviced.

– PS1 LED on

The primary power supply has failed.

Action: Replace the primary power supply.

– PS2 LED on

The secondary power supply has failed.

Action: Replace the secondary power supply.

– DASD 1 LED on

A hot-swap hard disk drive has failed.

Actions:

1. Check the error log for additional information. If the error log indicates a temperature problem and the fans are working correctly, have the system serviced.

2. If the amber Hard Disk Status LED on one of the hot-swap hard disk drives is on, see "Replacing a Faulty Drive" on page 86 for more information.

- System Error LED on the information LED panel on the front of the server is off. The light path diagnostics have not detected a system error.

Checking the System for Damage

This section provides instructions on what to do if your server might be damaged.

After Dropping It

Look for loose cables and obvious damage. If any cables are loose, reconnect them securely. If there is obvious damage to the server, have it serviced.

If you see no damage, turn on the server. If it works correctly, the server probably did not suffer any damage.

Attention:
Observe all electrostatic precautions listed in this book to avoid damage to your server.

If the server does not work correctly, turn it off and check the adapters and memory modules to ensure that they are connected correctly. Go to "Electrical Safety" on page 200 and follow the instructions for opening your server; then, reseat all adapters and memory modules.

If the server still does not work correctly, run the diagnostic tests from diagnostic utility menu. For information about running tests, see "Running Diagnostic Programs" on page 297.

After Spilling Liquid on It

If liquid gets on the keyboard:

1. Turn off the server.
2. Unplug the keyboard from the back of the server.
3. Turn the keyboard upside down to drain excess liquid.
4. Dry off the keyboard with a lint-free cloth.

After the keyboard is completely dry, plug it in and turn on the server. If it does not work correctly, have the keyboard serviced.

If liquid gets inside the monitor:

1. Turn off the monitor.
2. Turn off the server.
3. Unplug the monitor from the server and the electrical outlet.
4. Have the monitor serviced immediately.

If liquid gets inside the server:

1. Turn off the server and all attached devices.
2. Unplug the server from the electrical outlet and all attached devices.
3. Have the server serviced immediately.

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.

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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.

To order replacement batteries, call 1-800-772-2227 within the United States, and 1-800-465-7999 or 1-800-465-6666 within Canada. Outside the U.S. and Canada, call your IBM reseller or IBM marketing representative.

Before you begin, be sure you have:

- Read "Electrical Safety" on page 200 and "Handling Static-Sensitive Devices" on page 202.

- Followed any special handling and installation instructions supplied with the replacement battery.

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

To replace the battery:

1. Turn off the server and peripheral devices and disconnect all external cables and power cords (see "Preparing to Install Options" on page 205); then remove the top cover (see "Removing the Top Cover" on page 207).

2. Locate the battery on the system board (see "System Board Component Locations" on page 418).

3. Remove any adapters that are installed in PCI slots 1 and 2, so you can access the battery. (See "Installing a Hot-Plug PCI Adapter" on page 216 for information about installing and removing adapters from the hot-plug PCI slots.)

4. Lift and remove the plastic dividers between PCI slot 1 and the ISA slot and between PCI slot 1 and PCI slot 2 by pressing the latches on the top ends of the dividers toward the dividers and lifting the dividers from the server.

5. 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.
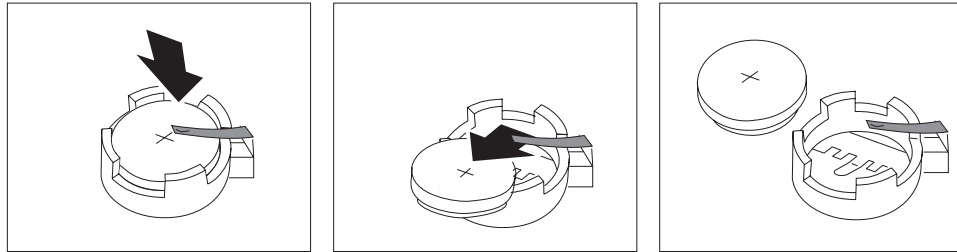
6. Insert the new battery:

   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.
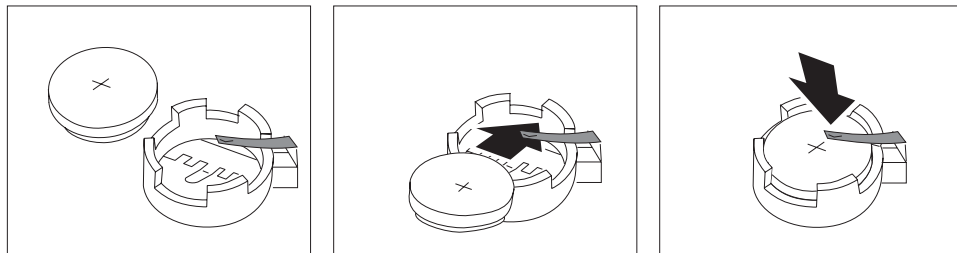
7. Reinstall any adapters you removed. (See "Installing a Hot-Plug PCI Adapter" on page 216 for information about installing and removing adapters from the hot-plug PCI slots.)

8. Insert the plastic dividers into the divider guides beside PCI slots 1 and 2.

9. Reinstall the top cover and complete the installation (see "Completing the Installation" on page 258).

    Note: You will have to wait approximately 20 seconds after you plug the power cord of your server into an electrical outlet for the Power Control button to become active.

10. Start the Configuration/Setup utility program and reset configuration parameters as needed.

    • To reset the system date and time, go to "Date and Time" on page 164.

    • To reset the power-on password, go to "Using the Power-On Password Menu" on page 167.

    • To reconfigure your server, follow the instructions given in "The Configuration/Setup Utility Program" on page 160 (all models).

Chapter 9. Getting Help, Service, and Information

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

For example, IBM maintains pages on the World Wide Web where you can get information about IBM products and services, find the latest technical information, and download device drivers and updates. Some of these pages are:

`http://www.ibm.com`	Main IBM home page
`http://www.pc.ibm.com`	IBM Personal Computing
`http://www.pc.ibm.com/us/desktop/`	IBM Commercial Desktop (U.S.)
`http://www.pc.ibm.com/us/intellistation/`	IBM IntelliStation (U.S.)
`http://www.pc.ibm.com/us/netfinity/`	IBM Netfinity and PC Servers (U.S.)
`http://www.pc.ibm.com/us/options/`	IBM Options (U.S.)

You can select a country-specific Web site from these pages.

Help is also available from bulletin boards and online services, as well as by fax and telephone. This section provides information about these sources.

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

Service Support

With the original purchase of an IBM hardware product, you have access to extensive support coverage. During the IBM hardware product warranty period, you may call the IBM Personal Computer HelpCenter (1-800-772-2227 in the U.S.) for hardware product assistance covered under the terms of the IBM Statement of Limited Warranty.

The following services are available during the warranty period:

- Problem Determination - Trained personnel are available to assist you with determining if you have a hardware problem and deciding what action is necessary to fix the problem.

- IBM Hardware Repair - If the problem is determined to be caused by IBM hardware under warranty, trained service personnel are available to provide the applicable level of service.

- Engineering Change Management - Occasionally, there might be changes that are required after a product has been sold. IBM or your reseller, if authorized by IBM, will make Engineering Changes (ECs) available that apply to your hardware.

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

Please have the following information ready when you call:
- Serial numbers of your IBM hardware products
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information

If possible, be at your computer when you call.

The following items are not covered:

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

  Note: All warranted parts contain a 7-character identification in the format IBM FRU XXXXXXX.

- Identification of software problem sources
- Configuration of BIOS as part of an installation or upgrade
- Changes, modifications, or upgrades to device drivers
- Installation and maintenance of network operating systems (NOS)
- Installation and maintenance of application programs

Refer to the IBM Statement of Limited Warranty for a full explanation of IBM's warranty terms.

Before You Call for Service

Many computer problems can be solved without outside assistance, by using the online help or by looking in the online or printed documentation that comes with your computer or software. Also, be sure to read the information in any README files that come with your software.

Most computers, operating systems, and application programs come with documentation that contains troubleshooting procedures and explanations of error messages. The documentation that comes with your computer also contains information about the diagnostic tests you can perform.

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

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

Getting Customer Support and Service

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

Using Electronic Support Services

If you have a modem, you can get help from several popular services. Bulletin boards and online information services provide assistance through question-and-answer message areas, live chat rooms, searchable databases, and more.

Technical information is available on a wide range of topics, such as:

- Hardware setup and configuration

- Preinstalled software
- OS/2, DOS, and Windows
- Networking
- Communications
- Multimedia

In addition, the latest device driver updates are available.

The IBM Bulletin Board System (BBS) can be reached 24 hours a
day, 7 days a week. Modem speeds of up to 14 400 baud are
supported. Long distance telephone charges might apply. To access
the IBM BBS:

- In the U.S., call 1-919-517-0001.
- In Canada:
    - In Montreal, call 514-938-3022.
    - In Toronto, call 905-316-4255 or 416-956-7877.
    - In Vancouver, call 604-664-6464.

Commercial online services that contain information about IBM
products include:

- CompuServe

  Use the following GO words: APTIVA, IBMPS2, ThinkPad,
  PowerPC, ValuePoint, IBMSVR, or IBMOBI.

- PRODIGY

  Use the Jump command; type **IBM** and select **PC Product
  Support.**

- America Online

  Use the "Go to" keyword **IBM Connect**.

Using the World Wide Web
On the World Wide Web, the IBM Personal Computing home page
has information about IBM Personal Computer products and
support. The address for the IBM Personal Computing home page
is:

```
http://www.pc.ibm.com
```

For information about specific Personal Computer products, visit the following pages:

```
http://www.pc.ibm.com/us/intellistation/

http://www.pc.ibm.com/us/desktop/

http://www.pc.ibm.com/us/netfinity/

http://www.pc.ibm.com/us/thinkpad/

http://www.pc.ibm.com/us/options/

http://www.pc.ibm.com/us/aptiva/
```

You can select a country-specific Web site from these pages.

Getting Information by Fax

If you have a touch-tone telephone and access to a fax machine, in the U.S. and Canada you can receive by fax marketing and technical information on many topics, including hardware, operating systems, and local area networks (LANs). You can call the IBM Automated Fax System 24 hours a day, 7 days a week. Follow the recorded instructions, and the requested information will be sent to your fax machine.

To access the IBM Automated Fax System, do the following:

- In the U.S., call 1-800-426-3395.
- In Canada, call 1-800-465-3299.

Getting Help Online

Online Housecall is a remote communication tool that allows an IBM technical-support representative to access your PC by modem. Many problems can be remotely diagnosed and corrected quickly and easily. In addition to a modem, a remote-access application program is required. This service is not available for servers. There might be a charge for this service, depending on the request.

For more information about configuring your PC for Online Housecall:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-565-3344.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Getting Help by Telephone

During the warranty period, you can get help and information by telephone through the IBM PC HelpCenter. Expert technical-support representatives are available to assist you with questions you might have on the following:

- Setting up your computer and IBM monitor
- Installing and setting up IBM options purchased from IBM or an IBM reseller
- 30-day, preinstalled-operating-system support
- Arranging for service (on-site or carry-in)
- Arranging for overnight shipment of customer-replaceable parts

In addition, if you purchased an IBM PC Server or IBM Netfinity Server, you are eligible for IBM Start Up Support for 90 days after installation. This service provides assistance for:

- Setting up your network operating system
- Installing and configuring interface cards
- Installing and configuring network adapters

Please have the following information ready when you call:

- Serial numbers of your computer, monitor, and other components, or your proof of purchase
- Description of the problem
- Exact wording of any error messages
- Hardware and software configuration information for your system

If possible, be at your computer when you call.

These services are available 24 hours a day, 7 days a week.[6]

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[6] Response time will vary depending on the number and complexity of incoming calls.

- In the U.S. and Puerto Rico, call 1-800-772-2227.
- In Canada, call 1-800-565-3344.

In all other countries, contact your IBM reseller or IBM marketing representative.

Getting Help Around the World

If you travel with your computer or need to move it to another country, you can register for International Warranty Service. When you register with the International Warranty Service Office, you will receive an International Warranty Service Certificate that is honored virtually worldwide, wherever IBM or IBM resellers sell and service IBM PC products.

For more information or to register for International Warranty Service in the U.S. or Canada, call 1-800-497-7426.

Purchasing Additional Services

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

Enhanced PC Support Line

Enhanced PC Support is available for desktop and mobile IBM computers that are not connected to a network. Technical support is provided for IBM computers and IBM or non-IBM options, operating systems, and application programs on the Supported Products list.

This service includes technical support for:

- Installing and configuring your out-of-warranty IBM computer
- Installing and configuring non-IBM options in IBM computers
- Using IBM operating systems in IBM and non-IBM computers
- Using application programs and games
- Tuning performance

- Installing device drivers remotely
- Setting up and using multimedia devices
- Identifying system problems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Enhanced PC Support, see "Ordering Support Line Services" on page 399.

900-Number Operating System and Hardware Support Line

In the U.S., if you prefer to obtain technical support on a pay-as-you go basis, you can use the 900-number support line. The 900-number support line provides support for IBM PC products that are out of the warranty period.

To access this support, call 1-900-555-CLUB (2582). You will be notified of the charge per minute.

Network and Server Support Line

Network and Server Support is available for simple or complex networks made up of IBM servers and workstations using major network operating systems. In addition, many popular non-IBM adapters and network interface cards are supported.

This service includes all of the features of the Enhanced PC Support Line, plus:

- Installing and configuring client workstations and servers
- Identifying system problems and correcting problems on the client or the server
- Using IBM and non-IBM network operating systems
- Interpreting documentation

You can purchase this service on a per-call basis, as a multiple-incident package, or as an annual contract with a 10-incident limit. For more information about purchasing Network and Server Support, see "Ordering Support Line Services" on page 399.

Ordering Support Line Services

Enhanced PC Support Line and Network and Server Support Line services are available for products on the Supported Products list. To receive a Supported Products list:

- In the U.S.:
    1. Call 1-800-426-3395.
    2. Select document number 11683 for Network and Server support.
    3. Select document number 11682 for Enhanced PC support.

- In Canada, contact IBM Direct at 1-800-465-7999, or:
    1. Call 1-800-465-3299.
    2. Select the HelpWare catalog.

- In all other countries, contact your IBM reseller or IBM marketing representative.

For more information or to purchase these services:

- In the U.S., call 1-800-772-2227.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Warranty and Repair Services

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

Warranty upgrades in the U.S. include:

- Carry-in service to on-site service

    If your warranty provides carry-in repair service, you can upgrade to on-site repair service, either standard or premium. The standard upgrade provides a trained servicer within the next business day (9 a.m. to 5 p.m., local time, Monday though Friday). The premium upgrade provides 4-hour average response, 24 hours a day, 7 days a week.

- On-site service to premium on-site service

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

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

For more information about warranty upgrades and extensions:

- In the U.S., call 1-800-426-4968.
- In Canada, call 1-800-465-7999.
- In all other countries, contact your IBM reseller or IBM marketing representative.

Ordering Publications

Additional publications are available for purchase from IBM. For a list of publications available in your country:

- In the U.S., Canada, and Puerto Rico, call 1-800-879-2755.
- In other countries, contact your IBM reseller or IBM marketing representative.

Chapter 10. Server Records and Specifications

Whenever you add options to your server, be sure to update the information in this chapter. Accurate, up-to-date records make it easier to add other options and, if the need should arise, to report a hardware problem.

In addition to server records, this chapter contains specifications. These specifications include product dimensions, environmental operating requirements, system and processor board layouts, and jumper settings.

Record the Identification Numbers

Record and retain the following information.

Table 9. IBM Netfinity 5500 Identification Numbers	
Product Name	IBM Netfinity 5500
Machine Type	_____
Model	_____
Serial Number	_____
Key Serial Number	_____

The server serial number and other identification numbers are located on a label under the media-bay trim bezel on the front of the server.

Note: Two keys are provided with your server. Store the keys in a safe place. If you lose the keys, you must order a replacement lock mechanism and keys from IBM.

Installed Device Records

Use the following tables to keep a record of the options installed in, or attached to, your system. You can also record your system's default configuration settings. This information can be helpful when you install additional options in your server or if you ever need to have your server serviced. Copy these tables before recording information in them, in case you need extra space to write new values later, when you update your system's configuration.

Note: If necessary, you can also refer to the system-board layout in "System Board Component Locations" on page 418 for connector locations.

Device Records

In the following table record the types and SCSI IDs for drives or devices attached to your server. If you attach a drive or other device to an adapter, be sure to record the descriptive information properly.

Location	Drive or Device Description
	Internal Devices
Diskette Drive Bay	_____
CD-ROM Drive Bay	_____
Bay A	_____
Bay B	_____
Bay 1	_____
Bay 2	_____
Bay 3	_____
Bay 4	_____
Bay 5	_____
Bay 6	_____
	External Devices
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____
SCSI ID	_____

Table 10. Internal and External Drives and Devices

Table 11 shows the Configuration/Setup utility program defaults. In the table, record any configuration changes you make.

Option	Default Value	New Value	Additional Information
Table 11 (Page 1 of 6). Configuration/Setup Utility Program Defaults and Changes			
System Summary			
Processor 1[1]	Pentium II	_____	_____
Processor 2[1]	_____	_____	_____
Processor Speed	_____	_____	
Math Coprocessor	Internal	_____	_____
System Memory	640 KB	_____	_____
Extended Memory	127 MB	_____	_____
Processor 1 Cache Size	512 KB	_____	_____
Processor 2 Cache Size	_____	_____	_____
Shadow RAM	384 KB	_____	_____
System ROM	F000h — FFFFh	_____	_____
Diskette Drive A	1.44 MB 3.5"	_____	_____
Primary Master Device	CD-ROM	_____	_____
Mouse	Installed	_____	_____
[1] Both microprocessors must have the same cache size and type, and the same clock speed.			
System Information			
Product Data			
Machine Type/Model	_____	_____	_____
Flash EEPROM Revision Level	_____	_____	_____
System Board Identifier	_____	_____	_____
System Serial Number	_____	_____	_____
BIOS Date	_____	_____	_____
BIOS Revision Number	_____	_____	_____
SP ROM Date	_____	_____	_____
SP ROM Revision Level	_____	_____	_____
Diagnostics Revision Level	_____	_____	_____
Diagnostics Date	_____	_____	_____
Diagnostics Version	_____	_____	_____
ServeRAID BIOS Version	_____	_____	_____

Device Records

Table 11 (Page 2 of 6). Configuration/Setup Utility Program Defaults and Changes			
Option	**Default Value**	**New Value**	**Additional Information**
System Card Data	_____	_____	_____
Model	_____	_____	_____
Submodel	_____	_____	_____
Planar	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
Processor	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
DASD Backplane	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
Power Backplane	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
Power Supply 1	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
Power Supply 2	_____	_____	_____
FRU Number	_____	_____	_____
Unique Number	_____	_____	_____
Mfg ID	_____	_____	_____
Slot Number	_____	_____	_____
PCI Routing			
Planar SCSI RAID	IRQ 11	_____	_____
Planar Ethernet	IRQ 15	_____	_____
Planar Video[2]	IRQ 9	_____	_____
Planar USB	IRQ 9	_____	_____
[2]The screen also displays Int_A, Int_B, Int_C, and Int_D for each PCI slot. You can list the values for the PCI and ISA slots in Table 13 on page 411.			

Table 11 (Page 3 of 6). Configuration/Setup Utility Program Defaults and Changes			
Option	**Default Value**	**New Value**	**Additional Information**
Devices and I/O Ports			
Serial Port A	[Port 3F8, IRQ 4]	_____	_____
Serial Port B	[Port 2F8, IRQ 3]	_____	_____
Parallel Port	[Port 378]	_____	_____
Parallel Port Mode	[Standard]	_____	_____
Parallel Port IRQ	[IRQ 7]	_____	_____
Parallel Port DMA	None	_____	_____
Mouse	[Installed]	_____	_____
Diskette Controller	[Enabled]	_____	_____
Diskette Drive A	1.44 MB 3.5"	_____	_____
Video		_____	_____
Video Controller	S3 Incorporated	_____	_____
Video Memory	1024 KB	_____	_____
IDE Configuration Menu		_____	_____
Primary IDE Channel	[Enabled]	_____	_____
Master Device		_____	_____
Device Type	CD-ROM	_____	_____
Size	650 MB	_____	_____
Transfer Selection:	Autoconfigure	_____	_____
Transfer Mode	PIO Mode 3	_____	_____
LBA Mode	Supported	_____	_____
System Security			
Power-On Password		_____	_____
Allow for Unattended			
Boot with Password	[On]		
Administrator Password		_____	_____
Power-on Password			
Changeable by User	[No]	_____	_____
Start Options			
Keyboard NumLock State	[On]	_____	_____
Keyboard Speed	[Fast]	_____	_____
Disketteless Operation Mode	[Disabled]	_____	_____
Displayless Operation Mode	[Disabled]	_____	_____
Keyboardless Operation Mode	[Disabled]	_____	_____
First Startup Device	[CD-ROM]	_____	_____
Second Startup Device	[Diskette Drive 0]	_____	_____
Third Startup Device	[Hard Drive 0]	_____	_____
Fourth Startup Device	[Network]	_____	_____
Power-On Self-Test	[Quick]	_____	_____
Virus Detection[3]	[Enabled]	_____	_____
[3]The Virus Detection test checks for changes to the boot sector.			

Device Records

Table 11 (Page 4 of 6). Configuration/Setup Utility Program Defaults and Changes

Option	Default Value	New Value	Additional Information
Advanced Setup			
ACPI Control			
ACPI BIOS	[Disabled∕Not Present]	_____	_____
ACPI Hardware Signature	[Auto]	_____	_____
ACPI Hardware Interrupt (IRQ)	None	_____	_____
Cache Control			
Processor Cache Type	[Write-Back]	_____	_____
Processor 1 Cache State	[Enabled]	_____	_____
Processor 1 Cache Size	512 KB	_____	_____
Processor 2 Cache State	[Enabled]	_____	_____
Processor 2 Cache Size	0 KB	_____	_____
PCI Bus Control			
PCI-PCI Bridge Pre-fetching	[Enabled]	_____	_____
PCI Primary Bus MLT	[30h]	_____	_____
PCI Secondary Bus MLT	[90h]	_____	_____
PCI Interrupt Routing		_____	_____
Planar RAID IRQ	[Autoconfigure]	_____	_____
Planar Enet IRQ	[Autoconfigure]	_____	_____
Planar Video IRQ	[Autoconfigure]	_____	_____
Planar USB IRQ	[Autoconfigure]	_____	_____
Slot 1[4]	_____	_____	_____
Slot 2	_____	_____	_____
Slot 3	_____	_____	_____
Slot 4	_____	_____	_____
Slot 5	_____	_____	_____
Slot 6	_____	_____	_____

[4]The screen displays IntA, IntB, IntC, and IntD for each slot. The default value for each is **Enabled,** if an adapter is installed in the slot. If no adapter is installed, the screen displays **No Irq Requested.**

Option	Default Value	New Value	Additional Information
Memory Settings			
Bank1: Row0	[Row Is Enabled]	_____	_____
Bank1: Row1	[Row Is Enabled]	_____	_____
Bank2: Row0	[Row Is Enabled]	_____	_____
Bank2: Row1	[Row Is Enabled]	_____	_____
Bank3: Row0	[Row Is Enabled]	_____	_____
Bank3: Row1	[Row Is Enabled]	_____	_____
Bank4: Row0	[Row Is Enabled]	_____	_____
Bank4: Row1	[Row Is Enabled]	_____	_____

Table 11 (Page 5 of 6). Configuration/Setup Utility Program Defaults and Changes			
Option	**Default Value**	**New Value**	**Additional Information**
Advanced ISA Setup			
16 Bit I/O Recovery Timer Delay	[1 SysClk]	_____	_____
8 Bit I/O Recovery Timer Delay	[1 SysClk]	_____	_____

Device Records

Table 11 (Page 6 of 6). Configuration/Setup Utility Program Defaults and Changes			
Option	**Default Value**	**New Value**	**Additional Information**
Sys. Service Proc. Hw. Int. (IRQ) Plug and Play	[Autoconfigure]	_____	_____
Memory Resources			
A0000h - A3FFFh[5]	[Plug and Play]	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

[5]The screen displays multiple address ranges. The default value for each is **Plug and Play**, except for E0000h - FFFFFh which is **Not applicable**.

I/O Port Resources			
108h - 10Bh[6]	[Plug and Play]	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

[6]The screen displays multiple address ranges. The default value for each is **Plug and Play**.

DMA Resources			
Channel 0	[Plug and Play]	_____	_____
Channel 1	[Plug and Play]	_____	_____
Channel 2	[Plug and Play]	_____	_____
Channel 3	[Plug and Play]	_____	_____
Channel 4	[Plug and Play]	_____	_____
Channel 5	[Plug and Play]	_____	_____
Channel 6	[Plug and Play]	_____	_____
Channel 7	[Plug and Play]	_____	_____
Interrupt Requests			
0:	Not applicable	_____	_____
1:	Not applicable	_____	_____
2:	Not applicable	_____	_____
3:	[Plug and Play]	_____	_____
4:	[Plug and Play]	_____	_____
5:	[Plug and Play]	_____	_____
6:	[Plug and Play]	_____	_____
7:	[Plug and Play]	_____	_____
8:	Not applicable	_____	_____
9:	[Plug and Play]	_____	_____
10:	[Plug and Play]	_____	_____
11:	[Plug and Play]	_____	_____
12:	[Plug and Play]	_____	_____
13:	Not applicable	_____	_____
14:	[Plug and Play]	_____	_____
15:	[Plug and Play]	_____	_____

Record the system memory (DIMMs) installed in your server in the following table.

Table 12. System Memory		
Memory Connector	**DIMM Size**	**Additional Information**
Connector J1	64 MB Kit □ 128 MB Kit □ 256 MB Kit □	_____
Connector J2	64 MB Kit □ 128 MB Kit □ 256 MB Kit □	_____
Connector J3	64 MB Kit □ 128 MB Kit □ 256 MB Kit □	_____
Connector J4	64 MB Kit □ 128 MB Kit □ 256 MB Kit □	_____
Total Memory (MB)	_____	

Record expansion slot configuration information for your server in the following table.

Table 13. Expansion Slot Configuration Information					
Expansion Slot	**IRQ**	**DMA**	**I/O Port**	**Memory Resources**	**Option Description and Additional Information**
ISA slot	_____	_____	_____	_____	_____ _____
PCI slot 1	_____	_____	_____	_____	_____
PCI slot 2	_____	_____	_____	_____	_____ _____
PCI slot 3	_____	_____	_____	_____	_____
PCI slot 4	_____	_____	_____	_____	_____ _____
PCI slot 5	_____	_____	_____	_____	_____
PCI slot 6	_____	_____	_____	_____	_____ _____

Notes:

1. PCI slots 1–4 are hot-plug slots.

2. Before setting values, review "Resolving Configuration Conflicts" on page 176 and follow the instructions for avoiding configuration conflicts.

Specifications

The following list contains the specifications for the Netfinity 5500.

Size (Tower Model)

- Depth: 700 mm (27.6 in.)
- Height with NetBAY3: 530 mm (20.9 in.)
- Height without NetBAY3: 356 mm (14 in.)
- Width: 483 mm (19 in.)
- Front clearance: 305 mm (12 in.)
- Rear clearance: 100 mm (4 in.)
- Side clearance: 50 mm (2 in.)

Size (Rack Model)

- Depth: 650 mm (25.6 in.)
- Height: 356 mm (14 in.) (8 U)
- Width: 440 mm (17.3 in.)

Weight

- Unpacked, minimum configuration (with empty NetBAY3): 39 kg (85 lb.)
- Unpacked, maximum configuration: 55 kg (120 lb.)

Heat Output

- Approximate heat output in British thermal units (Btu) per hour:
  - Minimum configuration: 1023.9 Btu
  - Maximum configuration: 2764.6 Btu

Environment

- Air temperature

  - System on: 10° to 35° C (50° to 95° F)
    Altitude: 0 to 914 m (3000 ft.)

  - System on: 10° to 32° C (50° to 89.6° F)
    Altitude: 914 m (3000 ft.) to 2133 m (7000 ft.)

  - System off: 10° to 43° C (50° to 110° F)
    Maximum altitude: 2133 m (7000 ft.)

- Humidity

    - System on: 8% to 80%; maximum wetbulb, 23° C (73.4° F)

    - System off: 8% to 80%; maximum wetbulb, 27° C (80.6° F)

- Altitude: 0 to 2133 m (0 to 7000 ft.)

Acoustical Noise Emissions Values
- Sound power, idling
    - 6.2 bel for open bay system (no hard disk drives installed)
    - 6.2 bel for typical system configuration (3 hard disk drives installed)
- Sound power, operating
    - 6.2 bel for open bay system (no hard disk drives installed)
    - 6.4 bel for typical system configuration (3 hard disk drives installed)
- Sound pressure, idling
    - 45 dBA for open bay system (no hard disk drives installed)
    - 45 dBA for typical system configuration (3 hard disk drives installed)
- Sound pressure, operating
    - 45 dBA for open bay system (no hard disk drives installed)
    - 46 dBA for typical system configuration (3 hard disk drives installed)

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

Electrical Input
- Sine-wave input (50± or 60± Hz) is required

- Input voltage

    - Low range
        - Minimum: 90 V ac
        - Maximum: 137 V ac
    - High range
        - Minimum: 180 V ac
        - Maximum: 265 V ac
    - Input kilovolt-amperes (KVA) approximately
        - Minimum configuration as shipped: 0.2 KVA
        - Maximum configuration: 0.78 KVA

Electrostatic Discharge

- Tested to 14 KV

Immunity

- Verified to comply with EN 50082-2

Safety Standards

- UL 1950
- CSA C22.2 No. 950-M93
- EN 60950 and countries deviations
- IEC 950
- NOM-019

Changing Jumper Positions

Jumpers located on the system board and the processor board help you to customize the way your server operates.

Your system board, processor board, and SCSI backplane contain two-pin and three-pin jumper blocks.

In some cases, groups of jumpers might combine to define a function.

Two-Pin Jumper Blocks

Covering both pins with a jumper defines one function of the jumper block. To change the function of the jumper block, cover one pin only or remove the jumper entirely.

The following illustration identifies pins 1 and 2 on a two-pin jumper block.
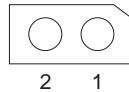
To change a jumper's position for a two-pin jumper block:

1. Turn off the server; then, disconnect the server power cords.

2. Remove the server cover (see "Preparing to Install Options" on page 205).

3. Do one of the following:

   - Lift the jumper straight off the pin block.
   - Align the holes in the bottom of the jumper with the two pins on the pin block, and then slide the jumper onto these pins.
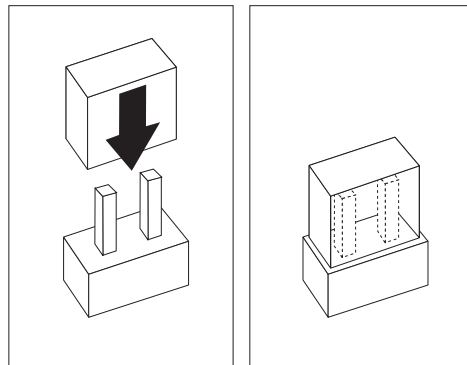
   - Align one of the holes in the bottom of the jumper with one of the pins on the pin block, and then slide the jumper onto that pin only.
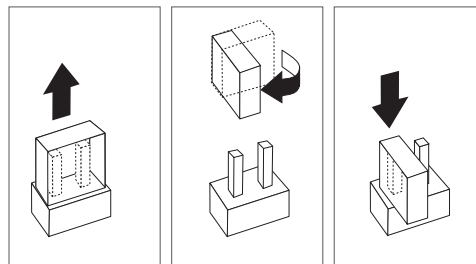
4. Reinstall the server cover and connect the cables (see "Completing the Installation" on page 258).

Three-Pin Jumper Blocks

With the three-pin jumper blocks, each jumper covers two of the three pins on a pin block. You can position the jumper to fit over the center pin and either of the other two pins.

The following illustration identifies pins 1, 2, and 3 on a three-pin jumper block.
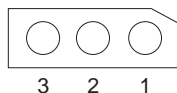
To change a jumper's position for a three-pin jumper block:

1. Turn off the server; then, disconnect the server power cords.

2. Remove the server cover (see "Preparing to Install Options" on page 205).

3. Lift the jumper straight off the pin block.

4. Align the holes in the bottom of the jumper with the center pin and the pin that was not covered previously.
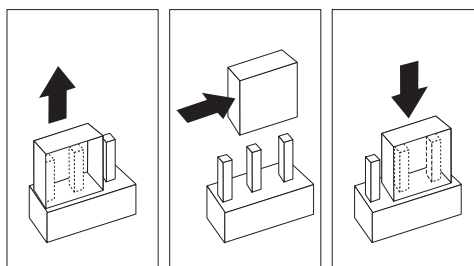
5. Slide the jumper fully onto these pins.

6. Reinstall the server cover and connect the cables (see "Completing the Installation" on page 258).

System Board Component Locations

The following illustration shows a layout of the system board and identifies system-board components. You might need to refer to this figure before you install hardware in your server, or when you record information in the tables in this chapter. You might also need to refer to this figure when you set configuration jumpers on the system board.
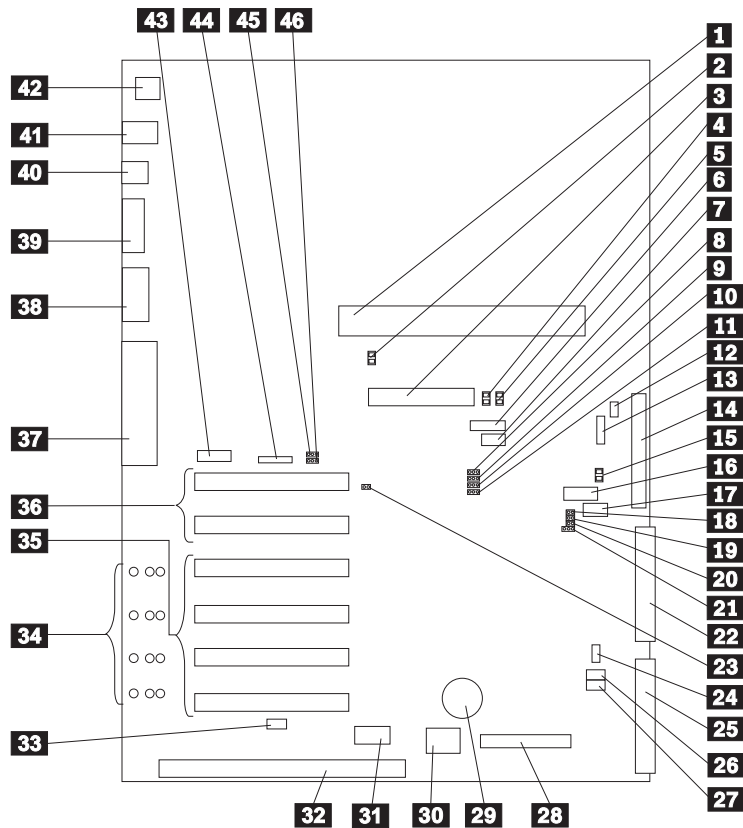
1 Processor board connector (J19)
2 System management processor error LED (CR24)
3 RAID channel 1 connector (J7)
4 RAID channel 1 error LED (CR30)
5 RAID channel 2 error LED (CR31)

6 Reserved (J54)

7 Reserved (J64)

8 Disable RAID controller jumper block (J11)

9 Reserved (J45)

10 Power on control jumper block (J32)

11 Reserved (J25)

12 Reserved (J9)

13 Power backplane cable connector (J8)

14 RAID channel 2 connector (to backplane) (J3)

15 RAID system error LED (CR32)

16 Reserved (J27)

17 Reserved (J35)

18 SCSI activity LED connector (J52)

19 Reserved (J34)

20 Reserved (J29)

21 Reserved (J26)

22 IDE connector (J33)

23 System reset jumper block (J51)

24 Fan connector (J36)

25 Diskette drive connector (J22)

26 Power on password override jumper block (J24)

27 Flash ROM page swap jumper block (J30)

28 Control panel connector (J20)

29 Battery

30 Reserved (J46)

31 Hot-plug PCI controller programmer interface connector (J53)

32 ISA expansion slot

33 Hot-plug switch connector (J16)

34 PCI slot LEDs (four are on the side of the board)

35 PCI slots 1–4 (hot-plug)

36 PCI slots 5 and 6

37 Parallel port connector (J56) (Serial port A and B connectors are below the parallel port connector.)

38 Video port connector (J2)

39 Management port C connector (J42)

40 USB 1 and USB 2 port connectors (USB 2 is below USB 1.) (J31)

41 Mouse and keyboard connectors (J1) (The mouse connector is above the keyboard connector.)

42 Ethernet port connector (J4)
43 Reserved (J17)
44 Reserved (J18)
45 Disable Ethernet controller jumper block (J5)
46 Disable video controller jumper block (J14)

System Board Jumpers

Table 14 describes the jumpers on the system board. The numbers in the table correspond to the highlighted numbers on the illustration in "System Board Component Locations" on page 418.

Note: Turn off the server, and disconnect the power cords before moving any jumpers.

Table 14 (Page 1 of 2). System Board Jumpers

Jumper Name	Description
8 J11 Disable RAID controller	The default position is Enabled (jumper on pins 1 and 2). Move the the jumper to pins 2 and 3 to disable the RAID controller.
9 J45 Reserved	The default position is a jumper on pins 2 and 3.
10 J32 Power on control	The default position is normal operation (jumper on pins 1 and 2). Moving the jumper to pins 2 and 3 allows the power supply to be turned on without a control panel or system management processor.
11 J25 Reserved	The default position is a jumper on pins 1 and 2.
12 J9 Reserved	The default position is a jumper on pins 1 and 2.
19 J34 Reserved	The default is no jumper installed on J34.
20 J29 Reserved	The default is no jumper installed on J29.
21 J26 Reserved	The default is a jumper on pins 2 and 3.
23 J51 System reset	In normal operation, there is no jumper on J51. Installing a jumper on J51 resets the system logic.
26 J24 Power on password override	Changing the position of this jumper bypasses the power-on password check if the jumper has been moved since the server was last powered on. You do not need to move the jumper back to the default position after the password is overridden. Changing the position of this jumper does not affect the administrator password check if an administrator password is set.

Table 14 (Page 2 of 2). System Board Jumpers	
Jumper Name	**Description**
27 J30 Flash ROM page swap	The default position is a jumper installed on pins 2 and 3. Changing the position of this jumper will change which of the two pages of Flash ROM is used when the system is started.
45 J5 Disable Ethernet controller	The default position is Enabled (jumper on pins 1 and 2). Move the the jumper to pins 2 and 3 to disable the Ethernet controller.
46 J14 Disable video controller	The default position is Enabled (jumper on pins 1 and 2). Move the the jumper to pins 2 and 3 to disable the video controller.

Bypassing an Unknown Power-on Password

When a power-on password is set, POST does not complete until you enter the password. If you forget the power-on password, you can regain access to the server through either of the following methods:

- Enter the administrator password at the power-on prompt, if an administrator password has been set. (If necessary, see "Using the Administrator Password Menu" on page 169 for details.) Start the Configuration/Setup utility programs and change the power-on password. See "Using the Power-On Password Menu" on page 167.

- Change the position of the jumper on J24 as described in Table 14 on page 420 to bypass the power-on password check. You can then start the Configuration/Setup utility programs and change the power-on password. See "Using the Power-On Password Menu" on page 167.

Processor Board Component Locations

A layout of the processor board is shown in the following illustration.
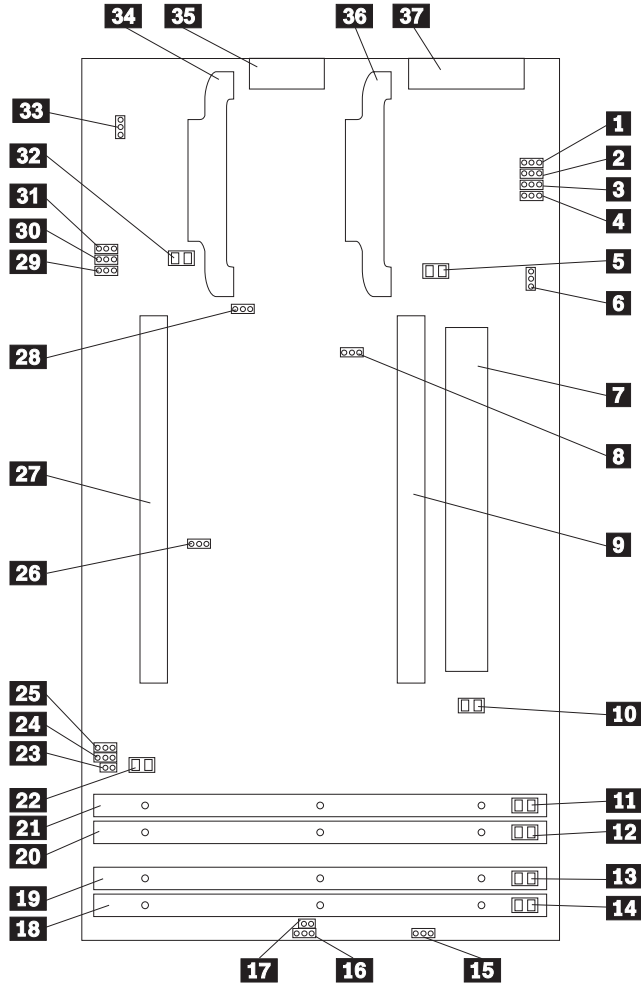
1 – **4** Microprocessor core-frequency-selection jumper block (J27–J30)

5 Primary microprocessor VRM error LED (CR17)

6 Reserved (J20)

7 System-board interface connector (J9) (on reverse side of processor board)

8 Reserved (J5)

9 Primary microprocessor card connector (U5)

10 Primary microprocessor error LED (CR12)

11 DIMM 1 error LED (CR8)

12 DIMM 2 error LED (CR9)

13 DIMM 3 error LED (CR10)

14 DIMM 4 error LED (CR11)

15 Reserved (J12)

16 Reserved (J13)

17 Reserved (J8)

18 DIMM socket 4 (J1)

19 DIMM socket 3 (J2)

20 DIMM socket 2 (J3)

21 DIMM socket 1 (J4)

22 Secondary microprocessor error LED (CR13)

23 Reserved (J7)

24 Reserved (J24)

25 Reserved (J6)

26 Reserved (J16)

27 Secondary microprocessor card connector (U6)

28 Reset-system jumper block (J23)

29 Reserved (J15)

30 Reserved (J14)

31 Reserved (J11)

32 Secondary microprocessor VRM error LED (CR19)

33 Reserved (J18)

34 Secondary microprocessor VRM connector (U22)

35 Power control connector (J17)

36 Primary microprocessor VRM connector (U15)

37 Power supply connector (J10)

Processor Board Jumpers

Table 15 contains the names and descriptions of the jumper blocks located on the processor board. The highlighted numbers in the table refer to the highlighted numbers in the illustration in "Processor Board Component Locations" on page 422.

Notes:

1. Turn off the server, and disconnect the power cords before moving any jumpers.

2. Be sure the microprocessor bus-to-core ratio is set correctly. For example, if you have a 350 MHz microprocessor installed and the system bus speed is 100 MHz (the default), be sure that the jumpers are set to a bus-to-core ratio of 3.5 (350/100). Refer to jumpers J27–J30 in Table 15 and Table 16 on page 425.

   MHz denotes internal clock speed of the microprocessor only; other factors also affect application performance.

Attention:
If the microprocessor bus-to-core ratio is incorrect, system-board components will overheat and component damage might occur. Be sure that the microprocessor core-frequency selection is properly set.

Table 15 (Page 1 of 2). Processor Board Jumpers	
Jumper Name	**Description**
1–**4** Microprocessor core frequency selection (J27–J30)	The default core/bus fraction is 3.5 (350/100 MHz). Jumpers are installed on pins 1 and 2 of J27 and J30; either jumpers are installed on pins 2 and 3 of J28 and J29 or no jumper is installed on J28 or J29.
	For the core/bus fraction 4 (400/100 MHz), the jumpers are installed on pins 1 and 2 of J28, J29, and J30; either a jumper is installed on pins 2 and 3 of J27 or no jumper is installed on J27.
	For the core/bus fraction 4.5, jumpers are installed on pins 1 and 2 of J28 and J30; and either jumpers are installed on pins 2 and 3 of J27 and J29 or no jumpers are installed on J28 or J30.
8 J5 Reserved	The default position is a jumper on pins 1 and 2.

Table 15 (Page 2 of 2). Processor Board Jumpers

Jumper Name	Description
15 J12 SDRAM selection	If your server has unbuffered SDRAM, a jumper should be on pins 1 and 2. If your server has registered SDRAM, a jumper should be on pins 2 and 3.
16 J13 Reserved	The default position is a jumper on pins 1 and 2.
17 J8 Reserved	The default position is no jumper on J8.
23 J7 Reserved	The default position is a jumper on pins 1 and 2.
24 J24 Reserved	The default position is a jumper on pins 2 and 3.
25 J6 Reserved	The default position is a jumper on pins 1 and 2.
26 J16 Reserved	The default position is a jumper on pins 1 and 2.
28 J23 System reset	In normal operation, there is either a jumper on pins 2 and 3 of J23 or no jumper on J23. Installing a jumper on pins 1 and 2 of J23 forces the system into the reset state.
29 J15 Reserved	The default position is a jumper on pins 1 and 2.
30 J14 Reserved	The default position is a jumper on pins 2 and 3.
31 J11 Reserved	The default position is a jumper on pins 1 and 2.

Table 16. Microprocessor Core Frequency Selection

Core/Bus Ratio	J27 Jumper	J28 Jumper	J29 Jumper	J30 Jumper
3	Pins 1 and 2	Pins 2 and 3	Pins 2 and 3	Pins 1 and 2
4	Pins 2 and 3	Pins 1 and 2	Pins 1 and 2	Pins 1 and 2
4.5	Pins 2 and 3	Pins 1 and 2	Pins 2 and 3	Pins 1 and 2

SCSI Backplane Component Locations

The following simplified layout of the SCSI backplane identifies the components. Refer to this figure when you set the jumpers on the backplane.
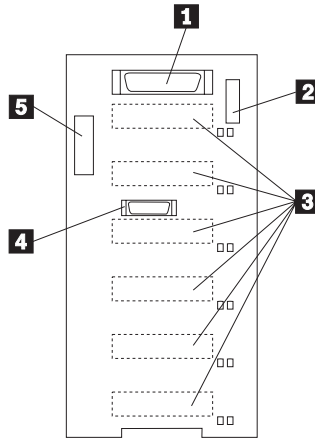
1 Wide (16-bit) SCSI connector
2 Option jumper block (J10)
3 SCSI hot-swap drive connectors (on reverse side of backplane)
4 Repeater card connector
5 Power connector

SCSI Backplane Option Jumpers

The option jumper block on the SCSI backplane defines the SCSI IDs for hot-swap drives. See the illustration in "SCSI Backplane Component Locations" on page 426 for the location of the option jumper block.

Table 17 summarizes the settings for the SCSI backplane option jumper block (J10).

Table 17. Backplane Option Jumper Block	
Pins	**Description**
1-2	Reserved.
3-4	Reserved
5-6	Placing a jumper on these two pins enables SCSI IDs 8-13
7-8	Reserved.
9-10	Reserved.
11-12	Placing a jumper on these two pins reverses the SCSI IDs on the backplane.
Note: The default is no jumpers installed on the J10 jumper block.	

Table 18 shows the SCSI IDs that you can use for hot-swap drives.

Table 18. SCSI IDs for Hot-Swap Drives							
J10 Pins 5-6	**J10 Pins 11-12**	**Bay 1**	**Bay 2**	**Bay 3**	**Bay 4**	**Bay 5**	**Bay 6**
No jumper	No jumper	0	1	2	3	4	5
No jumper	Jumper	5	4	3	2	1	0
Jumper	No jumper	13	12	11	10	9	8
Notes:							
1. No jumper on pins 5-6 and 11-12 is the default.							
2. Jumpers on pins 5-6 and 11-12 is not supported.							

Appendix A. Installing Devices in the NetBAY3

This appendix contains information about installing devices in the NetBAY3.

Note: The illustrations in this appendix do not show the server on top of the NetBAY3, however, you do not need to remove the NetBAY3 to install devices.

This appendix contains:

General Considerations

You can install three types of devices in the NetBAY3:

- Devices, such as the IBM EXP10, that sit on side rails

- Cantilevered devices, such as a power distribution unit (PDU), that are screwed to the front or rear of the NetBAY3

- Devices that sit on the NetBAY3 base plate

Notes:

1. To allow the NetBAY3 front bezel to close, devices with handles must not protrude out more than 56 cm (2.2 in.). The following illustration of the front bezel top-view cross section shows the clearances.

2. All device cables must exit from the rear of the NetBAY3.
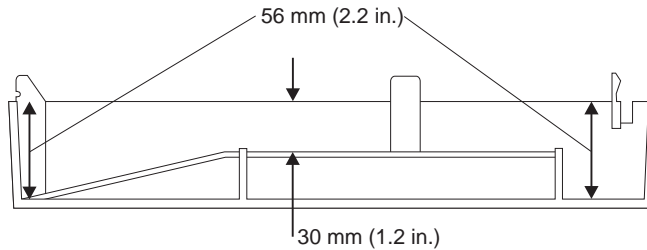
Removing the Rear Panel

Note: Do not remove the rear panel if you are not installing a
device in the NetBAY3.

1. Remove the NetBAY3 rear panel.

   a. Remove the four screws.
   b. Lift the rear panel off.
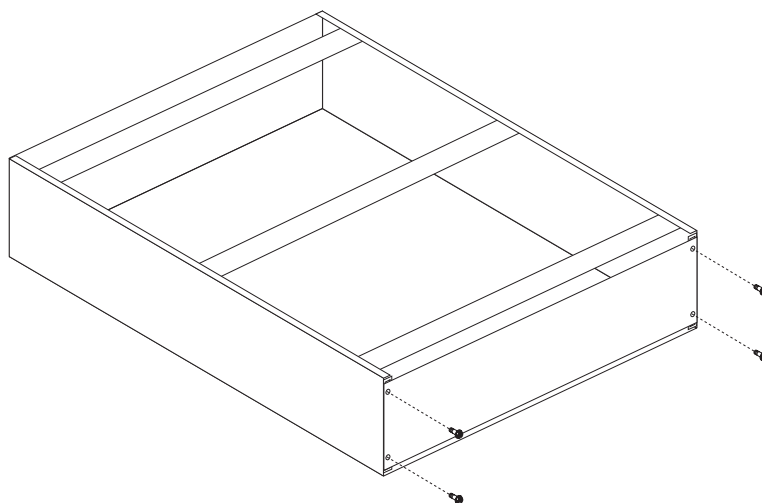
2. After you remove the rear panel, do one of the following:

   - Install a device on rails in the NetBAY3. (Go to "Installing
     Devices on Side Rails" on page 432.)

   - Install a cantilevered device in the NetBAY3. (Go to
     "Installing Cantilevered Devices" on page 436.)

   - Install a device on the NetBAY3 base plate. (Go to
     "Installing Devices on the NetBAY3 Base Plate" on
     page 437.)

Installing Devices on Side Rails

Installing devices that sit on side rails in a NetBAY3 is similar to installing these devices in a rack enclosure. The device side rails must be screwed to the NetBAY3 vertical mounting rails. Follow the instructions in the documentation that comes with the device and use the following illustrations as a guide.

If you need to remove or move the cage nuts at the rear of the NetBAY3 to hold the rails, go to "Removing Cage Nuts" on page 434.
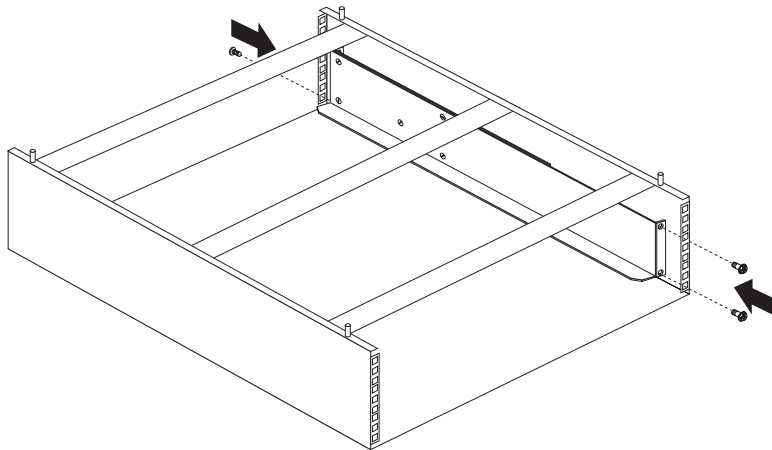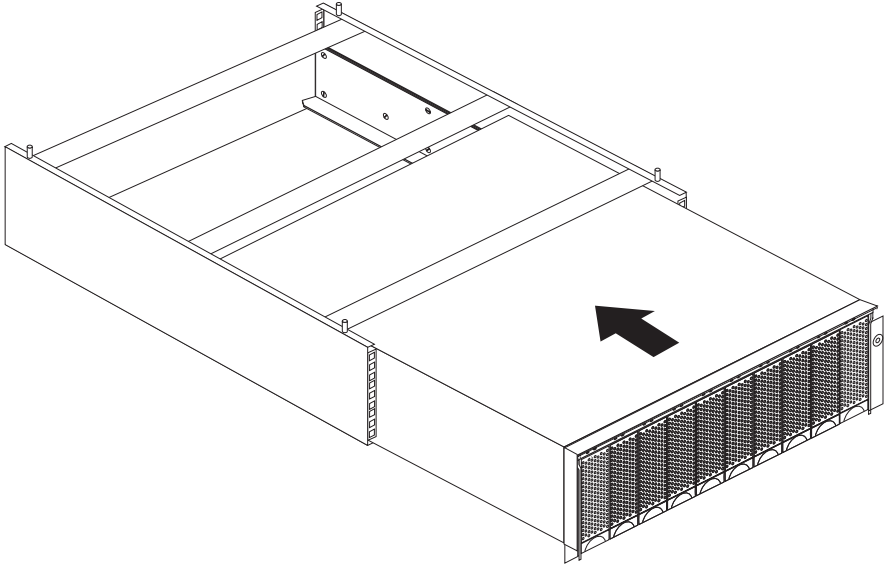
Removing Cage Nuts

Device installation might require the removal or moving of the rear-pane cage nuts. If you need to move the cage nuts, follow this procedure to move them and then go to "Installing Cage Nuts" on page 435 to install them in the correct position.

1. Hold the cage nut in place and compress the cage-nut clip with a flat screwdriver blade.
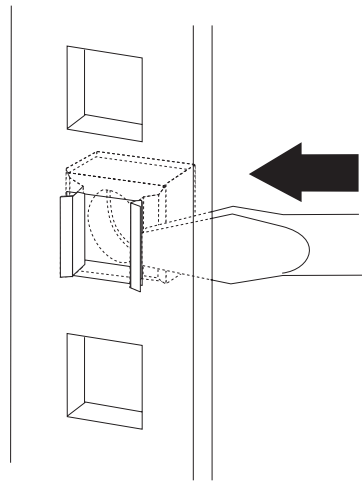
2. With the cage nut-clip compressed, push the cage nut-clip out of the square hole.

3. Release the screwdriver pressure on the clip. The cage nut is now loose and can be removed from the square hole.

Installing Cage Nuts

The nuts go toward the inside of the NetBAY3. Make sure you install all the cage nuts at the same level on the mounting rails.

1. Hook one side of the cage-nut clip into the rack-mounting-rail square hole.

2. Hold the cage nut in place and compress the cage-nut clip with a flat screwdriver blade.

3. With the cage-nut clip compressed, push the cage-nut clip into the square hole.

4. Release the screwdriver pressure on the clip. The cage nut is now locked in the square hole.
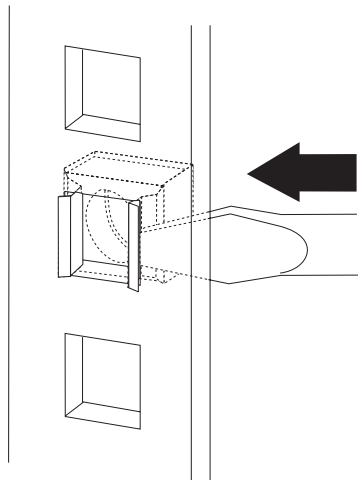
Installing Cantilevered Devices

Installing cantilevered devices in a NetBAY3 is similar to installing these devices in a rack enclosure. Cantilevered devices can be installed in the front or rear of the NetBAY3. The devices must be screwed to the NetBAY3 vertical mounting rails. Follow the instructions in the documentation that comes with the device and use the following figure as a guide.
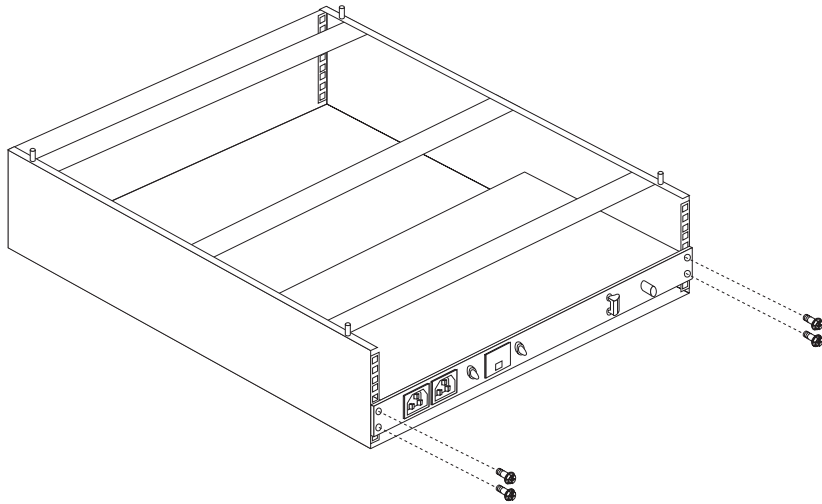
Installing Devices on the NetBAY3 Base Plate

Some devices rest on the NetBAY3 base plate. These devices must be screwed to the NetBAY3 vertical mounting rails.
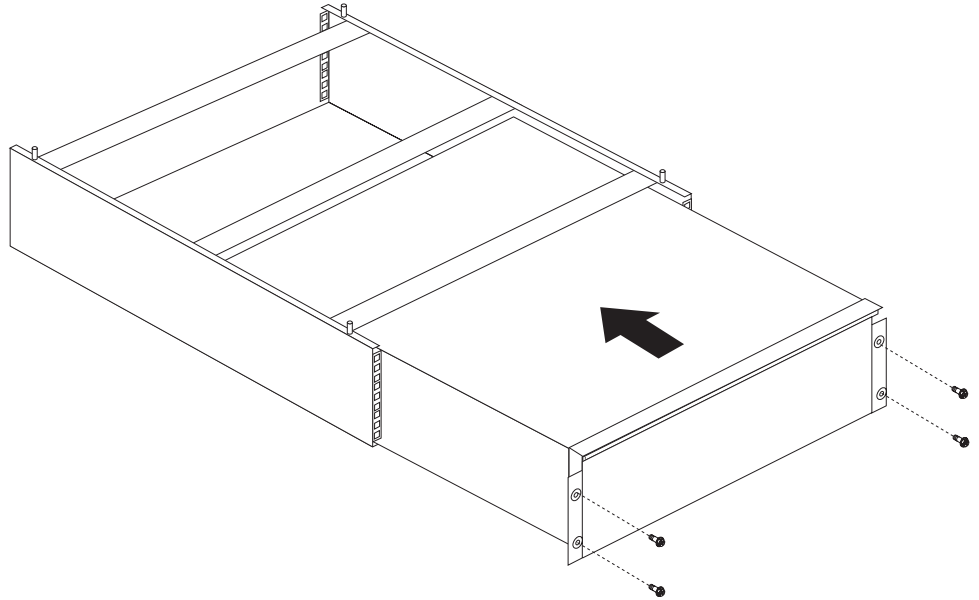
Installing Devices on the NetBAY3 Base Plate

Appendix B. Year-2000-Ready, I2O-Ready, S3 Video Modes

This appendix contains the Year 2000-ready statement, the I2O-ready statement, and information about unsupported S3 video modes.

Year-2000-Ready Statement

The Netfinity 5500 system BIOS is Year-2000 ready. It contains a century checking and maintenance feature (INT hex 1A; Get Date, Set Date, Get Time, Set Time) that reads and updates the century byte automatically. This feature enables the operating system and applications using the BIOS date/time services to reliably manipulate the year as a four-digit value. However, an application that bypasses the BIOS INT hex 1A service also bypasses the century checking and maintenance features; this might result in an error when reading the century byte. To prevent possible problems, either restart the system or enter the new date and time on or after January 1, 2000 for the update to occur. Reading the date will not cause the update to occur.

I2O-Ready Statement

The Netfinity 5500 is intended to support I2O deep adapters as listed in the Server Proven program. A deep adapter is a PCI card that has an embedded IOP (input/output processor). For the deep adapter to function correctly, the following items are needed:

- An operating system vendor-provided OSM (operating system service module) that supports the class of adapter (such as, storage) that is being installed in the server.

- A PCI card vendor-provided HDM (hardware device module).

Unsupported S3 Video Modes

The S3 VGA BIOS does not directly support display modes hex 1F and hex 10 (15 and 16). When using DOS or and OS/2 DOS session in the modes, the last two lines of text will be unviewable. The 8X14TSR.EXE program is available on the Netfinity World Wide Web site to restore full visibility for DOS applications requiring these modes.

Appendix C. Product Warranties and Notices

This appendix contains warranty and emission notices for the United States, Puerto Rico, Canada, and the United Kingdom. In addition, this appendix contains trademarks and general-information notices.

This appendix contains:

Warranty Statements

United States, Puerto Rico, and Canada

The following is the statement of limited warranty for the United States, Canada, and Puerto Rico.

International Business Machines Corporation   Armonk, New York, 10504

Statement of Limited Warranty

The warranties provided by IBM in this Statement of Limited Warranty apply only to Machines you originally purchase for your use, and not for resale, from IBM or your reseller. The term "Machine" means an IBM machine, its features, conversions, upgrades, elements, or accessories, or any combination of them. Unless IBM specifies otherwise, the following warranties apply only in the country where you acquire the Machine. If you have any questions, contact IBM or your reseller.

Machine: IBM Netfinity 5500

Warranty Period*: Three Years

*Contact your place of purchase for warranty service information.

Production Status

Each Machine is manufactured from new parts, or new and used parts. In some cases, the Machine may not be new and may have been previously installed. Regardless of the Machine's production status, IBM's warranty terms apply.

The IBM Warranty for Machines

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

During the warranty period IBM or your reseller, if authorized by IBM, will provide warranty service under the type of service designated for the Machine and will manage and install engineering changes that apply to the Machine.

For IBM or your reseller to provide warranty service for a feature, conversion, or upgrade, IBM or your reseller may require that the Machine on which it is installed be 1) for certain Machines, the designated, serial-numbered Machine and 2) at an engineering-change level compatible with the feature, conversion, or upgrade. Many of these transactions involve the removal of parts and their return to IBM. You represent that all removed parts are genuine and unaltered. A part that replaces a removed part will assume the warranty service status of the replaced part.

If a Machine does not function as warranted during the warranty period, IBM or your reseller will repair it or replace it with one that is at least functionally equivalent, without charge. The replacement may not be new, but will be in good working order. If IBM or your reseller is unable to repair or replace the Machine, you may return it to your place of purchase and your money will be refunded.

If you transfer a Machine to another user, warranty service is available to that user for the remainder of the warranty period. You should give your proof of purchase and this Statement to that user. However, for Machines which have a life-time warranty, this warranty is not transferable.

Warranty Service
To obtain warranty service for the Machine, you should contact your reseller or call IBM. In the United States, call IBM at **1**-**800**-**772**-**2227**. In Canada, call IBM at **1**-**800**-**565**-**3344**. You may be required to present proof of purchase.

IBM or your reseller will provide certain types of repair and exchange service, either at your location or at IBM's or your reseller's service center, to restore a Machine to good working order.

When a type of service involves the exchange of a Machine or part, the item IBM or your reseller replaces becomes its property and the replacement becomes yours. You represent that all removed items are genuine and unaltered. The replacement may not be new, but will be in good working order and at least functionally equivalent to the item replaced. The replacement assumes the warranty service status of the replaced item. Before IBM or your reseller exchanges a Machine or part, you agree to remove all features, parts, options, alterations, and attachments not under warranty service. You also agree to ensure that the Machine is free of any legal obligations or restrictions that prevent its exchange.

You agree to:

1. obtain authorization from the owner to have IBM or your reseller service a Machine that you do not own; and
2. where applicable, before service is provided —
   a. follow the problem determination, problem analysis, and service request procedures that IBM or your reseller provide,
   b. secure all programs, data, and funds contained in a Machine, and
   c. inform IBM or your reseller of changes in a Machine's location.

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

Extent of Warranty
IBM does not warrant uninterrupted or error-free operation of a Machine.

The warranties may be voided by misuse, accident, modification, unsuitable physical or operating environment, improper maintenance by you, removal or alteration of Machine or parts identification labels, or failure caused by a product for which IBM is not responsible.

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

1. damages for bodily injury (including death) and damage to real property and tangible personal property; and
2. the amount of any other actual direct damages or loss, up to the greater of U.S. $100,000 or the charges (if recurring, 12 months' charges apply) for the Machine that is the subject of the claim.

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

United Kingdom

This section contains warranty notices for the United Kingdom.

IBM warrants this IBM product to be in good working order and conforms to its officially published IBM specifications for a period of three years from the date of first purchase by an end-user customer.

Note: Batteries for Mobile products are limited to 1 year warranty.

Your sales receipt or authorised dated and stamped warranty service certificate is proof of your entitlement to warranty service.

If this product is not in good working order, IBM will, at its option, repair or replace this product at no additional charge except as set forth below. Repair parts and replacement products will be provided on an exchange basis and will be either new, equivalent to new or reconditioned. All replaced parts and products become the property of IBM. This warranty does not cover the repair of damage to the product resulting from:

- Accident, disaster, misuse and abuse

- Use of parts not manufactured or sold by IBM

- Modification of the product

- Service provided by anyone other than IBM or an authorised IBM service provider.

IBM does not warrant that the functions in any preloaded program will meet your requirements or that the operations of the preloaded program will be uninterrupted or error free.

There is no other warranty whether express or implied. In case the exclusion of certain warranties would be precluded by applicable law, such warranties would be limited in duration to the warranty period stated above.

Warranty Performance
Warranty service may be obtained by returning the product during warranty period to an authorised IBM service provider and by providing proof of your warranty service entitlement. You are responsible for any associated transportation charges and insurance during shipment and return.

For a product purchased in a group A country (as defined), warranty service may be obtained from any authorised IBM service provider in any group A country; similarly for a product purchased in a group B country, warranty service may be obtained from any authorised IBM service provider in any group B country.

Group A Countries

Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland Italy, Ireland, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

Group B Countries

Albania, Bosnia-Herzegovina, Bulgaria, Croatia, Czechia, Russia, Armenia, Bellarus, Georgia, Kirghizia, Hungary, Kazakhstan, Macedonia, Moldova, Poland, Romania, Slovakia, Serbia-Montenegro, Slovenia, Ukraine.

On-Site Service

Some IBM products are sold with a service entitlement which is delivered on the customers premises (on-site). If the product you have purchased carries with it an entitlement to IBM on-site service, this service is provided during the warranty period subject to the following terms and conditions:

- The product must have been announced as qualifying for On-Site Service in the country in which Warranty Service is being claimed.

- You must contact a local authorised IBM service provider and be prepared to supply proof of warranty entitlement. The authorised IBM service provider will attempt to resolve your problem over the telephone. If this is not possible, a trained service engineer will be dispatched to your location to repair the IBM product.

- The service representative must be provided with full access to the equipment reported as faulty.

- The equipment must be located within 50 kilometers (or more depending on country) of the authorised IBM service provider.

Liability

IBM shall have no liability for lost profits or other consequential damages, even if advised of the possibility of such damages, or for any claim by any third party. IBM's total liability for a breach or breaches of this warranty by IBM is limited to 100,000 US Dollars of direct damages. This financial limitation of liability will not apply

to claims for death or personal injury or damage to real or personal property caused by IBM negligence.

General
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Notice to Customers

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

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

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13F9997	Denmark
14F0015	Bangladesh, Burma, Pakistan, South Africa, Sri Lanka
14F0033	Antigua, Bahrain, Brunei, Channel Islands, Cyprus, Dubai, Fiji, Ghana, Hong Kong, India, Iraq, Ireland, Kenya, Kuwait, Malawi, Malaysia, Malta, Nepal, Nigeria, Polynesia, Qatar, Sierra Leone, Singapore, Tanzania, Uganda, United Kingdom, Yemen, Zambia
14F0051	Liechtenstein, Switzerland
14F0069	Chile, Ethiopia, Italy, Libya, Somalia
14F0087	Israel
1838574	Thailand
62X1045	Bahamas, Barbados, Bermuda, Bolivia, Brazil, Canada, Cayman Islands, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Guatemala, Guyana, Haiti, Honduras, Jamaica, Japan, Korea (South), Liberia, Mexico, Netherlands Antilles, Nicaragua, Panama, Peru, Philippines, Saudi Arabia, Suriname, Taiwan, Trinidad (West Indies), United States of America, Venezuela

This glossary includes terms and definitions from the following publications.

The *American National Dictionary for Information Systems*, ANSI X3.172-1990, copyright 1990 by the American National Standards Institute (ANSI). Copies may be purchased from the American National Standards Institute, 11 West 42 Street, New York, NY 10036. Definitions are identified by the symbol (A).

The ANSI/EIA Standard 440-A: *Fiber Optic Terminology*. Copies may be purchased from the Electronic Industries Association, 2001 Pennsylvania Avenue, N.W., Washington DC 20006. Definitions are identified by the symbol (E).

The *Information Technology Vocabulary*, developed by Subcommittee 1, Joint Technical Committee 1, of the International Organization for Standardization and the International Electrotechnical Commission (ISO/IEC JTC1/SC1). These definitions are identified by the symbol (I). Definitions from draft international standards, committee drafts, and working papers being developed by ISO/IEC JTC1/SC1 are identified by the symbol (T), indicating that final agreement has not yet been reached among the participating National Bodies of SC1.

A

ACPI. Advanced configuration and power management interface.

adapter. A printed circuit board that modifies the system unit to allow it to operate in a particular way.

address. (1) A value that identifies a register or a particular part of storage. The value is represented by one or more characters. (2) The location in the storage of a computer where data is stored. (3) To refer to a specific storage location by specifying the value that identifies the location.

analog. (1) Pertaining to data consisting of continuously variable physical quantities. (T) (2) Contrast with digital, discrete.

ANSI. American National Standards Institute. An organization consisting of producers, consumers, and general interest groups, that establishes the procedures by which accredited organizations create and maintain voluntary industry standards in the United States.

application. The use to which an information processing system is put; for example, a payroll application, an airline reservation application, a network application.

application program. (1) A program that is specific to the solution of an application problem.

Synonymous with application software. (T) (2) A program written for or by a user that applies to the user's work, such as a program that does inventory control or payroll. (3) A program used to connect and communicate with stations on a network, enabling users to perform application-oriented activities.

architecture. See computer architecture.

ASCII. American National Standard Code for Information Interchange.

AWG. American Wire Gauge.

B

backplane. In personal computers, a printed circuit board that sets the SCSI ID and termination for hot-swap hard disk drives.

back up. To copy information, usually to diskette or tape, for safekeeping.

backup. Pertaining to a system, device, file, or facility that can be used in the event of a malfunction or loss of data.

bank. An aggregation of similar devices, such as single inline memory modules, connected to each other and used cooperatively.

baud rate. In remote communications, the transmission rate that is synonymous with signal events. The baud rate is usually expressed in bits per second.

BBS. Bulletin board system.

BIOS (Basic Input/Output System). Code that controls basic hardware operations such as interactions with diskette drives, hard disk drives, and the keyboard.

bit. Either of the digits 0 or 1 when used in the binary numeration system. Synonymous with binary digit. (T)

buffer. (1) A routine or storage used to compensate for a difference in rate of flow of data, or time of occurrence of events, when transferring data from one device to another. (A) (2) A portion of storage used to hold input or output data temporarily.

bus. One or more conductors used for transmitting signals, data, or power. See also address bus and data bus.

bus master. A device or subsystem that controls data transfers between itself and a subordinate.

byte. A string that consists of a number of bits, usually 8, that are treated as a unit and represent a character.

C

cable. The physical medium for transmitting signals; it includes copper conductors and optical fibers.

cache. A buffer storage that contains frequently accessed instructions and data; it is used to reduce access time.

CD-ROM. Compact disc read only memory. High-capacity read-only memory in the form of an optically read compact disc. See also CD.

client. A functional unit that receives shared services from a server. (T)

clock. A device that generates periodic, accurately spaced signals used for purposes such as timing, regulation of the operations of a processor, or generation of interrupts. (T)

code. A collection of instructions that is in a form that can be read and processed by a computer.

compatibility. The capability of a hardware or software component to conform to the interface requirements of a given computer without adversely affecting its functions.

configuration. The manner in which the hardware and software of an information processing system are organized and interconnected. (T)

configure. To set up a computer for operation by describing to the system the devices, optional features, and programs installed in the computer.

connector. An electrical part used to join two or more other electrical parts. (Contrast with port.)

control. The determination of the time and order in which the parts of a computer and the devices that contain those parts perform the input, processing, storage, and output functions.

controller. A device that coordinates and controls the operation of one or more input/output devices, such as workstations, and synchronizes the operation of such devices with the operation of the system as a whole.

cycle. (1) An interval of space or time in which one set of events or phenomena is completed. (A) (2) A complete vibration, electric oscillation, or alternation of current.

D

DASD. Direct access storage device.

data. (1) A re-interpretable representation of information in a formalized manner suitable for communication, interpretation, or processing. Operations can be performed upon data by humans or by automatic means. (T) (2) Any

representations such as characters or analog quantities to which meaning is or might be assigned. (A)

device. A mechanical, electrical, or electronic piece of equipment designed to serve a special purpose or perform a special function.

device driver. A file that contains the code needed to use an attached device.

diagnostic. Pertaining to the detection and isolation of errors in programs and faults in equipment.

digital. (1) Pertaining to data in the form of digits. (A) (2) Contrast with analog.

DIMM. Dual inline memory module.

direct access storage device (DASD). A nonvolatile-storage device, such as a diskette drive, hard disk drive, or CD-ROM drive, in which access time is effectively independent of the location of the data on the storage medium.

direct memory access (DMA). The transfer of data between memory and input/output devices without microprocessor intervention.

disk array. Two or more hard disks interconnected to increase security, performance, or reliability.

diskette. A small magnetic disk enclosed in a jacket. (T)

diskette drive. The mechanism used to seek, read, and write data on diskettes. It can be installed in, or attached to, a computer.

display. A component capable of displaying information on a viewing surface; for example, a cathode ray tube or a gas panel.

DMA. Direct memory access.

E

ECC. Error correcting code.

ECP. Extended Capability Port

EEPROM. Electrically erasable programmable read-only memory.

EISA. Extended industry standard architecture.

electrically erasable programmable read-only memory (EEPROM). EPROM that can be reprogrammed while it is in the computer.

EPP. Enhanced Parallel Port

extended industry standard architecture (EISA). An expansion bus architecture used in a network server that provides compatibility among hardware components.

F

file.   A named set of records stored or processed as a unit. (T)

flash memory.   See electrically erasable programmable read-only memory (EEPROM).

frame.   (1) A data structure that consists of fields, predetermined by a protocol, for the transmission of user data and control data. The composition of a frame, especially the number and types of fields, may vary according to the type of protocol. (T)

G

GB.   Gigabyte.

gigabyte.   (1) For processor storage and real and virtual memory, 2^{30} or 1 073 741 824 bytes. (2) For disk storage capacity, 1 000 000 KB. (3) For transmission rates, 1 000 000 000 bytes.

H

hard disk.   A rigid magnetic disk such as the internal disks used in the system units of personal-computer systems and in external hard disk drives.

hard disk drive.   A disk drive that reads and writes data on rigid disks and can be installed in or connected to a computer.

hardware.   (1) All or part of the physical components of an information processing system, such as computers or peripheral devices. (T) (2) The equipment, as opposed to the programming, of a computer. (3) Contrast with software.

hot add.   Refers to a hardware component that can be installed without disturbing the operation of any other resource which is not connected to, or dependant upon, this component.

hot plug.   Refers to a hardware component that can be installed or removed without disturbing the operation of any other resource which is not connected to, or dependant on, this component.

hot swap.   (1) A hard disk subsystem feature of servers and storage enclosures that enables you to remove and replace hard disk drives without turning off the system. (2) To replace a hard disk drive while the system is turned on.

I

input/output.   Pertaining to a device, process, or channel involved in data input, data output, or both.

instruction.   A statement that specifies an operation to be performed by a microprocessor, and that identifies data involved in the operation.

I/O.   Input/output.

IRQ.   Interrupt request.

ISA.   Industry standard architecture

J

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

L

LED.   Light-emitting diode.

load.   To bring all or part of a computer program into memory from auxiliary storage so that the computer can run the program.

logical.   (1) Pertaining to content or meaning as opposed to location or actual implementation. (A) (2) Pertaining to a view or description of data that does not depend on the characteristics of the computer system or the physical storage. (A) (3) Contrast with physical. (A)

LUN.   Logical unit number.

M

math coprocessor.   In personal-computer systems, a microprocessor that supplements the operations of the system microprocessor, enabling the computer to perform complex mathematical operations in parallel with other operations.

MB.   Megabyte

megabyte.   (1) For processor storage and real and virtual memory, 2^{20} or 1 048 576 bytes. (2) For disk storage capacity and transmission rates, 1 000 000 bytes.

memory.   Addressable storage space in the computer that is used for temporary storage of instructions and data while a program is running, or for permanent storage of microcode. Contrast with auxiliary storage.

menu.   A list of options displayed to the user by a data processing system, from which the user can select an action to be initiated. (T)

microprocessor.   A processor whose elements have been miniaturized into one or a few integrated circuits. (T)

modem (modulator/demodulator). (1) A functional unit that modulates and demodulates signals. One of the functions of a modem is to enable digital data to be transmitted over analog transmission facilities. (T) (A) (2) A device that converts digital data from a computer to an analog signal that can be transmitted on a telecommunication line, and converts the analog signal received to data for the computer.

N

nanosecond (ns).   One thousand millionth (10^{-9}) of a second.

network.   (1) An arrangement of nodes and connecting branches. (T) (2) A configuration of data processing devices and software connected for information interchange.

nonvolatile.   (1) Pertaining to a storage device whose contents are not lost when power is cut off. (T) (2) Contrast with volatile.

ns.   Nanosecond.

O

OBI.   Options by IBM.

operating system.   Software that controls the execution of programs and that may provide services such as resource allocation, scheduling, input/output control, and data management. Although operating systems are predominantly software, partial hardware implementations are possible. (T)

P

pack.   Two or more hard disks interconnected to increase security, performance, or reliability. Commonly referred to as a disk array.

packet.   In data communication, a sequence of binary digits, including data and control signals, that is transmitted and switched as a composite whole. The data, control signals, and possibly error control information are arranged in a specific format. (I)

parallel port.   An access point through which a computer transmits or receives data that consists of several bits sent simultaneously on separate wires. Contrast with serial port.

PCI.   Peripheral component interconnect.

performance.   One of the two major factors, together with facility, on which the total productivity of a system depends. Performance is largely determined by a combination of throughput, response time, and availability.

PFA.   Predictive Failure Analysis

physical.   (1) Pertaining to actual implementation or location as opposed to conceptual content or meaning. (A) (2) Contrast with logical. (A)

pin.   One of the conducting contacts of an electrical connector.

port.   An access point for data entry or exit. (Contrast with connector.)

POST.   Power-on self-test.

power-on self-test (POST).   A series of diagnostic tests that are run

automatically by a device when the power is turned on.

processing. The performance of logical operations and calculations on data, including temporary retention of data in microprocessor storage while the data is being operated on.

processor. A functional unit that interprets and executes instructions. A processor consists of at least an instruction control unit and an arithmetic and logic unit. (T) See microprocessor and central processing unit.

program. (1) A sequence of instructions that a computer can interpret and execute. (2) To design, write, modify, and test computer programs. (I) (A)

prompt. A visual or audible message sent by a program to request the user's response. (T)

R

RAID. Redundant array of independent disks.

RAM. Random access memory.

random access memory (RAM). (1) A storage device in which data can be written and read. (2) A storage device into which data is written and from which data is read in a nonsequential manner.

RAS. Reliability, availability, and serviceability.

read. To acquire or interpret data from a storage device, from a data medium, or from another source.

read-only memory (ROM). Memory in which stored data cannot be modified by the user except under special conditions. See also EEPROM, EPROM, and PROM.

record. (1) A set of data treated as a unit. (2) A set of one or more related data items grouped for processing.

refresh. (1) To recharge a memory location in volatile memory with an electric current so that it retains a state or binary value. (2) In computer graphics, the process of repeatedly producing a display image on a display surface so that the image remains visible.

register. (1) An integrated circuit that contains 8, 16, or 32 storage locations, each of which can store 1 bit of binary data. See also binary. (2) An area that stores binary data while it is being processed by the computer.

repeater. A device used to amplify or reshape signals.

resolution. In video monitors, a measure of the sharpness of an image, expressed as the number of lines and columns on the monitor screen or the number of pels per unit of area.

ROM. Read-only memory.

S

SCSI. Small computer system interface.

segment. A section of cable between components or devices. A segment may consist of a single patch cable, several patch cables that are connected, or a combination of building cable and patch cables that are connected.

serial port. An access point through which a computer transmits or receives data, one bit at a time. Contrast with parallel port.

server. (1) A functional unit that provides shared services to workstations over a network. (2) In a network, a data station that provides facilities to other stations.

slot. (1) A position in a device used for removable storage media. (2) One of several receptacles in the rear panel of the system unit into which a user can install an adapter.

small computer system interface (SCSI). A standard input/output interface used by personal computers.

SMI. Systems management interrupt.

SMP. symmetric multiprocessing.

socket. A receptacle for a microchip.

software. (1) All or part of the programs, procedures, rules, and associated documentation of a computer. Software is an intellectual creation that is independent of the medium on which it is recorded. (2) Contrast with hardware.

SPP. Standard Parallel Port

startup sequence. In personal computers, the order that the computer uses to search the direct access storage devices for an operating system.

storage. A functional unit into which data can be placed, in which it can be retained, and from which it can be retrieved.

striping. In a disk array, the process of storing data across all the disks assigned to an array.

subsystem. In computers, a secondary or subordinate system, usually capable of operating independently of a controlling system, and usually having a single purpose, such as displaying video or reading from and writing to hard disks. A subsystem can be integrated into the system board or on an adapter.

SVGA. Super video graphics array.

symmetric multiprocessing. In personal-computer systems, a multiprocessing design that enables two or more microprocessors to run concurrently and work independently, with each

microprocessor capable of
performing any task.

system board. In a system unit, the
main circuit board that supports a
variety of basic system devices, such
as a keyboard or a mouse, and
provides other basic system
functions.

system unit. In personal-computer
systems, the part of the computer
that contains the processor circuitry,
read-only memory (ROM), random
access memory (RAM), and the I/O
channel.

T

transaction. An exchange between
a workstation and another device
that accomplishes a particular action
or result.

transmit. To send information from
one place for reception elsewhere.
(A)

U

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

USB. Universal serial bus.

utility program. (1) A computer
program in general support of
computer processes; for example, a
diagnostic program, a trace
program, a sort program. (2) A
program designed to perform an
everyday task such as copying data
from one storage device to another.

V

VFD. Vacuum fluorescent display.

VPD. Vital product data.

VRM. Voltage regulator module.

W

workstation. (1) A functional unit
at which a user works. A
workstation often has some
processing capability. (2) A
terminal or microcomputer, usually
one that is connected to a
mainframe or to a network, at
which a user can perform
applications.

write. To make a permanent or
transient recording of data in a
storage device or on a data medium.

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